

# Perceived Ease-of-Use and Intention to Use E-Government Services in Ghana: The Moderating Role of Perceived Usefulness

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**Abstract**—Public sector organizations, ministries, departments and local government agencies are adopting e-government as a means to provide efficient and quality service delivery to citizens. The purpose of this research paper is to examine the extent to which perceived usefulness (PU) of e-government services moderates between perceived ease-of-use (PEOU) of e-government services and intention to use (IU) e-government services in Ghana. A structured research questionnaire instrument was developed and administered to 700 potential respondents in Ghana, of which 693 responded, representing 99% of the questionnaires distributed. The Technology Acceptance Model (TAM) was used as the theoretical framework for the study. The Statistical Package for Social Science (SPSS) was used to capture and analyze the data. The results indicate that even though predictors such as PU and PEOU are main determiners of citizens' intention to adopt and use e-government services in Ghana, it failed to show that PEOU and IU e-government services in Ghana is significantly moderated by the PU of e-government services. The implication of this finding on theory and practice is further discussed.

**Keywords**—E-government services, intention to use, moderating role, perceived ease-of-use, perceived usefulness, Ghana, technology acceptance model.

## I. INTRODUCTION

THE objective of this research paper is to investigate and examine the moderation role of PU on the positive relationship between PEOU and IU e-government services in Ghana. The Government of Ghana as a matter of policy has adopted and is implementing e-government within the entire public sector including the local government and civil service arms of government, with a purpose to improve the delivery of public service delivery to the citizenry [1]. E-government is the application and use of appropriate information and communication technologies (ICT), particularly the Internet and web by a government and its public sector organizations to support or redefine the existing or future relations with 'stakeholders' in both their internal, as well external environment with a purpose to add value [2]. The purpose of e-government is to ensure that the application of appropriate technology in public administration improves the efficiency of government services and information provision to citizens, business, employees and government agencies [3]. E-government adoption by governments around the world is a

conscientious decision to become more service oriented and focused toward the implementation of the widespread of digital services through one-stop shop points of access for citizens and the general public [4]. E-government does not only provide incentives and benefits to government and the citizenry, but to other professionals and organizations [5]. Of the numerous benefits which e-government provides, citizens are more likely to enjoy a greater portion of these benefits [6]. The adoption of e-government by the government to provide enhanced service delivery has been largely occasioned by the compelling demand of the New Public Management Concept, which seeks to change the traditional public administration to a state where it can deliver efficient and effective public service. There are two very important trajectories created by the combination of e-government and new public management. The first one has to do with the external perspective on the relationship between government and citizens, while the second is concerned with the internal perspective of government i.e. changes within and between bureaucratic organizations [2].

The major intended goal of e-government implementation by governments is to foster a closer tie with citizens' and businesses and to importantly enable citizens to access public service delivery from anywhere, regardless of their location [7]. The concept of transparency and accountability in government operations can be achieved through e-government adoption and implementation [8], [9].

Though e-government adoption and implementation is a promising feature for governments around the world, the low usage of e-government services by citizens has been a concern for researchers [10]-[12], since the adoption and use of e-government services is a major factor for the success of e-government projects [13].

## II. PRESENCE OF E-GOVERNMENT IN GHANA

Ghana over the years has through policy adopted and implemented a number of e-government projects to bring effectiveness, efficiency, transparency and accountability in government interactions with the citizenry. These projects are aimed at bringing public service delivery close to the doorsteps of citizens and the general public. To achieve this, the government, through the National Information Technology Agency (NITA), which is the IT implementation sector under the Ministry of Communication, has developed a number of e-government services portals and centers for citizens to access public services. The notable among these e-government

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service platforms are the One-Stop-Service Center [14], which provides integrated services and information from the government and its agencies to the ordinary citizen. This is expected to ease the stress the public go through in accessing public services. The Online Services Portal of the Government of Ghana [15] is also expected to provide various services from Ministries, Departments and Agencies (MDAs), Metropolitan, Municipal and District Assemblies (MMDAs) and other Government of Agencies. It has sections (sub-portals) on Citizens, Non-Citizens, Businesses and Government. Another important portal is the Ghana e-Payment Portal (GEPP), which has been designed for the payment of Government of Ghana services by citizens and the general public who conduct business with the government through its MDAs [16].

### III. RESEARCH THEORETICAL FRAMEWORK

Researchers have embraced and applied many technology adoption theories to study, as well as to understand people's behavioral intention to adopt and use technology. The widely used theories are TAM by Davis [17], Theory of Reason Action (TRA) [18], Theory of Planned Behavior (TPB) [19], Innovation Diffusion Theory (IDT) by Rogers [20], and Unified Theory of Acceptance and Use of Technology (UTAUT) [21]. The TAM would be adopted and applied to the current study.

The TAM proposed by Davis [17] has two very important constructs predicting IU, which are PU and PEOU. PU is the degree to which a person considers that the use of a particular technology would eventually improve his or her performance of a task, while PEOU is the extent to which people expect that the use of a particular type of technology would be free of effort and challenges. The decision to use TAM is due to its theoretical advantages of first having been widely used, tested and validated in different spheres of fields [22], and secondly, the TAM instruments are considered reliable [23].

### IV. E-GOVERNMENT ADOPTION STUDIES

The technology adoption theories have been applied to examine the predictors of IU e-government services in mostly developed countries but little can be said of developing nations. For instance, in the study of [24], PU and PEOU were found to have a positive significant impact on intention to adopt and use mobile e-government services in Taiwan. PU was also found to have a direct positive significant impact on the intention of Malaysian citizens to adopt and use e-government services [25]. A similar finding was found among the citizens of Jordan, which indicate that PU and PEOU are significant indicators of IU e-government services in Jordan [26].

According to the study of [27], there is a positive significant relationship between PU, PEOU and IU e-government services among Jordanian Citizens. In examining the influence of age on e-government adoption in Jordan, even though the study found that age was negatively associated with IU, it, however, showed that PU and PEOU were positive significant

determiners of IU e-government services in Jordan [28]. Again, PU was found to have a significant and direct influence on the IU e-government services among Kurdistan citizens of Iraq [29]. In a further study of [30], not only were computer self-efficacy, perceived credibility, subject norms, and attitudes and behavioral intentions, found to be significant determiners of intention to adopt and use e-government services in Kuwait, PEOU and PU were also found to have positive significant impact on the citizens of Kuwait to use e-government services. In a similar study of e-government adoption among citizens of Jordan, contrary to previous findings, the study showed that PEOU was not a significant predictor of IU e-government services in Jordan, but it rather showed that PU was a positive significant predictor of Jordanians intention to adopt and use e-government services [31]. In Pakistan, it was found that PEOU was a significant predictor of IU e-government services [32].

### V. RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

#### A. Research Model

Based on the literature review conducted, the research model is depicted in Fig. 1. The independent variable is PEOU denoted by X1, the moderator is PU denoted by X2 and the dependable variable is IU e-government services in Ghana denoted by Y.

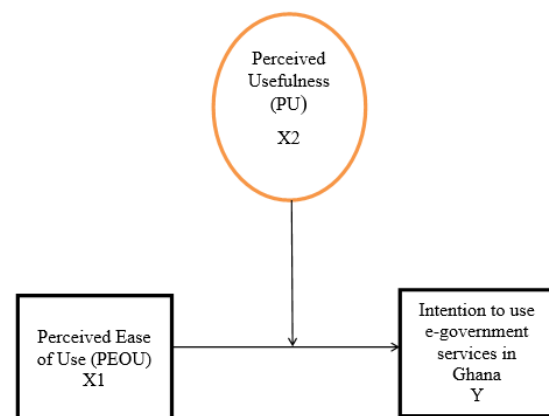


Fig. 1 Research Model

#### B. Research Hypotheses Development

The following hypotheses would be investigated through this study.

**Hypothesis (1)** The Intention to use e-government services in Ghana is positively and significantly impacted by Perceived Ease-of-Use.

**Hypothesis (2)** The Interaction Term (PEOU \* PU) have a significant positive impact on Intention to use (IU) e-government services in Ghana.

**Hypothesis (3)** The Intention to use e-government services in Ghana is positively and significantly impacted by Perceived Usefulness.

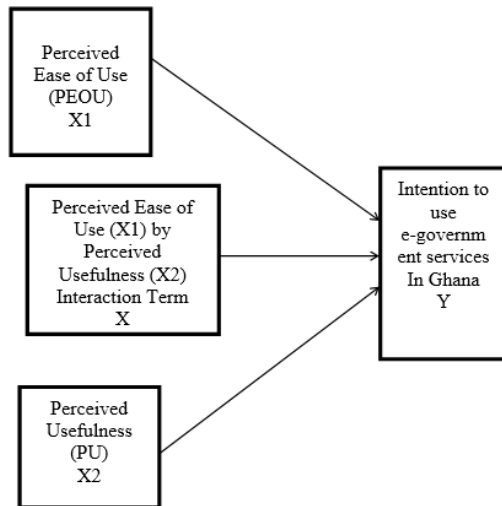


Fig. 2 Research Model with an Interaction Term

## VI. RESEARCH METHODOLOGY

The data for the study was collected from Ghana. A well-structured and designed research questionnaire based on previous research was distributed to 700 potential respondents, of which, 693 of responded which represents 99% of the research questionnaire distributed. The questionnaire instrument employed a five-point scale of measurement with '1' indicating Strongly Disagree (SD) and '5' indicating Strongly Agree (SA). The data gathered were captured and analyzed using SPSS Version 20.

## VII. RESULTS AND DATA ANALYSIS

### A. Demographic Statistics

Out of the total number of responses received, a total of 317 females responded, representing 45.7%, while 316 males responded, representing 54.3%. The age distribution of the respondents are: 18-28 years (35.2%), 26-30 years (19.8%), 31-35 years (17.7%), 36-40 (9.5%), 41-45 (5.9%), 46-50 (4.6%) and 51 and above year groups (7.2%).

The educational level of respondents are indicated in Table I and show that 81.5% were university/polytechnic graduates, 16.6% were postgraduate (Masters/PhD) holders, 1.7%, and 0.1% were Junior high school and Senior High School leavers, respectively. The detailed demographic statistics are shown in Table I.

### B. Reliability Test

In order to check the internal consistency of the constructs instrument used, a reliability test was conducted. The Cronbach's alpha ( $\alpha$ ) for PEOU is 0.712, PU is 0.564 and IU e-government services in Ghana is 0.772. IU had the highest value of Cronbach's alpha ( $\alpha$ ). All the constructs examined had alpha values which are acceptable [33], [34]. This means that the items in the constructs were highly reliable and consistent. The measure of reliability is displayed in Table II.

### C. Descriptive Statistics

The descriptive statistics (mean and standard deviation) and Pearson correlation are displayed in Table III.

TABLE I  
DEMOGRAPHIC STATISTICS OF RESPONDENTS

Item	Frequency(N)	Percentage (%)
Gender		
Female	317	45.7
Male	376	54.3
Total	693	100
Age Distribution of Respondents		
18-25	244	35.2
26-30	137	19.8
31-35	123	17.7
36-40	66	9.5
41-45	41	5.9
46-50	32	4.6
51 and above	50	7.2
Total	693	100
Education Levels of Respondents		
Junior High School	1	0.1
Senior High School	12	1.7
Polytechnic/University	565	81.5
Postgraduate (Masters/PhD)	115	16.6
Total	693	1000

TABLE II  
MEASURE OF RELIABILITY

Construct	N	Number of Items	Cronbach's alpha ( $\alpha$ )
PEOU	693	5	0.712
PU	693	5	0.564
IU e-government services	693	5	0.772

TABLE III  
DESCRIPTIVE STATISTICS

	PU	PEOU	IU	Interaction Term
PU	-			
PEOU	0.454	-		
IU e-government services	0.392	0.535	-	
Interaction Term	0.859	0.831	0.539	-
Mean	0.39896	3.7313	3.9100	15.1099
Standard Deviation	0.73682	0.66880	0.69538	4.69243

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

In Table III, the Pearson correlation shows that there is a significant positive relationship between PU and PEOU at  $r = 0.454$ ,  $p < 0.01$ . PU also has a positive relationship with IU e-government services at  $r = 0.392$ ,  $p < 0.01$  and the Interaction Term at  $r = 0.859$ ,  $p < 0.01$ . The mean and standard deviation for PU are 0.39896 (0.73682)

PEOU is further significantly correlated with IU e-government services at  $r = 0.535$ ,  $p < 0.01$  and the interaction Term at  $r = 0.831$ ,  $p < 0.01$ . IU e-government services also positively correlated with the Interaction Term at  $r = 0.539$ ,  $p < 0.01$ . The mean and standard deviation, respectively, for PEOU, IU and the Interaction Term are 3.7313 (0.66880), 3.9100 (0.69538) and 15.1099 (4.69243).

#### D. Regression Analysis

The data gathered was analyzed using multiple regression analysis. The independent predictors such as PEOU, Interaction Term, and PU were regressed individually on the dependent variable, IU e-government services in Ghana. The summary of the casual effect of the hypotheses tested is shown in Table IV.

TABLE IV  
CASUAL RELATIONSHIP EFFECT

Hypothesis	B	t	Sig.	R2	F	Sig.
1	0.535	16.643	0.000	0.286	276.975	0.000
2	0.539	16.799	0.000	0.290	282.222	0.000
3	0.392	11.198	0.000	0.154	125.385	0.000

#### 1. Hypothesis One: The Relationship between PEOU and IU e-government services in Ghana

The results in Table IV show that PEOU positively and significantly predicted IU e-government services in Ghana ( $B = 0.535$ ,  $t = 16.643$ ,  $p < 0.01$ ). It was found that PU explained a significant of the total variations in IU ( $R^2 = 0.286$ ,  $F = 276.975$ ,  $p < 0.01$ ). Hence, this hypothesis was statistically supported.

#### 2. Hypothesis Two: The Relationship between Interaction Term (PEOU \* PU) and IU e-government services in Ghana.

The results in Table IV further indicates that the Interaction Term (PEOU\* PU) significantly has a positive impact on the IU e-government services in Ghana ( $B = 0.539$ ,  $t = 16.799$ ,  $p < 0.01$ ). The Interaction Term also explains significant variation in IU ( $R^2 = 0.290$ ,  $F = 282.222$ ,  $p < 0.01$ ). This hypothesis is also supported.

#### 3. Hypothesis Three: The Relationship between perceived usefulness (PU) and Intention to use e e-government services in Ghana

PU as indicated in Table IV also positively and significantly predicts IU e-government services in Ghana ( $B = 0.392$ ,  $t = 11.198$ ,  $p < 0.01$ ) and also explains to some extent the variation in IU ( $R^2 = 0.154$ ,  $f = 125.385$ ,  $p = < 0.01$ ). This hypothesis is also statistically supported.

#### E. Moderation Analysis

In order to test for moderation, the three construct independent variables (PEOU, Interaction Term, and PU) were regressed together with IU e-government services in Ghana as the dependent variable. The results are displayed in Tables V-VIII.

TABLE V  
MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.561a	0.315	0.312	0.57687

a. Predictors: (Constant), PU, PEOU, Interaction term

b. Dependent Variable: IU e-government services in Ghana

As depicted in Table V, the R-square result of 0.315 represents 31.5% of the factors explaining the IU e-government services. This means that all the three predictors

tested in this study (PEOU, PU, and Interaction Term) altogether contribute 31.5% of the variations in IU e-government services in Ghana, while the other 68.5% could be attributed to other factors not accounted for in this study.

The general significance of the model was also tested and the results are shown in Table VI, and indicate that the research model under investigation is positively significant. Thus, the predictors: PEOU, PU and Interaction Term jointly, significantly and positively predict IU e-government services in Ghana.

TABLE VI  
ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	105.337	3	35.112	105.513	.000
Residual	229.284	689	.333		
Total	334.621	692			

a. Predictors: (Constant), PEOU, Interaction term

b. Dependent Variable: IU e-government services in Ghana

The individual predictor impact on the IU e-government services was also examined. The result in Table VII indicates that none of the predictors tested individually showed any positive significant effect on the IU e-government services in Ghana. PEOU ( $B = 0.336$ ,  $t = 2.372$ ,  $p > 0.01$ ), Interaction Term ( $B = 0.204$ ,  $t = 0.826$ ,  $p > .01$ ) and PU ( $B = 0.064$ ,  $t = 0.415$ ,  $p > 0.1$ ).

TABLE VII  
COEFFICIENTS

Model	Unstandardized coefficients		Standardized coeff.	T	Sig.
	B	Std. Error	Beta		
(constant)	1.908	0.563	0.336	3.390	0.001
PEOU	0.350	0.147	0.204	2.372	0.018
Interaction Term	0.030	0.037	0.064	0.826	0.409
PU	0.060	0.145		0.415	0.679

a. Dependent Variable: IU e-government services in Ghana

For moderation to have occurred, the Interaction Term, as well as the other predictors, must be significantly positive. In other words, moderation is said to have happened when a third variable or construct changes the relationship between two related variables (independent and dependent variables). But as indicated Table VII, the Interaction Term ( $B = 0.204$ ,  $t = 0.826$ ,  $p > 0.01$ ) was not significant. Thus, the coefficient of the Interaction Term was not significant. This implies that there was no positive significant moderation effect on the positive relationship between PEOU and IU e-government services in Ghana. The interaction effect is illustrated in Fig. 3. The graph was generated with the software known as Interaction Version 1.7.

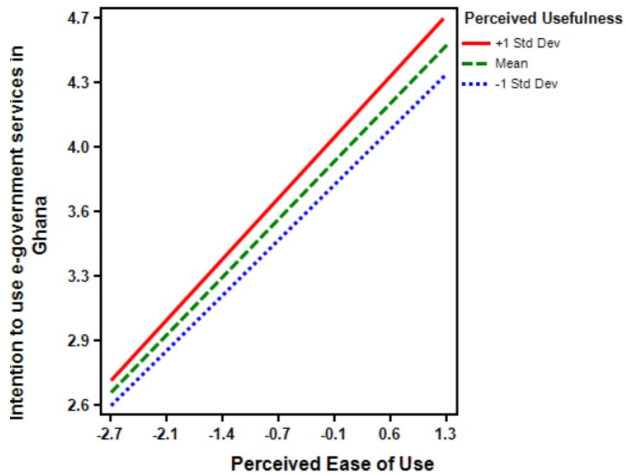


Fig. 3 Interaction/Moderation Effect

#### F. Summary Results of Hypotheses Tested

The summary results of the hypotheses investigated in this study are displayed in Table VIII.

TABLE VIII  
SUMMARY RESULT FINDINGS OF HYPOTHESIS TESTED

Hypothesis	Results	Supported (YES/NO)
H1: PEOU has a significant impact on citizens' IU and adopt e-government services in Ghana.	B= 0.353, t= 16.643, p< 0.01	YES
H2: The Interaction Term (PEOU * PU) have a significant positive impact on IU e-government services in Ghana	B = 0.539, t =16.799, p < 0.01	YES
H3: The IU e-government services in Ghana is positively and significantly impacted by PU	B = 0.392, t = 11.198, p < 0.01	YES
Test of Moderation	PEOU B = 0.336, t = 2.372, p > 0.01, Interaction Term	
The relationship between PEOU and IU e-government services is moderated by PU.	B = 0.204, t = 0.826, p > 0.01 PU B = 0.064, t = 0.415, p > 0.1	NO

#### VIII. DISCUSSION

The results of this study have empirically and statistically demonstrated that there is no moderation effect of PU on the positive relationship between PEOU and IU e-government services in Ghana. In other words, the already established positive significant relationship between PEOU and IU e-government does not change with the inclusion of a third variable i.e. PU. Whereas the study failed to show any moderation effect of PU on the relationship between PEOU and IU e-government services, it has shown that all the predictors investigated in this study are positive significant determiners of intention to adopt and use e-government services in Ghana. Thus, PU and PEOU are influencing factors citizens consider in a bid to adopt and use of e-government services in Ghana.

This research has further reaffirmed and corroborated the findings of previous research [24]-[26], [28] which has shown that PU and PEOU are positive significant predictors and directly impact the intention to adopt and use e-government services. Also, this research has contradicted the findings of [35] which showed that PU and PEOU were not significant in explaining intention to adopt and use e-government services in Macau.

The significant contribution of this study is that it has brought another understanding to e-government adoption research through exploring the moderation role of PU on the positive relationship between PEOU and IU e-government services in Ghana. As far as the literature is concerned, no study has so far examined this relationship of the moderation effect of PU. This study is also significant because it has examined influencing factors of intention to adopt and use e-government services among the citizens in Ghana, and thus, contributes to the literature on e-government adoption research from the Ghanaian perspective.

#### IX. IMPLICATIONS FOR THEORY AND PRACTICE

The result findings of this research have implications for theory and practice. The theoretical implication is that it has provided empirical evidence which has demonstrated that PU does not have any positive significant effect on the positive relationship between PEOU and IU e-government services. The implication for practice is for public administrators who are in charge of e-government adoption and implementation in Ghana; to design e-government services with these two important predictors of IU e-government services in mind i.e. PU and PEOU.

#### X. CONCLUSION

The adoption and implementation of e-government projects by government to improve the delivery of public service to citizens, business, and the general public would be meaningless if the very citizens this e-government is supposed to serve do not avail themselves to use and access public services through the e-government service system. Therefore, factors determining citizens' IU e-government services are necessary and worthy of investigation. This study has demonstrated that in the Ghanaian context, PU and PEOU of e-government services are positive significant predictors of intention to adopt and use e-government services in Ghana.

#### XI. LIMITATION AND FUTURE RESEARCH

The limitation of this study is that the predictors examined are not exhaustive of the factors influencing Ghanaian citizens' intention to adopt and use e-government services. Hence, future research would investigate other factors such as perceived service quality, system security and privacy issues, as well as trust in the government and the Internet, transparent and accountable government, and efficient public service delivery as predictors of IU e-government services in Ghana.

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