

# Assessing E-Government Effectiveness: A Structural Equation Modeling Approach

Aso K. Ameen<sup>1,2†</sup>, Dler H. Kadir<sup>3,4</sup>, Dana A Abdullah<sup>2</sup>, Ismail Y. Maalood<sup>2</sup> and Hewir A. Khidir<sup>3</sup>

<sup>1</sup>Department of Computer Science, College of Science, Cihan University-Erbil,  
Kurdistan Region - F.R. Iraq

<sup>2</sup>Department of Information and Communication Technology Center (ICTC)-System Information, Ministry of Higher Education and  
Scientific Research,  
Erbil, Kurdistan Region - F.R. Iraq

<sup>3</sup>Department of Statistics and Informatics, College of Administration and Economics, Salahaddin University-Erbil,  
Kurdistan Region - F.R. Iraq

<sup>4</sup>Department of Business Administration, Cihan University-Erbil,  
Kurdistan Region - F.R. Iraq

**Abstract**—In this study, we address the pressing need to improve e-government services by conducting a comprehensive evaluation of document management practices within the Ministry of Higher Education in the Kurdistan Region of Iraq. Employing structural equation modeling and regression modeling techniques, we assess the effectiveness of key variables using the six factors (digitalization, utility, reliability, efficiency, user satisfaction, and accessibility) under the e-government assessment model. Our findings reveal that user satisfaction and ease of access are pivotal for the success of e-government services, with digitization and efficiency significantly impacting operational effectiveness. Furthermore, it also concerns that without improving the overall user satisfaction, the level of acceptance and use of e-government remains low. High user satisfaction can make a lot of difference in overall engagement besides improving service delivery among organizations. Through insights specific to the Kurdistan Region, we underscore the importance of balancing technical infrastructure with user experience. Our proposed six-factor model offers valuable guidance for policymakers and practitioners globally, aiming to enhance e-government services.

**Index Terms**—E-Government services, Kurdistan region, Regression modeling, Structural equation modeling, User satisfaction

## I. INTRODUCTION

Digitization has radically transformed the area of E-Government Service Delivery, in particular, the Ministry of Higher Education in the Kurdistan Region of Iraq (KRI).

ARO-The Scientific Journal of Koya University  
Vol. XII, No.2 (2024), Article ID: ARO.11601. 9 pages  
Doi: 10.14500/aro.11601

Received: 23 April 2024; Accepted: 15 July 2024  
Regular research paper; Published: 05 August 2024

†Corresponding author's e-mail: [aso.khaleel@mhe-krq.org](mailto:aso.khaleel@mhe-krq.org)  
Copyright © 2024 Aso K. Ameen, Dler H. Kadir, Dana A Abdullah,  
Ismail Y. Maalood, and Hewir A. Khidir. This is an open-access  
article distributed under the Creative Commons Attribution License  
(CC BY-NC-SA 4.0).



The Ministry has been in line with other governments across the world to create efficiencies, enhance transparency, and establish good governance with the use of digital technology. It started with an e-government system called [www.erp.mohe.gov.krd](http://www.erp.mohe.gov.krd), which was designed and established in the buildings of the ministry and government universities in 2017. The main elements of this e-government system are six, namely, accounts, scholarships, student records, language center, and document management. In that regard, the paper will describe document management incorporated into the system. User satisfaction is another important factor; indeed, satisfaction is at the core of e-government acceptance and performance. The degree of perceived user satisfaction has a positive relationship with the amount of usage and level of confidence in the system which is also a significant reason for the effectiveness of e-government services.

Assessing the level of satisfaction of users about the management of documents in e-government services helps in the enhancement and operation of the government processes. As the Ministry of Higher Education, it functions in a complex environment that is keenly sensitive to advances in technology and changes in the citizens' expectations. Hence, it is important for policy makers, administrators, and stakeholders to know and measure satisfaction benchmarks about document management in e-government services. Document management in the context of this paper refers to the processes involved in creating, storing, accessing, and sharing documents and other forms of documentation that are critical for effective functioning and to ensure that the institutions of the government are efficient, credible, and reliable (Al-Musawi, 2020). The research of this study is to undertake a general investigation on e-government document management satisfaction among the Ministry of Higher Education of the KRI.

Using structural equation modeling (SEM) as a methodological framework, the study aims to clarify the complicated interactions between various elements that influence satisfaction levels. This study uses SEM to provide

a deeper knowledge of the causes of document management satisfaction by simultaneously examining several variables and their interactions. This work has significance beyond theoretical research, as its findings have practical consequences for policymakers and administrators responsible for improving the efficiency of e-government services. By identifying the primary factors that contribute to satisfaction with document management, policymakers can develop focused interventions and strategies to enhance the functioning and user experience of e-government platforms within the Ministry of Higher Education in the KRI. Furthermore, the findings from this study can provide guidance for larger efforts focused on establishing digital governance strategies and improving public participation and contentment in the higher education sector in the Kurdistan Region.

This means that the literature has emphasized the need to monitor and review progress and setbacks in the process of e-government implementation at different stages (Moon, 2002; Heeks, 2006; Nawafleh and Fares, 2024). Regarding the assessment model applied in this research, it is important to note that it focuses on six efficiency standards: Digitalization, Utility, Reliability, Efficiency, User Satisfaction, and Accessibility forming the e-government assessment model (EGOVSAT). By exploring these standards, the research seeks to find out the extent of efficacy of services and understand how the e-government systems can be fine-tuned to enhance performance and satisfaction levels.

The rest of the article is organized as follows: In Section II, related literature on e-government services and document management area is discussed. Section III of the study highlights the design of the research together with the ways of data gathering and analysis. The findings of the study are laid down in Section IV of the paper, while the discussion of the results is provided in Section V of the paper only. Finally, Section VI consists of the conclusion of the paper and implementation of recommendations for policy and practice.

## II. LITERATURE REVIEW

The integration of e-government services is continuously growing in recognition as an essential element of innovation in the public sector, ensuring easy access by citizens and stakeholders to information, transactions, and government services through e-government services (Moon, 2002). It also offers many benefits related to efficiency, transparency, citizen participation, and speed of access and use of data (Heeks, 2006). This is of particular importance in the Kurdistan Region, where e-government initiatives promise to transform the mechanisms used in providing public services. A key element of this transformation lies in improving document management systems, which play a crucial role in enhancing user satisfaction and overall service quality.

The characteristics that impact user satisfaction with e-government services include accessibility, ease of use, quality, and security. Recently, Muttaqin and Susanto emphasized the importance of trust and perceived ease of use in determining user satisfaction (Muttaqin and Susanto,

2019). Furthermore, new articles show an increase in the focus of e-government services on the user perspective and discuss the significance of the personalization factor in enhancing the efficiency of services, users' participation, and satisfaction levels (Maksimova, Solvak and Krimmer, 2021).

The application of SEM in e-government research allows for a comprehensive analysis of the relationship between user satisfaction and its determinants and shows how SEM can be used to investigate the impact of service innovation on user satisfaction (Nawafleh and Fares, 2024). They show that this method can deal with complex interactions of variables. Similarly, apply a SEM study to examine the impact of digital divide factors on the adoption of e-government services, providing in-depth insights into social, economic, and demographic influences (Muhammad and Kaya, 2023). However, certain limitations can be identified in these studies, which include restricted demographic factors, and the concentration on geographical areas only. In addition, according to improvements to the electronic government, service delivery system increase user satisfaction by positively influencing perceptions of ease of use and usefulness (Sachan, Kumar and Kumar, 2018).

Moreover, the use of blockchain as a tool for the improvement of security and openness of e-government services has been described in the works. Thus, current challenges are observed in the adoption of blockchain technology for various purposes because of legal and technical hurdles (Ølnes and Jansen, 2017).

The literature also addresses specific challenges and opportunities for implementing e-government in the KRI. It discusses the structural and political barriers to the adoption of e-government services (Doski, 2015). While emphasizing the role of public-private partnerships in accelerating the development of e-government services (Al-Taie and Kadry, 2013), E-government in the region, in addition, examines the impact of user perceptions and cultural factors on the adoption of e-government services in Iraqi Kurdistan, providing a comprehensive look at the local dynamics that influence e-government success (Yahia and Miran, 2022). These papers despite completing a vast coverage of the subject fail to capture the dynamism of the technological environment within which Content Delivery Networks exist and operate as well as the consequences thereof on the users' perceptions of satisfaction.

The usefulness of the EGOVSAT model for evaluating e-government services has been highlighted through its application in several studies that confirm its effectiveness in evaluating service quality and user satisfaction. Describes the model's adaptability and impact in a broader context, and emphasizes its importance in evaluating service quality and user satisfaction (Hassan, et al., 2021). While describing its adaptability and impact in a broader context and emphasize its importance in global e-government research (Nawafleh, 2021; Ahmed, et al., 2016). However, for the model to apply in other cultural contexts, further research is needed to prove the pertinent cross-cultural utility.

Extensive literature reviews have identified complex factors that influence satisfaction with e-government

services, with document management systems proving to be an essential component of effective service delivery. Implementing an electronic document management system can provide valuable insight into these complex dynamics and interrelationships that lead to user satisfaction. A deeper understanding can be gained. As e-government initiatives are implemented, especially in regions such as the KRI, it is important to address unique challenges and leverage the latest innovations to realize the full potential of e-government services. Future research should design the experiments to include more recent technological structures and take into account other organizational demographics.

### III. RESEARCH MODEL

This study utilized the “Six Factor Model” to evaluate the document management performance of e-government services, particularly at the Ministry of Higher Education and Scientific Research KRI. This comprehensive framework, which comprises six major dimensions that start with digitalization, utility, reliability, efficiency, user satisfaction, and accessibility, is required to assess the quality of e-government services from the end-user viewpoint.

Digitization is defined as the conversion of old services into digital representations, which is necessary for updating service delivery (Di Giulio and Vecchi, 2023). Moreover, we focus on five questions. Utility assesses the practical value and application of e-government services, ensuring that they satisfy users’ demands successfully (Dunayev, et al., 2023). Also here, we are using five questions. Reliability assesses the consistency and dependability of these services, which is critical for ensuring user confidence (AL-Kaabi, 2023). As well, we focus on three questions. Moreover, efficiency in the context of e-government services refers to the extent to which these services effectively use time and resources, hence demonstrating operational efficiency (AL-Kaabi, 2023). Moreover, we are working on three questions. User Satisfaction is a direct indicator of service success as it reflects consumers’ overall acceptance of the services offered (Lee, Lee and Lee, 2023.). Our attention is centered on five specific questions. Last but not least, accessibility assesses the ease with which services may be accessed, with an emphasis on the significance of accommodating all individuals (Othman, et al., 2023.).

By combining these characteristics, our study model seeks to give a thorough assessment of the present level of e-government services in the KRI’s higher education sector. The use of SEM will enable a sophisticated study of user data, identifying critical aspects that impact customer happiness and service quality. The six factors are shown in Fig. 1.

### IV. METHODOLOGY (MATERIALS AND METHODS)

#### A. Data Collection

Questionnaires were distributed to users of document management systems at public universities operating

under the auspices of the Ministry of Higher Education and Scientific Research in the KRI for the purposes of this research. Based on the constructs of the SEM model, these questionnaires sought to comprehensively assess the e-government services as perceived by the consumers.

A combination of qualitative and quantitative inquiries was used to collect information relating to efficiency, accessibility, reliability, facilities, digitalization, and user satisfaction with the system. The total number of questions distributed was 25. The dataset of the distribution of questions across sections is shown in Fig. 1. The total response collected was 369. After the completion of data collection, a comprehensive analysis was conducted using SPSS and R language, which unveiled noteworthy patterns, trends, and possible improvements for the e-government services.

The aforementioned methodical approach underscores our commitment to conducting a thorough assessment of the efficacy of e-government services in the higher education sector of KRI by means of methodical data collection and analysis.

#### B. Reliability Test

Cronbach’s alpha can be used to measure internal consistency, and its purpose adorns itself as the extent of the internality of Consistency tested among a set of items (Bonett and Wright, 2015). It is an index of reliability as well as consistency of scale measurements. This coefficient is ascertainable geometrically by the number of the items of the test and their mean inter-correlation. The general and standardized formula to calculate Cronbach’s alpha is shown in Equation (1).

$$\alpha = \frac{N * \bar{c}}{\bar{v} + (N - 1) * \bar{c}} \quad (1)$$

#### C. Confirmatory Factor Analysis (CFA) - Construct Validity

CFA is a statistical method that verifies the validity of a hypothesized factor structure in SEM, analyzing the relationships between observed variables based on a theoretical model. It is mainly used in social science, psychology, and education when scientists investigate an underlying structure about a set of observed variables. This statistical test has been declared to be done in various fields (Brown, 2015).

#### D. Basic Concepts

##### Latent variables

Latent variables are unobservable constructs or factors that are hypothesized to underlie the observed variables. In CFA, we assume that there are latent variables that influence the observed variables.

##### Observed variables

These are the measurable variables that are directly observed or measured in a study.

##### Factor loadings

Factor loadings represent the strength and direction of the relationship between a latent variable and an observed variable. Denoted as  $\lambda$  (lambda), the formula for the relationship between the latent variable (F) and the observed variable (X) is:



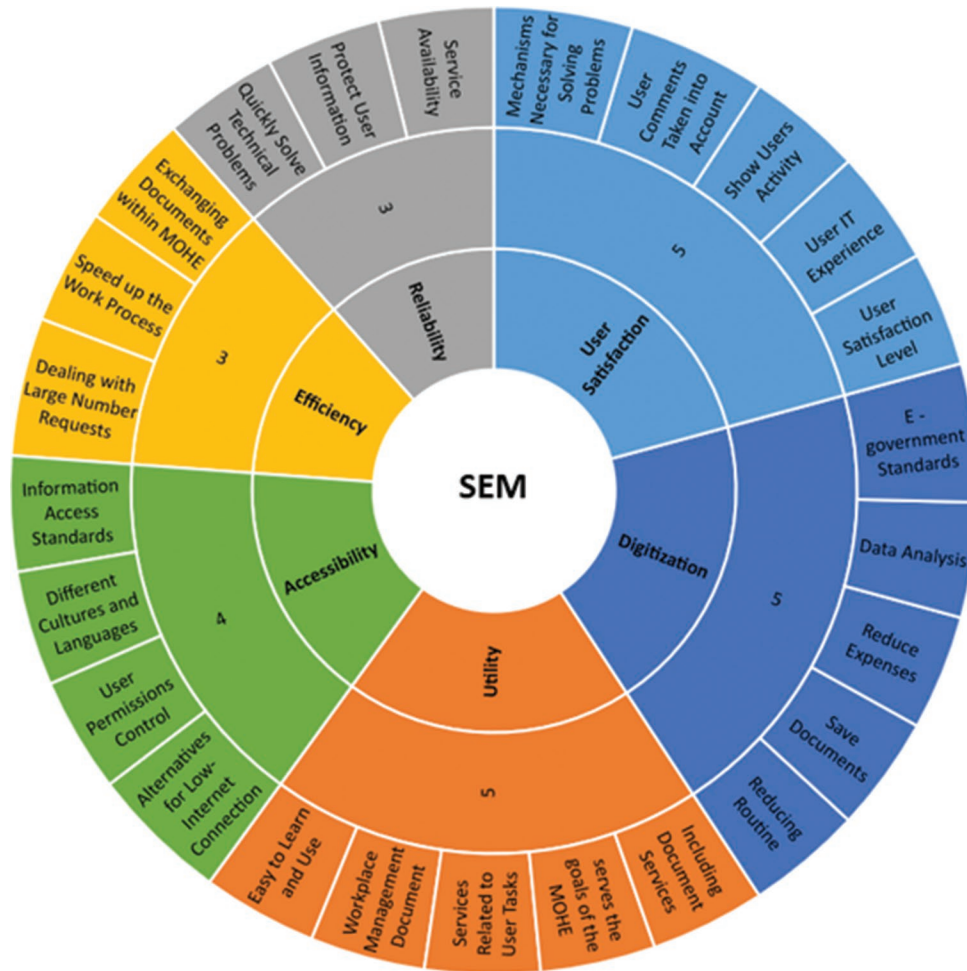


Fig. 1. Strategic Enterprise Management (SEM) model organized into several key domains: The sixS's of service dominant logic are Efficiency, Accessibility, Reliability, User Satisfaction, Utility and Digitization. Each domain is broken down into detailed goals and tasks, showing this broad and extensive system applied to the enhancement of the extent and quality of services as well as the satisfaction of the end-user within an organization.

$$X_i = \lambda_i * F + \epsilon \tag{2}$$

Where

$X_i$ : Observed variable  $i$

$\lambda_i$ : Factor loading for observed variable  $i$

$F$ : Latent factor

$\epsilon$ : Error term for observed variable  $i$

Where:

$Y$ : The dependent variable.

$X_1, X_2, X_3, \dots, X_n$ : The independent variables.

$\beta_0, \beta_1, \beta_2, \dots, \beta_n$ : the regression coefficients, representing the change in  $Y$  for a one-unit change in each independent variable, holding all other variables constant.

$\epsilon$  is the error term, representing the difference between the observed and predicted values of  $Y$ .

This equation allows us to estimate the value of the dependent variable  $Y$  based on the values of the independent variables  $X_1, X_2, X_3, \dots, X_n$ , with each independent variable contributing to the prediction of  $Y$  to some extent.

Multiple regression analysis is a powerful tool for understanding the relationships between multiple variables and predicting outcomes based on those relationships.

### V. REGRESSION MODELING ANALYSIS

Multiple regression analysis extends ordinary least squares linear regression to predict the value of a dependent variable using two or more independent variables. While simple linear regression involves predicting the dependent variable from just one independent variable, multiple regression allows for more complex relationships to be modeled. In multiple regression, the relationship between the dependent variable and each independent variable is considered simultaneously (Cohen, et al., 2013).

The multiple regression equation is represented as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \epsilon \tag{3}$$

### VI. STATISTICAL RESULTS

#### A. Descriptive Statistics

Before diving into the statistical tests, it was essential to provide a brief description of some of the respondent's

demographics. The findings regarding the respondent's gender reveal a notable gender distribution within the study. With 63.86% of respondents identifying as female and 36.14% as male, it suggests a higher participation rate among females in the evaluation of document management satisfaction in e-government services within the Ministry of Higher Education as seen in (Fig. 2a).

Moreover, the majority of responses are between the ages of 36–45 (48.10%) and 25–35 (30.98%), indicating a strong representation of people in their prime working years. While, less percentage of users were found within the age group (46–55) and above 55 years old with 16.85% and 4.08%, respectively as provided in (Fig. 2b).

The education background of respondents reveals that the majority (64.40%) hold undergraduate degrees, followed by post-graduate qualifications (30.16%). A lesser proportion (4.89%) claimed to possess a high school diploma, while only 0.54% fell into the “others” group. This distribution implies that people involved in rating document management satisfaction in e-government services within the Ministry of Higher Education are more likely to have higher education qualifications. Understanding respondents' educational backgrounds is critical for developing communication and training materials that enable effective engagement and understanding across the ministry's various educational levels which is shown in (Fig. 2c).

In addition to the above demographical variables, other information was also necessary to understand how the system can be improved based on their responses on the technical part. Participant's occupation was recorded and based on (Fig. 3a), the majority of responders (68.48%) work as administrative personnel, followed by academic staff (28.53%). A small minority of respondents identified as visitors (0.82%), with 2.17% falling into the category of “others.”

In (Fig. 3b), the breakdown of specialists' areas of work as users of the platform reveal that the majority (48.10%) come from science backgrounds, followed closely by those from social backgrounds (43.21%). A smaller percentage (8.70%) indicated that they do not have a specialized area. Understanding the distribution of specialists' areas of work helps in tailoring platform features and functionalities to cater to the specific needs and preferences of users from different disciplinary backgrounds within the Ministry of Higher Education.

The breakdown of respondents' computer skill levels shows that the majority (55.86%) had a medium level of proficiency, with 39.51% having an advanced level. A lesser percentage (4.63%) falls within the primary skill level as illustrated in (Fig. 3c). This distribution indicates a predominantly capable user population, with a significant number of advanced abilities, which is critical for

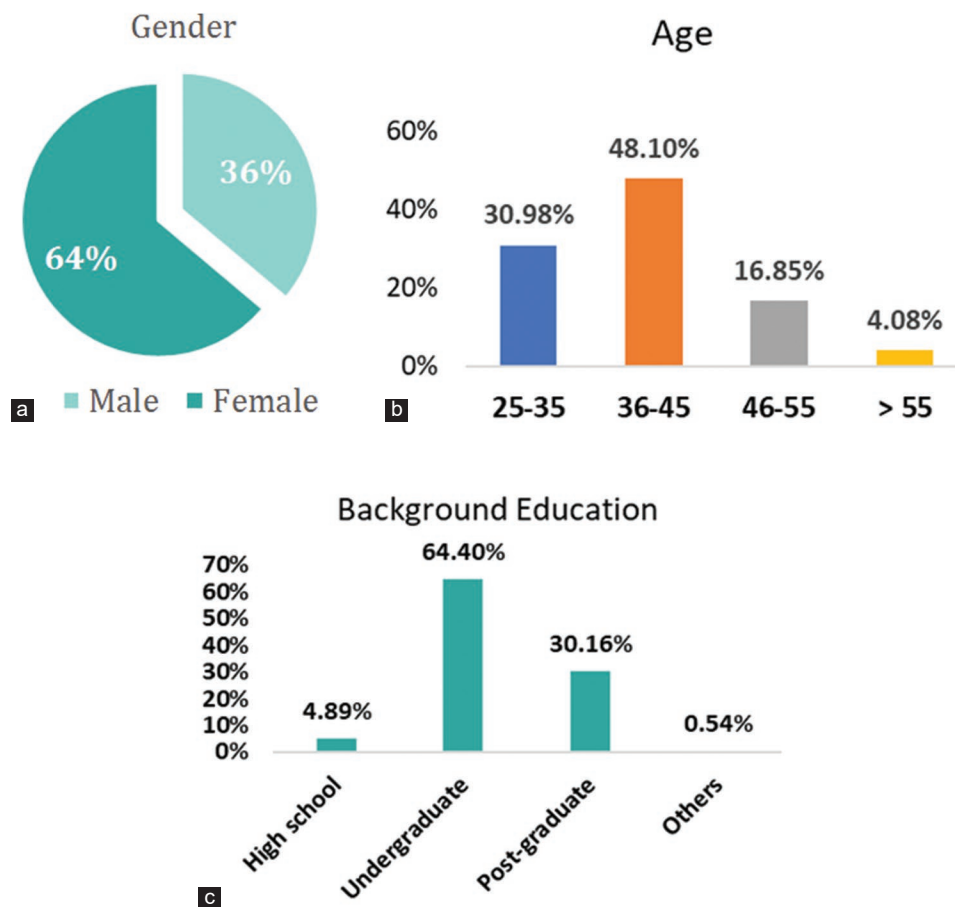


Fig. 2. (a) Pie-Chart illustration of participant's gender, (b) Age distribution bar-chart of the respondents and (c) Background Education bar-chart demonstration.

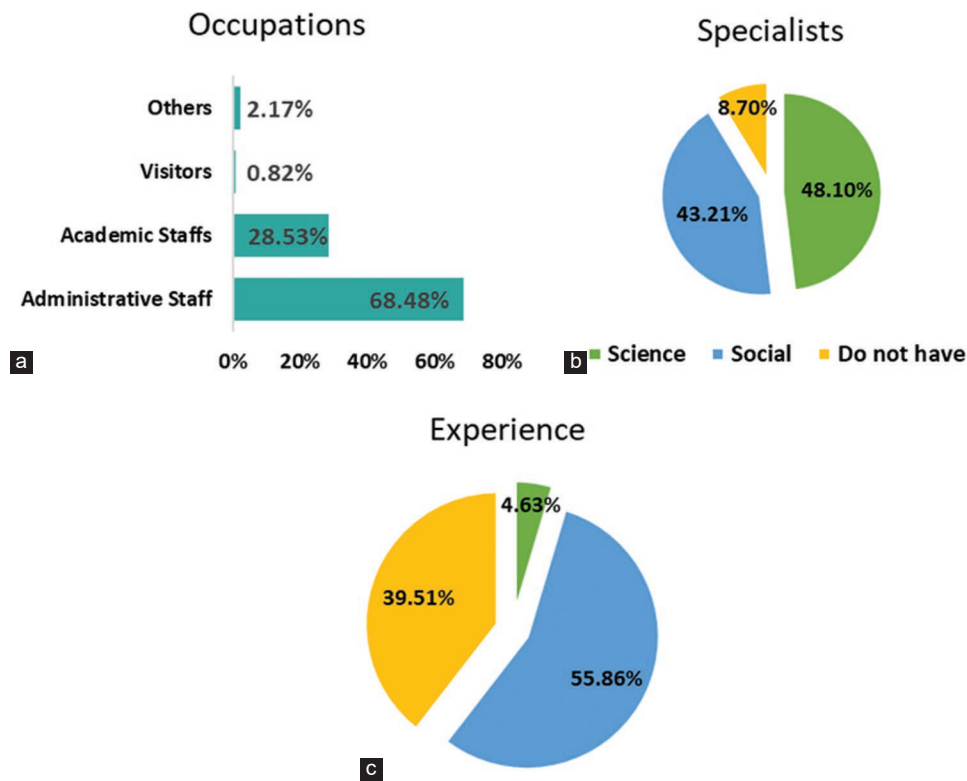


Fig. 3. (a) Pie-chart illustration of participant’s occupation, (b) Specialist’s distribution bar-chart of the respondents and (c) Experience bar-chart demonstration.

properly employing the platform for evaluating document management satisfaction in e-government services within the Ministry of Higher Education. Understanding skill levels allows you to adapt training and support materials to match the various needs of users with varying levels of proficiency.

### VII. SEM RESULTS

Six latent factors were studied to evaluate the platform from the view of the users and they were digitalization, utility, efficiency, reliability, user satisfaction, and accessibility. As part of implementing the construct validity which demonstrates the relationships between the latent factor and observed variables, regression modeling was also built to present how user satisfaction and reliability of the system are affected by other factors separately.

Cronbach’s alpha revealed good results across all aspects of the scale as provided in Table I. Reliability had the lowest score (0.751), while utility recorded the greatest consistency across the observed variables on this latent factor with a value of 0.849 as shown in Table I. Furthermore, the mean values of all latent factors indicated above are acceptable and all contributed to leveling up the performance of the system.

The corrected item-total correlations in the six-factor model showed values of 0.585–0.695 for Digitalization, 0.607–0.681 for Utility, 0.537–0.607 for Reliability factor, 0.650–0.713 for Efficiency, 0.556–0.700 for User Satisfaction and 0.606–0.657 for Accessibility as shown

TABLE I  
CRONBACH’S ALPHA OUTCOMES

Scale	Mean	SD	Cronbach’s alpha
Digitalization	3.9319	0.756	0.827
Utility	4.0556	0.7195	0.849
Reliability	3.6883	0.8181	0.751
Efficiency	3.9982	0.7888	0.827
User satisfaction	3.7204	0.7878	0.839
Accessibility	3.6901	0.8039	0.811
Total	3.876	0.7795	0.956

in Table II. Importantly, none of the items showed correlations <0.3 on either observed variables with their latent factors. Despite these findings, deleting any item did not increase Cronbach’s alpha which means that all observed variables measured, had significant contributions with their related latent factors, hence, demonstrating the relevance of each question in sustaining the scale’s integrity.

In terms of factor loading values, they denote the strength of the association between a latent factor and its indicators while considering the scale of measurement. Values closer to 1 imply a stronger correlation between the latent factor and the observed variable, with larger values indicating that the observed variable serves as a reliable indicator of the latent factor where all values were greater than the cut-off value of 0.3. In addition, all items for all six latent factors were statistically significant ( $p < 0.05$ ), signifying a substantial relationship between the latent factor and each observed variable. However, the R-square values for the

TABLE II  
FACTOR LOADING, CORRECTED ITEM-TOTAL CORRELATION, CRONBACH'S ALPHA IF ITEM DELETED, AND R-SQUARE RESULTS

Scales	Items	Factor loading (SE)	Corrected item-total correlation	Cronbach's alpha if the item deleted	p-value	R-square
Digitalization	D1	0.548 (0.020)	0.698	0.772	0.000	0.566
	D2	0.511 (0.024)	0.585	0.803	0.000	0.464
	D3	0.536 (0.033)	0.596	0.803	0.000	0.408
	D4	0.523 (0.023)	0.605	0.798	0.000	0.492
	D5	0.557 (0.022)	0.640	0.788	0.000	0.541
Utility	U1	0.461 (0.022)	0.607	0.831	0.000	0.432
	U2	0.536 (0.019)	0.677	0.813	0.000	0.55
	U3	0.514 (0.018)	0.681	0.812	0.000	0.551
	U4	0.565 (0.021)	0.662	0.817	0.000	0.56
	U5	0.539 (0.019)	0.665	0.816	0.000	0.559
Reliability	R1	0.563 (0.026)	0.607	0.638	0.000	0.516
	R2	0.561 (0.025)	0.605	0.643	0.000	0.535
	R3	0.626 (0.036)	0.537	0.729	0.000	0.535
Efficiency	E1	0.603 (0.022)	0.691	0.755	0.000	0.605
	E2	0.649 (0.023)	0.713	0.732	0.000	0.634
	E3	0.603 (0.022)	0.650	0.795	0.000	0.607
User satisfaction	US1	0.602 (0.021)	0.691	0.792	0.000	0.596
	US2	0.691 (0.026)	0.685	0.794	0.000	0.618
	US3	0.652 (0.026)	0.700	0.789	0.000	0.575
	US4	0.424 (0.026)	0.556	0.828	0.000	0.344
	US5	0.462 (0.021)	0.586	0.821	0.000	0.444
Accessibility	A1	0.553 (0.021)	0.636	0.762	0.000	0.565
	A2	0.609 (0.031)	0.657	0.750	0.000	0.508
	A3	0.607 (0.034)	0.630	0.765	0.000	0.473
	A4	0.542 (0.022)	0.606	0.775	0.000	0.538

observed variables were relatively modest, ideally falling within the range of 0.60–0.90, indicating that the latent factors effectively explained the variability in the observed variables.

In addition to the SEM findings, the CFA conducted on the hypothesized constructed questionnaire involving all six factors and demonstrated a satisfactory fit with the data ( $n = 368$ ):  $\chi^2 = 618.69$  (260),  $p < 0.001$ ; Comparative fit index (CFI) = 0.932; Tucker-Lewis index (TLI) = 0.921; root mean square error of approximation (RMSEA) = 0.061. In addition, it is advisable to achieve a CFI above 0.90 which was the case. Fortunately, both root mean square of residuals (RMSR) and RMSEA values were below 0.08, suggesting an acceptable fit to support the CFI.

As shown in Table III, all six latent factors showed a significant effect in evaluating the ERP system by the respondents, and it was important to measure the reliability and user satisfaction factors. Referencing the multiple regression model shown in Table IV, it can be noticed that all four latent factors were statistically significant in improving the system's reliability as well as satisfaction by the users and the variability of reliability was measured with 45.40% was due to the collective effect of digitalization, utility, efficiency, and accessibility, whereas these factors had an impact by 56.30% on user satisfaction. These findings suggested that one can pay attention to these factors to improve or increase the reliability and user satisfaction level. The values of R-square which were not very high indicate a good sign of not suffering from overfitting and can lead us to an accurate and reliable conclusion in reference to the independent's influences.

TABLE III  
CONSTRUCT VALIDITY RESULTS

Scales	X2	df	P	CFI	TLI	RMSR	RMSEA
Six factors model	618.69	260	<0.001	0.932	0.921	0.042	0.061

CFI: Comparative fit index, TLI: Tucker-lewis index, RMSR: Root mean square of residuals, RMSEA: Root mean square error of approximation

TABLE IV  
MULTIPLE REGRESSION MODELING ANALYSIS FINDINGS

Dependent	Independents	Unstandardized coefficients		p-value	Adjusted R-square	VIF
		B	SE			
		Reliability	(Constant)			
	Digitalization	0.194	0.066	0.003		2.006
	Utility	0.250	0.071	0.001		2.382
	Efficiency	0.267	0.059	0.000		2.237
	Accessibility	0.181	0.056	0.001		1.777
User satisfaction	(Constant)	0.137	0.174	0.030	56.30%	-
	Digitalization	0.166	0.055	0.002		2.006
	Utility	0.194	0.059	0.001		2.382
	Efficiency	0.156	0.049	0.001		2.237
	Accessibility	0.397	0.046	0.000		1.777

## VIII. DISCUSSION

This study used the EGOVSAT to assess the effectiveness of e-government document management systems at the Ministry of Higher Education in Iraq's Kurdistan Region. It utilizes a six-factor model that includes digitalization, utility, reliability, efficiency, user satisfaction, and accessibility. Utilizing SEM and regression analyses has provided valuable understanding regarding the factors



that improve user satisfaction and the dependability of the system.

The SEM analysis revealed that accessibility and user satisfaction play a significant role in the success of e-government services. This implies that, despite advances in digital infrastructure, the ease of access and extent to which these services meet user needs remain critical to their effectiveness. Furthermore, the study identifies digitization and efficiency as critical drivers of operational excellence, implying that continued efforts to improve these areas could result in significant improvements in service delivery.

The regression analysis confirms the impact of the aforementioned factors, demonstrating that digitalization, utility, efficiency, and accessibility all account for significant differences in reliability and user satisfaction. This demonstrates the interconnected nature of these factors, with improvements in one area potentially improving others, ultimately leading to better user experiences and service reliability.

Importantly, although the result is based on a moderate Cronbach's Alpha score of 0.695, which indicates sufficient reliability without significant multicollinearity among variables, it also confirms the independence of predictors in the regression model (Hassan, et al., 2021). Moreover, the proposed dimensions and the proposed dimensions in the EGOVSAT explained 53.2% of the variation in citizens' satisfaction with e-government services (Nawafleh, 2021). Accessibility, information, security, reliability, trust, and perceived ease of use all have a positive impact on service quality and customer satisfaction (AL-Kaabi, 2023). In addition, improvements to the electronic government service delivery system increase user satisfaction by positively influencing perceptions of ease of use and usefulness, as validated by SEM (Sachan, et al., 2018). However, our results show that the study is highly reliable (Cronbach's Alpha = 0.956), users are satisfied (56.30%), and the model fits well (CFI = 0.932; TLI = 0.921; RMSEA = 0.061). This shows that the research was done correctly, and the results may be useful in other places where e-government programs are being used, not just the Kurdistan Region.

This study makes a significant contribution to the e-government literature by identifying the critical factors influencing user satisfaction and system reliability. The findings advocate for a balanced approach that takes into account both technical infrastructure and user experience, and they provide a road map for policymakers looking to improve e-government service delivery. Future research could delve deeper into the dynamic interactions between these factors, as well as test the model in a variety of contexts, to broaden the findings.

## IX. CONCLUSION

This study evaluates e-government services provided by the Ministry of Higher Education of KRI using the EGOVSAT and a "six-factor" framework, emphasizing the significance of accessibility, utility, reliability, efficiency, digitization, and

user satisfaction. By analyzing user responses with SEM, we find that accessibility and user satisfaction are critical to the success of e-government, whereas operational efficiency is significantly impacted by digitization and efficiency and there was a significant relationship between latent factors and observed variables where all factor loading values were statistically significant. Our research findings suggest that continuous improvements are necessary to align with changing user demands, even in the face of progress in service digitization and accessibility, and the SEM of all six factors, demonstrated a satisfactory fit with the data ( $n = 368$ ):  $\chi^2 = 618.69$  (260),  $p < 0.001$ ; CFI = 0.932; TLI = 0.921; RMSEA = 0.061. Fortunately, both RMSR and RMSEA values were below 0.08, suggesting an acceptable fit to support the CFI. The application of the EGOVSAT offers profound insights into user requirements in KRI and promotes a well-rounded approach that takes into account user experience and technical infrastructure. In addition, we also reached a conclusion that both reliability and user satisfaction were significantly affected by other latent factors with R-square 45.40% and 56.30%, respectively. Furthermore, a comprehensive examination reaffirms that the six latent factors have a substantial effect on service dependability and user satisfaction. This study adds to the body of e-government literature by providing specific insights into the context of KRI. It also acts as a starting point for future research by advocating for an approach to e-government service provision that is user-centric, effective, and inclusive.

## REFERENCES

- Ahmed, A.M., Hassan, B., Saeed, S., and Saeed, A.A. 2016. Evaluating e-Government services in Kurdistan institution for strategic studies and scientific research using the EGOVSAT model. *Journal of Applied Research*, 1(2), pp.1-7.
- AL-Kaabi, R. 2023. The impact of e-government services on customer satisfaction in the private sector: A case study of the Kingdom of Bahrain (SIJILAT) an online commercial registration. *The Electronic Journal of Information Systems in Developing Countries*, 89(6), p.e12275.
- Al-Musawi, M.M. 2020. Transforming One-stop E-services in Iraq: Focusing on Perception of Blockchain Technology in Digital Identity System. In: *IEEE Global Humanitarian Technology Conference (GHTC)*. IEEE, pp.1-4.
- Al-Taie, M.Z., and Kadry, S. 2013. E-government: Latest trend and future perspective the Iraq case. *European Journal of Scientific Research*, 99(2), pp.307-323.
- Bonett, D.G., and Wright, T.A. 2015. Cronbach's alpha reliability: Interval estimation, hypothesis testing, and sample size planning. *Journal of Organizational Behavior*, 36(1), pp.3-15.
- Brown, T.A. 2015. *Confirmatory Factor Analysis for Applied Research*. Guilford Publications, New York.
- Cohen, J., Cohen, P., West, S.G., and Aiken, L.S. 2013. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Routledge, United Kingdom.
- Di Giulio, M., and Vecchi, G. 2023. Implementing digitalization in the public sector. Technologies, agency, and governance. *Public Policy and Administration*, 38(2), pp.133-158.
- Doski, S. 2015. Implementation of E-government in Kurdistan Regional Government (KRG): Political, Social and Economic Constraints. In:



- European Conference on Digital Government*. UK: Academic Conferences International Ltd, p.386.
- Dunayev, I., Byelova, L., Kud, A., and Rodchenko, V. 2023. Implementing the “government as a platform” concept: The assessment method and an optimal human-centered structure to address technological challenges. *Eastern-European Journal of Enterprise Technologies*, 122(13), pp.6-16.
- Hassan, B.A., Ahmed, A.M., Saeed, S.A., and Saeed A.A., 2021. *Evaluating E-government Services in Kurdistan Institution for Strategic Studies and Scientific Research Using the EGOVSAT Model*. [arXiv preprint] arXiv:2105.02697.
- Heeks, R. 2006. Understanding and Measuring eGovernment: International benchmarking Studies. In: *UNDESA Workshop “E-participation and E-government: Understanding the Present and Creating the Future”*. Budapest, Hungary, pp.27-28.
- Lee, B.K., Lee, E.H., and Lee, T. 2023. The effect of E-Government website evaluation on user satisfaction and intention to use: The mediating role of warmth and competence judgment on government. *Information Communication and Society*, 26(9), pp.1868-1889.
- Maksimova, M., Solvak, M., and Krimmer, R. 2021. Data-driven Personalized E-Government Services: Literature Review and Case Study. In: *International Conference on Electronic Participation*. Springer International Publishing, Cham, pp.151-165.
- Moon, M.J. 2002. The evolution of E-government among municipalities: Rhetoric or reality? *Public Administration Review*, 62(4), pp.424-433.
- Muhammad, A.S., and Kaya, T. 2023. Factors affecting the citizen’s intention to adopt E-government in Nigeria. *Journal of Information Communication and Ethics in Society*, 21(3), pp.271-289.
- Muttaqin, M.H., and Susanto, T.D. 2019. The Effect of Website Components on User Trust in Increasing the Interest to Use Public Administration Service on E-government Website. In: *2019 International Conference on Computer Science, Information Technology and Electrical Engineering (ICOMITEE)*. IEEE, pp.30-36.
- Nawafleh, S. 2021. E-government and citizen satisfaction in Jordan: EGOVSAT testing using SEM approach. *International Journal of Productivity and Quality Management*, 34(1), pp.20-32.
- Nawafleh, S., and Fares, A.M.S. 2024. UTAUT and determinant factors for adopting E-government in Jordan using a structural equation modelling approach. *Electronic Government an International Journal*, 20(1), pp.20-46.
- Ølnes, S., and Jansen A. 2017. Blockchain Technology as a Support Infrastructure in E-Government. In: *Electronic Government: 16<sup>th</sup> IFIP WG 8.5 International Conference Proceedings, EGOV 2017*. Springer International Publishing, St. Petersburg, Russia, pp.215-227.
- Othman, A., Al Mutawaa, A., Al Tamimi, A., and Al Mansouri, M. 2023. Assessing the readiness of government and semi-Government institutions in Qatar for inclusive and sustainable ICT accessibility: Introducing the MARSAD Tool. *Sustainability*, 15(4), p.3853.
- Sachan, A., Kumar, R., and Kumar, R. 2018. Examining the impact of E-government service process on user satisfaction. *Journal of Global Operations and Strategic Sourcing*, 11(3), pp.321-336.
- Yahia, H., and Miran, A. 2022. Evaluating the electronic government implementation in the Kurdistan region of Iraq from citizens’ perspective. *Humanities Journal of University of Zakho*, 10(2), pp.594-601.