

Determinants of Internet Use in Iraq

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The Internet is considered to be today's most advanced technology and a key to progress in communications and in the exchange of information, goods, services, and technologies. Since its introduction during the late 1960s, the Internet has been instrumental in creating opportunities and conditions for progress in developed and developing nations alike. Not all nations, though, welcome this particular tool of global interconnectivity. One such nation is Iraq, which faces huge challenges in increasing Internet penetration, capacity building, and changing the traditional methods of communications. This study of Iraq's efforts during this difficult undertaking explores the many factors that define this transition process. It concludes by explaining the determinants of Internet use in Iraq. The results of the study indicate that while Iraqis are eager to adopt this technology in order to reach out to the world, a number of factors are not allowing it to become a public domain. Factors include lack of adequate resources, insufficient incentives and encouragement from the government, and social inhibitions.

Introduction

The reason why the Internet seems all-powerful can be explained by two unique characteristics that no other previously existing information and communication mechanisms possess. First, the Internet is the largest information resource in the world. Second, it provides people with access to an interactive mechanism to directly communicate with each other (Jackson et al., 2004). The foundation of why people

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get online and use the Internet is determined by many factors. Many scholars have attempted to articulate the decision factors behind Internet use to understand people's needs and behavior in this age of information technology. Fundamental human needs—such as communication, learning, entertainment, and sharing information and resources—were most cited as key factors that play a major role in people's decisions to connect to the Internet.

People need to interact with each other through the Internet and share their experiences and knowledge, as in real life. Social networks, virtual worlds, or services built on existing communication/social protocols and services on the Internet provide very attractive tools for human social activities on the Web. Moreover, the Internet helps people learn from others through online training courses, social news, journals, and from educational institutions, such as universities and colleges online. The Internet also provides a means for users to have fun and enjoy movies, shopping, games, and other activities that increase their satisfaction in their leisure time.

People also use the Internet to make a living through a variety of businesses and services. Ranging from individual entrepreneurs to large corporations, everyone finds his or her stream of revenues and generates incomes. E-commerce industry is becoming more significant than ever.

The Internet is considered a huge development in human civilization. It has become the main sharing tool around the world. It enables people to create massive developments for many countries that are interconnected. The Internet is considered a practical key to human development and social advancement causing massive innovation in the world. Internet systems are among the most impressive innovations that communications engineers have introduced to the world. Our research seeks to address how Iraqis are able to mandate the existence of the Internet in their community, how they are able to control its effects on its citizens, and how people's traditional preferences become affected by the situational use of the Internet. These particular considerations are the focus of the discussion presented through the context of this research.

To serve as a practical guide toward the completion of this research, the following questions shall be used to make the presentation of the ideas in this research practical. This will provide readers with knowledge that they ought to know about Internet use in Iraq. First, the Internet is today's cradle of global development. It provides a wide array of consideration in the process by which people are interconnected in the society. How does Iraq fit into the picture of development considering this particular fact regarding the Internet? Second, maintaining the opportunity to develop toward a more industrialized nation is one of the most important concerns of the well-developed and the developing countries today. The Internet already has been recognized as a particular trend that allows humans to further progress. Does Iraq try to fit in and jump into the trend of development through the Internet or does it remain traditionally laid to its roots of progress?

To answer these questions, we utilized different methods of data collection that allow handling the different factors impacting Internet use. We used logit regression analysis methodology to investigate the determinants of Internet use in Iraq.

This study provides a practical explanation of the different determinants of Internet usability in Iraq that could already be identified and established for the sake of public knowledge and understanding.

The aim is to present practical and proper data to policy decision-makers in the information and communications technology sector in an effort to enhance their vision on developing Internet adoption.

The rest of this study is organized as following: Section 2 provides relevant literature review and research background. Section 3 presents the descriptive statistics, while methodology, model specification and estimation are presented in Section 4. Section 5 discusses the results and its analysis. Finally, we conclude our work in Section 6 with a summary of the research.

Literature Review

Development of the Interface Culture

Previous literature shows tremendous use of different factors to determine Internet use. However, there have been few studies that discuss Internet use and its determinants in Iraq. To overcome this gap, we have concentrated on an in-depth review of the literature and define the most important determinants that are relevant in the context of Iraq. This is to develop a model that theoretically and empirically is consistent with the conditions in the country. In this section, we emphasize some of these relevant studies. In addition, it presents an overall background and common understanding for the research context.

Digital Divide and the Determinants of Internet Use

The World Wide Web has become a main source of social and economic development (Crandall and Jackson, 2003). Internet access has become a necessity. Consequently, many scholars have investigated the determinants and factors that control Internet usage and access around the world. In their study of the Chilean Internet population, Mendoza and Alvarez de Toledo (1997) found that Internet users were young, male, and highly educated.

Internet usage is one aspect of the digital divide; earlier research implies that Internet use is affected by social and demographic characteristics, attitudes toward the Internet and social supports (Cukier, 2007; Jiang, 2009; Kraidy, 2007; Lin, 1998; Rogers, 1995; Zhu & He, 2002). Studies have found vast differences in the types and nature of population groups of users and non-users of Internet services. Internet use may be an indicator of changes in society, and Internet users and non-users may be differentiated according to their social demographics, attitudes toward the Internet, and the social support that they receive (Rhee and Kim, 2004). Prior research on the adoption of new technology has focused on an individual's economic characteristics; Perceived attributes of innovations, situational factors, and the characteristics of innovations that influence adoption have been identified as critical factors in using the Internet (Rogers, 1995; Zhu & He, 2002).

Meanwhile, Busselle et al. (1999) found that in the early stages of diffusion, the young, educated, and affluent were the typical adopters of the new information and communications technology. However, according to predictions made by Rogers (1995), demographics tend to be less important when innovations have reached a critical mass on their diffusion curves. Empirical results from studies of adoption of new technologies suggest that those who adopt new communications technologies are more

fashionable, better educated, and younger than non-adopter counterparts (Consoli, 2008; Dimaggio et al., 2001; Garramone et al., 1986; Henry & Mohit, 2009; Wotring & Forest, 1995).

Researchers have identified several reasons for the expanded demand for the new Internet technology. Higher education brings about a responsiveness of benefit from the use of the new technology, and higher incomes enable people to purchase new technological devices that are financially unreachable to others. As well, young people are more adventuresome when it comes to trying new technologies (Lin, 1998). The factors that impact uses of the Internet are diversified. Economic factors, such as income level, availability and price structures of services, bandwidth and supporting infrastructures are critical to an individual's decision to use the Internet (Kshetri, 2001). Bandwidth prices, for instance, are a main determinant of Internet adoption. For example, 50% of the worldwide bandwidth capacity is in North America compared to only 3% in the Middle East and Africa (Frontline.net, 2001). The technology capability and creation and its multiple use explains the difference in its utilization rate. Moreover, the lack of intraregional infrastructures in developing nations of Asia, Africa, and Latin America means that even Internet communications with neighboring countries have to be routed through the U.S. or other industrialized countries in Europe. When high bandwidth is available and the price is reasonable, as in South Korea, it becomes a driver of more rapid Internet diffusion.

Another category of factors includes social factors where an examination of the "values" inherent in the Internet helps to predict the degree of acceptance or rejection of the Internet in a society. An important component of the value system is related to skills required to use the Internet. Literacy and computer skills are almost always the prerequisites to Internet use. A large proportion of the population in developing countries is illiterate and an even larger proportion lacks computer skills. Thus, illiteracy and other important factors explain the fact that penetration of such technology is slower than in developed nations. Moreover, the Internet tends to favor the English-speaking population because most of the software and interfaces used with the Internet are in English. Also, a large proportion of World Wide Web content is in the English language. For instance, a survey conducted in 1998 found that about 85% of the texts on the Web were in English (Nunberg, 2000), which decreased to about 80% in 1999 (Nua Internet Surveys, 1999). Many people in the East, thus, tend to doubt the integrity of information originating from the Western world and view the use of English as a vehicle for executing an electronic *Pax Americana* (Shabazz, 1999). But lack of alternatives and formation of habit in the long term reduce the effects of such resistance factors.

A new study (Schubert, 2009) on the Intent Index shines some light on the intent and motivations for going online, while also proposing a new perspective on demographics. The study shows that 63% of Americans go online to try to change others' opinions or express their contrasting views on the discussed topics. The reasons for going online do not vary too much with age, as young people show the same motivations as seniors, with 82% using the Web to have fun and 80% to socialize. This homogenization, said the research firm, shows that regular demographics are becoming increasingly irrelevant in the online world.

Some of the top reasons for going online are learning, 88%; having fun, 82%; and socializing, 81%. Online communities are a big part of the Internet's draw, with 72% of those surveyed going online for this reason. Social networks are the preferred mediums for communities, with 41%, compared to 34% who go online to post comments or opinions (Kathryn & Gary, 2004). In Songan and Noor (1999), higher

education in Malaysia is a significant factor in Internet usage, while gender is not. Ono and Zavodny (2003), on the other hand, found that women were significantly less likely to use the Internet in the mid-1990s, but noted that since the 2000s, there has been little reason for concern about sexual inequality in Internet access and usage. Culture is also important; in fact Gong et al. (2007) investigated the role of national culture on Internet use and access using Hofstede's cultural dimensions (power distance, uncertainty, individualism, masculinity, long-term orientation) and education.

In general, the digital divide can be explained by different functions of the Internet. First of all, there is an instrumental function of the Internet, which is news and information gathering. This is perhaps the most important function of Internet use. The second function is communication; third, transaction (i.e., Internet shopping and banking), and fourth—entertainment. These functions are primarily engaged by different population subgroups based on their own needs and motivations (Rhee & Kim, 2004). Thus, whatever motivations there may be in using the Internet, they can be differentiated by various characteristics of the user population (Rogers, 1995).

Internet usage is more likely to expand among younger people who are the main participants in it. In the process of socializing, young people are commonly exposed to new technologies and tools, which they can easily assimilate for their own various purposes (Jiang, 2009). The younger generation, with better learning capability and the main consumers of most of the online services—such as entertainment—is more prone to its use and further development.

The above-mentioned background characteristic can be an obstacle in the introduction of new technologies. For example, elementary English-language knowledge is needed in order to be able to use the Internet. The education policy and system—by providing elementary English-language skills to the younger—may also influence the difference in Internet use by age cohorts. Another factor is educational level, which determines the capacity for Internet use. A well-educated group is more open to using the Internet than those with low levels of education. Income level is another criterion in the adoption of the Internet because of the increased purchasing power to buy computer equipment and meet the costs of Internet access (Zhu & He, 2002).

Since the objective of this study is to identify the key determinants of Internet use in Iraq, we will test a number of hypotheses. The focus is on the following three hypotheses:

- H1:* Individuals with higher educational standards and literacy rates are more likely to use the Internet.
- H2:* Population in the capital city of Baghdad is more likely to use the Internet.
- H3:* People's careers have a strong relation to the use of the Internet.

Iraqi Internet Policy

Iraq developed different procedures for increasing Internet use in the society, and benefitted from its advancement in global communication systems, which were available by the Internet. No matter, it should be considered that in Iraq, their conservative values still count as much as their willingness to progress further toward development. Hence, besides the need to be informed, the Iraq policy on Internet

usage defines other determinants of Internet usability in the country. The following policies of Internet usage in Iraq are presented. The text is based from the draft of the Iraq Internet Usage Policy, which was released June 2, 2003 and is found at <http://pws.prserv.net/sadowsky/papers/iraqpolicy.pdf>

First, Internet service pricing effectively controls Internet use. The guidelines and incentives provided by the government also are introduced in different ways that maximize Internet adoption. Second, government aims to support the Internet to become the tool for social and national development. Consequently, government will empower its people and provide proper funding to make it easier for the citizens to gain the basic knowledge and training assistance they need to become computer and Internet savvy. Third, websites produced by the Iraqi government and other institutions created for public knowledge should be presented in the Arabic language and English as well. This will increase the usability of the Internet for the locals who usually do not understand English fluently. Fourth, policies on computer and online crimes should allow using the Internet in a safe and proper way. Finally, laws on licensing, privacy, and ownership should be in accordance with international standards. Consumers need to have their choice for ownership while their privacy and rights are protected by the law.

These are a sampling of the policies that have been established in Iraq to assure that the population benefits well from its use of the Internet, and being connected to the world through the World Wide Web.

Data and Descriptive Statistics

As discussed in the literature review part, Internet users differ from non-users by a number of characteristics, including age, education, income, profession, gender, and location. Non-users of the Internet are more likely to be older individuals, and are more likely to have less education than Internet users. Non-users also are more likely to be women, at every age group, and those living in rural areas are less likely to use the Internet compared with their urban counterparts. Based on this, a survey was developed to collect the most relevant data that represent these aspects

Before discussion of the methodology used and model specifications, we introduce the readers to the data, its sources, and variable definitions. The following parts provide the survey instrument used and some summary statistics of the data employed in order to understand why people are using or not using the Internet.

Through a survey and interview process, we aim to show that there are indeed individuals in Iraq who use the Internet for several reasons and that they are benefited by this particular connectivity to the world. Through this approach, the understanding of the different factors contributing to the use of the Internet in Iraq could be readily determined and we could measure how much these determinants actually influence the perception of the people in Iraq toward the importance of the Internet for them personally and for their nation as a whole.

One important issue is quality of data. Data quality problems include inaccuracies, inconsistencies, and incomplete data. To control for data quality and proper sampling, we gathered data from various governorates around Iraq. A total of 19,800 questionnaires were distributed and 16,800 were returned. Nine hundred and sixty-six questionnaires were not complete and therefore were discarded. This yielded a total of 15,835 usable questionnaires. The questionnaire has close-ended questions. Table 1 categorizes the questions used in the questionnaire.

Table 1. The Iraqi Internet Use Questionnaire.

Factor	Questions	Constructed variable
Utility	What is Internet utility rate?	Utilize
Resources	What technology is used to connect to the Internet?	Modes
Cost	Cost of obtaining Internet connection?	Cost
Demographic factors	Gender	Gender
	Age	Age
	Location	Location
	Education	Education
	Type of work	Employment
	Do you have Internet?	Internet
Efficiency	Why do you use Internet?	Purpose
	Why do not have Internet?	No-Internet

The questionnaire contained 11 questions. The first six questions (Q1-Q5, Q11) ask about demographic information (gender, age, education, location, employment, and Internet usage), while the last five questions (Q6-Q10) are as follows: "Reasons why do not have Internet connections?" "Why do you use Internet service?" "What is the technology type that you use to connect to the Internet?" "What is the cost of obtaining Internet connection?" and "What is your Internet utilization rate?"

As illustrated in Table 2, the state company for Internet services divides Iraq into five regions: Baghdad the capital city, south, south-center, north-center and Middle Euphrates. The provincial structure is used to distribute questionnaires to a random sample of citizens of different ages, gender, and level of education. Data was collected in April 2009 on Internet use in Iraq. The total number of respondents is 15,835, consisting of 9,439 males and 6,396 females. In view of Iraq's population (30 million in 2005) the sample size is sufficiently large. The final data does not contain any missing units. Cities have been surveyed in stratified form by their population share, as shown in Table 2. The stratified sample was collected based on a population registry under the United Nations' 1996 Oil-for-Food Program for Iraq. Under that program, the U.N. made a population census in Iraq while providing every household a monthly coupon to get food. Moreover, the U.N. has updated the census information on a regular basis, hence, our data collection can be considered more accurate without giving any scope for the bias.

Table 2. Iraqi Random Sample Stratified by Provincial Location.

Number of Provinces	Province	Observations
1	Baghdad	3206
2	Southern Iraq	2969
3	Region of south-central Iraq	3593
4	Region of north-central Iraq	4045
5	Middle Euphrates region	2003

Table 3 contains a description of main factors used in this analysis. Questions in the survey and here are categorized according to the main construct. In addition to demographic factors, this study provides information about the determinants of the Internet utilization rate. Two efficiency variables are included. These refer to the reason for not having Internet and the reason for using Internet when they have access to it. Resources construct includes modes type, while cost construct includes costly or suitable. These constructs in this research model are better fitted to the aims of this study and the requirements for the Iraqi case.

The descriptions of the main factors are shown in Table 3. For a better understanding of the variables, we provide a description of them. . For instance, the variable *age* has been categorized into three age groups (12-25, 25-40, and 40+ years). The same treatment was given to the variable *education*, which is categorized into four different groups (primary and intermediate, high school and diploma, bachelor's degree, and people who carry a high diploma, master's or PhD degree).

Table 3. Description of the Main Variables and Their Classifications

Variable	Description	Category
Gender	0 for male and 1 for female	Demography
Age1	Less than 12 to 25 years	Demography
Age2	25 to 40 years	
Age3	More than 40 years	
Edu1	Primary and intermediate	Demography
Edu2	High school and diploma	
Edu3	BSc	
Edu4	High diploma, MSC and PhD	
Emp1	Unemployed	Demography
Emp2	Public employee	
Emp3	Private employee	
Emp4	Student	
Internet	0 if he has Internet and 1 do not have Internet	Access
Locatn1	Baghdad	Demography
Locatn2	South	
Locatn3	South-central	
Locatn4	North-central	
Locatn5	Middle Euphrates	
Nointn1	Do not know how to use	Efficiency
Nointn2	Not available	
Nointn3	Economic reasons	
Nointn4	No answer	
Purpos1	General search	Efficiency
Purpos2	Special purpose	
Purpos3	Entertainment, mail and chatting	

Purpos4	No answer	
Modes1	Dial-up	Resources
Modes2	Broadband	
Modes3	Internet cafe	
Modes4	More than one way	
Cost	Costly	Cost
Suitable	Suitably	
Utiliz1	Not at all	Utility
Utiliz2	Rarely or sometimes	
Utiliz3	Mostly	
Utiliz4	Always online	

Table 4 shows sub-factors, and a summary of statistics for the main factors that were used in this research on Internet use in Iraq. However, Table 4 illustrates high heterogeneity in mean between groups while dispersion around mean is low in general within groups. It strongly suggests the adequate use of groups in analysis.

**Table 4. Descriptive Statistics of Various Characteristics of Internet Users in Iraq.
(N=15,835 obs)**

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Gender	0.595	0.490	Modes1	0.971	0.296
Age1	0.586	0.492	Modes2	0.115	0.319
Age2	0.328	0.469	Modes3	0.618	0.485
Age3	0.850	0.278	Modes4	0.126	0.111
Edu1	0.178	0.383	Modes5	0.156	0.363
Edu2	0.462	0.498	Cost	0.313	0.463
Edu3	0.262	0.439	Utiliz1	0.193	0.395
Edu4	0.967	0.295	Utiliz2	0.399	0.489
Emp1	0.968	0.295	Utiliz3	0.236	0.424
Emp2	0.368	0.482	Utiliz4	0.170	0.375
Emp3	0.168	0.374	Locatn1	0.202	0.401
Emp4	0.366	0.481	Locatn2	0.226	0.418
Noint1	0.146	0.353	Locatn3	0.187	0.390
Noint2	0.219	0.413	Locatn4	0.256	0.436
Noint3	0.178	0.383	Locatn5	0.126	0.332
Noint4	0.455	0.498			
Purpos1	0.489	0.499			
Purpos2	0.193	0.395			
Purpos3	0.169	0.375			
Purpos4	0.147	0.354			

The Internet users, the non-Internet users, and Internet universal access are important concerning the descriptive statistics. The descriptive statistics shows that:

For Internet Users: Iraqis access the Internet through identifiable procedures. The survey found that there are those who use dial-up connections while others use wireless access. Dial-up users reached 10% while those who used a wireless connection approached 67%. Dial-up is a connection to the Internet using a fixed phone. The majority of users employ a wireless connection either through an Internet café or through a delivery line from the nearest Internet café to their houses. In fact, Internet cafés are convenient, cheap, and an easy way to access the Internet for users with minimal time. The purpose of use varied among the Internet users. A total of 56% spent time doing general searches, 19% looked for entertainment, e-mail, and chatting, and another 23% went online for special purposes. The main characteristics of users and non-users are described below.

Non-Internet Users: Non-Internet users are those who never use Internet services. Different reasons are given as explanation to their distanced behavior. Lack of computer knowledge and lack of access were key factors leading to non-use of the Internet. When non-users were asked to identify the greatest barrier that keeps them away from using the Internet, 45% chose as their reason: "Do not know how to use." Lack of access to computers or the Internet was the second most frequently cited barrier with more than 31%, cost came in third with more than 19%. Another barrier was language-related, as those who spoke only Arabic had access to less content.

Internet Universal Access: About 65% of Iraqis feel it is very important that everyone have access to the Internet. Another 3% believe that it is somewhat important, whereas approximately 23% do not believe Internet access for all Iraqis is important at all. Most people agree that barriers to the Internet should be removed, but there is no agreement on who should be responsible for their removal. About 23% do not know who should be responsible for removing barriers to the Internet. Of those who do express a view, the largest percentage indicates that individuals should be responsible for removing barriers. A slightly smaller percentage believes that the federal government should remove barriers or believes it is the responsibility of private industry, such as Internet providers (Iraqi Ministry of Telecommunication, 2009).

Table 5. Frequency Distribution of Internet Users and Non-users in Iraq.

Internet use in Iraq		Non-Internet use in Iraq	
Gender %			
Male	7637(64)	Male	1792(44)
Female	4126(34)	Female	2279(56)
Age %			
Less than 12 to 25	(56.1)	Less than 12 to 25	(63.3)
25 to 40	(35.4)	25 to 40	(25.5)
More than 40	(7.6)	More than 40	(11.1)
Education%			
Primarily and intermediate	(13.4)	Primarily and intermediate	(33.5)
High school and diploma	(45.7)	High school and diploma	(47.6)
BSc	(29.6)	BSc	(16.4)
High diploma, MSC and PhD	(12.2)	High diploma, MSC and PhD	(2.6)
Employment%			
Unemployed	(6.7)	Unemployed	(18.4)
Public employee	(39.6)	Public employee	(28.8)
Private employee	(17.9)	Private employee	(13.8)
Student	(35.7)	Student	(39.0)
Why do you use (do not use) Internet%			
General search	(56.5)	Do not know how to use and not convinced	(45.3)
Special purpose	(23.3)	Not available	(31.6)
Entertainment, mail and chatting	(19.1)	Economic reasons	(19.1)
No answer	(1.1)	No answer	(4.1)
Modes			
Dialup	(10.5)		
Broadband	(11.2)		
Internet cafe	(67.0)		
More than one way	(1.4)		
No answer	(0.9)		
Cost of obtaining Internet			
Costly	(68.5)		
Suitable	(13.5)		
Utilization rate			
Not at all	(1.0)		
Rarely or sometimes online	(45.5)		
Mostly online	(31.0)		
Always online	(22.6)		

Location %			
Baghdad	(20.3)	Baghdad	(20.1)
South	(22.9)	South	(22.1)
Middle Euphrates	(20.1)	Middle Euphrates	(18.0)
North	(29.1)	North	(28.6)
Muthana and Dewaneaa	(12.3)	Muthana and Dewaneaa	(13.7)

Methodology, Model Specification and Estimation

There are different methodologies, both parametric and non-parametric, which are used to investigate Internet use. Descriptive analysis was used before the multivariate analysis. A factor analysis was used to investigate significant factors that have had an influence on Internet use. As a third alternative, a multiple logistic regression analysis model was constructed. The concepts included in the above model were used to investigate the determinants of Internet users and non-users.

In this study, the descriptive and factor analysis methods are used to specify the model, while the main focus is on the parametric approach to estimate a model of Internet use. Since we are primarily interested in whether an individual sampled is an Internet user or not, in our analysis we use a simple binomial logit model to examine Internet use in Iraq. The model is written as:

$$(1) \quad P[Y|X] = \Phi(X' \beta)$$

$$(2) \quad Y_i^* = X_i' \beta + \varepsilon_i$$

where P indicates probability of being an Internet user, Y is a dependent variable indicating Internet use, X is a vector of explanatory or conditional variables or indicators of Internet use, Φ is a distribution variable, β is a vector of unknown parameters to be estimated, ε is a random error term, and i indicates individual Internet (non)user. The dependent variable representing Internet use is dichotomous and written as:

$$(3) \quad Y = \begin{cases} 1 & \text{if } Y^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

where Y is not observable and defined based on the latent variable Y^* . It takes value one ($Y=1$) if $Y^* > 0$ implying the person is an Internet user and zero ($Y=0$) if $Y^* = 0$ suggesting that the person is not an Internet user.

Based on the same methodology and findings in the literature we specify a model to identify the determinants of Internet use and to estimate each factor's impact on the probability of using the Internet. The model is specified as:

$$(4) \quad Y_i = f(X_{1i}, X_{2i}, \dots, X_{Ji})$$

where X_j are J individual indicators or vectors of indicators of Internet use. The indicators here are age, education level, employment, gender, modes of Internet access, reason for using the Internet, as well as location, as can be seen in the following equation:

$$(5) \quad Y = f(\text{Gen}, \text{Cos}, \text{Age}, \text{Edu}, \text{Emp}, \text{Pur}, \text{Loc}).$$

where Gen, Cos, Age, Edu, Emp, Pur and Loc represent gender, cost, age, education level, employment, purpose of use, and regional location of users. The number of categories in each group of variables (J) may differ by the way the variable category is defined. After appending an error term to capture measurement error in dependent variable and possible left out explanatory variables, the model specification is as follows:

$$(6) \quad Y_i = \alpha_0 + \beta_{\text{Gen}} \text{Gen}_i + \beta_{\text{Cos}} \text{Cos}_i + \sum_{j=1} \beta_j \text{Age}_{ji} + \sum_{j=1} \beta_j \text{Edu}_{ji} + \sum_{j=1} \beta_j \text{Emp}_{ji} \\ + \sum_{j=1} \beta_j \text{Pur}_{ji} + \sum_{j=1} \beta_j \text{Loc}_{ji} + \varepsilon_i$$

Since the dependent variable is not a continuous variable, we are not able to use ordinary least squares (OLS) estimation method. The models with dichotomous dependent variables are by tradition estimated using logit models. The model is written as:

$$(7) \quad P(Y_i = 0) = \frac{1}{1 + \exp(\beta x_i)}, \text{ Probability of being non-user.}$$

$$(8) \quad P(Y_i = 1) = \frac{\exp(\beta x_i)}{1 + \exp(\beta x_i)}, \text{ Probability of being user.}$$

where x is gender, cost, and vectors of age, education, employment, purpose, and location categories defined above. The model is estimated by maximum likelihood estimation method. The estimation method is iterative, and estimation results are reported in Table 6. A battery of model specification tests can be used by likelihood ratio test (LRT) based on the log likelihood values obtained from different restrictive versions of the model. LRT will lead to the selection of the final model specification presented in Table 6.

**Table 6. Maximum Likelihood Logit Model Parameter Estimates of Internet Use in Iraq
(N= 15,835 obs).**

Variable	Coefficient	Std Err	b/Std Err	p[z >z]	Mean of x
Constant	-0.202	0.017	-1.913	0.056	1.000
Gender (male=1)	0.926	0.008	18.004	0.001	0.595
Cost	0.290	0.009	5.215	0.001	0.313
Age 25 to 40	-0.068	0.011	-0.963	0.335	0.328
Age More than 40	-0.811	0.017	-7.667	0.001	0.085
Edu2	0.874	0.010	13.740	0.001	0.462
Edu3	1.420	0.013	17.280	0.001	0.262
Edu4	2.324	0.023	16.365	0.001	0.097
Emp2	0.806	0.015	8.736	0.001	0.368
Emp3	0.788	0.016	7.765	0.001	0.168
Emp4	0.412	0.013	4.936	0.001	0.366
Purpose2	0.173	0.011	2.461	0.014	0.193
Purpose3	0.054	0.010	0.826	0.409	0.169
Purpose4	-4.615	0.022	-34.138	0.001	0.147
Locatn2	-0.064	0.076	-0.845	0.398	0.226
Locatn3	0.119	0.082	1.455	0.146	0.187
Locatn4	0.004	0.075	0.060	0.952	0.256
Locatn5	0.078	0.090	0.873	0.383	0.126
LR ⁴	7377.070				
ρ^3	0.408				

Since the slope parameter estimates are not directly interpretable, we compute marginal effects. The marginal effects representing expected changes in the probability of Internet use $E(Y = 1)$ as a response to changes in the explanatory variables is computed and reported in Table 7.

Table 7. Marginal Effects Obtained from Estimation of Logit Model of Internet Use in Iraq (N= 15,835 obs).

Variable	Coefficient	Std Err	b/Std Err	p[z >z]	Mean of x
Constant	-0.033	0.017	-1.913	0.056	1.000
Gender	0.154	0.008	18.004	0.001	0.595
Cost	0.048	0.009	5.215	0.001	0.313
Age2	-0.011	0.011	-0.963	0.335	0.328
Age3	-0.135	0.017	-7.667	0.001	0.085
Edu2	0.146	0.010	13.740	0.001	0.462
Edu3	0.237	0.013	17.280	0.001	0.262
Edu4	0.388	0.023	16.365	0.001	0.097
Emp2	0.134	0.015	8.736	0.001	0.368
Emp3	0.131	0.016	7.765	0.001	0.168
Emp4	0.068	0.013	4.936	0.001	0.366
Purpose2	0.028	0.011	2.461	0.014	0.193
Purpose3	0.009	0.010	0.826	0.409	0.169
Purpose4	-0.770	0.022	-34.138	0.001	0.147
Locatn2	-0.010	0.012	-0.845	0.398	0.226
Locatn3	0.020	0.013	1.455	0.146	0.187
Locatn4	0.001	0.125	0.060	0.952	0.256
Locatn5	0.013	0.015	0.873	0.873	0.126

Analysis of the Results

According to the results illustrated in Table 6, the model with the highest RHO ($\rho=0.407$) indicates a best fitted with data (McFadden, 1974)³. Furthermore, the LR test value (LR=7354.377) exceeds its critical value (CV=27.59) at the 5% level of significance⁴. The test result indicates that the effect of the model specification is statistically significant (Greene, 2008).

³ $RHO = \left\{ 1 - \frac{LL1}{LL0} \right\}$ where LL1=Unrestricted log likelihood and LL0=Restricted log likelihood functions.

⁴ $LR = 2\{LL(1) - LL(0)\}$ is likelihood ration test where LL(1)=Unrestricted log likelihood and LL(0)=Restricted log likelihood functions.

Multicollinearity

All correlation coefficients between the key variables in Table 8 are less than 0.412, which shows that multicollinearity is not a significant problem in this case. Wheeler and Tiefelsdorf (2005) used [-0.59 and 0.59] as an acceptable range of correlations. In order to obtain more accurate results on factors affecting the dependent variable, pairs of variables with a correlation coefficient higher than 0.50 are assumed to be highly collinear.

Table 8 presents a correlation matrix for the explanatory variables, which show values below 0.50. This threshold usually is set for recognition of a multicollinearity problem. The multicollinearity problem makes the effects of collinear explanatory variables become mixed. In this case of multicollinearity we cannot isolate one variable, while keeping the others constant. Therefore, the interpretation of elasticity of causal relationship between dependent and independent variables is not correct since we cannot keep other variables constant. Luckily, in this study we do not have a serious multicollinearity problem, therefore the interpretation of the effects of explanatory variables on Internet use in the regression results are reliable.

Table 8. Correlation Matrix (N=15,835 obs).

	Gender	Cost	Age	Education	Employment	Purpose	Locations
Gender	1.000						
Cost	-0.056	1.000					
Age	0.057	0.016	1.000				
Education	0.040	-0.009	0.412	1.000			
Employment	-0.051	0.033	-0.367	-0.186	1.000		
Purpose	0.082	0.020	-0.007	-0.196	-0.041	1.000	
Locations	0.071	0.003	-0.023	-0.077	-0.017	0.032	1.000

Logit Parameter Estimates

The results of the binomial logit model presented in Table 6 show that gender, cost, and education – including its category groups of high school and diploma (second group), BSc (third group), and high diploma, M.Sc. and Ph.D. (fourth group) – are all positive and statistically significant factors that define the model of Internet use in Iraq. The same can be noticed in the category of employment type for public sector, private sector, and even students where the results are positive and statistically significant for Internet use.

In the category of factors for Internet usage purpose, the most important factors that have a positive impact were the need to use the Internet for research, whereas the need to use the Internet for entertainment showed a negative effect and statistically significant factors. In the category of factors for location, the Middle Euphrates area had a positive but statically less significant effect on Internet use. The results of the logit regression analysis show that in the age category, individuals older than 40 years have

a highly significant, and negative effect on Internet use. Finally, the results from the marginal effects obtained from estimation of logit model of Internet use are reported in Table 7.

Partial Output (Marginal Effects)

The concept of marginal effect is well defined by Wooldridge (2006) in his textbook *Introductory Econometrics* as, "Is the effect on the dependent variable that results from changing an independent variable by a small amount?" Thus, we will interpret the effects on Internet use with respects to incremental changes in our independent variables, such as education, age, gender, cost, employee categories, etc. Our logit model includes 17 independent dummy variables (see Table 7). The table presents partial output from the logistic regressions. The result is used to identify which of the coefficients differs significantly from zero showing impacts on Internet use.

As shown in Table 7, for gender, the logistic regressions coefficient for male is equal to 0.154, suggesting that males have a higher probability of having Internet by 0.154. The gender gap in Internet use is attributed to culture, employment, and income factors.

Moreover, the logistic regressions coefficient for Age2 (category of 25 to 40 years old) is -0.011 relative to Age1 (category of 12 to 25 years Base Group). Age2 has 0.011 less probability of using Internet ($y = 1$). Concerning for Age3 (category of older than 40 years) the logistic regressions coefficient is -0.135 relative to Base Group (Age1). Age3 has 0.135 less probability of using Internet ($y = 1$). This negative relationship between age and Internet use can be explained by the fact that the majority of the older Internet users in Iraq have no real concept in the use of this technology in terms of its efficiency, or real benefits from the wide spectrum of services that the Internet offers. In addition, the lack of domestic service providers who can offer local content, such as announcements, government e-services, e-shopping, money transactions, etc., is another negative factor. These have resulted in a reduction of motivation or desire to use the Internet for the higher age groups mentioned above.

For Edu2 (high school and diploma categories), Edu3 (B.Sc. category) and Edu4 (high diploma, M.Sc. and Ph.D. categories) the logistic regressions coefficients are 0.146, 0.237 and 0.388 respectively, relative to the Edu1 (Primary and intermediate treated as the Base Category). Edu2, Edu3 and Edu4 categories have 0.146, 0.237 and 0.388 higher probability of having Internet and using it ($y = 1$). The effect is successively increasing function of the level of education.

For job type, the Emp2 (public sector employee), Emp3 (private sector employee) and Emp4 (student), the logistic regressions coefficients are 0.146, 0.237 and 0.388 respectively, relative to the Emp1 (Unemployed serving as Base Group). The results suggest that Emp2, Emp3 and Emp4 have 0.134, 0.131 and 0.068 have higher probability of having/using Internet ($y = 1$), successively. Employment affects positively Internet access and use, but together with the age effect, enrollment in education leads to higher Internet access.

For the purpose of Internet use, the logistic regressions coefficient for the purpose2 (special purpose) is 0.028, relative to purpose1 (General search Base Group) purpose2 has higher probability of having Internet ($y = 1$). But the logistic regressions coefficient for purpose4 (No answer) is -0.770, relative

to purpose¹ the purpos⁴ has lower probability of $\gamma=1$. The results suggest that the Internet is used for special purpose, while the general search is unspecified. The category 4 consists of mainly non-users.

Finally, the cost has positive and statistically significant effect but it can be noted that its impact is not large compared to other factors. The reason is that the majority of the Internet users comes from the government sector and they do not pay for Internet access, as do Internet users in the private sector. It should be noted that, there are no other choices available to the potential users, because the Internet service is often provided by one supplier acting as a monopoly. This is the main reason why a majority of Internet users comes from the government sector. It is partly the result of a shortage of electricity, poor Internet service infrastructure and its unavailability. The public sector has better access to electricity than the private and household sectors.

There is no doubt that the Internet is a new communication medium for our life and is being promoted as the future way for data and information transfer and sharing in the globalization era, which reflects also the general technological capability of the nation. However, the Internet is still a new communication medium in the developing world. Therefore, results from our survey analysis showed that Internet use requires high levels of education and skills to use this service in an effective way, and it had a strong positive effect on education. The factor which has most positive impact on Internet use is high diploma, M.Sc. and Ph.D. degree holdings. This means that higher educated people are more prone or willing to use the Internet than other users.

The positive association between the level of education and Internet use indicates the need to develop proper policies to support education and create incentives for less educated people to use the Internet. Moreover, this requires that Iraq's policymakers invest more in the lower levels of education, building up necessary infrastructures and reducing the gender gap. These measures will increase Internet service users through development or promotion programs, such as training programs for students or enforcement of Internet service at schools. The use of the Internet should be linked to productive activities like e-government, education, and business to have stronger feedback on investments in education and infrastructures.

Experience from other countries, such as South Korea, which promoted education and the use of e-learning as one of the sources for middle and high school education, showed positive effect on Internet use in the long run (Josie et al., 2004). Such promotion programs will not only lead to an increase in the number of Internet users, but also to an increase in the number of individuals who have a computer device and computer skills.

The frequent and persistent shortage of electricity, lack of business regulations, few providers in the market, and inadequate infrastructure are among factors explaining the high cost of Internet access in Iraq. The availability of Internet free of charge in public workplaces and in many private companies explains the positive effect of employment on Internet use in Iraq. In general terms, employment increases the opportunity of a person to have access to and to use the Internet.

The location category has long played a significant role on Internet use in developing countries. In Iraq it is more important since at some points of time, access to all forms of telecommunications were extremely restricted. Yet, after the change of the previous regime and liberalization of the market, this sector has witnessed some positive growth, concentrated in the middle areas and in the cities more than

the rural areas. Living in the provinces of southern of Iraq shows (Locatn2) a negative impact on the use Internet compared with the reference region that is (Baghdad).

Thus, one could expect a positive association between urbanization and Internet access and use. However, this linkage is relatively weak in Iraq due to limited resources and the political situation. Nevertheless, the regional differences can also be attributed to other issues, such as low literacy rate, lack of motivation, and lack of infrastructure in telecommunication services. Therefore, there is still much to be done in the area of telecommunication infrastructure to balance the diffusion of communication mediums covering the whole country.

Summary, Conclusion and Recommendations

In this phase, it could be noted that the study has identified the different determinants of Internet usage in Iraq. The results reflect a full and accurate picture as the Internet moves deeper into the Iraqi population. The said determinants could be noted as: age cohort, gender, conservativeness, level of education, or, employment, and the purposes and interests.

Through the identification of these determinants, we see how the different situations in life among the individuals using the Internet in Iraq have naturally affected their perception in using the World Wide Web to connect with the world.

Basically, from this study, it has been shown how even a non-English-speaking country is able to pass through very difficult stages of penetrating the Internet technology and market. It has been shown how the Iraqi society was able to become a member of the growing information outflow in the Internet through converting texts into their own language, a process that retains cultural identity, while meeting the world's demand to become digitally advanced through the aid of the Web.

In summary, the analysis used in this study showed that education level is the most important factor that influences Internet use. Other characteristics, such as age, and utilization rate proved to be significant factors in Internet adoption as well. But cost level (affordability) has no strong effect on Internet adoption because the Internet is widely available to the public sector in Iraq, whereas it can also be easily accessed from Internet cafés. A majority of Internet users comes from the public sector, whereas students have a lower use rate due to weaker availability of this service in schools and universities. The weakness of governmental policy toward supporting Internet use in school and universities needs to be reviewed. Finally, government needs to support communications infrastructure and increase Internet diffusion through long-term policies and strict commitment.

Though this consideration, the Iraqi government should foster the process of making necessary investments and adjustments in the Internet infrastructure and systems in order to be able to meet the proper demands and needs of the citizens. Promotion of the use of the Internet in productive activities like e-government, education and business will certainly help in availability and effectiveness.

With reference to the analysis above, we have been able to respond adequately to the three hypotheses concerning an impact on the level of education, living in urban areas, and the nature of employment on Internet use in Iraq. In addition, we found a significant gender gap very likely linked to culture. The results showed that a higher level of education and public employment affected positively the

propensity to use the Internet and the intensity in its utilization. However, the rate of access and use did not significantly differ among different regions. It is explained by the special political circumstances in recent years and lack of public investment in resources, infrastructures, and regulations.

For further developments in upcoming research, it is hoped that advanced methods will be employed to account for heterogeneity in utilization of Internet services and its modes of service provision. These will help to calculate the results in consideration with the collected data used for the imposition of the outcomes of the survey and other possible interviews that may be incurred. It is believed that through the application of this particular process, the chances of coming up with a better sensed and policy relevant result would be much easier to encounter.

Finally, the study can be considered as unique as it critically evaluates the trend of use/non-use of the Internet in Iraq and provides immense scope for future studies on the impact of behavioral changes and changes in the life style of Iraqi people on use/non-use of the Internet. This study also proves to be vital in development of future government policy for encouraging Internet use and investment in infrastructure. Hence, it aids in some useful regulations related to education and information technology development in Iraq. As the factors responsible for use/non-use of the Internet have been systematically analyzed under this study, effective guidelines for both national and international governmental and non-governmental organizations involved in the rehabilitation and reconstruction of the country can be formulated.

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