

# The Moderating Role of Trust and the Benefits in Shaping the Adoption of M-Government in Developing Nations

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## Abstract:

Recently, developing countries, including Iraq, have sought to harness ICTs through establishing quality information system services. According to International Telecommunication Union (2024), 45.7 million mobile subscribers in 2023 in Iraq comparing with 37.5 million in 2020; that means there is a significantly increasing of using mobile technologies among Iraqi citizens. But despite this increase, the use of government services is still lower than expected. Therefore, this paper investigates the influence factors on the success of mobile government and the moderating role of trust, a critical factor in its use. Thus, this study investigates the influence of trust and benefits on mG success in new context such as Iraq, where literature explains there is lack in field research. A sample of 375 teachers who used mobile government services was used to collect data. For data analysis, this study used the PLS/SEM technique. The results showed that all independent quality factors influenced net benefits by user satisfaction; and trust moderates the relationship between satisfaction and the mG benefits. The findings recommend that decision-makers introduce high-quality services to assist users adopt mG services.

**Keywords:** m-Government, IS success model, Net benefits, Trust

## 1-Introduction

In the era of globalization and modern information and communication technology, governments around the world are striving to implement their projects by involving highly efficient information systems in their societies, which leads to spending large amounts of money to implement their projects [1]. Mobile technology has become a novel communication channel for the public sector. Consequently, numerous governments have sought to leverage it for engagement with citizens, businesses, agencies, employees, and other stakeholders. Mobile government (mG) is seen as particularly suitable for nations with limited internet access; however, mobile phone usage is expanding quickly, especially in developing nations [2]. Glood et al. [3] defined mobile government (mG) as encompassing the strategy and resources used to deliver information and services to citizens via mobile platforms, allowing access anytime and anywhere.

Ntaliani et al. [4] emphasized that mG services have several advantages, for example, real-time information, ease of use, mobility, and quick response, which are categorized as IT opportunities. However, these benefits depend on

optimal use [5], which makes it critical to the success of mG services initiatives. Moreover, most organizations measure system success by the cost, investments, and revenue of the system, while individuals (users) assess the system based on the benefits they receive, which are considered a key factor in the system's success [6]. Delone and McLean [6] explained that net benefits incorporate multi-impacts (organizational, individual, and societal) that result from system activity. Most developing nations, particularly Iraq, have tried to combine recent technologies (such as mG project) into their public organizations, making significant annual investments. Unfortunately, the rate of adoption of mG services is still low [2].

### 1.1 Problem Identification

Several developing governments are striving to adopt modern tools and technologies to present good services to their citizens. Iraq, as a developing nation, also seeks to enhance its services by using these technologies, where it spends huge amounts of money to implement the mG project; however, mG adoption remains at a low level [7, 8]. Several scholars (e.g., [9] [10] [11]) have investigated the influencing factors of the mG adoption; unfortunately, there are critical factors that have not been taken into account, such as trust, which could have an important impact on the mG adoption [12, 13]. Zhou [14] confirmed that the success of any IS depends on the net benefits and users' trust in the system. Hence, this study seeks to evaluate the mG services' success by investigating the net benefits they generate and the role of user trust.

## 2- Related Work

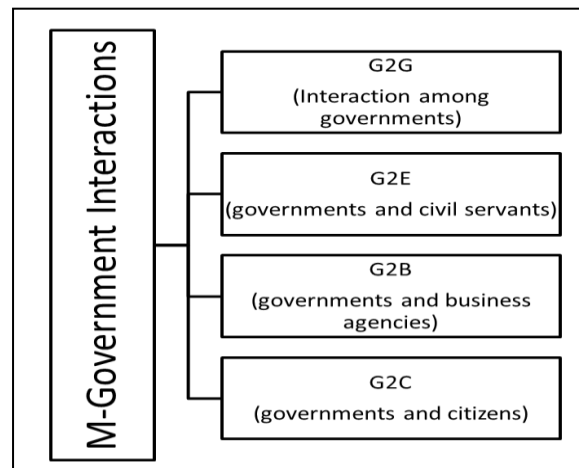
### 2.1 Mobile Government Concept (mG)

The mG is considered one aspect of e-government (EG) [15]. The rapid progress of ICT technologies in various sectors has presented an opportunity for governments to enhance e-government services, which has facilitated the transition to mG systems [16]. Mobile government (mG) is *"a strategy that employs mobile and wireless technology to deliver services and applications, aiming to improve the benefits of e-government [17]."* Mobile government has various characteristics, such as ubiquity, fast and easy access anywhere and any time, adaptability, and personalization. Table 1 depicts why developing countries prefer the use of mG.

**Table 1. Preferring M-Government in Developing Countries**

<b>Why prefer M-government?</b>	Number of mobile users increasing penetration
	Mobiles connecting people to the Internet
	Mobility
	Inclusiveness and Remote area access
	Low Cost
	Easy Infrastructure Setup
	Ease to Learning
	Improvement on e-government effort

The main value of mG interaction can manifest in four forms: from government to citizens (G2C), from government to business (G2B), from government to employees (G2E), and from government to government (G2G) [18-22]. Figure 1 lists the interaction categories of mG.



**Figure 1. The technologies used in mG systems**

## 2.2 The Status of Information and Communication Technology (ICT) in Iraq

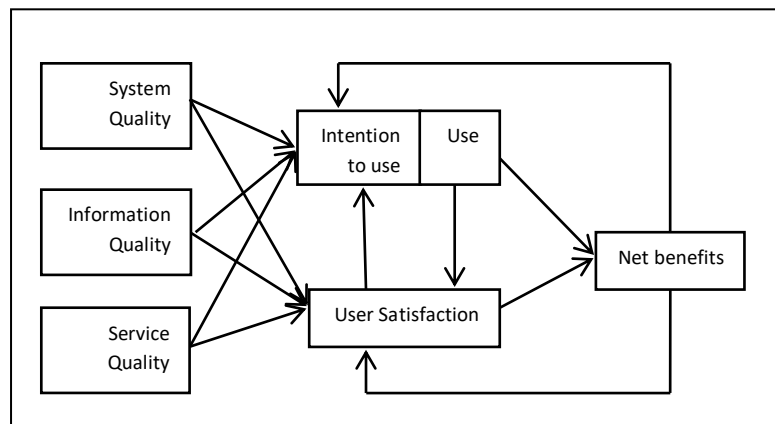
Between 1980 and 2003, Iraq endured numerous crises and conflicts, which includes economic sanctions and the Gulf Wars. As a result of these prolonged hardships over the preceding two decades, Iraq's telecommunications infrastructure sustained considerable damage, according to Al-Dabbagh [15]. These conditions led to the suspension of several government programs [23-25]. Iraq began a comprehensive restructuring process in all public governmental sectors, particularly the communication and technology sector, after 2003. In 2004, the government of Iraq appealed to the United Nations to lay the foundations of e-government [15]. However, this project has not yet been fully implemented.

Since the early 2000s, the Internet and mobile technologies have become key communication channels in the public sector. As a result, most governments aim to exploit these technologies to foster new partnerships within society by the latest ICTs [26]. In particular, today the Iraqi government has a strong infrastructure in ICTs [27]. According to a World Bank report issued in 2024, there are more than 45 million mobile subscribers in Iraq. As well as, a survey conducted by Younus [8] asserted that a significant proportion of these participants used smart devices. Furthermore, Internet usage in Iraq is also steadily increasing [28]. According to a 2023 World Bank report, %84.7 of subscribers can access the Internet through their mobile devices.

The mG initiative was launched with the first service (SMS) of mG provided by Messan's government in 2011 [29]. Then, the government of Thi-Qar initiated an SMS service for citizens [30]. Hence, the Iraqi government started to introduce various services in different governmental organizations [31]. Despite the huge investment in the mG project, the use of mG is still limited. Consequently, understanding the potential benefits of the mG services can be key to increasing their usage and adoption. This study, therefore, aims to investigate the net benefits that could influence the success of mG adoption among citizens.

## 3- Updated IS Success Model

The original model for the success of IS was suggested by Delone and McLean in 1992. After 10 years, they modified it depending on the criticism of some literature [32-35]. Therefore, Delone and McLean updated their original model in 2003 by incorporating some factors such as service quality. The updated model for D&M (2003) is depicted in Figure 2.



**Figure 2. Updated DeLone and McLean IS Success Model (2003, p. 24)**

Furthermore, this study seeks to employ the updated D&M model because it has been considered a strong theoretical framework for the measurement of the success of IS, as referred by Chatterjee, et al. [36]. Moreover, researchers, such as Visser, et al. [33], he also declared the updated IS Success Model is the most adequate for evaluating the success of IS. Gable, et al. [32] applied various IS success models along with the D&M and Seddon models to test empirical data and recognized that the D&M model is the best option for success evaluation of an enterprise system. Therefore, this study employs the updated IS success model as a theoretical base to assess the mG adoption from the viewpoint of “trust” and “net benefits” of mG services. Many scholars measured the influential factors of the mG adoption (such as [9-11]); however, they have overlooked and ignored trust and benefits, which could have a significant impact on the adoption of mG services [12, 13]. Therefore, applying the updated D&M model is critical to evaluate the adoption of mG services from the perspective of users in developing countries.

Many researchers harness this model in various disciplines, such as m-health, m-commerce, m-business, mobile payment, m-banking, e-government, and e-commerce. Teo, et al. [37] aggregated the D&M IS Success Model and the role of trust construct to investigate e-government success. The main objective of their study was to examine the effect of quality constructs (i.e., IQ, SYQ, and SQ) on the intention to continue “use” and satisfaction as dependent variables, as well as the role of trust in e-government success. A survey questionnaire was conducted among 214 users of Singapore’s eG platform to test the model. The findings of this study show that information quality, system quality, and service quality perceptions are regarded as key success factors that affect the final outcomes of e-government in terms of efficiency and effectiveness. They further find that trust in e-government websites is positively related to IQ, SYQ, and SQ. In m-Health context, Chatterjee et al. [36] highlighted that service quality and system quality are the most influential factors on user satisfaction and net benefits in the m-health context. Lu et al. [38] investigated the influence of interaction quality on service quality in the mobile commerce context. They emphasized that there is a significant relationship between interaction quality and service quality. Moreover, the study by Vuollee [32] evaluated m-business performance impacts on employee services through the customers’ perspective. This study combines developmental and theoretical approaches together by configuring the performance impacts and further incorporating the characteristic features and requirements of mobility and business use in the evaluation process of impacts. This study focuses on three types of mobile business services in different industries in Finland, and data were collected using interviews, observations, workshops, and questionnaires. This study stresses the significance of performance measurement with regard to the outcomes and merits of use of mobile business services to serve managerial objectives. In the mobile payment context, Zhou [14] explained that SYQ is the main determining factor for user satisfaction, while trust and satisfaction are influential factors regarding the continued use of mobile payment services.

Even though the IS Success Model has been widely used in various contextual backgrounds by IS researchers (i.e., m-banking [39], m-commerce [40], m-health [36], e-commerce, and e-government [37], it has seldom been tested

in the context of mG services, which represent the emerging information technology [41]. Thus, the IS Success Model can be generalized to mG services, as supported by Yfantis, et al. [42].

## 4- Proposed Model & Hypotheses

### 4.1 Information Quality (IQ)

According to DeLone and McLean [6], information quality (IQ) is defined as “*The information quality that is produced by the system*”. They further explain that IQ is considered valuable to users when they perceive the information presented is precise, complete, up-to-date, and well-organized [43].

Users perceive the IQ of mG services as the content quality that these services offer [6]. When using mG services, citizens anticipate obtaining relevant information conveniently, at any time and from any location. The main motivation for using mG services is to research information needs, with the expectation that the information will be clear, easily understandable, accurate, and up-to-date; otherwise, users will be dissatisfied and refrain from using such services in the future. Therefore, users can either feel satisfied or dissatisfied with these services, which influence the performance of users. Based on the above, the quality of information is a critical factor in determining user satisfaction with the adoption of mG services [14]. Within the context of this study, IQ is the extent to which users perceive the information produced by the mG service in terms of accuracy, completeness, timeliness, and well-organization. Consequently, this study suggests the following hypothesis:

**H1:** Information quality has a positive impact on the user satisfaction of the mG services.

### 4.2 System Quality (SYQ)

System quality (SYQ) is defined as “*the performance technical quality of any IS through retrieval and delivery, reliability, accessibility, and flexibility of information* [3].” Prior studies have revealed a close relationship between the success of an IS and its benefits. For instance, Nelson et al. [43] indicated that the SYQ addresses information processing necessary to achieve these benefits and also the value of the performance system [6]. System quality has been considered one of the most significant components to evaluate and measure the success of systems [6] [36] [43].

In the mG context, System quality (SYQ) indicates to citizens' perception of the technological performance of the services in terms of retrieving and delivering information [37]. From a technical standpoint, mG services provide easy access to timely information with consistent performance. Furthermore, The SYQ has a crucial role in determining the extent of user satisfaction with the system [6]. Several researches confirmed the relationship between system quality (SYQ) and both the use of m-technology and user's satisfaction within different contexts, such as Chatterjee et al. [36] in m-healthcare, Lee et al. [44] in m-technology. Based on the findings of the study by Glood et al. [3], the relationship between system quality and user satisfaction in the mG context was supported. This implies that citizens expect mG services to provide efficient, easy and timely access, as well as reliable and up-to-date information to meet their needs; otherwise, it potentially leads to decreased user satisfaction and a return to traditional methods. Therefore, based on previous studies such as [45-47], this study expects that improved system quality will lead to an increase in user satisfaction, which leads to adopting this services. Within the scope of this study, SYQ is defined as the performance technical quality of any IS through retrieval and delivery, reliability, accessibility, and flexibility of information. Consequently, the current study suggests the following hypothesis is proposed:

**H2:** System quality has a positive impact on the user satisfaction of the mG services.

### 4.3 Interface Design Quality (IDQ) and Communication Tool Quality (CTQ)

The term interaction design has recently been considered one of the most important design disciplines, which focuses on the development and design of systems [48]. This term consists of two dimensions: interface design

quality (IDQ) and communication tool quality (CTQ) [49]. Interactivity is defined by Albrecht et al. [50] as "the degree of the participation of organizations in online exchange with others regardless of time and distance restrictions." Cooper et al. [49] emphasized that interaction design focuses on users' desires and satisfaction, due to its interest in form design and strong focus on behavior, as the situation influences behavioral actions [53, 54]. Lawson-Body et al. [51] and Joinson [55] explained that the level of interaction between users may affect their satisfaction. Therefore, aligning with prior studies, this study refers to the interaction design concept as a two-dimensional factor (IDQ and CTQ). Hence, the present study defines interaction design as the degree to which mG services enable citizens to engage with others (experts, organizations, people) through user interfaces and communication tools [50-52]; as well as measures of these dimensions are adapted from previous studies [51] [52]. This study defines user interface quality as the extent to which a system's user interface interacts effectively with users properly in terms of profiling and links [55] [56]. Communication tool quality is defined as the degree to which mG services provide communication tools (comments, discussion forums, and FAQ) to allow for the exchange of knowledge between users [51]. Some prior studies (such as [49] [51] [53-56]) of the IS, for instance, the study by Urbach et al. [56], have confirmed that IDQ and CTQ positively influence user satisfaction. Thus, using and examining IDQ and CTQ dimensions in the mG context is critical. Therefore, the current study proposes the following hypotheses:

**H3:** Interface design quality has a positive impact on the user satisfaction of the mG services.

**H4:** Communication Tool quality has a positive impact on the user satisfaction of the mG services.

#### 4.4 User Satisfaction (US)

User satisfaction (US) is one of the main variables that can determine the success of an IS [6]. Generally, the US is known as the user's feeling of enjoyment and satisfaction or dissatisfaction resulting from the sum of the benefits hoped to obtain from IS interaction [57]. Several studies have claimed that this factor is crucial in the evaluation of IS success [such as 6, 14, 36, 58]. Furthermore, Delone and McLean [6] emphasized that US is significantly influenced by net benefits.

Previous studies reveal paucity in the examination of US of mG services in the public sector. Thus, evidence is unavailable for the evaluation of US and its pertinent influence on success or failure of mG services [59]. Specifically, the success of mG services among citizens depends on effective engagement from both government and citizens to meet the needs. Therefore, accomplishment of the mG benefits relies on the providing of appropriate services that are related to the needs of the target users. Alawneh, et al. [58] claimed that the user satisfaction factor in mG will mostly increase citizen usage and create positive feelings after they use mG services. Thus, we expect these relationships to also exist in the context of mG services, assuming that when users are satisfied with the service, they will have positive feelings toward using mG services. Hence, users would receive the desired benefits by using mG services. In this study, US refers to the net feeling of pleasure or displeasure that results from aggregating all the benefits that users hope to receive from interaction with the mG service. Based on prior discussion, the US is included in the proposed model as an independent variable that could affect the NB of mG services. Thus, this study suggests the following hypothesis:

**H5:** User satisfaction has a positive impact on the net benefits of the mG services.

#### 4.5 Trust (TR)

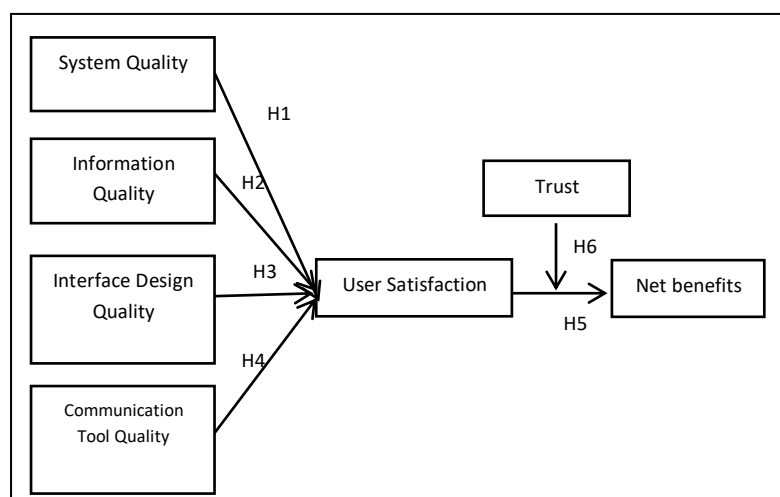
Trust (TR) was studied in several contexts and has multiple definitions. In information technology literature, the most widely accepted definition of trust is that suggested by Mayer et al [60], who asserted that trust is considered as "One party's willingness to be exposed to the actions of another party depends on their belief that the other party will take specific action against the donor, regardless of the ability to monitor that other party." The literature explains that trust in the context of digital government reflects the extent to which users believe in the integrity, efficiency, and ability of government entities to provide fair and reliable services. Welch et al [61] indicated that institutional trust in government directly influences citizens' willingness to use e-services. Moreover, Trust includes users' confidence in the system's reliability, technical stability, and ability to perform tasks with high

efficiency. McKnight et al [62] asserted that trust is a critical factor in reducing perceived risks (such as information Security and Privacy) associated with the use of systems such as mG. According to Al-Hujran et al [63], a user's perception of a high level of trust will increase their satisfaction with using and adopting the mG services. Some research models have demonstrated that trust is a complementary variable to traditional variables (such as perceived utility and ease of use). For instance, Venkatesh et al [64] confirmed that integrating trust into explanatory research models enhances their ability to interpret the user behavior in e-government environments. Furthermore, recent studies in mG have revealed that trust not only impacts the intention to use but also influences user satisfaction and net benefits [65].

The literature review shows that the relation between user satisfaction and net benefits is not always constant when using information systems, as it's affected by contextual and psychological factors, most notably trust. A study by DeLone & McLean [6] demonstrated that trust can enhance or weaken the effect of satisfaction on net benefits. Similarly, a study by Alalwan et al [66] indicated that increased trust in e-services enhanced user satisfaction with actual and continued use, positively impacting the benefits derived from e-services. Therefore, trust is a significant moderating factor expected to strengthen the positive relationship between "user satisfaction" and "net benefits" from using mobile government services. The effect of satisfaction is more pronounced among users with high levels of trust compared to those with lower levels. Based on the above, the following hypothesis is proposed:

**H6:** Trust moderates the relationship between user satisfaction and the net benefits of using mG services.

Thus, depending on the theoretical review mentioned above, Figure 3 shows the research model and its hypotheses.



**Figure 3. Path Model**

## 5- Methodology

### 5.1 Data Collection

The current study used teachers from the Directorates-General for Education in the southern region of Iraq as the target population. This population was selected because they are familiar with technologies and have a high level of education. Also, the southern area of Iraq was selected because it is the first area to implement eG services.

According to commission of statistics of education ministry, the total number of teachers from the Directorates-General for Education in the southern region of Iraq is around 99,788. This population is divided among four directorates-general for education (Thi-Qar, Al-Basra, Muthanna, and Missan). Given the large number of participants and the extensive geographical area covered, the present study utilizes an online quantitative research method that was distributed via a web link sent via email and social media platforms, from Oct 16, to Nov 25, 2025.

The total number of returned questionnaires was 480. A filtering question was used to categorize the participants as users (who ticked yes) and non-users (who ticked no). The number of non-users is 105 (21.9%), while the number of users was 375 (78.1%), which represents the sample size. The non-users of mG services in the southern region of Iraq cite low income, low technological aspects, political issues, Internet cost, low skill level, and inexperience in using these services as reasons for their non-use. Therefore, 375 valid questionnaires remained for further analysis, with a valid response rate of 78.1%.

## 5.2 Instrument

The survey was designed based on measures from prior studies that align with the proposed model. This model includes seven variables; each assessed using multiple items rated on a five-point Likert scale ranging from "strongly disagree" to "strongly agree". Ten information quality items reflect completeness, format, accuracy, currency, and understandability. Ten system quality items reflect reliability, accessibility, and flexibility. Four items of user interface quality reflect user interface layout, ease of reading and viewing, compatibility of colors and images, which enable users to react with the system correctly. Five items of communication tool quality reflect links between users and government staff (e.g., comments, e-mail, links, discussion form, FAQ page). Five items of satisfaction reflect satisfaction, contentment, and pleasure. Five items of trust reflect the meaningful of trust. Net benefits have eight items that reflect productivity, task performance, and saving time and money (all items in Appendix A). Furthermore, expert professors refined the initial questionnaire version, which was pilot tested on 40 participants. These phases have contributed to improving and developing the instrument, as well as proving the validity of the measures [67].

## 6- Data and Results Analysis

This section explains the data analysis tool that was used to test the proposed model. The partial least squares (PLS) approach with the structural equation modeling (SEM) tool was used in this study. This approach is suitable when the study objective focuses on prediction and explaining the variance of key target constructs through different explanatory constructs and if data distribution is non-normal, given that available data are non-normal [68]. PLS have major advantages over covariance-based methods, such as LISREL, EQS, and AMOS. PLS avoids two major problems of covariance-based modeling, namely, inadmissible solutions and factor indeterminacy [69]. Moreover, PLS can be handle formative and reflective constructs, while COBM handles reflective constructs only. Hence, PLS uses data of normal and non-normal distribution, while COBM uses normal data only, and PLS requires a sample size with at least 10 times the largest number of indicators of the construct in the model, while COBM requires 200 and above as a sample size [38, 68]. According to the general rule, the sample size should be equal to ten times the number of items in the construct with the greatest number of items in the inner path model [70]. In the hypothesized model, system quality is represented by the largest number of indicators, totaling 10 items. Based on this, the minimum required sample size was calculated to be 100. The actual sample size for this study was 375, which comfortably surpasses this minimum. The findings from the implementation of PLS-SEM (Partial Least Squares Structural Equation Modeling) analysis follow Chin's [71] two-stage approach. The first stage includes assessing the measurement model in terms of validity and reliability; the second stage focuses on evaluating the structural model in terms of examining the hypothesized relationships among the constructs. The subsequent subsections will present a detailed discussion of both stages.

### 6.1 The Measurement Model

After the proposed model was designed, Smart-PLS 2.0 software was used to assess its reliability and validity. Reliability was evaluated using two coefficients: composite reliability (CR) and Cronbach's alpha [72]. Table 2 shows that all constructs had Cronbach's alpha values that exceeded the threshold value of 0.60, and CRs were above the threshold value of 0.70 [73] [74]. Hence, the findings suggested the reliability of all constructs in the study model.

**Table 2. Measurement Characteristics of Constructs**

Construct	Items	loadings	T-Statistics	AVE	CR	Cronbach's Alpha
SYQ	SYQ1	0.8012	40.9664	0.58	0.87	0.82
	SYQ2	0.7285	23.1544			
	SYQ3	0.7538	22.9826			
	SYQ4	0.7542	24.8454			
	SYQ6	0.7522	24.4765			
IQ	IQ1	0.8036	41.1804	0.64	0.90	0.86
	IQ2	0.8245	41.8962			
	IQ3	0.7135	18.6918			
	IQ5	0.8112	36.5583			
	IQ8	0.8384	50.7921			
IDQ	IDQ1	0.7913	31.5842	0.6	0.82	0.67
	IDQ3	0.8394	44.796			
	IDQ4	0.6861	16.1104			
CTQ	CIQ1	0.7855	32.6676	0.59	0.85	0.77
	CIQ2	0.7583	16.4966			
	CIQ3	0.833	24.7617			
	CIQ4	0.6796	17.9047			
US	US1	0.8611	50.0995	0.75	0.92	0.89
	US2	0.8843	54.2024			
	US3	0.8961	58.3848			
	US4	0.8163	37.06			
NB	NB1	0.7356	23.1362	0.56	0.88	0.84
	NB3	0.7672	26.3456			
	NB4	0.7805	28.8807			
	NB5	0.7775	31.3777			
	NB6	0.767	27.8182			
	NB7	0.6433	18.1123			
TR	U1	0.7859	35.8453	0.63	0.90	0.85
	U2	0.8225	40.6833			
	U3	0.853	47.0067			
	U4	0.7812	25.3318			
	U5	0.7284	20.1995			

Construct validity can be achieved through convergent and discriminant validation analyses. Convergent validity refers to the degree to which items measuring the same construct correlate highly, and has been evaluated using the AVE (Average Variance Extracted) and factor loadings. Convergent “*validity is considered established when all constructs exhibit an AVE value exceeding 0.50* [75].” As presented in Table 2, all AVE values in this study are above 0.50, thus asserting the convergent validity of the constructs. Furthermore, the absolute standardized loadings of the items ranged from 0.64 to 0.89. Chin [76] suggests that loading coefficients greater than 0.5 can only be accepted if other indices within the same set provide a sufficient basis to compare. Notably, all items in this study were statistically significant at the 0.001 level. Therefore, based on these findings, the convergence of the constructs is asserted.

Discriminant validity assesses the degree to which the constructs are distinct from one another. It is confirmed when the loading coefficients on their respective measured constructs are consistently higher than their cross-loading coefficients on the other constructs, and when the square root of the AVE for each construct is greater than its correlations with other constructs [76]. This confirms that each construct measures a unique concept.

The first phase in evaluating discriminant validity "involves examining the indicator loadings in relation to all construct correlations." The algorithm function in the SmartPLS was applied to calculate cross-loading coefficients of all items. As demonstrated in Table 3, all items loaded onto its construct had higher than cross-loading coefficients on other constructs. Therefore, the first phase of evaluating the discriminant validity measurement model has been completed.

**Table 3. Factor Loadings and Cross-Loadings**

	CTQ	IDQ	IQ	NB	SYQ	U	US
CTQ1	<b>0.7855</b>	0.3875	0.3285	0.2129	0.3406	0.2827	0.422
CTQ2	<b>0.7583</b>	0.3091	0.225	0.1263	0.2255	0.1555	0.2862
CTQ3	<b>0.833</b>	0.4117	0.2949	0.1821	0.2733	0.2284	0.3476
CTQ4	<b>0.6796</b>	0.3678	0.2657	0.2263	0.3192	0.2205	0.3916
IDQ1	0.4955	<b>0.7913</b>	0.3212	0.3043	0.2882	0.3103	0.4362
IDQ3	0.3513	<b>0.8394</b>	0.3155	0.3178	0.289	0.3833	0.436
IDQ4	0.2618	<b>0.6861</b>	0.2632	0.199	0.2448	0.3008	0.3014
IQ1	0.2187	0.2664	<b>0.8036</b>	0.4303	0.531	0.4816	0.4971
IQ2	0.2773	0.3277	<b>0.8245</b>	0.4391	0.4973	0.5316	0.4629
IQ3	0.3939	0.318	<b>0.7135</b>	0.3366	0.5238	0.4466	0.4813
IQ5	0.3161	0.3641	<b>0.8112</b>	0.452	0.4829	0.5553	0.4869
IQ8	0.2844	0.2809	<b>0.8384</b>	0.4616	0.6546	0.581	0.5279
NB1	0.3363	0.4016	0.4523	<b>0.7356</b>	0.3987	0.4988	0.5404
NB3	0.2053	0.2356	0.3532	<b>0.7672</b>	0.283	0.4529	0.3844
NB4	0.1328	0.2881	0.3543	<b>0.7805</b>	0.2997	0.5014	0.3815
NB5	0.1087	0.1984	0.463	<b>0.7775</b>	0.3818	0.4894	0.3974
NB6	0.182	0.2566	0.3896	<b>0.767</b>	0.3137	0.5002	0.416
NB7	0.1389	0.2109	0.3626	<b>0.6433</b>	0.2669	0.4009	0.3013
SYQ1	0.3427	0.3543	0.5117	0.3469	<b>0.8012</b>	0.4405	0.5221
SYQ2	0.3358	0.2851	0.4176	0.3438	<b>0.7285</b>	0.4	0.3957
SYQ3	0.2542	0.2646	0.5606	0.3118	<b>0.7538</b>	0.377	0.3992
SYQ4	0.2318	0.1806	0.4806	0.3381	<b>0.7542</b>	0.3988	0.424
SYQ6	0.2988	0.2499	0.5847	0.3207	<b>0.7522</b>	0.4386	0.4727
TR1	0.2014	0.3091	0.5685	0.5128	0.4675	<b>0.7859</b>	0.4775
TR2	0.2434	0.3953	0.5361	0.5079	0.4145	<b>0.8225</b>	0.488
TR3	0.2685	0.366	0.5597	0.5565	0.397	<b>0.853</b>	0.5366
TR4	0.2284	0.3498	0.4271	0.5123	0.4331	<b>0.7812</b>	0.5017
TR5	0.2454	0.2778	0.4947	0.4405	0.4593	<b>0.7284</b>	0.4452
US1	0.4207	0.4427	0.547	0.4746	0.5081	0.4997	<b>0.8611</b>
US2	0.4619	0.476	0.5761	0.4997	0.5158	0.5655	<b>0.8843</b>
US3	0.379	0.4807	0.5399	0.4619	0.4986	0.5245	<b>0.8961</b>
US4	0.4092	0.3728	0.4595	0.4573	0.5127	0.5422	<b>0.8163</b>

In the second phase of the analysis, the discriminant validity was verified by comparing the square root of each construct's AVE with its correlation coefficients with all other constructs. As shown in Table 4, the square root of the AVE for each construct consistently exceeded its highest correlation coefficient with any other construct. This provides further evidence of discriminant validity, confirming that each construct is distinct from the others [75, 76].

**Table 4. Correlations of Constructs**

Construct	CTO	IDQ	IQ	NB	SYQ	TR	US
<b>CTO</b>	<b>0.77</b>						
<b>IDQ</b>	0.4883	<b>0.77</b>					
<b>IQ</b>	0.3709	0.3889	<b>0.80</b>				
<b>NB</b>	0.2517	0.3609	0.5325	<b>0.75</b>			
<b>SYQ</b>	0.3878	0.3546	0.6749	0.438	<b>0.76</b>		
<b>TR</b>	0.2984	0.4283	0.6522	0.6378	0.5437	<b>0.79</b>	
<b>US</b>	0.4838	0.5133	0.6148	0.5479	0.5882	0.6167	<b>0.86</b>

## 6.2 Structure Model

This subsection describes the second step that involves evaluating the structural model. The bootstrapping procedure was used to examine the proposed model and hypotheses [68]; this includes generating approximately 1,000 resampled datasets [76] [77]. The quality of the model can be achieved based on its predictive ability for the dependent constructs, which relies on several criteria, including the coefficient of determination ( $R^2$ ), the cross-validated redundancy ( $Q^2$ ), and the path coefficients. Therefore, a bootstrapping mechanism was applied to determine the statistical significance of all path coefficients relating the independent and dependent variables. Thus, this study evaluates the predictive ability of the model by examining the coefficient of determination ( $R^2$ ), which is a primary criterion for assessing model fit in PLS analysis [76]. The  $R^2$  value ranges between 0 and 1, with higher values indicating well estimates from the path model. The  $R^2$  values for the dependent constructs are 0.54 for the US and 0.45 for NB, indicating a moderate variance.

**Table 5. Results of  $R^2$  and  $Q^2$**

Construct	$R^2$	$Q^2$
<b>US</b>	0.54	0.40
<b>NB</b>	0.45	0.24

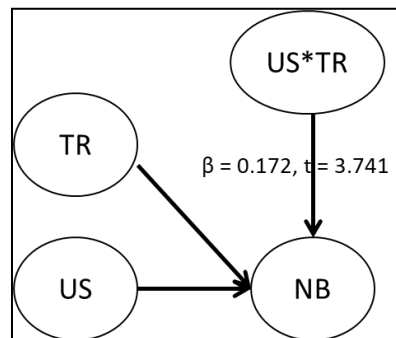
We assess the predictive relevance of the model by using  $Q^2$  statistic [78].  $Q^2$  represents a measure of how well-observed values are reconstructed by the model and its parameter estimates.  $Q^2 > 0$  implies that the model has predictive relevance, whereas  $Q^2 < 0$  represents lack of predictive relevance. Cross-validated redundancy measure is recommended to examine the predictive relevance of theoretical/structural model [76].

Blindfolding procedure was used to assess cross-validated redundancy of constructs [79]. Table 5 shows that cross-validated redundancies for all endogenous variables were greater than zero, thereby suggesting predictive relevance of the model.

To evaluate the suggested hypotheses, we assessed path coefficients among the underlying variables and their statistical importance. Following the execution of the PLS model estimates for the path coefficients were generated, representing the hypothesized relationships connecting the latent constructs. To formally test these main hypotheses, the bootstrap method was employed to determine the importance of the assumed relations within the research model. In the present study, 1,000 resampled datasets were applied for the bootstrapping procedure [76].

The bootstrap cases were set equal to the original number of observations to generate the standard errors necessary for calculating the t-statistics.

Moreover, the current study investigated the moderating effect of Trust on the relation between user satisfaction and net benefits of mG services, which considered as new contribution to existing literature. Therefore, to assess the moderating impact, product indicator approach was been used; which was suggested by Henseler et al. [79]. In this approach, product terms are established and constructed by multiplying items of the independent construct and items of the moderator construct. The “product terms” are utilized as measures of the interaction term. The moderating influence is confirmed when the interaction variable coefficient is “statistically important” (t-value >1.96).



**Figure 4. Validated structure moderator mode**

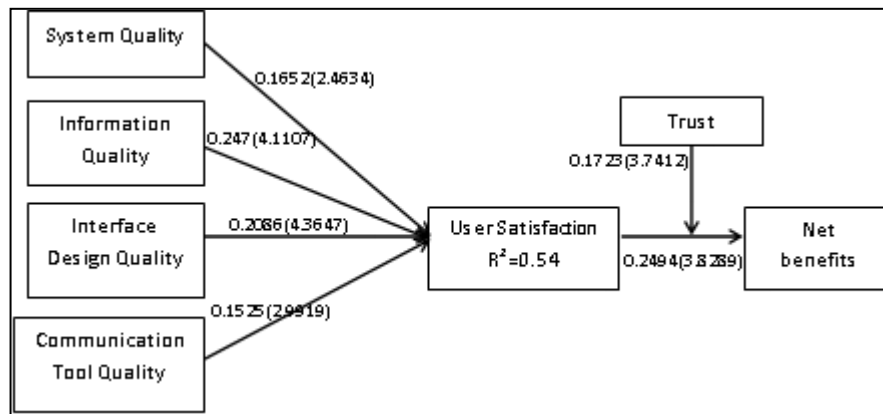
The US\*TR is an interaction term that was involved in the suggested model. This term shows a significant positive impact ( $\beta = 0.172$ ,  $t = 3.741$ ,  $p < 0.01$ ) on the US (independent construct), as illustrated in Figure 4. It can be argued that the TR positively moderates the relationship between US and NB. Therefore, H6 is confirmed. Table 6 illustrates the results of t-values and hypotheses for the research model, where all path coefficients were confirmed (T statistic > 1.96).

**Table 6. Result of Hypotheses Testing**

Relationship	Path-Coefficients( $\beta$ )	T-Statistics	Assessment
H1: IQ -> US	0.2470***	4.1107	Support
H2: SYQ -> US	0.1652**	2.4634	Support
H3: IDQ -> US	0.2086***	4.3647	Support
H4: CTO -> US	0.1525***	2.9919	Support
H5: US -> NB	0.2494***	3.8289	Support
H6: US * TR -> NB	0.1723***	3.7412	Support

## 7- Discussion

The findings acquired from the study model will be discussed in this section. As illustrated in Figure 5, all hypotheses are confirmed.



**Figure 5. Research Model**

We assessed the path coefficients of proposed model between the latent variables and their statistical significance, the findings showed that all hypotheses are supported. SYQ, IQ, IDQ, and CTQ have significant influences on US, while US predicted NB. Furthermore, this study reveals that TR positively moderates the relation between US and NB of mG services.

Out of the factors that influence the US, IQ has the greatest impact (0.2470). This finding is consistent with the findings of Jung et al. [80], who emphasized the impact of IQ on US. Providing IQ to users entails continuous effort and resource investment of the government [81]. Therefore, IQ may be a strong indicator of satisfaction, as it demonstrates users' ability to access appropriate information at any time and from anywhere. If the services meet users' requirements, they will be satisfied with mG services. SYQ, IDQ, and CTQ have direct impacts on US (0.1652, 0.2086, and 0.1525, respectively). The findings suggested that SYQ had a significant impact (0.1652) on the US. This result is consistent with extant findings [41]. Service providers (governments) need to improve SYQ to improve their reputation. This requires developing different mG service operating systems, which is a challenge for service providers. Therefore, addressing these challenges will support users in achieving their satisfaction and continuing to use mG services. In addition, service providers can use propaganda and online assistance to familiarize users with mG system operations. These steps may improve perceived ease of use. Interface design quality has a significant effect (0.2086) on user satisfaction. The constraints of mobile terminals highlight the necessity to present a well-designed interface to users [82]. If mG services have an inferior or difficult-to-use interface, users will not be satisfied. Thus, service providers (government) must improve the quality of user interface design to promote user satisfaction.

Communication tool quality significantly influences (0.1525) user satisfaction. This situation implies that rapid response of government staff to user questions and inquiries plays an important role in user satisfaction. Generally, the mG system contributes to improve interactive capacity between government departments and users through discussion and feedback forms, FAQ page, and newsgroups; these tools can increase user satisfaction. More communication tools lead to more satisfaction. If a user cannot connect with experts and groups, then users cannot be satisfied, thereby reducing their usage. Users may rely on the quality of links and forms as communication tools to engender satisfaction.

User satisfaction affects net benefits. mG services are used primarily to obtain the net benefits. Therefore, if net benefits have a positive effect, then users will use mG services again, and their satisfaction with mG services will increase. If net benefits have a negative effect, then users will not use mG services and will not be satisfied with them. Service providers (government departments) can improve information quality, system quality, interface design quality, and communication tool quality to improve the net benefits of using mG services, thereby further promoting their usage and adoption.

In addition, this study reveals that trust can play a significant moderating role in the relationship between the US and NB of using mG. A prior study has argued that users who are aware of mG services' benefits are more satisfied

with their use of mG services. In other words, this relationship is stronger among users with higher levels of trust. This refers to the fact that the US does not necessarily translate into tactile benefits unless it is joined with sufficient trust in the system and the government entity providing the service. This result also confirms that building trust contributes to maximizing the value derived from mG services by supporting sustained use and reducing perceived risks.

Furthermore, this study provides several theoretical implications for IT literature. The main contribution is an extended updated IS success model by incorporating the trust (TR), interface design quality, and communication tool quality constructs. The results suggest that the constructs added to the proposed model increased predictive power in explaining the adoption of mG services. As well as, trust is a new construct added that has been less examined in post-adoption context studies. Moreover, the proposed model is pioneering in evaluating the moderating role of Trust (TR) in the relatively new relationship between US-NB; few or no studies have examined the moderating role of TR on this link. The findings corroborate that TR has moderated the impact of US-NB.

## 8- Conclusion

The extension of the IS success model is considered the main contribution of the current study by adding new constructs to enhance predictive power in explaining the mG adoption. Realizing benefits is crucial to the success of any information system; therefore, it plays a pivotal role in encouraging users to continue using mG. However, benefits will only be realized if the use of these services is perfect. Results indicated that SYQ, IQ IDQ, and CTQ affect net benefits through user satisfaction. These findings call on providers of the service to provide a high level of quality in terms of systems, information, communication tools, and interface to support the adoption and usage of mG services. In addition, this study reveals that trust can play a significant moderating role in the relationship between the US and NB of using mG services and this finding confirms that fostering trust contributes to maximizing the value derived from mG services by supporting sustained use and reducing perceived risks.

Finally, the current study includes some restrictions. Firstly, it was conducted in a specific area (southern area) of Iraq, and generalizing its findings to other areas or to other nations that have made progress on the mG requires further research. Secondly, in addition to user satisfaction, other factors may influence net benefits, for instance, security and the usage environment; therefore, the future studies could investigate the influence of different constructs. Thirdly, the present study adopted a cross-sectional design, which limits its ability to monitor the dynamic nature of user behavior over time; therefore, future research could employ longitudinal approaches to provide deeper insights into the evolution of user behavior. Furthermore, this phenomenon remains insufficiently explored (especially in the Iraqi context), highlighting the requirement for further studies, which would contribute to a more comprehensive understanding of the barriers hindering the adoption of mobile technologies in Iraq's public sector.

## Conflicts Of Interest

The author declares no conflicts of interest.

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### Appendix A

Constructs	Items	
Information Quality	1. I obtain any information in time when using the mG service. 2. mG service meets my needs of information. 3. Information in the mG service is in a useful format. 4. Information in the mG service is clear. 5. Information in the mG service is easy to understand. 6. I am satisfied with the accuracy of the information provided by the mG service. 7. Information provided by the mG service is accurate. 8. Information provided by the mG service is most current. 9. Information provided by the mG service is up-to-date. 10. Overall, mG service provides me with high-quality information.	[47] [6] [37] [46]
System Quality	1. The mG service operates reliably and securely. 2. The mG service is characterized by its smooth performance. 3. The mG service can be accessed immediately. 4. The mG service loads all text and graphics quickly. 5. The mG service provides quick access to information. 6. The mG service can meet diverse needs. 7. The mG service is easy to use. 8. The mG service is easy to navigate. 9. The mG service is user-friendly. 10. Overall, I rate the mG service highly.	[45] [47] [6] [14]
Communication Quality	1. The mG service service provides a form for discussion. 2. The mG service service provides a form for comments and feedback. 3. The mG service displays a frequently asked questions page. 4. The mG service provides a subscription form for related news groups. 5. The mG service provides a form for communicating with other Users and experts.	[51]
Interface Design Quality	1. I can read and view the main menu of mG service easily. 2. I like the layout of the mG service's interfaces. 3. There is compatibility between colours and images of mG service's interfaces. 4. The presentation style of mG service is easy to understand.	[52]
User Satisfaction	1. I feel satisfied with using mG service. 2. I feel contented with using mG service. 3. I feel pleased with using mG service. 4. I feel delighted with using mG service. 5. mG service has met my expectations.	[45] [37]
Net Benefits	1. In my work, I can accomplish my tasks quickly using mG service. 2. The mG service enhances my task performance. 3. My productivity at the job increased when I used mG service. 4. My income level improved when I used mG service. 5. My time and money saved by using mG service. 6. I can exchange information to increase my knowledge when I use mG service. 7. I can establish and maintain a good image and reputation when I use mG service. 8. The mG service meets my requirements.	[37] [46] [47]

Trust	<ol style="list-style-type: none"><li>1. I think mG service providers keep their users' interests in mind.</li><li>2. The information provided by the mG service is reliable.</li><li>3. The other parties participating in the mG service are completely honest in their dealings with one another.</li><li>4. Overall, I think that the mG service is trustworthy.</li></ol>	[37] [83] [84]
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