

A study to determine influential factors on data security

Naser Azad*, Neda Abbasi and Seyed Foad Zarifi

Department of Management, Islamic Azad University, South Tehran Branch, Tehran, Iran

CHRONICLE

ABSTRACT

Article history:

Received September 15, 2012

Accepted August 5, 2013

Available online

August 7, 2013

Keywords:

Data security

Factor analysis

Municipality

During the past few years, there has been increasing interest in making online transaction. As people become more interested in using internet for their daily business activities such as regular communications, financial transactions, etc., there will be more concerns on security of available data. In fact, data security is the primary concern in today's online activities. This paper performs an empirical investigation to find important factors influencing data security in Municipality is city of Tehran, Iran. The survey uses factor analysis to find important factors using a questionnaire consist of 29 variables, which were reduced to 22 questions after considering skewness statistics. Cronbach alpha is calculated as 0.86, which validates the questionnaire. The survey detects six factors influencing feasibility study, organizational learning, management strategy, enterprise resource management, process approach and the acceptance.

© 2014 Growing Science Ltd. All rights reserved.

1. Introduction

The new millennium started with tremendous changes on business models due to recent advances of information technology (Niehaves, 2011; Janowski et al., 2012). People now are able to make a purchase order on different goods and services by simply clicking a bottom on their computer at home without bothering to go out. They may even file their income tax using the internet facilities (Terpsiadou & Economides, 2009). This makes it easy to save time and money for end users since there is no need to walk out of house for no good reason. However, one important concern is to make sure the data are transmitted, properly and securely. Any e-government that uses easy access and friendly web based system to offer services could significantly save people's time and energy. Bureaucratic institutions not only provide tools to coordinate work activities in the public sector, but also serve to enforce the democratic values of equality and impartiality.

* Corresponding author.

E-mail addresses: dr.naserazad@yahoo.com (N. Azad)

Cordella (2007) explored how recent techniques to e-government ignore these necessary dimensions of bureaucracy and proposed an alternative approach to e-government. The e-bureaucratic form has been proposed as an e-government solution, which, help to enforce the values of equality and impartiality underpinned through the necessary actions emanating from bureaucratic structures. Cordella and Iannacci (2010) investigated the logics embedded in the design of new technology and extant political interests and values inscribed in e-government policies. Kardan and Sadeghiani (2011) implemented a longitudinal investigation at two points in time to evaluate the path from e-government to e-democracy based on two different methods of a systematic evaluation based on a checklist and a questionnaire survey. Zissis and Lekkas (2011) explored increasing participation and sophistication of electronic government services, through using a cloud computing architecture.

Dawes (2009) presented a conceptual framework for learning the future, drawn from a stakeholder-driven investigation into potential scenarios of society and government. The framework presents a dynamic socio-technical system encompassing interactions among societal trends, human elements, changing technology, interaction and complexity, information management, and the role of government. Hung et al. (2012) learned more about user acceptance of mobile e-government services.

2. The proposed method

The proposed model of this paper uses factor analysis (Azad & Hassanabadi, 2013; Azad & Mohammadi, 2013) to determine important factors influencing data security in municipality organization in city of Tehran, Iran. The study designs a questionnaire consists of 29 questions and in Likert scale. The sample size is calculated as follows,

$$n = \frac{N \times z_{\alpha/2}^2 \times p \times q}{\varepsilon^2 \times (N-1) + z_{\alpha/2}^2 \times p \times q}, \quad (1)$$

where N is the population size, $p=1-q$ represents the yes/no categories, $z_{\alpha/2}$ is CDF of normal distribution and finally ε is the error term. Since we have $p=0.5, z_{\alpha/2}=1.96$ and $N=1300$, the number of sample size is calculated as $n=185$. Cronbach alpha has been calculated as 0.856 in preliminary stage and final 0.856 in final stage, which are statistically acceptable. In addition, Kaiser-Meyer-Olkin Measure of Sampling Adequacy is calculated as 0.76, which is within an acceptable limit and validates the results. Since factor analysis is sensitive on skewness of factors, we have decided to delete seven questions. Fig. 1 demonstrates Scree plot on questions of the survey. Table 1 demonstrates important extracted factors.

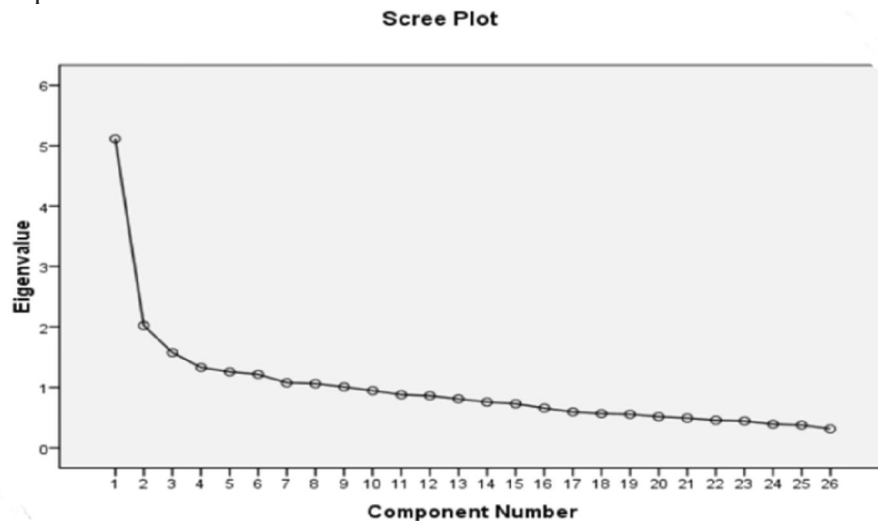


Fig. 1. The Scree plot

Table 1
The results of extracted factors

Description	Initial	Extraction
Network modernization of the country	1.000	.574
Public acceptance of new electronic systems	1.000	.593
Bandwidth expansion	1.000	.648
Description of individual responsibilities	1.000	.712
Training	1.000	.617
Legislation in the field of Internet	1.000	.596
Economical use of public	1.000	.493
Create a learning organization	1.000	.615
Two-way interactions between people and electronic government	1.000	.600
Decision support systems	1.000	.618
Human resource development	1.000	.626
The popularity of mobile communication software for public	1.000	.508
Economic development organizations	1.000	.544
Customers access to the Internet	1.000	.666
Ease of use of the system for employees	1.000	.624
Sharing organizational resources	1.000	.628
Benefits perceived by the public	1.000	.630
Being user friendly	1.000	.680
Trust of citizens to use e-government services	1.000	.633
Re-engineering methods	1.000	.575
Systems life cycle	1.000	.603
Standardization of procedures	1.000	.552
Updating the system	1.000	.387
Sufficient monitoring	1.000	.601
Top management support	1.000	.609
Integrated assessment of organizational performance	1.000	.720

Table 2
The results of total variance explained

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.113	19.665	19.665	5.113	19.665	19.665	2.368	9.107	9.107
2	2.019	7.767	27.432	2.019	7.767	27.432	2.093	8.051	17.158
3	1.575	6.056	33.489	1.575	6.056	33.489	2.084	8.014	25.172
4	1.330	5.114	38.603	1.330	5.114	38.603	1.679	6.459	31.631
5	1.257	4.834	43.437	1.257	4.834	43.437	1.646	6.330	37.961
6	1.216	4.676	48.112	1.216	4.676	48.112	1.626	6.253	44.214
7	1.077	4.141	52.253	1.077	4.141	52.253	1.564	6.014	50.229
8	1.062	4.083	56.337	1.062	4.083	56.337	1.299	4.995	55.224
9	1.007	3.874	60.211	1.007	3.874	60.211	1.297	4.987	60.211
10	.945	3.636	63.847						
11	.878	3.377	67.224						
12	.862	3.315	70.539						
13	.810	3.116	73.654						
14	.756	2.909	76.564						
15	.729	2.803	79.367						
16	.657	2.528	81.895						
17	.595	2.289	84.184						
18	.566	2.178	86.362						
19	.555	2.133	88.495						
20	.515	1.982	90.478						
21	.492	1.891	92.369						
22	.457	1.756	94.125						
23	.444	1.709	95.834						
24	.392	1.507	97.341						
25	.378	1.453	98.794						
26	.314	1.206	100.000						

In addition, Table 3 and Table 4 show details of principles component analysis before and after rotation.

Table 3**The results of Principal Component Analysis**

Components		1	2	3	4	5	6	7	8	9
Customer access to internet	VAR00016	.593							-.409	
Human Resource development	VAR00012	.576								
Easy access for users	VAR00018	.547						-.351		
Organization resource distribution	VAR00019	.539				-.495				
Economic resource development	VAR00015	.523					-.405			
Two-way interactions between people	VAR00010	.501								
Life cycle system	VAR00024	.500		-.374		.353				
Employee training	VAR00006	.500								
Updating systems	VAR00026	.486								
Reengineering of methods	VAR00023	.481		-.402						
Perception of profitability	VAR00020	.457	.374							
Having support systems	VAR00011	.447			-.406					
Rules and regulations on the internet	VAR00007	.447		.337						
The culture of accepting new systems	VAR00002	.411	.362							
Easy access for customers	VAR00021	.357	.689							
Customer's trust	VAR00022	.405	.670							
Popularity of using the software	VAR00014		.554			.336				
Economical advantage	VAR00008	.362		.470						
Renovation of internet	VAR00001			.461						
Standardization of systems	VAR00025	.382		-.427						
People's responsibilities	VAR00005	.360		.451	.481					
Sufficient administration control	VAR00027	.426					.468			
Top management support	VAR00028	.458					.463			
Creating learning organization	VAR00009				.372			.401		
Organizational performance	VAR00029	.336							.526	
Band wide expansion	VAR00004	.388						.346		-.423

Table 4**The results of Principal component analysis after rotation**

		1	2	3	4	5	6	7	8	9
Customer trust	VAR00022	.772								
Being user friendly	VAR00021	.752								
Perception of benefit	VAR00020	.566							.398	
Popularity of software	VAR00014	.551								-.342
The culture of accepting systems	VAR00002	.475					.335	.436		
Standardizing the existing methods	VAR00025		.705							
Re-engineering methods	VAR00023		.683							
Systems life cycle	VAR00024		.539				.363			
Updating systems	VAR00026		.391							
Decision support system	VAR00011			.737						
Human resource development	VAR00012			.728						
Economic resource development	VAR00015			.507						
Top management support	VAR00028				.723					
Sufficient administration monitoring	VAR00027				.711					
Organizational performance	VAR00029		.436		.449			.354		
People's responsibilities	VAR00005					.782				
Easy use for employees	VAR00018			.334		.560				
Training	VAR00006		.341			.469				
Access to internet	VAR00016						.662			
Two-way interactions between	VAR00010						.660			
Infrastructure renovation	VAR00001							.676		
Economical advantage	VAR00008							.596		
Organization resource distribution	VAR00019			.414					.580	
Creating learning organization	VAR00009					.381			.431	
Band wide expansion	VAR00004									.722
Rules and regulation on internet	VAR00007									.570

As we can observe from the results of Table 4, we may extract six important factors influencing on data security. Next, we explain all these factors in details.

3. The results

The implementation of factor analysis helps us group different factors and find better insight on market development.

3.1. Acceptance

The first factor is associated with the level of acceptance and it includes five factors including customer trust to e-government, being user friendly for customers, general perception of advantages, popularity of software packages and general culture of using electronic services. Table 5 summarizes the results of our findings.

Table 5

The summary of different components associated with acceptance

Option	Factor weight	Eigenvalue	% of variance	Accumulated
Customer trust to e-government	.681			
Being user friendly for customers	.716	2.990	42.712	42.712
General perception of advantages	.715			
Popularity of software packages	.709			
General culture of using electronic services	.646			

Cronbach alpha = 0.76

As we can observe from the results of Table 5, being user friendly is the most important factor followed by general perception of advantages.

3.2. The second factor: Process approach

The second factor is associated with process approach, which consists of four factors summarized in Table 6 as follows,

Table 6

The summary of different components associated with process approach

Option	Factor weight	Eigenvalue	% of variance	Accumulated
Standardization of all services	.781			
Re-engineering of methods	.807	2.562	51.241	51.241
Having updated systems	.668			
Life cycle of system	.672			

Cronbach alpha = 0.65

According to the results of Table 6, re-engineering of methods and approaches is the most important factor followed by standardization of all services, having updated systems and life cycle of system.

3.3. The third factor: Human resources management

Human resource management is the third factor and it includes four items summarized in Table 7 as follows,

Table 7

The summary of different components associated with human resources management

Option	Factor weight	Eigenvalue	% of variance	Accumulated
Having supportive operating systems	.709			
Human resource development	.710			
Economic resource development	.782	1.994	49.839	49.839
Organizational resource distribution	.612			

Cronbach alpha = 0.786

According to the results of Table 7, economic resource development is the most important factor followed by human resource development, having supportive operating systems and organizational resource distribution.

3.4. The fourth factor: Management strategy

Management strategy is the fourth factor and it includes three items summarized in Table 8 as follows,

Table 8

The summary of different components associated with management strategy

Option	Factor weight	Eigenvalue	% of variance	Accumulated
Top management support	.649			
Sufficient management control	.764	2.289	45.777	45.777
Integrated performance measurement	.673			

Cronbach alpha = 0.786

According to the results of Table 8, sufficient management control is the first important factor followed by integrated performance measurement and top management support.

3.5. The fifth factor: Organizational learning

The fifth factor is associated with organizational learning, which consists of four factors summarized in Table 9 as follows,

Table 9

The summary of different components associated with organizational learning

Option	Factor weight	Eigenvalue	% of variance	Accumulated
Clear responsibility of all workers	.607			
Ease of use of software packages	.832	1.936	48.398	48.398
Training	.656			
Organizational learner capabilities	.744			

Cronbach alpha = 0.64

According to the results of Table 9, ease of use of related software packages is the most important factor followed by organizational learning capabilities, training and clear responsibility of all workers.

3.6. The sixth factor: Feasibility study

The last factor is associated with feasibility study, which consists of two sub-components summarized in Table 10 as follows,

Table 10

The summary of different components associated with feasibility study

Option	Factor weight	Eigenvalue	% of variance	Accumulated
Having bigger internet band wide	.805			
Existing law on cyberspace	.707	1.692	56.387	56.387

Cronbach alpha = 0.67

According to the results of Table 10, having bigger internet band wide is number one priority followed by existing laws, rules and regulations.

4. Conclusion

This paper has presented an empirical investigation to find important factors influencing data security in municipality of Tehran, Iran. Using a questionnaire in Likert scale, the survey used factor analysis to find influencing factors in data security. The first factor was associated with the level of acceptance including five factors of customer trust to e-government, being user friendly for customers, general perception of advantages, popularity of software packages and general culture of using electronic services where being user friendly was the most important factor followed by general perception of advantages. The second factor is associated with process approach, which consists of four factors where re-engineering of methods and approaches was the most important factor followed by standardization of all services, having updated systems and life cycle of system.

Human resource management is the third factor and it includes four items, where economic resource development was the most important factor followed by human resource development, having supportive operating systems and organizational resource distribution. Management strategy is the fourth factor and it includes three items where sufficient management control was the first important factor followed by integrated performance measurement and top management support. The fifth factor is associated with organizational learning, which consists of four factors where ease of use of related software packages was the most important factor followed by organizational learning capabilities, training and clear responsibility of all workers. Finally, the last factor was associated with feasibility study, which consists of two sub-components where having bigger internet band wide was number one priority followed by existing laws, rules and regulations.

Acknowledgement

The authors would like to thank anonymous referees for constructive comments on earlier version of this paper.

References

- Azad, N., & Hassanabadi, M. (2013). An empirical investigation on factors influencing on brand loyalty. *Management Science Letters*, 3(7), 2113-2118.
- Azad, N., & Mohammadi, M. (2013). An empirical survey on factors influencing on packaging dairy products. *Management Science Letters*, 3(7), 1901-1906.
- Cordella, A. (2007). E-government: towards the e-bureaucratic form?. *Journal of Information Technology*, 22(3), 265-274.
- Cordella, A., & Iannacci, F. (2010). Information systems in the public sector: The e-Government enactment framework. *The Journal of Strategic Information Systems*, 19(1), 52-66.
- Dawes, S. S. (2009). Governance in the digital age: A research and action framework for an uncertain future. *Government Information Quarterly*, 26(2), 257-264.
- Hung, S. Y., Chang, C. M., & Kuo, S. R. (2012). User acceptance of mobile e-government services: An empirical study. *Government Information Quarterly*, 30, 33-44.
- Janowski, T., Pardo, T. A., & Davies, J. (2012). Government Information Networks-Mapping Electronic Governance cases through Public Administration concepts. *Government Information Quarterly*, 29, S1-S10.
- Kardan, A. A., & Sadeghiani, A. (2011). Is e-government a way to e-democracy?: A longitudinal study of the Iranian situation. *Government Information Quarterly*, 28(4), 466-473.
- Niehaves, B. (2011). Iceberg ahead: On electronic government research and societal aging. *Government Information Quarterly*, 28(3), 310-319.
- Terpsiadou, M. H., & Economides, A. A. (2009). The use of information systems in the Greek public financial services: the case of TAXIS. *Government Information Quarterly*, 26(3), 468-476.

Zissis, D., & Lekkas, D. (2011). Securing e-Government and e-Voting with an open cloud computing architecture. *Government Information Quarterly*, 28(2), 239-251.