

# Toward the Conceptualization of Citizen's Trust in Jordanian E-Government Systems: A Q-Methodology Approach

Yousef Elsheikh

Department of Computer Network Systems Applied Science Private University Amman, Jordan.

## Summary

Trust highlights as an important factor in helping citizens to overcome the perceived risks. Accordingly, the in-depth investigation of citizen's trust has become a necessity for researchers and practitioners to understand citizens' acceptance of e-government in developed countries in general, and developing countries in particular. This research paper proposes a theoretical model to achieve this task. The research paper also aims to develop items to measure constructs in the theoretical proposed model. Q-Methodology has been used to validate the measurement items that have been developed. However, conducting two-phase Q-sort led to the development of a survey instrument for the theoretical proposed model with excellent reliability and validity of statistical results.

## Keywords:

*Citizen Trust; G2C; E-Government; Q-Methodology; Developing Countries*

## 1. Introduction

In the past few years, many governments around the world have sought to activate the e-government initiative to provide their citizens with more appropriate ways to access government information and services [1]. Many of the research conducted has addressed e-government services and factors that may affect the overall adoption of these services [2] [3]. Among the factors that has shown an important role in the success or failure of the adoption of these e-government services in general, building trust between the citizen and the government [4] [5] [6]. In this research paper, citizen trust can be defined as belief or expectation that the government and IT will provide a particular service in the absence of monitoring their performance [7]. However, in-depth research on the study of trust in e-government services, particularly in Arab countries such as Jordan, is still relatively low [8] [9] [10]. This is based on the nature of these countries, which are dominated by social relations and cohesion of families, which means that the governments of those countries must do more to understand this to be able to build trust with citizens, and thus will have a significant impact on the success of the adoption of e-government. This research paper aims to identify the factors that are likely to affect the citizens' trust in e-government from multi-dimensional perspective on the one hand, and on the other hand, the development of survey instruments to measure the

theoretical constructs in the proposed model.

## 2. Literature Review

The concept of trust is a broad concept that encompasses many areas including psychology, sociology, and management science [11]. However, it is noted that these areas share the common values of the concept of trust, which may enable researchers to reuse the results between different contexts. Many definitions of trust have been formulated so far. But one of the most common definitions is the definition of trust as a party's willingness to be susceptible to another party's action based on the expectation that the other party will perform the important action of the first party, regardless of the ability to monitor either party [12]. Regardless of context, trust usually has the following characteristics: First, it is highly related to risk, as trust usually arises when there is risk [7]. Risks cause uncertainty and insecurity. Trust is the most effective instrument to deal with such risks. It is worth mentioning that trust helps to overcome these risks by changing how they are conceived. Second, trust subjectivity in terms of situation and person [13]. People usually judge the risks involved in a particular situation and may decide to take the risk if they see benefits that may return to them more than the risks they may cause. Therefore, the necessary level of trust that we need is based primarily on the level of perceived risks, and we conclude that they differ from one party to another. Moreover, past experiences may play a vital role in the perception of risk, making it a complex phenomenon. Third, trust nature that is oriented towards the future [14]. It is necessary for future risky situations and involves the expectation that a trusted partner will not act opportunistically. Previous research has shown the importance of the trust factor in influencing the adoption of the use of electronic services in general and e-government services in particular, despite their different characteristics [1] [7] [15] [16]. Citizens' expectations of their governments are different from those of other organizations [17]. Thus, the dynamics of e-government services are very similar to other e-services, but are not similar to them, making it a different field of research [18]. The proliferation of news in the media about what is

known as phishing, selling customer data without their consent and the disclosure of staff records, all of these have increased citizens' concerns about how their privacy and personal data will be protected [19]. These and other reasons were behind the increased negative sensitivity of citizens towards the adoption of e-government services. Acceptance of e-government services depends on several factors, including trust in government and information technology [3] [20]. However, the increasing negative sensitivity of citizens and the media with regard to trust is clearly undeniable. This is the case. Governments should realize that without an in-depth analysis of the trust factors in e-government such as socio-cultural environment factors, socio-political environment factors, service based factors and ICT based infrastructure factors, the potential of e-government cannot be achieved [30]. After all, gaining citizen trust is critical to governments, which directly affects the adoption of e-government services [3] [6]. This also applies to the Jordanian government.

In a study of [26], a framework of four types of antecedents affecting trust in e-government was proposed. This proposed framework incorporates technical factors (system quality, service quality and information quality), government agency factors (reputation of an agency and past experience), risk factors (security and privacy, time risk and performance risk), and aspects of citizens (age, gender, education, disposition to trust and internet experience).

Another study of [27] showed that there are various factors that govern the degree of citizen trust in the adoption of e-government services, these factors are summarized in three main categories, namely Internet-based trust factors (propensity to trust and level of Internet experience), organization-based trust factors (organizational reputation and quality of previous online transaction experience) and website-based trust factors (website quality, website security and privacy statements).

A study of [28] also showed other factors affecting citizen trust in the adoption of e-government services such as individual-based trust factors (computer self-efficacy and personal innovativeness). However, a study of [29] reached the same results as a study of [27] regarding the factors that may affect the trust of citizens in the adoption of e-government services.

### 3. Research Model

The theoretical research model in Figure 1 consists of four constructs that define the conceptual model of how citizens' trust can affect the adoption of e-government services. These constructs are the results of a previous study by the author of this research paper. This proposed model can be applied to government to citizen (G2C)

services and identifies the roles of important factors in the process of trust in the adoption of e-government services.

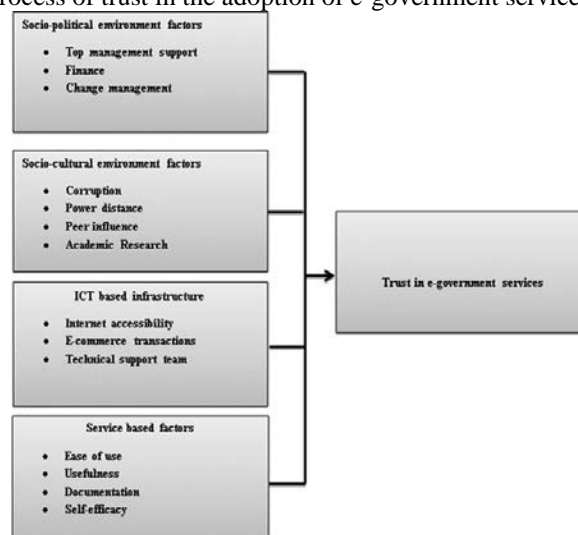


Fig1. Theoretical research model

#### 3.1 Socio-Political Environment Factors

Based on previous research, socio-political environment factors are among the factors that have a significant impact on the success of the adoption of e-government services [21]. In this research, the socio-political environment is defined as an uncontrollable external environment and often has an impact on decision-making in the country, particularly national strategies and policies, which means affecting the services provided to all segments of society. Three constructs resulted from a previous study [30] in order to evaluate the socio-political environment factors to support the development of e-government services in this research. Since the political environment prevails in most developing countries, including Jordan, is not sufficiently developed to radically change public services, the development of the socio-political environment in these countries is likely to be among the main determinants of increasing trust among citizens to adopt and implement e-government Services in Jordan. This conclusion is consistent with some previous research, which considered that factors such as political support and stability have an impact on the success of technology transfer in different contexts.

H1: Socio-political environment (top management support, finance and change management) is likely to be among the main determinants of increasing trust among citizens to adopt and implement e-government Services.

#### 3.2 Socio-Cultural Environment Factors

Based on previous research, socio-cultural environment factors are among the factors that have a significant impact

on the success of the adoption of e-government services [22]. In this research, the socio-cultural environment is defined as is defined as the practices, beliefs and traditions within a given society. Four constructs resulted from a previous study [30] in order to evaluate the socio-cultural environment factors to support the development of e-government services in this research. Since the cultural environment prevails in most developing countries, including Jordan, is not sufficiently developed to accept radical change, particularly in public services, the development of the socio-cultural environment in these countries is likely to be among the main determinants of increasing trust among citizens to adopt and implement e-government Services in Jordan. This conclusion is consistent with some previous research, which considered that factors such as power distance, sharing experiences and information, past than future orientation and gender roles have an impact on the success of technology transfer in different contexts.

H2: Socio-cultural environment (corruption, power distance, peer influence and academic research) is likely to be among the main determinants of increasing trust among citizens to adopt and implement e-government Services.

### 3.3 ICT-Based Infrastructure Factors

Based on previous research, ICT-based infrastructure factors are among the factors that have a significant impact on the success of the adoption of e-government services [23]. In this research, the ICT-based infrastructure is defined as the technical services and facilities needed to enable and implement e-government services. Three constructs resulted from a previous study [30] in order to evaluate the ICT-based infrastructure factors to support the development of e-government services in this research. Since the cultural environment prevails in most developing countries, including Jordan, is not developed enough to successfully deliver e-government services, the development of the national ICT-based infrastructure in these countries is likely to be among the main determinants of increasing trust among citizens to adopt and implement e-government Services in Jordan. This conclusion is consistent with some previous research, which considered that factors such as accessibility, e-commerce infrastructure and IT support team have an impact on the success of technology transfer in different contexts.

H3: Robust ICT-based infrastructure (Internet accessibility, e-commerce transactions and technical support team) is likely to be among the main determinants of increasing trust among citizens to adopt and implement e-government Services.

### 3.4 Service-Based Factors

Based on previous research, citizens' aspects of IT usage are among the factors that have a significant impact on the success of the adoption of e-government services [15]. In this research, the service usage factors are defined as the cognitive aspects of citizens in the provision of e-government services. Four constructs resulted from a previous study [30] in order to evaluate the service usage factors to support the development of e-government services in this research. This conclusion is consistent with some previous research, which considered that factors such as such as ease of use, usefulness, self-efficacy, control and commitment have an impact on the success of technology transfer in different contexts.

H4: Service usage aspects (ease of use, usefulness, documentation and self-efficacy) are likely to be among the main determinants of increasing trust among citizens to adopt and implement e-government Services.

## 4. Research Methodology

### 4.1 Instrument Development: Generation of Items

The theoretical constructs in this research were developed in a previous study of the researcher [30]. Multi-item scales were developed for measuring constructs in the research model. The theoretical constructs in this research paper are between three and four items. As shown in the research model (Figure there are five main constructs, all developed in a previous study of the researcher to measure the factors affecting citizens' trust in the adoption of e-government services. Table 1 shows a pool of constructs' items to be entered into the data-matrix to allow Q-Sort process analysis.

Table 1: constructs' items to be entered into the data-matrix to allow Q-sort analysis

Theoretical Construct	Construct items	Number of construct items
Socio-political environment	Top management support	3
	Finance	2
Socio-cultural environment	Change management	4
	Corruption	2
	Power distance	3
	Peer influence	4
ICT based infrastructure	Academic research	3
	Internet accessibility	4
	E-commerce transactions	3
	Technical support team	2
Service based aspects	Ease of use	3
	Usefulness	3
	Documentation	4
	Self-efficacy	3
Trust in e-government services		3
Total items		46

#### 4.2 Scale Development Process: Q-Sort Method

The Q-Sort method is also known as factor analysis technique [24], which falls under the Q-Methodology. The origin of its development is due to William Stephenson in [31]. This methodology has been used in many social sciences to investigate the correlation between individuals' viewpoints on specific phenomena. In the Q-methodology, the items represent the sample in Q-Sort while the people who complete the Q-Sort can be considered as the experimental condition [24] [31]. However, the Q-methodology is concerned with investigating the correlations between subjects through a sample of items. In this research, one of the reasons for choosing the Q-methodology is its ability to assess reliability [24] [31] on the one hand, and on the other hand, the validity of the questionnaire items that are usually prepared in survey research [24] [31]. The methodology is based on two phases [25]. In the first phase, the questionnaire items are sorted by a group of judges in the field according to different constructs. The joint agreement between the judges in each phase is calculated at this phase. In the second phase, some of the items, which were not classified well or were vague in the first phase, were reformulated in a clearer manner, and if this is not possible, they were deleted. This two-phase process is repeated until a satisfactory level of agreement is achieved. Judges are experienced individuals in the e-government program in Jordan. Judges were divided into pairs. Each pair has two judges per phase. The judges are responsible for sorting the list of items into groups, which collectively represent the five constructs of the research model. As an indicator of construct validity, the differences and similarities between the items sorted above are carefully analyzed.

The Q-Sort process begins by defining the five constructs of the research model including the items to the judges. The judges then randomly mix items that are supposed to measure the five constructs. The developed items are classified into categories according to the five constructs with the option "Not Applicable" to investigate the scale of each construct accurately. Each phase was assisted by two independent judges to agree on a specific classification of the items under the categories representing the constructs of the above research model.

In a review of the literature on the investigation of the validity and reliability of questionnaire items (or instrument), two measures were used to assess the joint agreement level between the participating judges: Cohen's Kappa [32] and Moore and Benbasat's "Hit Ratio" [33]. However, joint agreement level between the participating judges is usually referred to by calculating the number of items that all judges agree to classify and within a given category. The value of the number of items agreed by judges is divided by the total number of items in order to reach the percentage of agreement between the

participating judges. The Cohen's Kappa measure is usually referred to as is the proportion of cases in which there is agreement between the participating judges, excluding the chance agreement. The Cohen's Kappa measure should be greater than 0.65 to be acceptable [32]. While Moore and Benbasat's "Hit Ratio" [33] represents the number of items that are categorized accurately in the categories targeted by the participating judges. This measure is calculated by counting all the items that are accurately sorted into the theoretical construct by each independent judge, and then dividing them by double the total number of items.

#### 5. Research Findings

In the first phase, 46 items were sorted on 5 theoretical constructs. The percentage of joint agreement between the participating judges was 84% as shown in Table 2, while the total initial classification of the items within the targeted constructs reached 81% as shown in Table 3, where 70 out of 86 of the items were categorized accurately.

Table 3 shows the results of the first Q-sort phase, where it is noted that there is no major misclassification of any of the items within the five theoretical constructs described above in the research model. The diagonal values give a good indication that the items classified by the judges involved in this phase reflect one of the five targeted constructs above. For example, 4 out of 23 of the classifications were not successful for the first construct (socio-political), but the classifications were 2 for the second construct (socio-cultural) and the same for the fourth construct (service usage aspects). There is a great correlation between how change management and values and cultural habits prevail in a society on the one hand, and on the other hand, change may cause practices that may affect the service provided to citizens and how to benefit from it. For the second construct (socio-cultural), 3 out of 15 of the classifications were not successful, where the misclassifications were 1 for the third construct (ICT infrastructure) and the other for the fourth construct (service usage aspects). There is a strong correlation between society culture and the use of e- services such as ease of use, usefulness, documentation and self-efficacy. For the third construct, 4 out of 13 of the classifications were not successful and were associated with the first construct (socio-political). Not surprisingly, there is a strong correlation between support and funding at the national level and the construction of IT infrastructure. For the fourth construct, 4 out of 18 of the classifications were not successful and were associated with both the second construct (socio-political) and the third construct (ICT infrastructure) through 2 misclassifications for each construct. Not surprisingly, there is a strong correlation

between the usage aspects of e-services, habits and society practices (culture) on the one hand, and the existence of a robust infrastructure to support new e-services on the other. As for the fifth and most important construct, it is expected to be related to the rest of the theoretical constructs as described above, where 1 out of 17 of the classifications were not successful. The percentage is very low and therefore not taken into account in subsequent analysis. To assess the level of joint agreement between the participating judges for this phase, the value of Cohen's Kappa [32] was calculated at 0.84 (k=84%). This value is an excellent indicator of the joint agreement beyond chance between the participating judges for this phase. However, the percentage of items classified correctly is 81%. According to Table 3, the lowest percentage was 66% for the second and fourth constructs, 69% for the third construct, 82% for the fifth construct and 83% for the first construct. Due to the low number of unsuccessful classifications at this phase, the researcher has deleted, added, and redrafted some items that have been improperly classified into unexpected constructs. This is to ensure that all the theoretical constructs described in the research model are valid.

Table 2: joint agreement between the participating judges: first Q-sort phase analysis

		Judge 1					
		Theoretical construct	1	2	3	4	5
Judge 2	1	5	1				
	2		7	2	1		
	3			4			
	4		2	3	6		
	5					4	
	Not Applicable						0
<b>Total items=46</b>		<b>Total agreements=39</b>			<b>Agreement percentage=84%</b>		

Table 3: initial classification of the items within the targeted constructs: first Q-sort phase analysis

		Targeted constructs								
		Theoretical construct	1	2	3	4	5	Not Applicable	Total	Percentage
Targeted constructs	1	19	2		2				23	83%
	2		12	1	2				15	66%
	3	4		9					13	69%
	4		2	2	14				18	66%
	5		1				16		17	82%
	<b>Total items classified =86</b>		<b>Total items classified correctly=70</b>		<b>Percentage of items classified correctly =81%</b>					

In the second phase, 36 items were sorted on 5 theoretical constructs. The percentage of joint agreement between the participating judges was 91% with an improvement of 7% compared to the percentage in the first phase, as shown in Table 4, while the total follow-up classification of the items within the targeted constructs reached %92 with an improvement of 1% compared to the percentage in the first phase, as shown in Table 5, where 74 out of 81 of the items were categorized accurately.

Table 4: joint agreement between the participating judges: second Q-sort phase analysis

		Judge 1					Not Applicable
		Theoretical construct	1	2	3	4	
Judge 2	1	5	1				
	2		7		1		
	3			5			
	4				8		
	5					6	
	Not Applicable						0
<b>Total items=36</b>		<b>Total agreements=33</b>			<b>Agreement percentage=91%</b>		

Table 5: follow-up classification of the items within the targeted constructs: second Q-sort phase analysis

		Targeted constructs								
		Theoretical construct	1	2	3	4	5	Not Applicable	Total	Percentage
Targeted constructs	1	23	1						24	83%
	2		12	1					13	66%
	3	2		9					11	69%
	4		2	1	13				16	66%
	5					17			17	82%
	<b>Total items classified =81</b>		<b>Total items classified correctly=74</b>		<b>Percentage of items classified correctly =92%</b>					

Table 5 shows the results of the second Q-sort phase, where it is noted that there is almost no major misclassification of any of the items within the five theoretical constructs described above in the research model. The diagonal values give very good indication that the items classified by the judges involved in this phase reflect one of the five targeted constructs above. In other words, the modifications introduced in the first phase by the researcher on the items have led to an even slight improvement in the reliability and validity of the constructs described in the research model. In this phase, the value of Cohen's Kappa [32] was also calculated at

0.91 ( $k=91\%$ ), with an improvement of 7% compared with the value calculated in the first phase. This value is an excellent indicator of the joint agreement beyond chance between the participating judges. However, this remarkable improvement was enough for the researcher to be satisfied with only two phases of Q-sorting method to ensure the reliability and validity of the constructs described in the research model.

## 6. Conclusion

In this research paper, a conceptual model of factors that may affect citizens' trust in e-government services has been proposed. The model includes five theoretical constructs that define the concept of citizens' trust in e-government services. A tool to measure these constructs was also developed in this research paper. A group of 46 items was generated. The Q-methodology was then used to ensure the validity and reliability of the theoretical constructs. Two-phase Q-sort process was performed to validate the survey instrument. After analyzing the first Q-sort phase, 36 items remained and can be provided on request. However, these survey instruments can be used to investigate citizens' trust in e-government services in the context under investigation namely, Jordan. In the future, the model, as well as the survey instruments developed, will be tested empirically in different contexts to generalize the results.

## Acknowledgement

The author is grateful to the Applied Science Private University, Amman, Jordan, for the financial support granted to cover the publication fee of this research article.

## References

- [1] Rovina Kumar, Vinod, et al. "Factors for successful e-government adoption: A conceptual framework." *Electronic Journal of E-government* 5.1 (2007).
- [2] Carter, Lemuria, and France Bélanger. "The utilization of e-government services: citizen trust, innovation and acceptance factors." *Information systems journal* 15.1 (2005): 5-25.
- [3] AlAwadhi, Suha, and Anne Morris. "Factors influencing the adoption of e-government services." *Journal of Software* 4.6 (2009): 584-590.
- [4] Almarabeh, Tamara, and Amer AbuAli. "A general framework for e-government: definition maturity challenges, opportunities, and success." *European Journal of Scientific Research* 39.1 (2010): 29-42.
- [5] Weerakkody, Vishanth, et al. "Examining the influence of intermediaries in facilitating e-government adoption: An empirical investigation." *International Journal of Information Management* 33.5 (2013): 716-725.
- [6] Elkadi, Hatem. "Success and failure factors for e-government projects: A case from Egypt." *Egyptian Informatics Journal* 14.2 (2013): 165-173.
- [7] Bélanger, France, and Lemuria Carter. "Trust and risk in e-government adoption." *The Journal of Strategic Information Systems* 17.2 (2008): 165-176.
- [8] Al Hujran, Omar, Anas Aloudat, and Ikhlas Altarawneh. "Factors influencing citizen adoption of e-government in developing countries: The case of Jordan." *International Journal of Technology and Human Interaction (IJTHI)* 9.2 (2013): 1-19.
- [9] Al-Shboul, Muhannad, et al. "Challenges and factors affecting the implementation of e-government in Jordan." *Journal of Software Engineering and applications* 7.13 (2014): 1111.
- [10] Ibrahim, Omar Ahmed, and Nor Hidayati Zakaria. "E-government services in developing countries: a success adoption model from Employees perspective." *Journal of theoretical and applied information technology* 94.2 (2016): 383.
- [11] Bachmann, Reinhard, and Akbar Zaheer, eds. *Handbook of trust research*. Edward Elgar Publishing, (2006).
- [12] PytlíkZillig, Lisa M., and Christopher D. Kimbrough. "Consensus on conceptualizations and definitions of trust: Are we there yet?." *Interdisciplinary Perspectives on Trust*. Springer International Publishing, 2016. 17-47.
- [13] Das, T. K., and Bing-Sheng Teng. "The risk-based view of trust: A conceptual framework." *Journal of Business and Psychology* 19.1 (2004): 85-116.
- [14] Bachmann, Reinhard. "At the crossroads: Future directions in trust research." *Journal of Trust Research* 1.2 (2011): 203-213.
- [15] Lean, Ooh Kim, et al. "Factors influencing intention to use e-government services among citizens in Malaysia." *International Journal of Information Management* 29.6 (2009): 458-475.
- [16] Belanche, Daniel, Luis V. Casaló, and Carlos Flavián. "Integrating trust and personal values into the Technology Acceptance Model: The case of e-government services adoption." *Cuadernos de Economía y Dirección de la Empresa* 15.4 (2012): 192-204.
- [17] Bekkers, Victor, and Vincent Homburg. "The myths of e-government: Looking beyond the assumptions of a new and better government." *The Information Society* 23.5 (2007): 373-382.
- [18] Colesca, S. E., and L. Dobrica. "Adoption and use of e-government services: The case of Romania." *Journal of applied research and technology* 6.3 (2008): 204-217.
- [19] Boritz, J. Efrim, and Won Gyun No. "E-commerce and privacy: Exploring what we know and opportunities for future discovery." *Journal of Information Systems* 25.2 (2011): 11-45.
- [20] Grimsley, Mike, and Anthony Meehan. "E-government information systems: Evaluation-led design for public value and client trust." *European Journal of Information Systems* 16.2 (2007): 134-148.
- [21] Dwivedi, Yogesh K., Vishanth Weerakkody, and Marijn Janssen. "Moving towards maturity: challenges to successful e-government implementation and diffusion." *ACM SIGMIS Database* 42.4 (2012): 11-22.

- [22] Gupta, Babita, Subhasish Dasgupta, and Atul Gupta. "Adoption of ICT in a government organization in a developing country: An empirical study." *The Journal of Strategic Information Systems* 17.2 (2008): 140-154.
- [23] Patel, Hemant, and David Jacobson. "Factors Influencing Citizen Adoption of E-Government: A Review and Critical Assessment." *ECIS*. 2008.
- [24] Brown, Steven R. "Q methodology and qualitative research." *Qualitative health research* 6.4 (1996): 561-567.
- [25] Block, Jack. *Q-sort methodology*. American Psychological Association, 2008.
- [26] Alzahrani, Latifa, Wafi Al-Karaghoul, and Vishanth Weerakkody. "Analysing the critical factors influencing trust in e-government adoption from citizens' perspective: A systematic review and a conceptual framework." *International Business Review* 26.1 (2017): 164-175.
- [27] Khasawneh, R., W. Rabayah, and E. Abu-Shanab. "E-government acceptance factors: trust and risk." *The 6th international conference on information technology (ICIT 2013)*. 2013.
- [28] Mellouli, Majdi, Omar Bentahar, and Marc Bidan. "Trust and e-government acceptance: The case of Tunisian on-line tax filing." *The Electronic Journal Information Systems Evaluation Volume* 19.3 (2016).
- [29] Warkentin, Merrill, et al. "Encouraging citizen adoption of e-government by building trust." *Electronic markets* 12.3 (2002): 157-162.
- [30] Elsheikh, Yousef, and Mohammad Azzeh. "What Facilitates the Delivery of Citizen-Centric E-Government Services in Developing Countries: Model Development and Validation Through Structural Equation Modeling." *International Journal of Computer Science & Information Technology* 6.1 (2014): 77.
- [31] Alsaghier, Hisham, et al. "Conceptualising citizen's trust in e-government: Application of Q methodology." *Leading Issues in E-Government* 1 (2011): 204.
- [32] Cohen, Jacob. "Weighted kappa: Nominal scale agreement provision for scaled disagreement or partial credit." *Psychological bulletin* 70.4 (1968): 213.
- [33] Moore, Gary C., and Izak Benbasat. "Development of an instrument to measure the perceptions of adopting an information technology innovation." *Information systems research* 2.3 (1991): 192-222.



**Yousef Elsheikh** is an assistant professor of Information Technology at the Applied Science Private University. He holds PhD in Informatics from University of Bradford, UK and MSc in Information Technology from University of the West of England, UK. His research interests includes conceptual modeling, e-business applications, information systems engineering, knowledge based representations, risk management, ontologies and issues in software engineering.