E-government Adoption in Romania

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Abstract—The Romanian government has been making significant attempts to make its services and information available on the Internet. According to the UN e-government survey conducted in 2008, Romania comes under mid range countries by utilization of e-government (percent of utilization 41%). Romania's national portal www.e-guvernare.ro aims at progressively making all services and information accessible through the portal. However, the success of these efforts depends, to a great extent, on how well the targeted users for such services, citizens in general, make use of them. For this reason, the purpose of the presented study was to identify what factors could affect the citizens' adoption of e-government services. The study is an extension of the Technology Acceptance Model. The proposed model was validated using data collected from 481 citizens. The results provided substantial support for all proposed hypotheses and showed the significance of the extended constructs.

Keywords—e-government, citizen's adoption, Technology Acceptance model.

I. INTRODUCTION

IN the entire world, the modernization of public services through the adoption of information and communication technologies is in motion. There are, all around us, evidences of a universal shift toward modern online public services (e-services) and a dynamic e-business environment. This has caused governments and public sector organizations around the globe to take notice of this phenomenon, become aware of its potentials and consequently utilize them, thereby triggering investments into e-services. The resulting benefits can be diverse and long lasting such as, among others, less corruption, increased transparency, better delivery of government services to citizens, improved interactions with business and industry, greater convenience, citizen empowerment through access to information, growth of revenues, cost reductions, and more efficient government management.

However, the success of these efforts depends, to a great extent, on how well the targeted users for such services, citizens in general, make use of them. While e-government serves to present a single face for all types of visitors, service needs differ among government's many customers. For example, local residents might expect to find information on

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local or state government contacts, social services, educational institutions. Businesses might expect to find information on taxes, contracts, procurement, and requests for proposals. Visitors to the area might expect to find information on recreational activities, hotels, restaurants, and other businesses, as well as a calendar of local events. Others may be looking for employment opportunities, local ordinances, and other information. In order to achieve the needs of all types of users, the designers have to first understand the different requirements that users expect, and then relate these characteristics to the design features.

II. LITERATURE REVIEW

E-government services are provided using information and communication technologies. Consequently, theories on information technology adoption are relevant to understand the adoption of e-government. Generally, these theories take one of three possible approaches*:* a diffusion approach, an adoption approach or a domestication approach [20].

Adoption researchers typically describe and explain the acceptance decision of individual users applying different social theories of decision-making. In 1989, based on the Theory of Reasoned Action (TRA) [1], [2], Fred Davis developed the Technology Acceptance Model (TAM) to explain how users come to accept and use a technology [7]. The main elements of Davis's TAM model are "perceived usefulness" (the degree to which a person believes that using a particular system would enhance his or her job performance) and "perceived ease of use" (the degree to which a person believes that using a particular system would be free from effort).

Next, Venkatesh, Morris, Davis, and Davis [18] introduced an extension of TAM called Unified Theory of Acceptance and Use of Technology (UTAUT), which helps managers assess the likelihood of success for new technologies as well as understand the drivers of technology acceptance.

In the framework of the *diffusion approach* Everett Rogers' develops the theory of Diffusion Of Innovations (DOI) with the goal to analyze of the characteristics of technology adopters [14]. These characteristics include the relative advantage, complexity, image, visibility, compatibility, results demonstrability, and voluntariness of use of the innovation. Certain key constructs in innovation diffusion theory are analogous to the constructs in TAM (relative advantage is similar to perceived usefulness, complexity is similar to perceived ease of use).

Domestication researchers study the adoption, use and domestication of technology in society with a particular focus

on the societal consequences of technology domestication [17].

Based on these theories, a number of studies have investigated the adoption of e-government services.

Carter and Belanger [4], [5] investigated the effects of the relative advantage, compatibility, ease of use and image with regards to the citizen's intention to use e-government services. They adopted the theory of Diffusion Of Innovations and examined the most relevant factors that affect the intention of citizens in using e-government services. Findings from this study reveal that perceived ease of use, compatibility, and trustworthiness are important constructs when predicting intentions to use the state e-government services.

Wangpipatwong, Chutimaskul and Papasratorn [20] explored which factors influence the adoption of e-Government websites regarding information quality and system quality aspects. The findings showed that all explored characteristics of information quality significantly influence the adoption of e-Government websites. Accuracy, relevancy, and completeness were more significant than timeliness and precision. Efficiency was the most significant factor.

Choudrie and Dwivedi [6] examined the citizens' awareness and adoption of e-government initiatives in the United Kingdom. The findings revealed that citizens with home broadband access are more likely to be aware of and adopt e-government services. The study also found that the demographic characteristics of citizens such as the age, gender, education, and social class have an imperative role in explaining the citizen's awareness and adoption of e-government services in the household.

Dimitrova and Chen [8] examined the effects of socio-psychological factors on the adoption of e-government in the US by combining two theoretical perspectives, Technology Acceptance Model and Diffusion Of Innovations. The findings showed that perceived usefulness, perceived uncertainty and prior interest in government were associated with the adoption of e-government in the US.

While the literature review has identified a number of factors that determine the adoption of e-government services in countries all around the world, there isn't any study concerning the adoption of e-government services in Romania. So, the purpose of the presented research was to assess and test the factors that are related to e-government adoption in Romania.

III. E-GOVERNMENT IN ROMANIA

The Romanian government has been making significant attempts to develop a proper framework for the development of e-Government. Important steps were made in the development of the national e-Government infrastructure. An e-Government portal - www.e-guvernare.ro - was launched in September 2003, providing a one-stop shop to public services online, and incorporating a transactional platform enabling users to register for interactive and transactional services. Romania's national portal received in 2003 an achievement

award from the World Summit of the Information Society for its comprehensiveness and innovation and aims at progressively making all services and information accessible through the portal.

The fast-developing infrastructure makes it possible for the Romanian government to deliver a number of interactive and transactional services online, such as VAT declaration, a fully operational e-procurement platform, submission of statistical information, electronic payment of social security contributions and of local taxes, advanced job search facility and civil service recruitment platform.

The legislation concerning the protection of individuals with regard to the processing of personal data, processing of personal data and the protection of privacy in the telecommunications sector, the electronic signature, the cyber crime, the electronic commerce, e-procurement and e-tax are a few examples of EU-compatible legislation already in force.

According to the UN e-government survey conducted in 2008 [17], Romania comes under mid range countries by utilization of e-government (percent of utilization 41%). This proves that Romania needs to increase its efforts to encourage potential users to use the available online e-government services.The research model

IV. THE STUDY

In other to achieve the objective of the research - to explore the factors that determine the adoption of e-government services in Romania – we made an analysis to establish which theory is most suitable for the Romanian context. We had in view the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology.

TAM has been extensively used to analyze citizen's acceptance in various e-government researches. It is based on the belief that individual factors affecting the user's decision whether to accept or reject an e-government service can be identified and measured. TAM sees perceived ease of use and perceived usefulness as fundamental determinants of user acceptance. These two variables influence intention to use an e-government service, which, in turn, correlates with actual use. The model uses measurement scales for both ease of use and usefulness.

Although it has already been used in other e-government acceptance studies, UTAUT does not seemed to be easily adapted for our purposes. The model is best used to measure technology acceptance in companies. Two of its six variables rely heavily on the technology being introduced in an organization. Some of the criteria suggested to measure "social influence" include help of the senior management, and organizational support for the new technology. "Voluntariness of use" measures whether technology is compulsory in the job, to what extent it is required by the boss, or expected by supervisors.

Because many e-government services are designed to be used in the citizens' everyday life, we decided that the use of TAM to predict user acceptance in this field seems more

appropriate. When used in new fields of study, TAM often needs to be adapted or expanded to suit the characteristics of the specific service. According to Serenko and Bontis [15], the major advantage of TAM is that it can be extended by using domain-specific constructs when used with newer technologies.

So, the next step was to identify the user acceptance constructors for e-government. Defining acceptance constructors however is only the beginning of the TAM process. The next step involves developing multi-item scales to measure each constructor. Various stakeholders may require different criteria to measure each constructor, hence the need for a customized set of measures for e-government.

Based on the existing research literature, a list of e-government acceptance constructors was identified:

- perceived ease of use
- perceived usefulness
- perceived trust
- perceived quality
- demographic factors
- user satisfaction
- e-government adoption

Subsequently, specific criteria measuring each constructor were devised using:

- the authors' previous research, in which identified the features used to evaluate e-government systems;
- adaptation of some criteria used in the related studies
- analysis of features of other e-fields, including e-commerce.
- the results of some empirical studies on citizens' satisfaction in e-government

Table I presents criteria that can be used to measure the user acceptance constructors for e-government.

TABLE I
CRITERIA USED TO MEASURE THE USER ACCEPTANCE CONSTRUCTORS FOR E-GOVERNMENT

Constructor	Criteria
Perceived Ease of Use (PEU)	Usability
	Navigation
	Availability
	Readability
	Responsiveness
	Accesibility
	Helpfulness
Perceived Usefulness (PU)	Content
	Timeliness
	Accuracy
	Transparency
	Pricing
	Accountability
Perceived Trust (PT)	Trustworthiness
	Privacy
	Security
	Reliability
Perceived quality (PQ)	Information quality
	Service quality
User satisfaction (US)	Overall satisfaction
	Time spent using e-government services
Demographic factors (DF)	Gender
	Age

Constructor	Criteria
E-government adoption (EA)	Occupation
	Education
	Income
	Years of Internet use
	Willingness to use
	Intent to use
	Frequency of use

Based on the discussion above, the research model we propose is presented in Fig. 1.
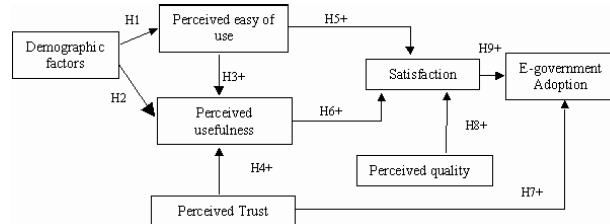

Fig. 1 The research model

Understanding the factors that cause the e-government adoption and acceptance would be of great value for the successful design, implementation and deployment of e-government services, so, in our study, we hypothesize that:

H1: The demographic factors have a significant effect on perceived easy of use of an e-government service

H2: The demographic factors have a significant effect on perceived usefulness of an e-government service

H3: Perceived ease of use of an e-government service will positively influence perceived usefulness of an e-government service

H4: High perceived trust on an e-government service will lead to increased perceived usefulness

H5: Perceived easy of use while using an e-government service has a positive effect on satisfaction

H6: Perceived usefulness while using an e-government service has a positive effect on satisfaction

H7: High perceived trust on an e-government service will lead to increased e-government adoption.

H8: Increased perceived quality will lead to increased satisfaction in e-government services.

H9: User's satisfaction has a positive effect on the adoption of an e-government service

V. METHODOLOGY

To test the research model for this study a survey was conducted. A questionnaire was designed to gather the necessary information. Each item in the model had a corresponding question. The questionnaire was composed of 30 questions, unambiguous and easy for respondents to complete. Davis's (1989) original measurement scales for perceived usefulness and perceived ease of use included seven levels. The seven-point scale was used by other researchers in their studies (Serenko & Bontis (2004), Lee et al. (2003)), so

the proposed model followed the convention since it has been validated in previous researches. Each item of the questionnaire was measured on a seven-point Likert scale with end points of "strongly agree" (7) and "strongly disagree" (1). The questionnaire was administered to 530 citizens in all Romanian districts. 507 responses were received. After eliminating incomplete responses, we selected 481 usable responses as the sample.

In order to confirm that sample group represents a population, we conducted the chi-square fitness validation. The result shows that sample group represents a population well (p=0.982 > 0.05).

Table II shows the profile of the demography of the respondents to the survey. The proportion of gender of participants is almost equal. Most of them are between 21−40 years of age (39.29%), have finished the high school (58.42%), work in the state sector (27.86%), have monthly income between 401 and 600 Euro (36.38%) and between 3 and 10 years of experience in Internet use (49.27%).

TABLE II
DEMOGRAPHIC PROFILE OF RESPONDENTS

Measure	Item	Frequency	Percentage
Gender	Male	243	50.52%
	Female	238	49.48%
Age	<20	84	17.46%
	21-40	189	39.29%
	41-60	177	36.80%
	>60	31	6.44%
Occupation	Private sector employee	122	25.36%
	State enterprise employee	134	27.86%
	Government employee	43	8.94%
	Students	65	13.51%
	Unemployed	19	3.95%
	Retiree	27	5.61%
	Others	71	14.76%
Education	Middle school or less	48	9.98%
	High school	281	58.42%
	College or more	152	31.60%
Income (per month)	< 200 Euro	73	15.18%
	201-400 Euro	121	25.16%
	401-600 Euro	175	36.38%
	601-1000 Euro	89	18.50%
	>1000 Euro	23	4.78%
Years of Internet use	<3 years	30	6.24%
	3-10 years	237	49.27%
	>10 years	214	44.49%

Citizens' experience with e-Government websites is illustrated in Table III. The most frequently mentioned experience is searching, inquiry, or complaint (86.07%), followed by downloading forms (60.7%). The percent of citizens that initiated an on line transaction with a public institution is very low (3.28%). 10.40% said that they had no experience with Internet.

TABLE III
CITIZENS' EXPERIENCE WITH E-GOVERNMENT WEBSITES

Experience	Frequency	Percent
Search/Inquire/Complain	414	86.07%
Download form	292	60.71%
Conduct on-line transaction	15	3.12%
No experience	50	10.40%

Before testing the model, we performed a validity and reliability analysis to verify how closely the measurement results met the objectives of this study.

Reliability is an assessment of the degree of consistency between multiple measurements of a variable. One type of diagnostic measure that is widely used and employed here is the Cronbach's alpha. The generally agreed upon lower limit for Cronbach's alpha is 0.70 [12]. The results of the reliability analysis are presented in Table IV. As the table shows, the reliability analysis gave alpha coefficients exceeding 0.70, which are regarded as acceptable reliability coefficients. Hence, the results demonstrate that the questionnaire is a reliable measurement instrument.

TABLE IV
RELIABILITY ANALYSIS

Construct (number of items)	Cronbach's Alpha
PEU (7)	0.739
PU (6)	0.821
PT (4)	0.823
PQ (2)	0.901
US (2)	0.842
DF (6)	0.879
EA (3)	0.815

A correlation analysis was then run based on each of these constructs, and the results are reported in Table V. As can be seen from the matrix, there is a significant relationship between the e-government adoption (EA) and the rest of constructs, although the relationship varies in strength from one construct to the next. Overall, the correlations provided confidence that the measures were functioning effectively.

TABLE V
CORRELATION OF CONSTRUCTS

Constructs	PEU	PU	PT	PQ	US	DF	EA
PEU	1						
PU	0.594	1					
PT	0.307	0.312	1				
PQ	0.322	0.419	0.453	1			
US	0.581	0.528	0.394	0.721	1		
DF	0.385	0.487	0.442	0.379	0.402	1	
EA	0.580	0.625	0.597	0.432	0.684	0.537	1

p<0.01

To test the hypotheses we conducted multiple regression analysis. In Table VI, we summarize the findings regarding the research hypotheses resulting from the above data analysis, where all nine hypotheses are supported, and Fig. 2 is a graphical depiction of the analysis results.

TABLE VI
HYPOTHESES RESULTS

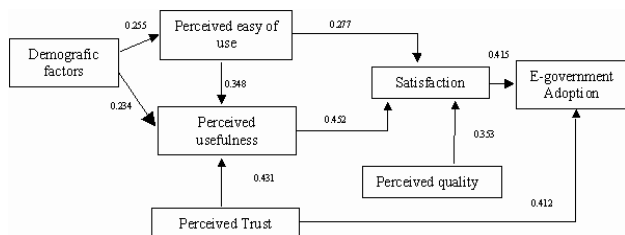| Hypotesis	Variable	Coef.	Significance	Supported
H1	DF	0.255	0.0094	YES
H2	DF	0.234	0.0078	YES
H3	PEU	0.348	0.0054	YES
H4	PT	0.431	0.0052	YES
H5	PEU	0.277	0.0034	YES
H6	PU	0.452	0.0023	YES
H7	PT	0.412	0.0037	YES
H8	PQ	0.353	0.0012	YES
H9	US	0.415	0.0049	YES

Fig. 2 Model testing results

VI. CONCLUSION

The analysis revealed that the citizen's higher perception of usefulness, ease of use, quality and trust of e-Government services directly enhanced the level of adoption of e-Government. For an effective adoption of the e-government services, widespread and attractive awareness campaigns should be conducted, targeting potential users properly to inform them about the real benefits they would be gained.

Before drawing definitive conclusion from these results, it is important to consider the study's limitations. The questionnaire approach is not free of subjectivity in the respondent and was taken at one point in time. User reactions change in time and may depend on the environment.

The objective of this study was to extend TAM to understand the potential user's adoption behavior of e-government. Such user acceptance model can be used by e-government services providers to predict the adoption of their new solutions. In the design stage such evaluations can be used to identify and address user requirements, and therefore shape a new service. Services already deployed may be improved. Information gathered in the survey can be used to better understand users' preferences, and the reasons for lack of acceptance of some e-government services. The scales will not only indicate which of the factors are fulfilled overall, but analysis of responses to each criterion may be useful to identify very specific areas of improvement. Moreover, it enables meaningful comparisons of various systems.

REFERENCES

[1] Ajzen, I and Fishbein, M.- "Understanding Attitudes and Predicting Social Behaviour", Prentice-Hall, Englewood Cliffs, 1980.
[2] Ajzen, I. – "The Theory of Planned Behaviour", Organisation Behaviour and Human Decision Processes, 1991, Vol. 50, Dec 2, pp 179-211.
[3] Benbasat I., Zmud R. W. – "Empirical research in information systems: the practice of relevance", MIS Quarterly,1999, no. 23, pp. 3–17.
[4] Carter, L., Belanger F. - "Diffusion of innovation & citizen adoption of e-government", The Fifth International Conference on Electronic Commerce (ICECR-5), Pittsburg, PA, 2003, pp.57-63.
[5] Carter, L., Belanger F.,-"The utilization of e-government services: citizen trust, innovation and acceptance factors" Information Systems Journal, (15:1), 2005, pp.5-25.
[6] Choudrie J., Dwivedi Y.K. – "A Survey of Citizens' Awareness and Adoption of E-Government Initiatives, the 'Government Gateway': A United Kingdom Perspective", In the proceedings of the E-Gov. 2005 workshop, Brunel University, London, UK
[7] Davis F.: - "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology", MIS Quarterly, Vol. 13, 1989, pp. 318-341
[8] Dimitrova, D.V., Chen Y.C.,- "Profiling the adopters of e-government information and services: the influence of psychological characteristics, civic mindedness, and information channels", Social Science Computer Review, (24:2), 2006, pp.172-188.
[9] Hu P. J., Chau P. Y. K., Sheng O. R. L., Tam Y. K. – "Examining the technology acceptance model using physician acceptance of telemedicine technology", Journal of Management Information Systems, 1999, no. 16, pp. 91–112.
[10] Lee, J., Cho, H., Gay, G., Davidson, B. & Ingraffea, A., - Technology Acceptance and Social Networking in Distance Learning. Educational Technology & Society, 2003, 6(2), 50-61
[11] Mahajan, V., Muller, E., Bass, F – "New product diffusion models in marketing: A Review and Directions for Research", Journal of Marketing, January 1990, Vol. 54. pp. 1 – 26.
[12] Nunnaly, J. – "Psychometric theory", New York: McGraw-Hill, 1978
[13] Phang, C. W., Li Y., Sutanto J., Kankanhalli A. - "Senior citizens adoption of e-government: in quest of the antecedents of perceived usefulness" 38th Hawaii International Conference on System Sciences, 2005.
[14] Rogers, E M – "Diffusion of innovations: 4th edition", 1995, New York: Free Press, 518pp
[15] Serenko, A., & Bontis, N. - "A Model of User Adoption of Mobile Portals", Journal of Electronic Commerce, 4, 1, 69-98, 2004
[16] Townsend, A.M. – "Life in the real – mobile telephones and urban metabolism", Journal of Urban Technology, 2000, no. 7, 85-104.
[17] United Nation – "United Nations e-Government Survey 2008 - From e-Government to Connected Governance", New York, 2008
[18] Venkatesh, V., Morris M., Davis G., Davis F. – "User Acceptance of Information Technology: Toward a Unified View", MIS Quarterly, Vol. 27, 2003, pp. 425-479
[19] Vigayan, P., Perumal, V., and Shanmugam, B. 2005 – "Multimedia Bank and Technology Acceptance Theories", Journal of Internet Banking and Commerce, vol. 10. no.1
[20] Wangpipatwong S., Chutimaskul W. and.Papasratorn B. A Pilot Study of Factors Affecting the Adoption of Thai eGovernment Websites. Proceedings of the International Workshop on Applied Information Technology 2005, Bangkok, Thailand, pp. 15-21, November 25-26, 2005.