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Modelling Government-to-Government (G2G) usage among government employees in Kuwait: The contingent role of task interdependence

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Abstract: The purpose of this paper is to investigate employee performance using G2G system in Kuwait. The study is based on D&M model, and it proposed the moderating effect of task interdependence on employee performance. Data of 290 employees were collected from Kuwait ministries, and smart PLS was used to analyse the data. Results indicate that information quality, service quality, and employee training have positive influence on G2G usage. Information quality, G2G usage, and service quality have positive influence on employee satisfaction. G2G usage, employee satisfaction, and employee training have positive influence on employee performance. However, system quality and employee training have no relationship with employee satisfaction. System quality also has no relationship with G2G usage. The study also showed no moderating effect of task interdependence on the relationship between G2G usage and employee performance. To overcome research limitations, several recommendations have been given for future research on this area.

Keywords: G2G; e-government; employee performance; task interdependence; Kuwait e-government; technology adoption; government to government; e-government
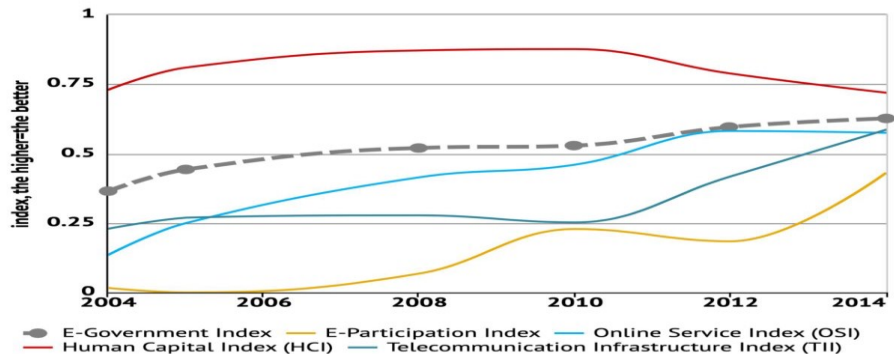
1. Introduction

The term 'e-government' began to gain prominence in the late 1990s due to technological developments in the United States of America (Hernon and Dugan, 2015). This development led to the implementation of e-government in different categories (G2G, G2C, G2E, and G2B) to enhance governmental transactions and information sharing among agencies.

The Kuwaiti government acknowledged the significance of e-government and implemented it in 2006 through the Central Agency for Information Technology (CAIT), which was tasked with overseeing e-government implementation (Central Agency for Information Technology, 2018). Furthermore, the introduction of CAIT contributed to a significant increase in the trend of e-government over a decade (from 2004 to 2014), as shown in **Figure 1**. In this figure, the yellow line signifies a steep increase between 2008 and 2014.

In 2014, Kuwait implemented legislation to establish the Government-to-Government (G2G) system in all government agencies (Central Agency for Information Technology, 2018). The Kuwaiti government introduced the G2G system to enhance the performance of government employees in processing governmental transactions (Kuwait National Development Plan—New Kuwait, 2018). The system also aims to support the 2035 Kuwaiti government vision of transforming Kuwait into

a financial and commercial center by improving online governmental services. Thus, introducing the G2G system is important to achieve the Kuwaiti vision in 2035.

Figure 1. Kuwait Ranking Indexes according to the UN e-government development index in 2018.

Although the G2G system was introduced in 2014, its activation in Kuwait took place in 2017, and it was not fully implemented in all government ministries. The CAIT announced in 2024 that some departments in government ministries still have problems in uploading large government files into the G2G system and they are doing the best to solve any problem facing the G2G system (Central Agency for Information Technology, 2024). Also, the World E-Government Index report showed that Kuwait's rank in e-government declined from 41 in 2018 to 61 in 2022. **Table 1** illustrates the reduction in Kuwait's e-government rank between 2018 and 2022.

**Table 1.** UN e-government development index (United Nations, 2023).

E-Government development index	2022	2020	2018
Kuwait (Rank)	61	46	41

The decline in the e-government index clearly shows that the recent usage of the G2G system by employees in Kuwait ministries does not help improve their performance in processing government transactions, raising an alarming sign for the Kuwaiti government to investigate this issue. Most importantly, Kuwait's Labor Efficiency Rank in the Global Competitiveness Report decreased to 120 in 2018 compared to 117 in 2016 (World Economic Forum, 2018), and this reduction led to a poor performance of Kuwaiti employees in Kuwait ministries. All the above examples indicate the importance of highlighting the performance of employees using the G2G system in Kuwait ministries. This study investigates the performance of Kuwaiti employees using the G2G system in e-government.

2. Literature review

Veeramootoo et al. (2018) asserted that the updated Information System Success Model, with its six success dimensions, is the most suitable model for measuring the successful usage of e-government (Veeramootoo et al., 2018). To support this notion, a number of scholars such as Alshaher (2021); Kilani (2021); and Mellouli et al. (2020) believed that the Information System Success Model (2003) is a useful model to

evaluate the success of e-government implementation (Alshaher, 2021; Kilani, 2021; Mellouli et al., 2020). **Figure 2** and **Table 2** below explain the Information System Success Model.
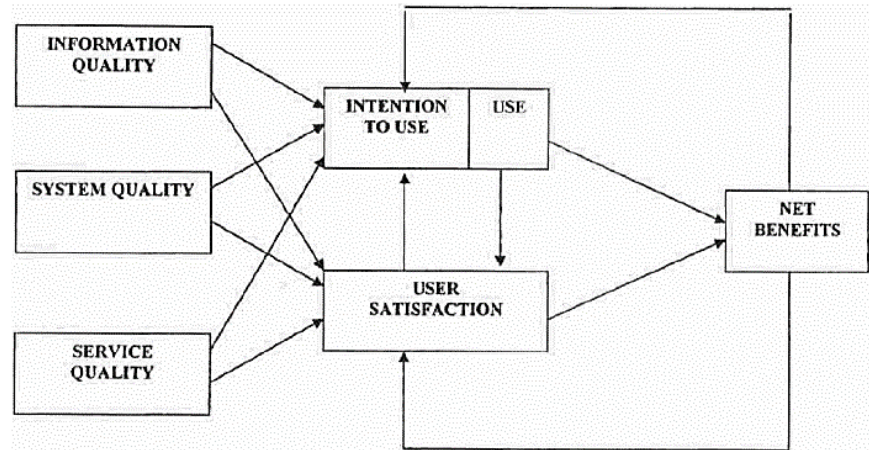
Figure 2. Information system success model (DeLone and McLean, 2003).

Table 2. The information system success model (DeLone and McLean, 2003).

Construct	Definition
Information quality	Quality of the information that the system is able to store, deliver, or produce (Rani et al., 2023).
System quality	Extent to which the system is able to deliver benefits (Bouteraa et al., 2022).
Service quality	Service that can be delivered (Fülöp et al., 2020).
User satisfaction	Extent to which a user is pleased with the system.
System use	Actual usage of the system (Martín-Navarro et al., 2021).
Net benefits	Overall benefits provided by the system (DeLone and McLean, 2003).

The information system success model has an advantage over other technology theories and models because it focuses on the actual use of technology and its impact on performance. It is considered one of the most important technology adoption models. In contrast, other theories and models have failed to explain employee (user) performance as a result of technology usage (Aldholay et al., 2018).

Isaac et al. (2017) stated that previous studies have found varying results regarding the relationship between technology usage and performance, including strong, weak, and no relationship. The insignificant relationship between two connected variables can be strengthened by introducing another variable as a moderator (Isaac et al., 2017; King, 2020). Task interdependence is suggested by recent literature to be added as a moderator to strengthen the relationship between G2G system usage and employee performance in Kuwait ministries. Task interdependence will be discussed in more detail in section 2.7. Employee training is another variable suggested to be added to the information system success model, and it is considered an essential component of the use of new technology (Batane and Ngwako, 2017). Employee training will also be discussed in more depth in section 2.4.

2.1. Information quality

Previous research on technology adoption has concluded that information quality is positively related to the usage of various technologies. In the context of e-government, Sewandono et al. (2023) showed that employees would be able to use the e-government system more effectively to perform their daily work routine when the system provides up-to-date, relevant, and accurate information. Previous literature has shown that information quality is positively correlated with employee satisfaction in the context of e-government. In this regard, Mellouli et al. (2020) found that e-government websites providing accurate, clear, and understandable information positively influence employee satisfaction. This suggests that improved information quality can have a positive impact on the usage of government-to-government (G2G) services and employee satisfaction in Kuwait ministries (Mellouli et al., 2020). It can be hypothesized that:

H1: Information quality positively influences G2G usage in Kuwait ministries.

H2: Information quality positively influences G2G employee satisfaction in Kuwait ministries.

2.2. System quality

Based on previous research, studies have demonstrated that system quality is positively related to technology usage. Stefanovic et al. (2016) examined e-government success from the employees' perspective, finding that aspects of system quality, such as system usability and system functionality, have a direct effect on employees' usage of the system as well as an indirect effect on their performance (Stefanovic et al., 2016). Suryanto et al. (2023) found that system quality positively affects employee satisfaction. They argue that when e-government applications are user-friendly, reliable, and responsive, users are satisfied with the system and continue to benefit from using it. This implies that higher system quality can positively impact G2G usage and employee satisfaction in Kuwait ministries (Suryanto et al., 2023). Therefore, the following hypothesis can be made:

H3: System quality positively influences G2G usage in Kuwait ministries.

H4: System quality positively influences G2G employee satisfaction in Kuwait ministries.

2.3. Service quality

The literature has explored the connection between service quality and technology usage. In terms of the governmental services, Oppong et al. (2021) assessed the level of mobile health service quality and its effect on employee satisfaction and continual usage among selected maternal healthcare users in rural Ghana. They found a positive and significant effect of mobile health service quality on the continual usage (Oppong et al., 2021). In another work of research connected to the e-government, Al-Zahrani (2020) concluded that service quality has a positive influence on e-government employee satisfaction. He claimed that in terms of providing users with assistance in completing their tasks, service quality characteristics become critical in determining the satisfaction of e-government users (Al-Zahrani, 2020). This suggests that higher service quality can have a positive

impact on G2G usage and employee satisfaction in Kuwait ministries. As a result, the following hypothesis is proposed:

H5: Service quality positively influences G2G usage in Kuwait ministries.

H6: Service quality positively influences G2G employee satisfaction in Kuwait ministries.

2.4. Employee training

Several studies have confirmed that employee training has a positive impact on technology usage. Doran et al. (2023) conducted a study to assess the effectiveness of government IT training programs on users' usage of e-government. They found that users' participation in training programs related to the IT branch of their government improved their usage of e-government. Previous studies have shown that employee training on technology usage positively affects employee satisfaction. In the context of technology usage in public organizations, Raymundo and Santana (2018) found a positive impact of technology training on older workers' satisfaction. Raymundo and Santana (2018) found that older employees who received technology training experienced increased satisfaction. Similarly, employee training on technology usage is positively related to employee performance. AlMulhim, (2023) argued that the failure of numerous e-government initiatives in developing countries can be attributed to a lack of employee training and proficiency in utilizing e-government applications. In developing countries where users lack technical skills in e-government usage, training programs can help users improve their usage skills of e-government technology, leading to better job performance (Abdullah et al., 2016). This indicates that G2G user training can positively impact G2G usage, employee satisfaction, and employee performance in Kuwait ministries. Therefore, the following hypothesis can be created:

H7: Employee training on G2G system positively influences G2G usage in Kuwait ministries.

H8: Employee training on G2G system positively influences employee satisfaction in Kuwait ministries.

H9: Employee training on G2G system positively influences employee performance in Kuwait ministries.

2.5. System usage

Prior literature sheds light on the positive relationship between technology usage and employee satisfaction. In the context of e-government, Shuib et al. (2019) revealed a significant positive relationship between e-government usage and employee satisfaction, indicating that e-government users become satisfied with the e-government website utilization when they have a positive experience using this system (Shuib et al., 2019). In the same topic, recent studies have also discussed the positive impact of technology usage on employee performance. In the context of e-government, Alameria et al. (2019) evaluated the employees' perspective on the success of e-government. They found that the employees' use of e-government applications enhances their performance, making their jobs easier and reducing working errors, which helps to improve the performance of employees (Alameria et al., 2019). This

suggests that implementing a G2G system can have a positive impact on employee satisfaction and employee performance. This leads to the following hypothesis:

H10: G2G system usage positively influences employees' satisfaction in Kuwait ministries.

H11: G2G system usage positively influences employees' performance in Kuwait ministries.

2.6. User satisfaction

A recent study related to technology usage in organizations, Al Sayegh et al. (2023), found that employee satisfaction is a predictor of employee performance. They stated that when employees are pleased with their decision to use the Internet, they are most likely to be more productive in their jobs (Isaac et al., 2016). In the context of e-government, Mellouli et al. (2020) stated that to increase employees' satisfaction with e-government, government authorities need to develop a system that is user-friendly and has high technical quality to be effectively used by employees (Mellouli et al., 2020). This suggests that higher employee satisfaction can positively impact the performance of employees using the G2G system in Kuwait ministries. Therefore, the following hypothesis can be formulated:

H12: Employee satisfaction positively influences employees' performance in Kuwait ministries.

2.7. Moderation effect of task interdependence on the relationship between G2G usage and employee performance

Task interdependence plays a major role in influencing employees' performance. It refers to the extent to which employees depend on one another to complete their work tasks (Seshadri and N., 2021). The literature has shown that high task interdependence has a negative influence on employee performance (Demerouti, 2014; Tasheva and Hillman, 2019). High task interdependence among employees means that the completion of work tasks by one employee relies on others (Yu et al., 2023). Similarly, low task interdependence among employees would make them less dependent on their colleagues in completing work tasks.

This indicates that high task interdependence could make G2G users dependent on their colleagues for completing their tasks, which can cause delays in completing government transactions and reduce employee performance. This indicates that task interdependence can moderately impact the relationship between G2G usage and employee performance in Kuwait ministries. Therefore, the following hypothesis can be formulated:

H13: With high level of task interdependence, the positive relationship between G2G usage and employee performance will be weakened.

2.8. Employees performance

Employee performance refers to the impact of system usage on users in terms of improving productivity and saving time in performing work-related tasks (Patro, 2019). In previous studies connected with technology, the intention to use or actual use has been employed as the dependent variable in the examination of factors impacting the

usage of specific technology systems (Eksail and Afari, 2020; Liébana-Cabanillas et al., 2020; Saeed Al-Maroof et al., 2020; Watson and Rockinson-Szapkiw, 2021), as well as disregarding the outcomes of system usage in the context of evaluating the performance of users. In the context of e-government adoption, evaluating system performance is crucial for measuring the success of system usage. Several studies have highlighted the importance of assessing outcomes in terms of performance when it comes to e-government adoption (Alenezi et al., 2015; Stefanovic et al., 2016; Yousef, 2017).

As such, this section includes an overview of the proposed research model. In this regard, the D&M model will be used to evaluate the performance of employees using the G2G system in Kuwait ministries. The model will be extended by adding task interdependence as a moderator to improve the performance of employees using the G2G system in Kuwait ministries. The model will also be extended by adding employee training to improve the performance of employees in Kuwait ministries. The proposed framework is depicted in **Figure 3**.
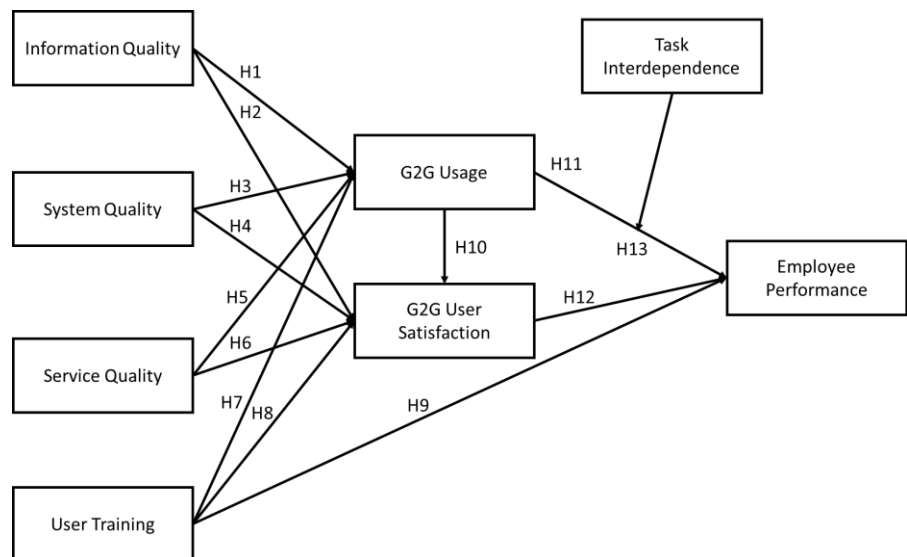
Figure 3. Conceptual framework of the study.

3. Methodology

The study collected primary data from 1500 G2G users working in 283 departments across 17 Kuwait ministries (Central Agency for Information Technology, 2018). The data was collected from various levels of G2G users, including supervisors, assistant managers, and managers, who utilize the G2G system. The researcher collected the sample from only five ministries: Ministry of Education, Ministry of Public Health, Ministry of Justice, Ministry of the Interior, and Ministry of Higher Education. These ministries accounted for 73 percent of the departments using the G2G system (Central Agency for Information Technology, 2018).

The researcher utilized a quota sampling technique due to the lack of knowledge regarding the exact number of users in each department. This technique involves dividing samples into categories based on ministries (Acharya et al., 2013). A five-point Likert scale questionnaire was manually distributed with the assistance of a

contact person in each ministry to expedite the collection of questionnaires. The G*Power is used to calculate the minimum sample size required for this study. The minimum sample size required for this study was determined to be 153 using G*Power 3. As a similar study on e-government in developing countries found a response rate of 30% (Deng et al., 2018), 200 distributed questionnaires in each ministry, totalling 1000 questionnaires, to reach the minimum sample size of 153 (i.e., 30% of 500 distributed questionnaires equals 150).

4. Research instruments

The instruments were carefully developed to accurately reflect the nature of the study. The questionnaires used in this research consisted of 16 items. The variables (information quality, system quality, service quality, training, employee satisfaction, task interdependence, and employee performance) were assessed using a five-point Likert scale, with five indicating 'strongly agree' and one indicating 'strongly disagree.'

Furthermore, the measurement of system usage took place using a five-point Likert scale, with the first item (U1) measured as follows: one (once a day), two (several times a day), three (once a week), four (several times a week), and five (once a month). Similarly, G2G usage (U2) was measured using a five-point Likert scale, including one (less than one hour), two (one to two hours), three (three to four hours), four (four to five hours), and five (more than five hours).

Since the respondents were Arabic speakers, it was crucial to accurately translate the questionnaire from English to Arabic. Therefore, a back translation was performed, which is a widely used procedure to test the accuracy of translation in a cross-cultural survey (Brislin, 1970). Additionally, the validated instruments demonstrated in Appendix A were adapted from corresponding prior studies to measure the variables of this study. The measurement of the constructs in relation to the conceptual framework is shown in Appendix B.

5. Findings

The study will demonstrate the demographic information in this section, and it will assess the proposed model in two steps including assessment of the measurement model (outer model) and the assessment of the structural model (inner model) using SmartPLS 3.3. In the measurement model, the study will examine the Convergent Validity, discriminant validity (Fornell and Larcker Criterion), and Heterotrait-Monotrait ratio (HTMT). In the structural model, (A) assess of the structural model for collinearity issues; (B) assess the significance of the structural model relationships; (C) assess of the structural model for coefficient of determination; (D) assess of the effect size; (E) assess of the predictive relevance; (F) assess of moderation analysis.

5.1. Respondents' profile

In the demographic information section, respondents were categorized by age, education, occupation, marital status, and ministry as shown in **Table 3**.

Table 3. Sample characteristics (*n* = 290).

Item	Choice	Frequency	Percent
Gender	Male	151	52.1
	Female	139	47.9
Age	20–25	77	26.6
	26–30	92	31.7
	31–35	52	17.9
	36–40	40	13.8
	41 and above	29	1.0
Education	High school	54	18.6
	College	122	42.1
	Bachelor	86	29.7
	Master	19	6.6
	PhD	9	3.1
Occupation	Employee	144	49.7
	Supervisor	84	29.0
	Assistant manager	38	13.1
	Manager	24	8.3
Material status	Single	70	24.1
	Married	220	75.9
Ministry	Justice	151	52.1
	Health	67	23.1
	Interior	29	10.0
	Higher education	26	9.0
	Education	17	5.9

5.2. Measurement model

The research model of this study was tested using SmartPLS 3.3. In addition, an examination was conducted in regard to the measurement model (validity and reliability of the measures) and the structural model (testing the hypothesized relationships). **Table 3** illustrates the convergent validity scores. All variables scored satisfactory values for Composite Reliability and Average Variance Extracted (AVE), surpassing the recommended cutoff points of 0.7 and 0.5, respectively, as suggested by Hair et al. (2021). However, items IQ1 and TR3 had factor loadings of 0.027 and 0.049, respectively, which is below the recommended threshold of 0.5 as suggested by Ramayah et al. (2018). Therefore, IQ1 and TR3 were removed. The IQ scores had a low value of Cronbach's Alpha (0.649). This value falls below the recommended cut-off point of 0.7 for Cronbach's Alpha, as suggested by Hair et al. (2017). Therefore, a form of modification was considered in the second run and, consequently, IQ1 and TR3 were deleted in order to achieve satisfactory levels of Cronbach's Alpha. Overall, all variables have achieved the cut-off point, as illustrated in **Table 4**. Moreover, Appendix C shows the second run of the PLS algorithm after deleting IQ1and TR3.

Table 4. Convergent validity.

Items	Factor loadings	Cronbach's Alpha	Composite reliability	Average variance extracted (AVE)
IQ2	0.839			
IQ3	0.853	0.829	0.895	0.740
IQ4	0.889			
P1	0.738			
P2	0.801	0.795	0.866	0.619
P3	0.795			
P4	0.810			
SAT1	0.885			
SAT2	0.852	0.815	0.890	0.730
SAT3	0.826			
SQ1	0.702			
SQ2	0.948	0.782	0.827	0.553
SQ3	0.701			
SQ4	0.573			
SerQ1	0.784			
SerQ2	0.831	0.877	0.916	0.732
SerQ3	0.902			
SerQ4	0.899			
TI1	0.701			
TI2	0.609	0.906	0.862	0.616
TI3	0.818			
TI4	0.967			
TR1	0.919			
TR2	0.936	0.920	0.950	0.863
TR4	0.931			
U1	0.898	0.813	0.913	0.841
U2	0.936			

(*) IQ1and TR3 were deleted due to low Factor loadings and Cronbach's Alpha.

Discriminant validity was assessed to determine the distinctiveness of a construct from other constructs. In the field of validity assessment, it is important to examine the variable correlation.

The model's estimation did not exceed 0.95, as recommended by Kline (2016). The validity was assessed by measuring the correlations between constructs and calculating the square root of the average variance for each construct (Fornell and Larcker, 1981; Kline, 2016). Hence, **Table 5** contains the results of the Fornell and Larcker Criterion and shows no value above the recommended cutoff point of 0.95 (Fornell and Larcker, 1981).

Moreover, the Heterotrait-Monotrait ratio (HTMT) is an estimate of what the true correlation between two constructs would be if they were perfectly measured (i.e., if they were perfectly reliable). HTMT is a measure of the correlations between indicators across different constructs compared to the average correlations between

indicators within the same construct. It is used to assess discriminant validity (Hair et al., 2021). The recommended level of HTMT is 0.90, as suggested by Gold et al. (2001) (see **Table 6**).

Table 5. Fornell and Larcker criterion.

	IQ	P	SAT	SQ	SerQ	TI	TR	U
IQ	0.860	-	-	-	-	-	-	-
P	0.557	0.787	-	-	-	-	-	-
SAT	0.706	0.654	0.855	-	-	-	-	-
SQ	0.204	0.214	0.202	0.743	-	-	-	-
SerQ	0.618	0.611	0.673	0.204	0.855	-	-	-
TI	0.089	0.116	0.114	0.008	0.091	0.785	-	-
TR	0.598	0.579	0.571	0.249	0.531	0.138	0.929	-
U	0.622	0.604	0.716	0.183	0.516	0.040	0.511	0.917

Table 6. HTMT ratio.

	IQ	P	SAT	SQ	SerQ	TI	TR	U
IQ	-	-	-	-	-	-	-	-
P	0.678	-	-	-	-	-	-	-
SAT	0.836	0.807	-	-	-	-	-	-
SQ	0.182	0.195	0.169	-	-	-	-	-
SerQ	0.718	0.729	0.796	0.184	-	-	-	-
TI	0.067	0.085	0.098	0.087	0.081	-	-	-
TR	0.682	0.681	0.658	0.228	0.591	0.102	-	-
U	0.729	0.733	0.865	0.152	0.602	0.024	0.584	-

5.3. Structural model

The structural model represents the theoretical or conceptual element of the path model. The structural model, also known as the inner model in PLS-SEM, consists of latent variables and their path relationships (Hair et al., 2021). The next step after evaluating the measurement model is to assess the structural model. In sync with PLS-SEM, there are five steps required to assess the structural model (Hair et al., 2021) including the assessment of collinearity (step one), assessment of the path coefficients (step two), coefficient of determination (R^2 value) (step three), blindfolding and predictive relevance Q^2 (step four), effect size f^2 (step five), and assessment of the moderation analysis (step six).

Table 7 illustrates the results of PLS bootstrapping consisting of the Beta value, *t*-values, *p*-values, hypothesis results (whether supported or not) BCILL, BCIUL, f^2, and *VIF* scores. Furthermore, Appendix D summarizes the results of the structural model and PLS bootstrapping.

Table 7. Summary of structural model (PLS bootstrapping).

H	Path	Std. Beta	Std. Error	*t*-values	*p*-values	Decision	BCILL	BCIUL	*f²*	*f²* level	*VIF*
H1	IQ → U	0.413	0.073	5.669	$P < 0.001$ (0.000)	Supported	0.291	0.527	0.155	Medium	1.939
H2	IQ → SAT	0.251	0.055	4.578	$P < 0.001$ (0.000)	Supported	0.159	0.344	0.065	Small	2.345
H3	SQ → U	0.022	0.043	0.519	$P > 0.05$ (0.302)	Rejected	−0.046	0.096	0.000	No effect	1.076
H4	SQ → SAT	0.005	0.037	0.147	$P > 0.05$ (0.441)	Rejected	−0.052	0.069	0.001	No effect	1.077
H5	SerQ → U	0.166	0.057	2.931	$P < 0.05$ (0.002)	Supported	0.079	0.272	0.028	Small	1.738
H6	SerQ → SAT	0.282	0.046	6.121	$P < 0.001$ (0.000)	Supported	0.206	0.357	0.064	Small	2.364
H7	Tr → U	0.170	0.077	2.215	$P < 0.05$ (0.014)	Supported	0.040	0.285	0.030	Small	1.701
H8	Tr → SAT	0.080	0.053	1.507	$P > 0.05$ (0.066)	Rejected	−0.006	0.168	0.005	No effect	1.859
H9	U → SAT	0.372	0.045	8.295	$P < 0.001$ (0.000)	Supported	0.299	0.443	0.242	Medium	1.772
H10	U → P	0.218	0.055	3.990	$P < 0.001$ (0.000)	Supported	0.132	0.309	0.030	Small	2.156
H11	SAT → P	0.336	0.064	5.271	$P < 0.001$ (0.000)	Supported	0.223	0.428	0.021	Small	2.728
H12	TR → P	0.269	0.045	5.942	$P < 0.001$ (0.000)	Supported	0.192	0.344	0.022	Small	1.779
H13	U*TI → P	−0.049	0.068	0.719	$P > 0.05$ (0.236)	Rejected	−0.117	0.099	0.005	No effect	1.105

- Assessment of the structural model for collinearity issues

The first step in the structural model is to assess collinearity issues. It is vital to safeguard against collinearity issues between the constructs before performing a latent variable analysis in the structural model. As such, the collinearity has been measured by measuring the *VIF* value. The threshold value for the assessment is 3.3, following the recommendation of Diamantopoulos and Siguaw (2006). In this study, as illustrated in **Table 6**, all inner *VIF* values for the constructs are within the range of 1.076 to 2.728. All are less than 3.3, thus indicating that collinearity is not a concern in this study.

- Assessing the significance of the structural model relationships

The bootstrapping procedure was used to test the hypotheses and generate results for each path relationship in the model, as shown in **Table 7**.

Bootstrapping in PLS is a nonparametric test which comprises of repeated random sampling with replacement from the original sample with the goal of producing a bootstrap sample and attaining standard errors for hypothesis testing (Hair et al., 2021). In regard to the number of resampling, Chin (2010) suggested performing bootstrapping with 1000 samples (Chin, 2010). In this study, 12 hypotheses have been developed for the constructs. To test the significant level, *t*-statistics for all paths have been generated using the bootstrapping function in SmartPLS 3.3. The bootstrapping has been set at a significant level of 0.05 for a one-tailed test, using 1000 subsamples. The critical value for the significant level of five percent ($\alpha = 0.05$) is 1.645 for the one-tailed test (Thurasamy et al., 2018).

Based on the findings shown in **Table 6**, the value of the path coefficients has a standardized value approximately between −1 and +1 (values from 0.413 and 1.076). According to Hair et al. (2021), estimated path coefficients near +1 demonstrate strong positive relationships and the closer the value gets to zero, the weaker the relationships become. In the next step, toward conducting the *t*-test, relationships are found to have *t*-values of more than or equal to 1.645 (Hair et al., 2021). These relationships are statistically significant at significance level of 0.05 for H1 ($\beta = 0.413$, $t = 5.669$, $P <$

0.001), H2 ($\beta = 0.251$, $t = 4.578$, $P < 0.001$), H5 ($\beta = 0.166$, $t = 2.931$, $P < 0.05$), H6 ($\beta = 0.282$, $t = 6.121$, $P < 0.001$), H7 ($\beta = 0.170$, $t = 2.215$, $P < 0.05$), H9 ($\beta = 0.372$, $t = 8.295$, $P < 0.001$), H10 ($\beta = 0.218$, $t = 3.990$, $P < 0.001$), H11 ($\beta = 0.336$, $t = 5.271$, $P < 0.001$), and H12 ($\beta = 0.269$, $t = 5.942$, $P < 0.001$), whereas H3 ($\beta = 0.022$, $t = 0.519$, $P > 0.05$), H4 ($\beta = 0.005$, $t = 0.147$, $P > 0.05$) and H8 ($\beta = 0.080$, $t = 0.066$, $P > 0.05$) were observed to be insignificant. A summary of these findings is illustrated in **Table 7**.

- The Coefficient of Determination (R^2)

The next stage is to evaluate the model's predictive accuracy through the derived value of the coefficient of determination (R^2). The value of R^2 is associated with the predictive power of the model and ranges from zero to one. A higher value indicates a greater level of predictive accuracy (Hair et al., 2021). Using the SmartPLS algorithm, the value of R^2 has been calculated as shown in Appendix E.

Since there exists a variety of sets of rules regarding the acceptable value of R^2, this study has followed guidelines set by Cohen (1989), designating the values of 0.02, 0.13, and 0.26 to represent a weak, moderate, and substantial level of predictive accuracy (Cohen, 1989). Overall, referring to **Table 8**, SAT, and U explain 51.70 percent of P which indicates a substantial level of predictive accuracy. Also, U, IQ, SQ, SerQ and TR explains 68.00 percent of the variance in SAT. This signifies a substantial level of predictive accuracy. In addition, IQ, SQ, SerQ, and TR explain 43.40 percent of the variance in U, and this represents a substantial level of predictive accuracy.

Table 8. The coefficient of determination (R^2).

	R square	*R* square adjusted
P	0.517	0.509
SAT	0.680	0.675
U	0.434	0.426

On the whole, the R^2 values found in this study are extremely similar to those reported in a majority of extant works of research in the corresponding literature. For instance, in a study conducted by Awad (2020), the R^2 value reported is 54.7% percent from which it can be concluded that the model can predict up to 50.9 percent of the factors influencing performance (PR) (Awad, 2020). This percentage is deemed to be satisfactory in the context of a social science study.

- Assessment of the effect size (f^2)

In this stage, the effect sizes (f^2) have been evaluated. The value of f^2 is connected to the relative impact of a predictor construct on endogenous constructs. According to Sullivan and Feinn (2012), aside from reporting the *p*-value, both the substantive significance (effect size) and statistical significance (*p*-value) are crucial to be reported (Sullivan and Feinn, 2012). Furthermore, in order to measure the effect size, a guideline set by Cohen (1988) has been followed. According to Cohen's (1988) study, effect sizes of 0.02, 0.15, and 0.35 are considered small, medium, and large, respectively (Cohen, 1988). As shown in **Table 6**, SerQ and Tr have a small effect on the value of R^2 for U. In addition, User IQ has Medium size of effect on generating the

value of R^2 for U. However, SQ has no effect on the production of the value of R^2 for U.

Furthermore, the impacts of IQ, SerQ, and U are small, small, and medium respectively in regard to the generation of the value of R^2 for SAT. However, SQ does not affect the value of R^2 for SAT. In addition, the impacts of U, SAT, and TR are small, small, and small respectively in regard to the generation of the value of R^2 for P.

- Assessment of the predictive relevance (Q2)

As the final step, the predictive relevance of the model has been assessed through the blindfolding procedure, as suggested by Hair et al. (2021) and **Table 8** contains the corresponding findings (Hair et al., 2021). On this subject, the value of Q^2 is larger than zero, implying that the model has sufficient predictive relevance. The blindfolding procedure was used to analyze the predictive relevance or value of Q^2. Based on the blindfolding assessment on **Table 9**, the predictive relevance values (Q^2) for P, SAT, and U are 0.349, 0.466, and 0.405 respectively. This indicates that the model has predictive relevance, as the Q^2 values are significantly above zero.

Table 9. The predictive relevance (Q^2).

Variable	Q^2
P	0.349
SAT	0.466
U	0.405

- Assessment of the moderation analysis

After evaluating the direct effect, the moderation hypothesis has been tested. A moderator is characterized as a third construct with the ability to change or affect the relationship between the independent and dependent variables (Dawson, 2014; Hair et al., 2021). This study has utilized continuous types of data as the moderation and the corresponding analysis has been conducted via SmartPLS 3.3.

In this study, the following hypothesis has been formulated:

H13: With high level of task interdependence, the positive relationship between G2G usage and employee performance will be weakened.

The value of the beta confident for the interaction of U × TI is −0.049 (refer to **Table 7**) with a p-value of 0.236. Therefore, to obtain the significance of the relationships, bootstrapping procedures have been conducted. As shown in **Table 10**, the interaction term of U × TI is not significant ($t = 0.719$) for the one-tailed test, with a significant level below 0.05. Therefore, it can be concluded that hypothesis H13 will be rejected.

Table 10. Moderation model assessment.

Path	Path coefficient	Std. Error	t-value	f^2	p-value
U × TI → P	−0.049	0.068	0.719	0.005	$P > 0.05$ (0.236)

6. Discussions

In this study, the hypothesis regarding the positive impact of information quality

on G2G usage was supported, indicating that information quality plays a significant role in influencing the usage of the G2G system. Therefore, it is recommended that the G2G system prioritize providing up-to-date and easy-to-understand information to its users to enhance G2G usage. This conclusion is supported by the findings of Alameria et al. (2019), who found that employees are more likely to use the e-government system efficiently when the information provided is up-to-date and user-friendly (Alameria et al., 2019).

Furthermore, the hypothesis concerning the positive impact of service quality on G2G usage was supported, indicating that service quality plays a crucial role in influencing the usage of the G2G system. Therefore, it is recommended that G2G system staff should prioritize providing fast service and be readily available to users when needed. This conclusion is consistent with the findings of Alkraiji and Ameen (2022), who found that students are more likely to efficiently use the government e-services system when the staff provides fast and responsive service to users (Alkraiji and Ameen, 2022).

Moreover, the hypothesis stating that employee training has a positive impact on G2G usage was supported, indicating that providing comprehensive training to G2G system users leads to better usage of the system. Therefore, it is recommended that G2G system users should receive thorough training on how to effectively use the system. This conclusion is consistent with the findings of Porumbescu (2019), who observed that e-government users are more efficient in utilizing the system when they receive comprehensive training on its usage (Lee and Porumbescu, 2019).

In this study, the hypothesis suggesting that information quality positively affects G2G employee satisfaction was supported, indicating that having up-to-date and easy-to-understand information in the G2G system leads to higher employee satisfaction. Therefore, it is recommended that the G2G system should be equipped with accurate and easily understandable information to enhance employee satisfaction. This conclusion aligns with the findings of Mellouli et al. (2020), who observed that e-government users are more efficient in utilizing the e-government system when the information provided by the system is accurate and easy to comprehend, leading to increased employee satisfaction (Mellouli et al., 2020).

In addition, the hypothesis proposing that service quality positively influences G2G employee satisfaction was supported. This suggests that offering fast and easily accessible services to users is crucial for improving employee satisfaction with the G2G system. As a result, it is recommended that G2G system staff should prioritize delivering efficient and timely services to users whenever they are needed. This conclusion is consistent with the findings of Al-Zahrani (2020), who observed that e-government users are more efficient in using the e-government system when the staff provides fast and available services, leading to increased employee satisfaction (Al-Zahrani, 2020).

In this study, the hypothesis suggesting that G2G usage positively impacts G2G employee performance was supported. This means that the more G2G users utilize the G2G system, the more they become familiar with its functionalities, leading to increased satisfaction with the system. As a result, it is recommended to encourage G2G users to utilize the system more frequently to enhance their overall experience and satisfaction. This finding is in line with the research of Shuib et al. (2019), who

also observed that increased usage of e-government systems resulted in users gaining more experience, leading to higher satisfaction with the system (Shuib et al., 2019).

The study's hypothesis suggesting that G2G usage has a positive impact on G2G employee performance was supported. This indicates that when G2G users actively utilize the G2G system, they become more proficient in performing their work tasks, leading to improved overall employee performance. The finding is consistent with the research conducted by Alameria et al. (2019), who also observed that the use of e-government systems contributed to making employees' jobs easier and reducing errors in their work, thereby enhancing their performance. Therefore, it is recommended to encourage G2G users in Kuwait ministries to actively use the G2G system to leverage its benefits and improve their performance in processing government transactions and other related tasks.

The study found support for the hypothesis that employee satisfaction positively affects G2G employee performance. This implies that when G2G users are satisfied with the e-government system, they are more likely to be efficient in completing their work tasks. The finding aligns with Mellouli et al.'s (2020) research, which also found that employee satisfaction with the e-government system positively impacted their work task effectiveness.

However, the hypothesis that system quality has a positive impact on G2G usage was not supported. Therefore, it is suggested that the use of technology may not always have a positive impact on system quality aspects (Tam et al., 2019). Most of the government employees in Kuwait have a high level of education, and this can make the use of the G2G system easy for them, enabling them to interact easily with the new system (Riddell and Song, 2017). The Kuwait government online portal (2019) reported that 45% of the employees in Kuwait ministries hold a bachelor's degree. This suggests that employees in Kuwait ministries can easily use the G2G system, indicating that system quality may not be a significant factor in determining G2G system usage in Kuwait ministries.

Similarly, the hypothesis stating that system quality positively influences employee satisfaction was not supported. Hence, it is recommended that system quality aspects, such as the use of technology, may not necessarily positively influence employee satisfaction (Sun et al., 2008). According to the Kuwait government online portal (2019), government employees in Kuwait generally have a high level of education. This high level of education makes it easier for them to use the G2G system, resulting in their satisfaction with the system. This suggests that system quality may not significantly impact employee satisfaction.

Additionally, the hypothesis that Employee training positively affects employee satisfaction was not supported. It is not necessarily recommended that employee training aspects, such as providing employees with a complete G2G training program, will positively influence employee satisfaction. The reason for this finding may be that employees in Kuwait ministries need to be trained on using the G2G system. However, they also have to return to work immediately after the training session to complete their remaining administrative tasks. As a result, they might not be entirely satisfied with the G2G training program.

Task interdependence was hypothesized to have a moderating effect on the positive relationship between G2G usage and employee performance, such that a high

level of task interdependence can weaken employee performance. According to the findings, this hypothesis was not supported. Zhang et al. (2022) stated that high task interdependence can encourage employees to cooperate with each other and share information among each other, enabling problem-solving compared to interdependent individuals (Zhang et al., 2022). Similarly, employees who have low task interdependence may be limited in their ability to utilize each other's skills and resources due to constraints in job design. Due to the complex nature of government transactions in Kuwait ministries, employees who work on the G2G system often need to rely heavily on each other for information, resulting in a high level of dependency in their work. Therefore, high task interdependence may not weak employee performance in this context.

7. Practical implication

This study aims to provide a comprehensive understanding of the current usage and impact of the G2G e-government system on employee performance. By incorporating the concept of task interdependence and expanding on the updated information system success model (DeLone and McLean, 2003), this research enhances the existing model and investigates new relationships in the context of G2G system usage and employee performance. This approach provides valuable insights into the adoption of G2G systems and their impact on employee outcomes.

This study makes a unique contribution to the field, particularly in the context of Kuwait. While previous research has primarily focused on G2C (Government to Citizen) systems, there has been limited exploration of G2G (Government to Government) systems. By examining the G2G system in Kuwait, this study fills a gap in the literature and improves our understanding of e-government practices in the country.

The findings of this study have important implications for Kuwaiti policy makers and e-government professionals. The findings of this research can greatly enhance the performance of Kuwait employees who use the G2G e-government system in different ministries. As Kuwait strives to become a financial hub by 2035, the successful implementation of efficient government-to-government (G2G) e-government systems becomes crucial. Therefore, the recommendations and conclusions drawn from this study provide valuable guidance for the government to improve employee performance when using the G2G system.

This study provides theoretical and practical contributions by examining the relationships between G2G system usage and employee performance. It also offers actionable insights to enhance the effectiveness of the G2G e-government system in Kuwait ministries, aligning with the country's future goals.

8. Limitation and future suggestions

The study focuses specifically on G2G e-government, and the results obtained only pertain to this type of e-government, excluding other types. The study's findings cannot be generalized to e-government in Kuwait. This study could be extended to examine the other types of e-government (G2C, G2E, and G2B) in order to address the limitations of e-government studies in Kuwait (Rabaa'i et al., 2016).

The study was conducted as a cross-sectional study, which is a limitation. In a cross-sectional study, there may be a lack of understanding regarding the relationship between G2G user behavior and employee performance over time. Longitudinal research can provide a deeper understanding of the dynamic nature of G2G user behavior and its impact on employees' performance in Kuwait ministries.

Lastly, the sample of this study is drawn only from 5 Kuwait ministries out of 17 ministries, the 5 ministries were only used because the researcher cannot get permission accessing all ministries. However, the five Kuwait ministries still account for 73% of all government-to-government (G2G) departments in Kuwait.

9. Conclusions

The study aimed to investigate factors influencing employee performance when using the G2G system in Kuwait ministries. The study expanded on DeLone and McLean's (2003) model by including task interdependence and G2G employee training as predictors of G2G employees' performance in Kuwait ministries. The findings revealed that information quality, service quality, and employee training positively influenced G2G usage. Additionally, the use of G2G (government-to-government) communication had a positive impact on employee satisfaction. Both employee satisfaction and G2G usage also had a positive influence on employees' performance. However, it was found that high task interdependence weakens the positive relationship between G2G usage and employee performance. Interestingly, system quality and training did not predict employee satisfaction, and system quality did not predict G2G usage in Kuwait ministries.

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Appendix A

Table A. Study instruments.

Construct	Items	Rating scale
Information quality (IQ)	IQ-1 The G2G system provides up-to date information. IQ-2 The G2G system provides information that is exactly what I need. IQ-3 The G2G system provides. information that is relevant to my job. IQ-4 The G2G system provides information that is easy to understand.	Five-point Likert scale: (1) Strongly disagree to (5) Strongly agree
System quality (SQ)	SQ-1 I find it easy to use the G2G System. SQ-2 I think using the G2G system is secure. SQ-3 I find the G2G system to be flexible to interact with. SQ-4 I think the G2G system speed is satisfactory. Source: Aldholay et al. (2018)	Five-point Likert scale: (1) Strongly disagree to (5) Strongly agree
Service quality (SerQ)	SerQ-1 The staff of technical support for the G2G System in the ministry provides users with a fast service. SerQ-2 The staff of technical support for the G2G System in the ministry is available when I need help. SerQ-3 The staff of technical support for the G2G System in the ministry understands the specific needs of users. SerQ-4 The staff of technical support for the G2G system in the ministry shows the sincere interest in solving it. Source: Roky and al Meriouh (2015)	Five-point Likert scale: (1) Strongly disagree to (5) Strongly agree
User satisfaction (SAT)	SAT-1 My use of G2G system was wise. one. SAT-2 The G2G system has met my expectations. SAT-3 Overall, I am satisfied with the G2G system. Source: Isaac et al. (2017)	Five-point Likert scale: (1) Strongly disagree to (5) Strongly agree
System usage (U)	U-1 How often do you use the G2G system. U-2 How long do you use G2G system each time. Source: Aldholay et al. (2018)	(U1) is measured with a five-point Likert scale consisting of one (once a day), two (several times a day), three (once a week), four (several times a week), and five (once a month). (U2) is also measured with a five-point Likert scale, including one (less than one hour), two (one to two hours), three (three to four hours), four (four to five hours), and five (more than five hours).
Employee performance (P)	P-1 The G2G system improves my productivity. P-2 The G2G system is beneficial for my work tasks. P-3 The G2G system enhances the quality of my decision making in performing my work tasks. P-4 The G2G system saves my time in performing my tasks and duties. Source: Ifinedo (2007)	Five-point Likert scale: (1) Strongly disagree to (5) Strongly agree
Task Interdependence (TI)	TI-1 I have to work closely with others in doing my work on G2G system. TI-2 The way I perform my job with G2G system has a significant Impact on others. TI-3 I have to consult with others frequently to perform my G2G work. TI-4 I frequently have to obtain information from others to use G2G system. Source: Pearce and Gregersen (1991)	Five-point Likert scale: (1) Strongly disagree to (5) Strongly agree
User training (Tr)	Tr-1 The ministry provided me complete training on G2G system. Tr-2 I fully understand the G2G system after going through the training program. Tr-3 The training program gave me the confidence to use the G2G system. Tr-4 The trainers were knowledgeable and aided me in my understanding of G2G system. Source: Amoako-Gyampah and Salam (2004)	Five-point Likert scale: (1) Strongly disagree to (5) Strongly agree

Appendix B

Survey questionnaire

Dear respondent,

Thank you very much for taking time off from your busy schedule to participate in this study.

The present study is intended to examine employee's performance using the G2G system in Kuwait ministries. Please complete the questionnaire based on your honest opinion. Your opinion is very much valued and will be kept with strict confidentiality. Completion of this survey takes less than 10 min.

Your kind participation and assistance are highly appreciated.

Yours Sincerely.
Faisal Almutairi

Age	20–25
	26–30
	31–35
	36–40
	41 and above
Gender	Male
	Female
Highest degree in education	High school
	College
	Bachelor
	Master
	PhD
Occupation	Employee
	Supervisor
	Assistant manager
	Manager
Material status	Single
	Married
Ministry	Justice
	Health
	Interior
	Higher education
	Education

Information quality (IQ)

Please answer according to numbers below:

Note: 1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, 5= strongly agree

Item	Questionnaire	Answer				
IQ1	The G2G system provides up-to date information.	1	2	3	4	5
IQ2	The G2G system provides information that is exactly what I need.	1	2	3	4	5
IQ3	The G2G system provides. information that is relevant to my job.	1	2	3	4	5
IQ4	The G2G system provides information that is easy to understand.	1	2	3	4	5

System quality (SQ)

Please answer according to numbers below:

Note: 1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, 5= strongly agree

Item	Questionnaire	Answer				
SQ1	I find it easy to use the G2G System.	1	2	3	4	5
SQ2	I think using the G2G system is secure.	1	2	3	4	5
SQ3	I find the G2G system to be flexible to interact with.	1	2	3	4	5
SQ4	I think the G2G system speed is satisfactory.	1	2	3	4	5

Service quality SerQ

Please answer according to numbers below:

Note: 1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, 5= strongly agree

Item	Questionnaire	Answer				
SerQ-1	The staff of technical support for the G2G System in the ministry provides users with a fast service.	1	2	3	4	5
SerQ-2	The staff of technical support for the G2G System in the ministry is available when I need help.	1	2	3	4	5
SerQ-3	The staff of technical support for the G2G System in the ministry understands the specific needs of users.	1	2	3	4	5
SerQ-4	The staff of technical support for the G2G system in the ministry shows the sincere interest in solving it.	1	2	3	4	5

Usage (U)

Please answer according to numbers below:

Note: U1 = 1 (once a day), 2 (several times a day), 3 (once a week), 4 (several times a week), and 5 (once a month).

U2 = 1 (less than one hour), 2 (one to two hours), 3 (three to four hours), 4 (four to five hours), and 5 (more than five hours).

Item	Questionnaire	Answer				
U-1	How often do you use the G2G system.	1	2	3	4	5
U-2	How long do you use G2G system each time.	1	2	3	4	5

User satisfaction (SAT)

Please answer according to numbers below:

Note: 1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, 5= strongly agree

Item	Questionnaire	Answer				
Sat-1	My use of G2G system was wise one.	1	2	3	4	5
Sat-2	The G2G system has met my expectations.	1	2	3	4	5
Sat-3	Overall, I am satisfied with the G2G system.	1	2	3	4	5

Performance (P)

Please answer according to numbers below:

Note: 1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, 5= strongly agree

Item	Questionnaire	Answer				
P1	The G2G system improves my productivity.	1	2	3	4	5
P2	The G2G system is beneficial for my work tasks.	1	2	3	4	5
P3	The G2G system enhances the quality of my decision making in performing my work tasks.	1	2	3	4	5
P4	The G2G system saves my time in performing my tasks and duties.	1	2	3	4	5

Training (Tr)

Please answer according to numbers below:

Note: 1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, 5= strongly agree

Item	Questionnaire	Answer				
Tr-1	The ministry provided me complete training on G2G system.	1	2	3	4	5
Tr-2	I fully understand the G2G system after going through the training program.	1	2	3	4	5
Tr-3	The training program gave me the confidence to use the G2G system.	1	2	3	4	5
Tr-4	The trainers were knowledgeable and aided me in my understanding of G2G system.	1	2	3	4	5

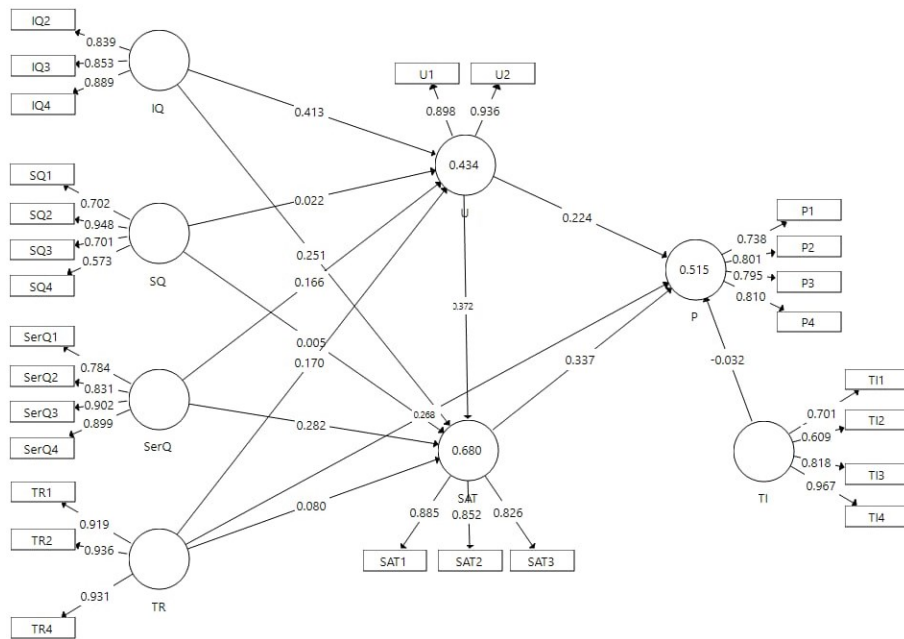## Task Interdependence (TI)

Please answer according to numbers below:

Note: 1= strongly disagree, 2 = disagree, 3= neutral, 4= agree, 5= strongly agree

Item	Questionnaire	Answer				
TI-1	1 I have to work closely with others in doing my work on G2G system.	1	2	3	4	5
TI-2	The way I perform my job with G2G system has a significant Impact on others.	1	2	3	4	5
TI-3	I have to consult with others frequently to perform my G2G work.	1	2	3	4	5
TI-4	I frequently have to obtain information from others to use G2G system.	1	2	3	4	5

Appendix C

Figure C1. PLS algorithm before including the moderator.

Note: IQ: information quality, SQ: system quality, SerQ: service quality, TR: employee training, SAT: employee satisfaction, TI: task interdependence, P: employee performance.
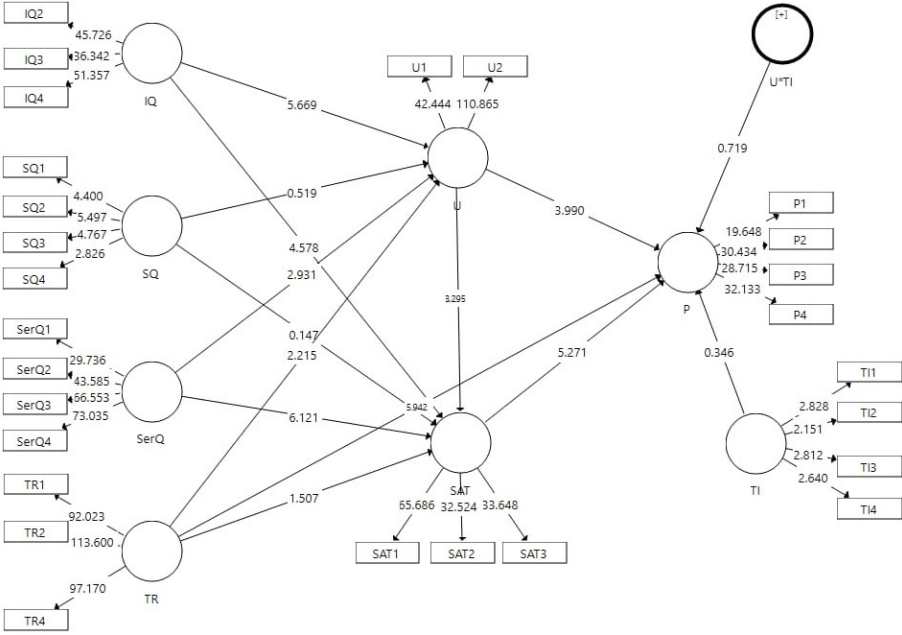
Appendix D

Figure D1. PLS bootstrapping results.

Note: IQ: information quality, SQ: system quality, SerQ: service quality, TR: employee training, SAT: employee satisfaction, TI: task interdependence, P: employee performance.
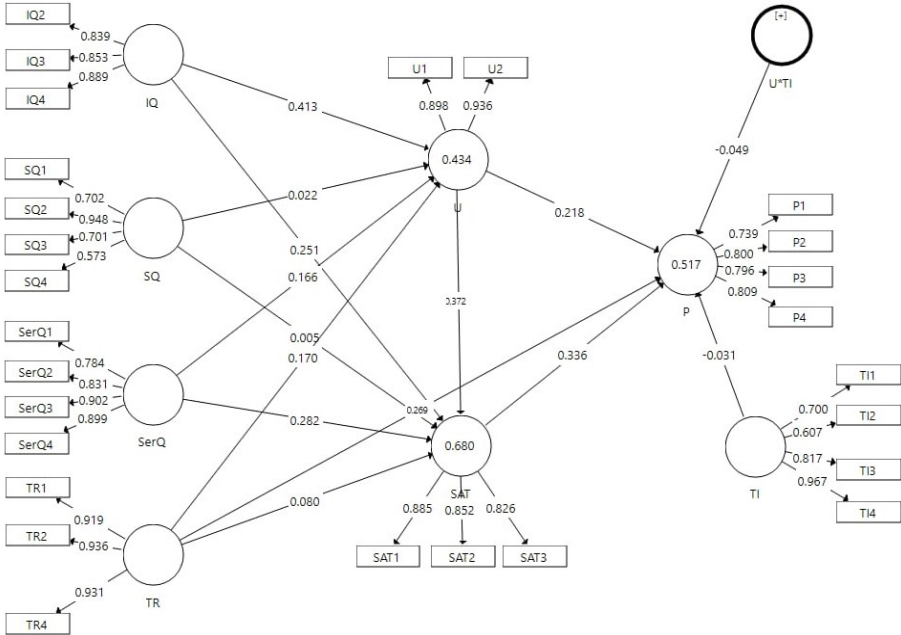
Appendix E

Figure E1. PLS algorithm before including the moderator.

Note: IQ: information quality, SQ: system quality, SerQ: service quality, TR: employee training, SAT: employee satisfaction, TI: task interdependence, P: employee performance.