

# Role of E-government in Reducing Disasters

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**Abstract** – Disasters affect three-quarters of the world, they cause huge losses of life and property every year. Information and communication technology (ICT) - as the backbone of e-government is one of the factors that reduce the damage caused by these disasters. This paper discusses the impact of demographic factors on citizens' readiness towards ICTs and disaster management, by conducting a questionnaire form that tests the readiness of the Iraqi citizen and the extent of their interest in this technology being threatened by disaster.

**Keywords** – Disasters, Information and Communication Technology (ICT), E-government, Readiness.

## 1. Introduction

Nature is the compassionate mother of all living creatures on this planet. However, despite this, nature may pose a real danger to the lives of these beings through disasters.

Disasters can vary in strength, impact, and duration, but they are similar in the horrific destruction they leave behind. Disasters can be classified into two categories (natural and human made disasters) [1]. The focus of this article is on natural disasters, which are caused by nature and no

hand for humans in their occurrence (such as floods, droughts, earthquakes, volcanoes, avalanches, cyclones, forest fires, landslides, and tsunamis) [2]. These disasters when occur, cause many deaths, and cause heavy material losses. In addition, restoring the impact of disasters costs the government a lot of time, effort and money. Therefore, it is necessary to pay attention to the use of all modern methods in order to reduce the effect of these disasters [3].

From another point of view, the development of ICT (Information and Communication Technology) has led to the use of this technology in all areas of life in general, and the use of it in the field of E-government especially [4]. The reduction of disasters impact is certainly one of these areas.

However, using this type of application needs to two basic things. The first thing is citizens' interest in disasters. The second thing is the ability of citizens to use e-government applications in general and especially in disasters.

### 1.1 Research Motivation

The losses suffered by Iraq in previous periods due to disasters were due to mismanagement of disasters, in addition to the lack of awareness among citizens in this aspect, and the unwillingness of citizens to use information and communication technology. All these motives led to the completion of this research as well as to increase the citizen readiness toward ICT and Disasters.

### 1.2 Research Objectives

The objective of this research is to test the Iraqi citizen readiness toward disasters and ICT, in order to find a way to increase their readiness to reduce the damage that caused by disasters.

### 1.3 Research Problem

Information and communication technology (ICT) is an important factor in reducing disaster damage. The lack of attention to this factor is a problem which requires a solution. This paper focuses on the problem of low ICT readiness and the lack of disaster readiness.

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The rest of this paper will be arranged as follows: section 2 will review related works literatures, the research methodology will be discussed in section 3, then research findings will be presented in section 4, section 5 contains the discussion of this work, and finally the conclusion of this paper, the limitations, and the future work will be in section 6.

## 2. Related work

The number of disasters around the world is increasing. This is due to the increased vulnerability of citizens' lives and property to disaster risk; these disasters are caused by the rapid increase in economic development [5]. In addition, the urban growth has increased in hurricane-prone and earthquake-prone areas [6], as well as poor management and weak ecosystems. Climate change is also instrumental in the occurrence of climate-related disasters such as hurricanes, forest fires and tsunamis. Disasters are one of the causes of rising poverty, especially in the developing countries. Disasters have caused hundreds of thousands of deaths in the last period, and millions of people who have become homeless, in addition cause huge financial losses estimated at billions of dollars. The economic losses from disasters have exceeded Gross domestic product (GDP) in some countries [8].

That is why many researchers have tried to find different solutions to reduce the risk of disasters, so do ICT researchers. [9] tried to reduce the rate of disaster losses by using Radio Frequency Identification (RFID) technology by installing these sensors on people with mental disabilities, the elderly and children in order to identify their locations easily and facilitate the rescue. Internet of Things (IOT) can be one of E-government application, so it can be used to reduce disaster affection. [10] tried to propose a solution to manage disasters by using Internet of Things, the proposed solution is to use IOT to provide a real time information about areas that are effected by disaster in order to facilitate the mission of decision makers to decide effective decisions towards the affected areas.

Citizen readiness toward ICT and disasters is an important factor in disaster management. The effect of demographic factors (Age, Gender, Settlement Area, and Educational Level) on ICT readiness was examined in [11], the researcher found that within the sample that he chooses to test that age factor has no significant effect on ICT readiness. However, gender factor has a significant effect on ICT readiness; also, he failed to discover the effect of educational level on ICT readiness. [12] discovered that all demographic factors can affect the ICT readiness. The researcher discovered this result by applying a questionnaire to 312 participants to

examine the readiness of the participants to use ICT applications. After conducting statistical analyzes on the questionnaire, it was found that the place of residence and the academic level have a great impact on the readiness of the citizens. The researcher pointed out that the factor of age and gender cannot be neglected because of the impact of these two factors on the readiness towards ICT.

Disaster readiness is the second important factor in disaster management. Many researchers tried to test the effect of this factor in reducing the effect of the disaster. In Nepal as it can be one of the disaster hotspot in the world, [13] tried to test the impact of demographic factors on disaster readiness. The researcher made interview with 124 students from 17 districts in Nepal, and he found that young citizens are more aware about disasters and they have more knowledge of how to deal with disasters, so he concluded that age, settlement area, and educational level has significant impact on disaster readiness however gender has no significant impact on this issue. Women are less aware of disasters than men, so their readiness is less, that what [14] found when he make his research by analyzing 2385 feedbacks that obtained from the survey he made. The researcher concluded that gender has an impact on citizens readiness toward disasters.

## 3. Methodology

In order to improve the readiness of Iraqi citizens towards (ICT) and Disasters, the methodology of the research will be implement by setting research hypotheses, prepare the questionnaire, disseminate the questionnaire, collect feedbacks, analyze feedbacks, and finally obtain results.

### 3.1 Set Hypothesis

The motivation behind preparing this article as mentioned in section 3.1 is to increase the readiness of Iraqi citizens to use Information and Communication Technology (ICT) and E-government applications in a correct way, in addition to increase the citizen reliability in E-government applications by enhance the usability of these applications.

Another important thing that is the increasing of citizen readiness for disaster management, by facilitating the communication way between citizens and the Disaster Management System.

According to literature that reviewed in (section 2), a set of hypotheses were prepared, and these hypotheses are divided into two parts:

- A. Hypotheses related to citizen readiness towards Information and Communication Technologies (ICT) and E-government.
- B. Hypotheses related to citizen readiness towards disasters.

The demographic factors that affect the readiness of Iraqi citizens are divided into three factors, which are (Gender, Age, and Educational Level). These factors are considered as independent variables as shown in the research model in (Figure 1.) below.

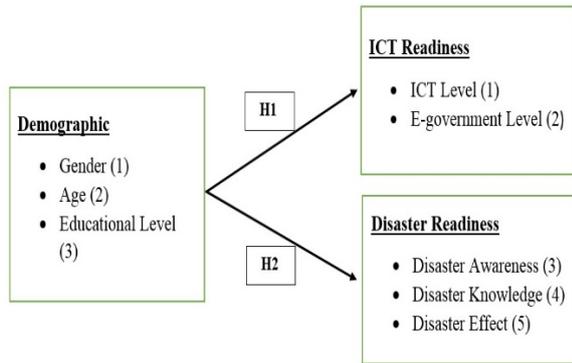


Figure 1. Research Model of Hypotheses of Readiness

The dependent factors will classify into two factors as follows:

- A. Information and Communication Technology Readiness  
It define as hypotheses H1J,  
Where J= 1...2.
- B. Disaster readiness  
It define as hypotheses H2K,  
Where K= 3...5.

The hypothesis for each one of these variables is configured as follows:

**3.1.1 Information and Communication Technology (ICT) Readiness**

Literature shows that the demographic factors as an independent factors are effects of the Information and Communication Technology (ICT) and readiness for citizens. [15] discussed the effect of the gender on ICT usage. While the rule of age in using ICT technology was discussed in [16]. Finally, [17] pointed out that the level of study has a significant impact on the use of information and

communication technology. ICT factors, as a dependent variables are ICT level, and E-government level.

ICT level shows the level of citizens who use the Information and Communication Technology, and the way that citizens use these technologies [18]. E-government level refers to the ability of citizens to use the E-government application, as well as the percentage of citizen confidence in e-government applications [19].

The hypotheses related to Information and Communication Technology (ICT) suggested that Iraqi citizen are included in the following table.

Table 1. The Definition of Hypotheses of ICT readiness

Hypothesis	Definition
H111	Citizens' age has a positive impact on ICT level
H121	Citizens' gender has a positive impact on ICT level
H131	Citizens' educational level has a positive impact on ICT level
H112	Citizens' age has a positive impact on E-government level
H122	Citizens' gender has a positive impact on E-government level
H132	Citizens' educational level has a positive impact on E-government level

**3.1.2 Disaster Readiness**

Disaster readiness means the way that citizen are thinking about disasters, are they aware about disaster, do they have any knowledge of disaster, do they know about disaster effect or the damages that caused by disasters [20], and how they can deal with disasters to reduce the proportion of losses resulting from these disasters [7]. The effect of demographic factors is discussed in. Therefore, the dependent factors related to disaster readiness are:

- Disaster Awareness
- Disaster Knowledge
- Disaster Effect

The following table contains the hypotheses related to Disaster readiness that is suggested for Iraqi citizen.

Table 2. The Definition of Hypotheses of Disaster readiness

Hypothesis	Definition
H213	Citizens' age has a positive impact on Disaster Awareness
H223	Citizens' gender has a positive impact on Disaster Awareness
H233	Citizens' educational level has a positive impact on Disaster Awareness
H214	Citizens' age has a positive impact on Disaster knowledge
H224	Citizens' gender has a positive impact on Disaster knowledge
H234	Citizens' educational level has a positive impact on Disaster knowledge
H215	Citizens' age has a positive impact on Disaster Effect
H225	Citizens' gender has a positive impact on Disaster Effect
H235	Citizens' educational level has a positive impact on Disaster Effect

### 3.2 Preparation and Implementation of Questionnaire Form

In order to satisfy the objectives of this research which are as follow:

1. Test hypotheses that defined in section 3.1 above.
2. Evaluate the awareness of Iraqi citizen for disaster.
3. Evaluate the readiness of Iraqi citizen for disaster and ICT.
4. Determine types of disasters that effect Iraqi citizen.

The following steps were completed:

#### 3.2.1 Questionnaire Preparation

In order to check citizens' awareness about disasters and know their ability to use e-government applications to reduce the effect of disasters as well as to prove hypotheses developed in (section 3.1) a questionnaire was prepared.

The questionnaire contains three main sections which are (Personal Information, Questions related to information and communication technologies, and Questions related to disasters), and contains 11 questions as well. These questions are shown in (Table 2a.) below:

Table 2a. Questions of the questionnaire

Question No.	Question Detail
Q1	What is your Age?
Q2	What is your Gender?
Q3	What is your Settlement Area?
Q4	What is your Educational level?
Q5	What is your Information and Communication (ICT) level?
Q6	What is your knowledge level towards E-government applications?
Q7	What is your level of disaster knowledge?
Q8	What is your level towards disaster awareness?
Q9	What is your level of knowledge towards Disaster Management?
Q10	Have you effected by disaster before?
Q11	Which kind of disaster you have effected before?

#### 3.2.2 Reliability Testing

There is an important step that should be done before the questionnaire dissemination, that is the reliability testing, therefore a random training sample contains of (30) participants in the questionnaire chosen to test the reliability of the questionnaire by using Statistical Package for Social Sciences (SPSS) from IBM© V.19.0.

By using Cronbach's Alpha function which tests the reliability, the tested sample reliability was 0.732 which means 73%, as shown in (Figure 2.) below. If the obtain result of reliability is more than 70%, this means that the questionnaire is reliable to be applied on a real sample.

Reliability Statistics	
Cronbach's Alpha	N of Items
.732	11

Figure 2. Reliability of the tested sample

#### 3.2.3 Questionnaire Dissemination

The questionnaire focuses on Iraqi citizens as a test sample. Therefore, the questionnaire is made in Arabic language and disseminate in Iraq by using two methods. The first method was the traditional method, by printing paper sheets for the questionnaire form, and submitting them to citizens to fill these sheets and return them back. The second method of dissemination was conducted by using Google Forms, preparing a soft copy for the questionnaire and send it to citizen, and then we received feedbacks. Collecting feedbacks stopped in

April 25.2019, after collection of 513 feedbacks. Questionnaire results are shown in figures below from Figure 3. to Figure 13:

1. Question 1: What is your Age?

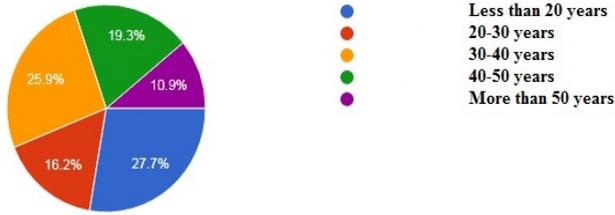


Figure 3. Results of Question 1 of Questionnaire Form

2. Question 2: What is your Gender?

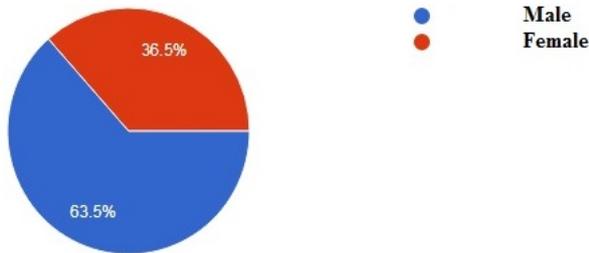


Figure 4. Results of Question 2 of Questionnaire Form

3. Question 3: What is your Settlement Area?

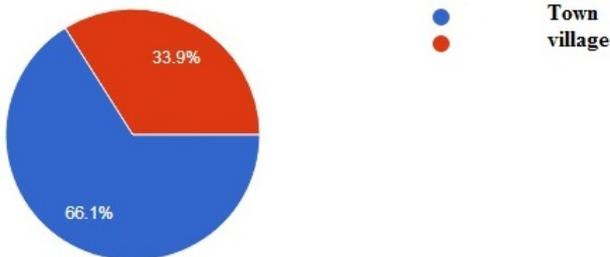


Figure 5. Results of Question 3 of Questionnaire Form

4. Question 4: What is your Educational Level?



Figure 6. Results of Question 4 of Questionnaire Form

5. Question 5: What is your Information and Communication (ICT) level?

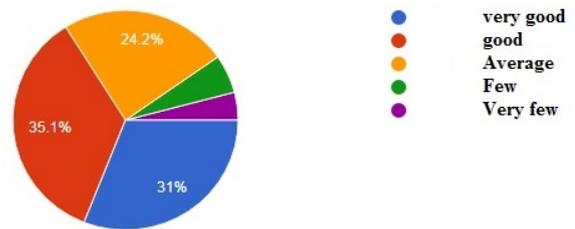


Figure 7. Results of Question 5 of Questionnaire Form

6. Question 6: What is your knowledge level towards E-government applications?

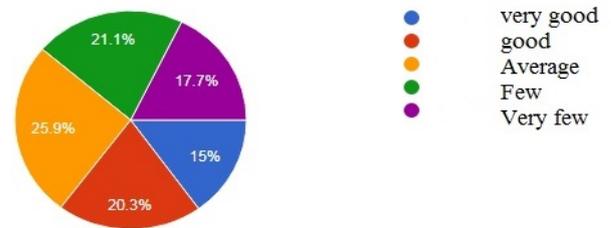


Figure 8. Results of Question 6 of Questionnaire Form

7. Question 7: What is your level of disaster knowledge?



Figure 9. Results of Question 7 of Questionnaire Form

8. Question 8: What is your level towards disaster awareness?

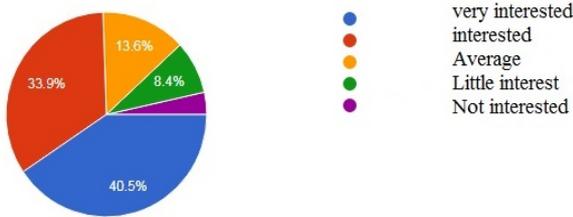


Figure 10. Results of Question 8 of Questionnaire Form

9. Question 9: What is your level of knowledge towards Disaster Management?

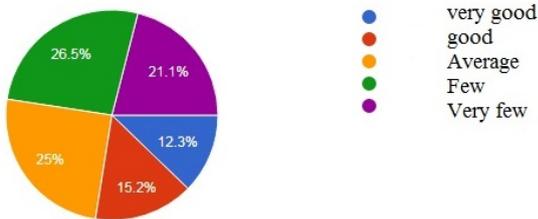


Figure 11. Results of Question 9 of Questionnaire Form

10. Question 10: Have you been effected by disaster before?

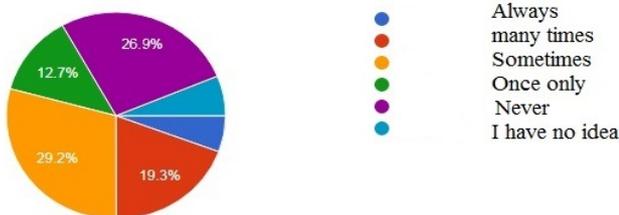


Figure 12. Results of Question 10 of Questionnaire Form

11. Question 11: Which kind of disaster have you effected before?

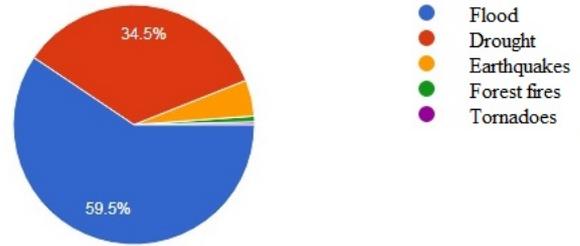


Figure 13. Results of Question 11 of Questionnaire Form

### 3.2.4 Feedbacks collection

The feedbacks collected until April 25.2019 were 513 feedbacks; this sample is a small number if we compare it with the population of Iraq which is 39534803 as on Sunday, September 29, 2019, based on World meters elaboration of the latest United Nations data. In addition, this can be one of the limitations because the researchers' lives in Turkey and the questionnaire sample is in Iraq.

Feedbacks collected by using the traditional method were 235 feedbacks. The rest feedbacks were 278, and they are collected by using Google Forms.

Google Forms has the ability to save all feedbacks in MS Excel © sheet. This operation facilitates the analysis of feedbacks by using that sheet directly in the analysis software.

### 3.2.5 Feedbacks Coding

The tested sample was Iraqi citizens; therefore, the questionnaire language was Arabic. In order to use feedbacks in the statistical analysis, all feedbacks were translated from Arabic language to English language. Later on, feedbacks were coded by using MS. Excel © V.2016 in order to analyze them by using the statistical analysis program (Statistical Package for The Social Sciences) SPSS from IBM © V.19.0.

### 3.2.5 Feedbacks Analysis

Results obtained from the analysis of feedbacks can be divided into two parts, the first part is the Demographic information, and this information are included in the Table 3 below:

Table 3. Demographic Information about Participant

Variable	Number	Percentage
Participant	513	
<b>Gender</b>		
Male	323	63.5%
Female	186	36.5%
<b>Age</b>		
< 20	142	27.7%
20-30	83	16.2%
30-40	133	25.9%
40-50	99	19.3%
> 50	56	10.9%
<b>Settlement Area</b>		
Town	339	66.1%
Village	174	33.9%
<b>Educational Level</b>		
Primary school or less	36	7%
Secondary school	178	34.7%
Bachelor's degree	187	36.5%
Master's degree	78	15.2%
Ph.D. degree	34	6.6%

The second part of feedbacks analysis is the correlation part, in which Pearson correlation function is used to assess the correlation questions of the questionnaire form. There are two main parts of the questionnaire that should be proved. These parts are Readiness of Iraqi citizen towards ICT, and Readiness of Iraqi citizen towards disasters. The readiness can be tested by checking the effect of demographic parameters on the knowledge and the awareness of Iraqi citizen towards ICT and disasters. The effect of Gender parameter on citizen readiness is shown in Table 4 below:

Table 4. The effect of Gender parameter on citizen readiness

		Q5	Q6	Q7	Q8	Q10
Gender	Pearson Correlation	.085**	.083**	.075**	.092**	.012
	Sig. (2-tailed)	.002	.002	.005	.001	.651
	N	513	513	513	513	513

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The effect of Age parameter on citizen readiness is shown in Table 5 below:

Table 5. The effect of Age parameter on citizen readiness

		Q5	Q6	Q7	Q8	Q10
Age	Pearson Correlation	.145**	-.074**	-.116**	-.130**	.033
	Sig. (2-tailed)	.000	.006	.005	.001	.217
	N	513	513	513	513	513

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The effect of Educational Level parameter on citizen readiness is shown in (Table 6.) below:

Table 6. The effect of Educational Level parameter on citizen readiness

		Q5	Q6	Q7	Q8	Q10
Level of Study	Pearson Correlation	.507**	.555**	.569**	.481**	-.051
	Sig. (2-tailed)	.000	.000	.000	.000	.060
	N	513	513	513	513	513

\*\* . Correlation is significant at the 0.01 level (2-tailed).

#### 4. Findings

The use of Pearson correlation function was to define the correlation between demographic parameters and the readiness of Iraqi citizen towards Information and Communication Technology, as well as the readiness of Iraqi citizen towards disasters. This test shows that demographic parameters have two types of effects (positive and negative) on the readiness of Iraqi citizen.

#### 5. Discussion

Demographic factors of Iraqi citizens are considered as an independent factor of their readiness towards ICT and disasters as shown in Figure 1. Most of Iraqi citizens have good experience in ICT technology, as notes in Figure 7, there are 31% chooses (Very Good) and 35.1% chooses (Good). However, (Figure 8.) shows that most of them have low experience in E-government applications.

About disaster, Figure 10 shows that although 40.5% of citizens are very interested in disaster. There are 27.5 % have a good knowledge about disasters as shown in Figure 11.. As well as, 66.9% have effected by disasters as shown in Figure 12. Another important thing that is noticed in Figure 13, is that floods are the most common type of disaster for Iraqi citizens with 59.5%. Drought comes second with a percentage 34.5 %.

Statistical analysis approved that Gender factor has positive correlation with citizen awareness toward ICT with value 0.085, as shown in Table 4, which agrees with previous studies [9]. Age has a positive correlation with citizen awareness toward ICT with value 0.145, as shown in Table 5, which does not agree with previous studies [10]. Level of study has the highest correlation with citizen awareness toward ICT with value 0.507, as shown in Table 6, which agrees with previous studies [11].

Statistical analysis approved that Gender factor has positive correlation with citizen awareness toward disasters with value 0.092, as shown in Table 4, which agrees with previous studies [12]. Level of study has the highest correlation with citizen awareness toward disasters with value 0.481, as shown in Table 6, which agrees with previous studies [13]. However, Age has a negative correlation with citizen awareness toward disasters with value -0.130, as shown in Table 5, which does not agree with previous studies [14].

#### 6. Conclusion

The use of Information and Communication Technology as a backbone of E-government is an important factor to reduce the damage that is caused by disasters. However, this mission will not succeed if the citizen readiness is not enough to prevent the damage. In this article, we tested the readiness of Iraqi citizens by preparing a questionnaire form contains of 11 question, after that we disseminate this questionnaire among Iraqi citizens by using tow deferent methods (traditional method and modern method). Later on we collected 513 feedbacks. Finally we analyzed these feedbacks using MS Excel © and IBM SPSS © software in order to obtain reliable results that approve the relation between the demographic factors (Gender, Age, and Level of study), and the readiness of citizen towards ICT and Disasters.

This article has many limitations. The first limitation in this article was the questionnaire dissemination in which the researcher is living in Turkey, but the research sample was in Iraq. Other limitation is software that was used in the questionnaire analysis was a bit old version, because these versions are available as free of license. This article is limited to test the readiness of Iraqi citizens towards ICT and disasters since it was chosen as a case study. The questionnaire shows that Iraqi citizens have low readiness for ICT and disasters, therefore the future work will be the enhancing the readiness of Iraqi citizens.

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