

Citizens' Intentions to Adopt Innovative E-Government Services: A Technology-Adoption Perspective

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ABSTRACT

The aim of this research is to understand role of citizens' perception of legitimacy and trust on the government on the relationship between perceived usefulness of innovative e-government services and citizens' intentions to adopt innovative e-government services in Pakistan. The authors used both qualitative and quantitative methods in two studies and collected data with mixed survey technique for the inclusion of the perception of the citizens from both sample groups. Data collected in both of the studies was then analyzed with KH Coder 3 for co-occurrence network and with Mplus 7.0 for random coefficient models. Results shown that trust on the government as affected by perception of legitimacy emerged as moderators of the relationship between perceived usefulness of innovative e-government services and intentions to adopt innovative e-government services in addition to simple moderation and mediated moderation. joint effect of perceived usefulness of innovative e-government services, trust on the government, and perception of legitimacy, found for intentions to adopt innovative e-government services. This research will help policy makers and government officials to understand, what might be hindering citizens' adoption of innovative e-government services and what they need to focus on in addition to useful features of the digitalized government services.

KEYWORDS

Intentions to Adopt Innovative E-Government Services, Legitimacy Perception, Perceived Usefulness, Social Information Processing Theory, Technology Adoption Model (TAM), Trust on the Government

INTRODUCTION

As a response to the COVID-19 pandemic, a burning question for the countries is whether and how COVID-19 will change what and how we do as a country? Therefore, most of the countries in the world have to radically digitalize their operations (Parker & Grote, 2022; Singh, Rawat, & Singhla, 2021). The development and introduction of Innovative e-government reforms has been

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a creative tool for bringing creativeness, competency, strength and transparency in the country (Carter, Yoon, & Liu, 2022; Hochstetter, Vásquez, Diéguez, Bustamante, & Arango-López, 2023; Singh et al., 2021; Sneed & Wright, 2014; Zhang, Jiang, Adeel, & Yaseen, 2018). Scholars and practitioners have been sharing a strong interest in understating factors that contribute to adoption of innovative e-government services - intentions to use digitalized government services (Aggelidis & Chatzoglou, 2009; Maatuk, Elberkawi, Aljawarneh, Rashaideh, & Alharbi, 2022). Based on technology acceptance model (TAM), for several decades, researchers have believed that perceived usefulness explain a large portion of the variance in adoption of innovative e-government services (Carter et al., 2022; Horst, Kuttschreuter, & Gutteling, 2007; Sang, Lee, & Lee, 2009; Warkentin, Gefen, Pavlou, & Rose, 2002). When citizens perceive usefulness, they are motivated to use innovative e-government services (Rehman, Kamal, & Esichaikul, 2016). Thus, perceived usefulness is thought to affect intentions to adopt innovative e-government services by affecting citizens' attitude, convenience, and cost perception of the government services (Rana, Dwivedi, Williams, & Weerakkody, 2015).

However, the empirical evidence linking perceived usefulness to intentions to adopt innovative e-government services is equivocal (Abu-Shanab, 2017; Agarwal & Prasad, 1998; Davis, 1989; Maatuk et al., 2022). Some studies have identified that perceived usefulness is positively related to innovative e-government adoption (Abu-Shanab, 2017; MacLean & Titah, 2022; Rana et al., 2015), whereas others have shown a weak or even non-significant relationship (Agarwal & Prasad, 1998; Davis, 1989; Gilbert, Balestrini, & Littleboy, 2004). Additionally, yet, after all of these years, innovative e-government outcomes are being questioned by researchers, despite having all useful technical features, most innovative e-government projects fail (Anthopoulos, Reddick, Giannakidou, & Mavridis, 2015) due to citizens' lack of interest to adopt (Carter et al., 2022; Janssen, van Veenstra, & Van Der Voort, 2013). In light of low success rate and conflicting findings (Anthopoulos et al., 2015), scholars need to explore the new theoretical perspectives and empirical investigations to deepen knowledge of the effects of innovative e-government service features on citizens' adoption of innovative e-government services (Rana et al., 2015; Sá, Rocha, & Cota, 2015).

Our objective in this research is to explain and resolve the conflicting relationship between perceived usefulness and citizens' intentions to adopt innovative e-government services and to explain how innovative e-government adoption can be enhanced in post pandemic covid-19. Technology Adoption Model (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) is a powerful model to predict acceptance and usage of information technology (Gefen & Straub, 2000). Fundamental to TAM, Individuals' adoption to IT is volunteer and based on the believes of the individuals that use of particular system would enhance performance. Thus, perceived usefulness would precede citizens' intentions to adopt innovative e-government services. Additionally, integrating with TAM, we take social information processing theory (Salancik & Pfeffer, 1978) from social psychology as an explaining mechanism that how citizens' adoption of innovative e-government services is affected by perceptions of individuals.

The main tenant of this theory is that individuals use information in their immediate environment for development of perceptions that regulate their behavior. Thus, in addition to usefulness of services, perceptions developed by citizens due to their external environment would affect their behavior to use innovative e-government services. Therefore, taking perceptual lens (Adeel, Batool, Daisy, & Khan, 2022; Khuwaja, Ahmed, Abid, & Adeel, 2020; Maatuk et al., 2022) for innovative e-government, we propose here that intentions to adopt innovative e-government services are contingent upon the perceptions of the citizens about legitimacy of the government (MacLean & Titah, 2022; Tolbert & Mossberger, 2006) and also citizens' trust on the government (MacLean & Titah, 2022; Rehman et al., 2016). This research will provide in-depth understanding on what is required for the success of innovative e-government projects from citizen's view while using mixed-method and multi-survey data analysis techniques.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Citizens' Adoption of Innovative E-Government Projects

The COVID-19 pandemic has amplified problems for the countries to enhance and provide e-service delivery to their citizens (Barnes, 2020; Maatuk et al., 2022; MacLean & Titah, 2022; Parker & Grote, 2022). Over the years, this alternative form of governance from tradition to electronic is warmly welcomed by citizens and users of both developing as well as developed nations. The ultimate phenomenon for using innovative e-government is to build up connections between citizens and the services that government offers and is transformation of non-automated systems into computerized ones (Ahmed, Adeel, Ali, & Rehman, 2019; Arfeen & Kamal, 2014).

Researchers suggested that there is an increasing trend in research on innovative e-government adoptions (Rana et al., 2015). It is undoubtedly right that innovative e-government applications have the potential to mitigate the development and administrative dilemmas (Schuppan, 2009), however, the gap in the rate of its growth and adoption in economically under-developed and developed nations is quite big (Gupta, Dasgupta, & Gupta, 2008). Each year, many governments spend huge portion of their budgets to these projects. But the results are quite different for developed vs developing countries. Most of innovative e-government projects and applications have shown either complete failure, partial failure or major objectives remain un-achieved in developing countries (Heeks & Bailur, 2007; Snead & Wright, 2014). Because of these failures, the adoption of innovative e-government projects and services received less attention from citizens which is one of the criteria for the success of innovative e-government project (Hwang, Li, Shen, & Chu, 2004; MacLean & Titah, 2022). [REMOVED HYPERLINK FIELD] shared a model for innovative e-government adoption in which, citizens were considered as main component of its success as compared to others.

Social information processing theory (Salancik & Pfeffer, 1978) from social psychology is distinctly placed with integration of TAM model in this research in explaining and resolving the inconsistent relationship between perceived usefulness and adoption of innovative e-government services. The main tenant of the theory explains development of perceptions as affected by immediate environment regulate behavior. This theoretical perspective provided a promising framework for this research.

Perceived Usefulness

Perceived usefulness is defined as “individual’s perceptions that using new technology will enhance or improve her/his performance (Davis, 1989, 1993). The definition follows from the word “*useful*” meaning “to be useable advantageously”. There exists a positive use-performance relationship so, if this positive relationship does not exist and a system that does not help its user to perform their job than it will not receive favorable feedback for its user (Robey, 1979). From the Technology Acceptance Model’s introduction, perceived usefulness of a system remains an influential factor for any system/project’s success and adoption (Henderson & Divett, 2003).

According to Technology Acceptance Model (Davis, 1989) citizen’s intentions to use new technology widely depends on its perceived usefulness and ease of use (Rehman et al., 2016). Since then these two were considered primary drivers for technology adoption (Kamal, Hackney, & Ali, 2013). Researchers found that perceived usefulness of any technology system is the main reason of intentions to use innovative e-government project or service (Horst et al., 2007). In addition, (Hung, Chang, & Yu, 2006) worked on Taiwanese online tax system and reported perceived usefulness as a strongest predictor/determinant of innovative e-government project’s adoption. (Ranaweera, 2016), found trust and usefulness of innovative e-government projects as vital and significant for adoption of innovative e-government services. Similarly, (Parker & Grote, 2022; Zafiroopoulos, Karavasilis, & Vrana, 2012) shared that emphasizing the advantages of innovative e-government project is necessary as it will improve probable adoption of the project. Accordingly users will only adopt the project once they feel that it will help them to work more effectively and efficiently (Komba, 2016). Prior literature generally, on adoption of technology and the adoption of innovative e-government services particularly (Bruner II & Kumar, 2005; Singh et al., 2021; Yu, Ha, Choi,

& Rho, 2005) highlighted the positive impact of perceived usefulness on technology adoption by its users. Hence, based on the above findings we propose following hypothesis:

H1: Perceived usefulness will positively affect citizens' intentions to adopt innovative e-government services.

Trust on the Government

Trust on government refers to the belief, assurance and confidence a citizen has on its government that government will not compromise its vulnerabilities while gaining access to services (Aggelidis & Chatzoglou, 2009; Rana et al., 2015). It means that citizens will not face any discrimination or biasness on the basis of race, religion, language and status (Qureshi, Salman, Irfan, & Jabeen, 2017). (Srivastava, 2011) considered it as a citizen's faith that his government is fair and impartial. (Bélanger & Carter, 2008) argued that citizen's must have confidence on government as well as enabling technologies because both play a crucial roles in developing trust on the government through past experiences, and beliefs based on the transparency (Hochstetter et al., 2023). These existing believe of citizens on government initiatives yield significant results associated with perception and intentions on and about government. Literature (Qureshi et al., 2017) segregated trust with reference to innovative e-government into two major dimension i.e. trust in government itself and trust in technology (internet etc.).

Trust on government as important factor that influence how citizens perceive innovative e-government projects (Parker & Grote, 2022; Qureshi et al., 2017; Tyler, 2006). As trust predicts the risk concerns for of particular project, hence the more the trust a citizen has less will be the risk concerns, thus, improving his/her perceptions of usefulness (Horst et al., 2007). (Khayun, Ractham, & Firpo, 2012), considered trust as a first level predictor of perception of usefulness in innovative e-government projects. Prior literature suggested positive relationship between trust and perceived usefulness of technology. (Carter & Bélanger, 2005; Horst et al., 2007; MacLean & Titah, 2022), found that with higher level of trust on perceived usefulness about an innovative e-government project, it is more likely the citizen will adopt the service and use it. Based on above findings following hypothesis is proposed:

H2: Trust on the Government will positively influence the perceived usefulness of innovative e-government services.

According to (Mayer, Davis, & Schoorman, 1995) trust is the degree to which a trustor trusts a trustee is dependent on the trustworthiness of the trustee. This trustworthiness is the result of the trustor's perceived attributes of the trustee. (Lee, Braynov, & Rao, 2003) have empirically validated the relevance of trustworthiness beliefs in generating trust for innovative e-government projects. Under e-services provided by government where the citizens interact primarily with the IT-enabled web interface, it is not hard to imagine the importance of trust in this transaction. When citizens are doubtful about using online services they may avoid or simply ignore this use as it requires detailed personal information. This situation requires having trust in the service provider. Trust is an important factor that determines the success of any innovative e-government project. Similarly, according to (Alzahrani, Al-Karaghoul, & Weerakkody, 2018; Singh et al., 2021) one of the benefits of a successful innovative e-government is building trust between governments and citizens. Hence it is proposed that the positive impact of perceived usefulness on adoption of innovative e-government services will be stronger, when there is trust on government:

H2a: The relationship between perceived usefulness and intentions to adopt innovative e-government services will be moderated by the trust on the government, such that, the positive impact of perceived usefulness on intentions to adopt innovative e-government services will be highly positive, when trust on government is high.

Perception of Legitimacy

Perception of government legitimacy is a pivotal factor that can help governments to build citizen's trust and improve their intentions to use innovative e-government services. Legitimacy remain a confusing construct having enroots in psychology (Tyler, 2006), sociology (Johnson, Dowd, & Ridgeway, 2006), philosophy (Habermas & rgen Habermas, 1975), management (Parker & Grote, 2022; Suddaby, Bitektine, & Haack, 2015) and political science (Lipset, 1959). Legitimacy in management theory has been subject to extensive research and was first defined by (Suchman, 1954) as “generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions”.

The epistemology of legitimacy varies from being treated as a *property*, *process* and *a perception* by different researchers. Legitimacy as perception is a cross-level process of perceptions, actions and judgments of appropriateness that happens in interactions between the collective and the individual. This logic of appropriateness typically refers to the legitimacy of government (Weber et al., 2004) that it is able to deal with the concerning issues for citizens (Carter & Bélanger, 2005). In the literature, little attention has been paid to legitimacy and its relationship with innovative e-government concept (De Vries, Bekkers, & Tummers, 2016; Singh et al., 2021). (Bekkers, Edelenbos, & Steijn, 2011) identified that innovative e-government projects not only require to be effective and efficient but they also need to focus of building trust and legitimacy and also transparency (Hochstetter et al., 2023). Similarly, (Wihlborg, 2014) considered legitimacy as an essential component for government and accordingly, has to be continuously reproduced and maintained into new sceneries such as innovative e-government projects. Based on above discussion following hypothesis is proposed:

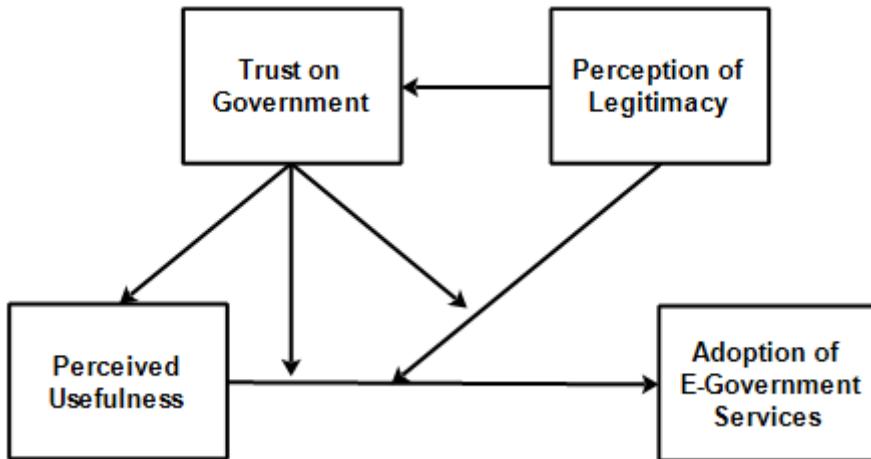
H2b: The relationship between perceived usefulness and intentions to adopt innovative e-government services will be moderated by the perception of legitimacy, such that, the positive impact of perceived usefulness on the intentions to adopt innovative e-government services will be highly positive, when perception of legitimacy is high.

Trust on Government and Perception of Legitimacy

We have used dual-process theory to investigate the impact of trust on government and perception of legitimacy on the relationship of perceived usefulness and adoption of innovative e-government services by citizens. As according to dual process theory decisions are either made automatically and quickly (process 1) or after deliberation and slowly (process 2) (Aggelidis & Chatzoglou, 2009; Hochstetter et al., 2023; MacLean & Titah, 2022; Stanovich & West, 2000). The trust in government help the citizens make automatic and quick decisions hence, trust acts as system 1. Whereas, the perception of legitimacy, acts as system 2 which help citizens to deliberate on the issue and the use of online services provided by government. It is proposed that presence of both trust in government and perception of legitimacy as system 1 and system 2 are required to enhance the relationship between perceive usefulness and adoption of innovative e-government projects/services:

H3: Perception of legitimacy and trust on the government will jointly moderate the positive relationship between perceived usefulness and intentions to adopt innovative e-government services, such that, the positive impact of perceived usefulness on intentions to adopt innovative e-government services will be highly positive, when perception of legitimacy and trust on government are high.

Figure 1. Research model



RESEARCH METHODOLOGY

For the current study we have collected both quantitative (Study 1) and qualitative (Study 2) data and have used mixed method data analysis techniques for analyzing the proposed model.

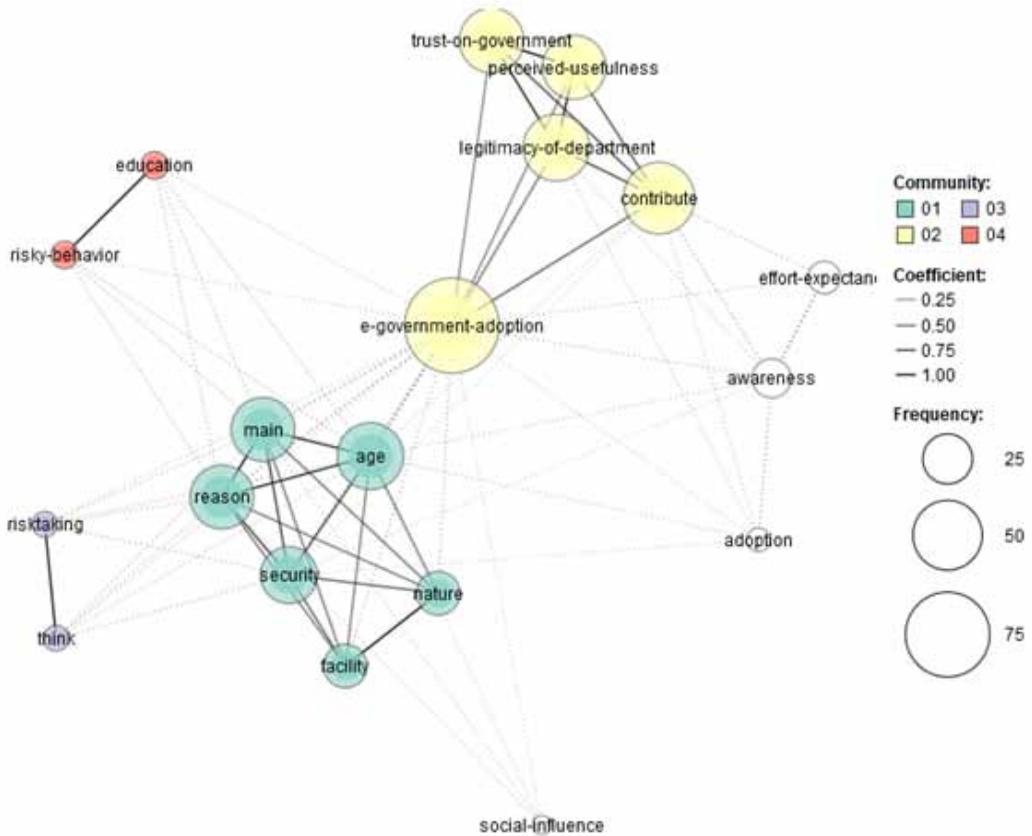
Study 1: Expert Reviews

The purpose of the expert review was to validate the proposed model and main study variables. For this, a total of 100 interviews were conducted with individuals of business community, educators, and government and private job holders in equal proportion. We asked one main question from the respondents. “What main factors may affect innovative e-government adoption in Pakistan?”. 100 interviews were then further analyzed with KH Coder 3.Alpha. 13g. The results of this analysis are presented below in figure 2, three valuable keywords are highlighted as a matter of attention in the context of Pakistan by the software are trust on the government, legitimacy of departments, and perceived usefulness. It is important to note that previous research has already highlighted, although, Pakistani government lacks in collaboration between its department (Waseem & Shaikh, 2019), Pakistani citizens are concerned about security features and coordination between departments in adopting innovative e-government services (Bélanger & Carter, 2008; Carter & Bélanger, 2005; Welch & Pandey, 2006). As it can also be seen from the results, facility, nature, age, and security also found related to adoption of innovative e-government services directly and also in relation with other variables. This network also highlighted that citizens of Pakistan are also more concerned about security features and nature of facility offered by the government. Additionally, age group also emerged as a main concern of the citizens of Pakistan, indicating that adoption of innovative e-government services also related with age group.

Study 2: Sample and Data Collection

For this study, data was collected from general public using both online and offline survey techniques. The purpose of this mixed survey technique was to ensure the inclusion of the perception of the citizens from both sample groups that may play vital role in adoption of innovative e-government services. For online survey, in order to approach large public on their email ids, we approached a private commercial Islamic bank operating in Pakistan. We discussed purpose and significance of the study with top management of the bank, with approval from the top management, as agreed,

Figure 2. Word co-occurrence network extracted from KH Coder



we provided survey items to hr representative of the bank who himself sent survey items to 2,000 customers for equal participation of customers from all of the provinces in Pakistan. The survey involved 15 questions for main study variables and 15 questions of control variables related to demographic, cultural, performance, and security perception. In order to eliminate chances of any uncertainty, ambiguity, and bias, the questions were translated into Urdu. For four weeks, on every Monday, hr officer keep sending reminders to customers about survey. After four weeks, we had received response from 1,378 respondents for perceived usefulness of innovative e-government services and perception of legitimacy along with all control variables. After eight weeks of first response, we again initiated second phase of our data collection process, we sent questions related to adoption of innovative e-government services and trust on the government to those 1,378 citizens who had already provided their response during the first phase. Again after sending four weekly reminders to the respondents, we had received response from 1,176 individuals with response rate of 58.8%, after dropping cases with incomplete information; online response yielded a final response of 974 with a response rate of 48.7%.

We then initiated an offline survey in the Punjab province of Pakistan with face to face visit to markets, universities, and offices, with same version of online survey. Selection criteria for the survey were again internet use and awareness about innovative e-government services. In order to make sure equal participation from different sub groups, the survey items were equally distributed to individuals of business community, educators, and government and private job holders. A total of 400 survey questions were distributed, a response of 248 was received, after dropping data with

missing information, offline final sample yielded a response of 233. Overall, offline and online survey yielded a final sample of 1207 which was used in all of the analyses of this study. For both surveys, as we had selection criteria for this research, we used purposive sampling as we do not collect data from whoever is available for survey (Fraenkel, Wallen, & Hyun, 2012).

MEASURES

Main Study Variables

Perceived usefulness was measured with adapted three items- five points likert type scale (Kim, Mirusmonov, & Lee, 2010). The sample item was “I would find innovative e-government services a useful possibility for getting government services.” ($\alpha = 0.76$). Trust on the government was measured with adopted four items- five points likert type scale (Kurfalı, Arifoğlu, Tokdemir, & Paçin, 2017). The sample item was “I trust government’s institutions and departments.” ($\alpha = 0.87$). Perception of Legitimacy was measured with adopted five items-five points likert type scale of a diffuse support attempting to tap into confidence in the key institutions of government (Klingemann, 1999), this scale has already been used in previous studies to measure trust on the government (Seligson, 2002). The sample item was “How much respect do you have for the political institutions of the country?” ($\alpha = 0.78$). Intentions to adopt innovative e-government services was measured with three items- five points likert type scale (Kurfalı et al., 2017). The sample item was “I intend to use innovative e-government e-services in the future.” ($\alpha = 0.83$).

Control Variables

In this study we controlled for gender, age, education, internet usage experience which may affect adoption of innovative e-government services (Akman, Yazici, Mishra, & Arifoglu, 2005; Bwalya, 2009; Choudrie & Dwivedi, 2005). Some of the researchers have theorized and found, that tangible security features, security culture, and performance expectancy may affect adoption of innovative e-government services (Adeel, Batool, & Ali, 2018; Alharbi, Papadaki, & Dowland, 2017; Kurfalı et al., 2017). Tangible security features were measured with four items- five points likert type scale (Adeel, Ali, & Pengcheng, 2018; Alharbi et al., 2017; Halaweh, 2012). The sample item was “Government websites require users to follow security practices in the selection and use of passwords.” ($\alpha = 0.76$). Security culture was measured with four items- five points likert type scale (D’Arcy & Greene, 2014). The sample item was “I believe that citizens’ Internet activities are monitored by the government.” ($\alpha = 0.74$). Performance expectancy was measured with four items- five points likert type scale (Alshehri, Drew, Alhussain, & Alghamdi, 2012; Venkatesh, Morris, Davis, & Davis, 2003). The sample item was “Using innovative e-government services help me accomplish things more quickly.” ($\alpha = 0.82$).

RESULTS

Analytical Strategy

Mplus 7.0 was used in all of the analyses of this study. Although, individual citizens provided their response, they belonged to different provinces, therefore, nested nature of data received from the citizens of Pakistan. For nested data, use of simple regression could underestimate the standard error; random coefficient modeling is recommended for nested data (Scherbaum & Ferrerter, 2009). Thus, in order to control for interdependence among study variables (Bauer, 2003) and to eliminate chances of standard error underestimation (Scherbaum & Ferrerter, 2009; Shan & Ahmad Adeel, 2021), we used random coefficient modeling with individual level analyses technique analyzed with Mplus 7.0 for random coefficient effects. Additionally, with random coefficient modeling, regular model fit indicators cannot be used in a regular way, Satorra-Bentler difference test is recommended (Muthen & Muthen, 2010), therefore, we also performed Satorra-Bentler difference test with log-

likelihood method using scaling correction factor for MLR with null and alternate models; the values are presented in table 2. All the data for main study variables and interaction terms were grand mean centered (Hofmann & Gavin, 1998).

HYPOTHESES TESTING

The descriptive statistics of the respondents are presented in table 1. Although, model fit indicators were calculated with Satorra-Bentler scaled chi-square difference test with log-likelihood, conventional model fit indicators for final model are presented here for reference. The measurement of baseline model $\chi^2 = 91.571$, $N = 1207$, $p < .001$, measurement model 1617.883, 38, loglikelihood for null model = -11139.155, 7, scaling correction factor for MLR = 11.523, loglikelihood for alternate model = -5526.317, scaling correction factor for MLR = 7.652, CFI = 1, TLI = 1, and RMSEA = 0.0001. The values of CFI and TLI are exact 1 with a very low value for RMSEA, indicate a very low correlation among the study variables, thereby reducing much power to reject alternate explanations (Muthen & Muthen, 2010).

First, we used simple model by regressing perceived usefulness of innovative e-government services on trust on the government on for random coefficients. In order to check this direct impact, we introduced gender, age, education, internet experience, tangible security features, security culture, and performance expectancy as control variables along with trust on the government as predictor of perceived usefulness of innovative e-government services. Table 2-model1, we found significant coefficient for the impact of trust on the government on perceived usefulness of innovative e-government services ($\beta = 0.374$, $p \leq .05$). In this test, among control variables, only performance expectancy ($\beta = 0.235$, $p \leq .01$) showed significant coefficients.

Table 2-model2, we regressed intentions to adopt innovative e-government services on perceived usefulness of innovative e-government services for random coefficients. In order to check this direct

Table 1. Means, Standard Deviation, and Correlation among study variables

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10
1.Gender	0.63	0.48										
2.Age	36.78	6.32	0.148**									
3.Education	2.63	0.48	-0.001	-0.130**								
4.Internet Experience	7.48	1.38	0.106**	0.209**	-0.015							
5.Tangible Security Features	3.16	0.95	0.076**	0.056	-0.051	0.016						
6.Security Culture	3.15	1.05	0.012	-0.002	-0.004	-0.025	0.331**					
7.Performance Expectancy	3.34	1.02	0.019	0.058*	0.006	-0.023	0.477**	0.565**				
8.Perceived usefulness	3.19	1.08	-0.008	-0.004	0.029	-0.025	0.330**	0.460**	0.535**			
9.Perception of legitimacy	3.32	0.97	-0.064*	-0.024	0.015	0.018	0.025	0.042	-0.004	0.227**		
10.Trust on the government	3.57	1.10	0.022	-0.010	0.046	0.011	0.026	0.012	0.021	0.151**	0.291**	
11. Adoption of Innovative e-government Services	3.46	0.94	0.002	0.022	-0.024	-0.025	0.238**	0.244**	0.343**	0.435**	0.050	0.440**

Note: Observations = 1207. Clusters = 4. Gender was coded as 0 = Female, 1 = Male. Professional Experience was measured in years.

* $p \leq .05$. ** $p \leq .01$

Table 2. Random coefficients regression analyses

Predictor	Model 1 Perceived Usefulness		Model 2 Adoption of Innovative E-Government Services		Model 3 Adoption of Innovative E-Government Services		Model 4 Trust on the Government		Model 5 Adoption of Innovative E-Government Services		Model 6 Adoption of Innovative E-Government Services		Model 7 Adoption of Innovative E-Government Services	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Gender	-0.036	0.039	-0.005	0.038	-0.009	0.037	-0.015	0.033	0.096**	0.034	-0.024	0.042	-0.048	0.036
Age	0.001	0.004	0.002	0.004	0.002	0.004	0.001	0.004	-0.001	0.002	0.002	0.003	0.001	0.003
Education	-0.078	0.084	-0.059	0.070	-0.058	0.070	-0.050	0.076	0.082	0.065	-0.088	0.060	-0.069	0.064
Internet Experience	-0.016	0.010	-0.012	0.007	-0.011	0.008	-0.012	0.009	0.004	0.003	-0.015	0.010	-0.013	0.010
Tangible Security Features	0.080	0.032	0.061	0.052	0.061	0.053	0.057	0.050	0.007	0.043	0.059	0.038	0.059	0.034
Security Culture	0.067	0.046	-0.011	0.084	-0.011	0.084	-0.019	0.082	-0.062	0.040	0.012	0.069	0.006	0.060
Performance Expectancy	0.235**	0.061	0.123	0.084	0.118	0.069	0.137	0.072	-0.022	0.032	0.146*	0.073	0.149*	0.069
Perceived usefulness			0.304 *	0.153	-0.031	0.083	0.070	0.189	-0.321	0.219	0.193*	0.077	0.583	0.337
Perception of legitimacy					0.313 *	0.129	0.069 **	0.025	-0.276*	0.138			0.030	0.335
Perceived usefulness X Perception of legitimacy							0.249*	0.124	0.079*	0.036			-0.085	0.081
Trust on the government	0.374*	0.188									0.011	0.018	0.870*	0.375
Perceived usefulness X Trust on the government											0.309**	0.062	-0.187*	0.077
Perception of legitimacy X Trust on the government													-0.131	0.089
Perceived usefulness X Perception of legitimacy X Trust on the government													0.467*	0.218
$\Delta \chi^2 (\Delta df)$	826.013(7)**		842.81(7)**		955.18(8)**		1198.09(9)**		1073.84(9)**		922.24(9)**		772.38(9)**	
ΔR^2	0.305		0.294		0.305		0.183		0.284		0.021		0.016	

Note: Observations = 1207. Clusters = 4. Average Cluster Size = 301.750. Gender was coded as 0 = Female, 1 = Male. Age, Education, and Internet Experience were measured in years.

$\Delta \chi^2$ refers to Satorra-Bentler scaled chi-square difference test (Muthen & Muthen, 2010). Δdf is change in degree of freedom.

ΔR^2 is degree of reduction in error variance.

* $p \leq .05$. ** $p \leq .01$

impact, we introduced gender, age, education, internet experience, tangible security features, security culture, and performance expectancy as control variables along with perceived usefulness of innovative e-government services as predictor of intentions to adopt innovative e-government services. In presence of control variables (gender, age, education, internet experience, tangible security features, security culture, and performance expectancy), we found significant coefficient for the impact of perceived usefulness of innovative e-government services on intentions to adopt innovative e-government services ($\beta = 0.304, p \leq .05$).

Table 2-model3, we regressed intentions to adopt innovative e-government services on perception of legitimacy for random coefficients. In order to check this direct impact, we introduced gender, age, education, internet experience, tangible security features, security culture, and performance expectancy as control variables along with perception of legitimacy as a predictor of intentions to adopt innovative e-government services. In presence of the control variables, we found significant coefficient for the impact of perception of legitimacy on intentions to adopt innovative e-government services ($\beta = 0.313, p \leq .05$).

We then confirmed the moderation and mediation with three step procedures of moderation (Aiken, West, & Reno, 1991) and mediation (Baron & Kenny, 1986) analysis. For mediation, due to limitation of use of bootstrap option with random coefficients, indirect option could not be used for mediation analysis (Muthen & Muthen, 2010). Therefore, we have to follow three step procedure of mediation analysis (Baron & Kenny, 1986). Table 2-model4, we regressed gender, age, education, internet experience, tangible security features, security culture, and performance expectancy as control variables along with perceived usefulness of innovative e-government services, perception of legitimacy, and an interaction term representing perceived usefulness of innovative e-government services and perception of legitimacy on trust on the government for random coefficients. In presence of control variables, we found significant coefficients for perception of legitimacy ($\beta = 0.069, p \leq .01$) and the interaction of perceived usefulness of innovative e-government services and perception of legitimacy ($\beta = 0.249, p \leq .05$).

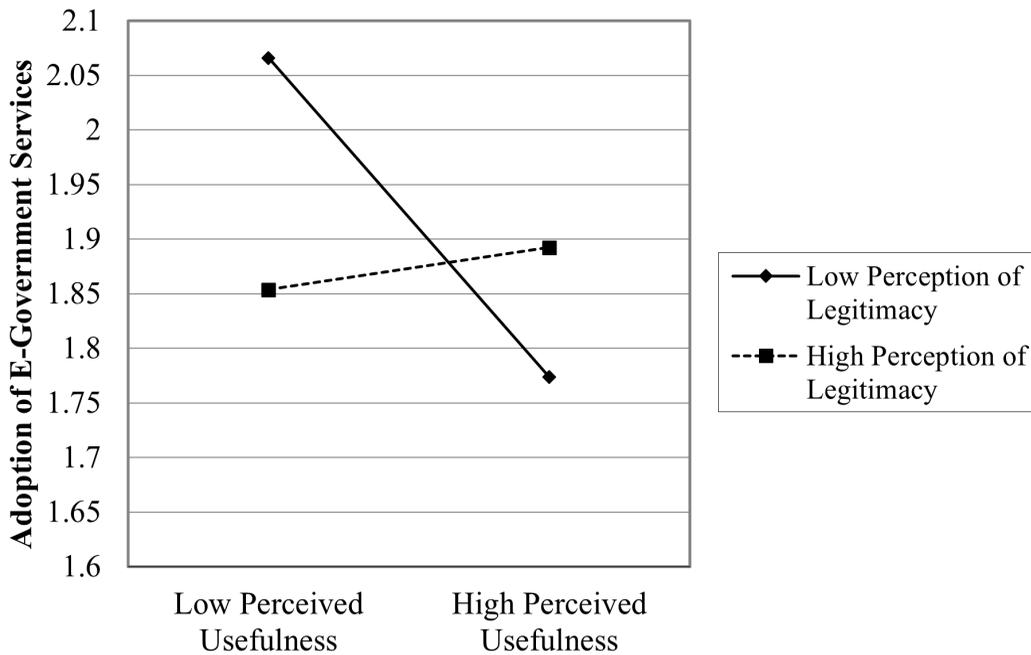
Table 2-model5, we regressed gender, age, education, internet experience, tangible security features, security culture, and performance expectancy as control variables along with perceived usefulness of innovative e-government services, perception of legitimacy, and an interaction term representing perceived usefulness of innovative e-government services and perception of legitimacy on intentions to adopt innovative e-government services. In presence of control variables, we again found significant coefficients for perception of legitimacy ($\beta = -0.276, p \leq .05$) and the interaction of perceived usefulness of innovative e-government services and perception of legitimacy ($\beta = 0.079, p \leq .05$). The plot of interaction between perceived usefulness of innovative e-government services and perception of legitimacy is shown in figure 3, the interaction plot suggested that high perception of legitimacy will positively affect the relationship between perceived usefulness of innovative e-government services and intentions to adopt innovative e-government services, however, low perception of legitimacy will negatively affect the relationship between perceived usefulness of innovative e-government services and intentions to adopt innovative e-government services.

Table 2-model6, we regressed gender, age, education, internet experience, tangible security features, security culture, and performance expectancy as control variables along with perceived usefulness of innovative e-government services, trust on the government, and an interaction term representing perceived usefulness of innovative e-government services and trust on the government on intentions to adopt innovative e-government services.

In presence of control variables, we found significant coefficient for the interaction of perceived usefulness of innovative e-government services and trust on the government ($\beta = 0.309, p \leq .01$). The plot of interaction between perceived usefulness of innovative e-government services and trust on the government is shown in figure 4, the interaction plot suggested that high trust on the government will have more positive effect on the relationship between perceived usefulness of innovative e-government services and intentions to adopt innovative e-government services than low trust on the government.

Table 2-model7, to test a three way interaction between perceived usefulness of innovative e-government services, perception of legitimacy, and trust on the government, we regressed gender, age, education, internet experience, tangible security features, security culture, and performance expectancy as control variables along with perceived usefulness of innovative e-government services, perception of legitimacy, an interaction term representing perceived usefulness of innovative e-government services and perception of legitimacy, trust on the government, an interaction term representing perceived usefulness of innovative e-government services and trust on the government,

Figure 3. Plot of interaction between perceived usefulness and perception of legitimacy



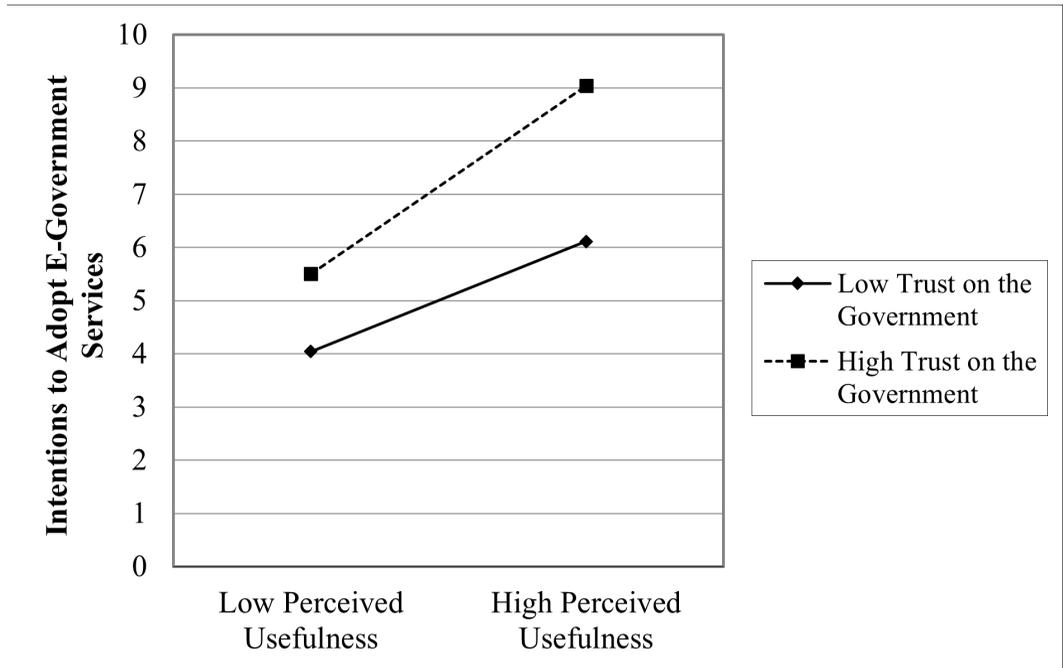
an interaction perception of legitimacy and trust on the government, and a three way interaction of perceived usefulness of innovative e-government services, perception of legitimacy, and trust on the government on intentions to adopt innovative e-government services.

The results of table2-model7 suggested that, addition of a three way interaction term overall increased the predicting power for intentions to adopt innovative e-government services ($\beta = 0.467, p \leq .10$), however, the proportionate reduction in error variance approached to lowest 0.016 among all the models reducing the strength of the final model with a three way interaction. The three way interaction is also shown in figure 4, the plot of interaction suggest that citizens' high perception of legitimacy, high trust on the government, and high perceived usefulness of innovative e-government services will bring more positive results for adoption of innovative e-government services. The interaction term patters were also confirmed with additional slope difference tests (Dawson & Richter, 2006), such that high perception of legitimacy and high trust on the government slope was more positively significant ($t = 2.98, p < .01$) than ($t = 2.27, p < .05$), ($t = 2.15, p < .10$), and ($t = 2.01, p < .10$). These patterns of results provided a more clear and accurate picture that adoption of innovative e-government services will increase when citizen will have more trust on the government and highly positive perception about key institutions of the government. These results can be interpreted in another way that government can reduce chances of failure of innovative e-government projects by developing and maintaining citizens' trust on the government and citizens' positive perception about key institutions of the government. With these results we provided support to all of the hypotheses of this study.

SUMMARY OF RESULTS

Overall, results of this study can be summarized as follows; trust on the government will have positive impact on perceived usefulness of innovative e-government services; perceived usefulness

Figure 4. Plot of interaction between perceived usefulness and trust on the government



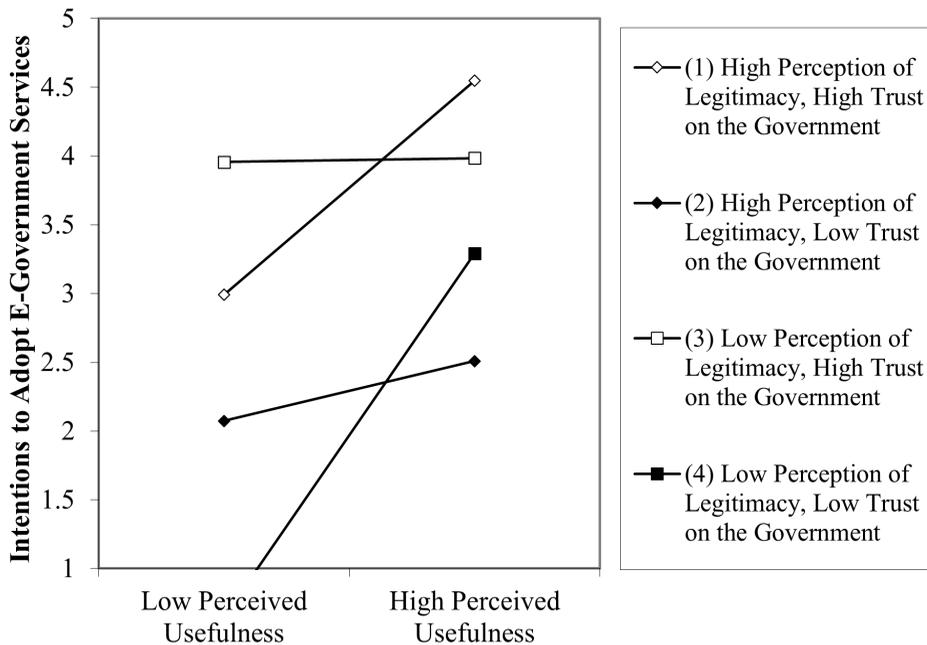
of innovative e-government services will have positive impact on intentions to adopt innovative e-government services; high perception of legitimacy enhances the positive impact of perceived usefulness of innovative e-government services on citizens' adoption of innovative e-government services, reduces otherwise; perception of legitimacy also emerged as a positive predictor of adoption of innovative e-government services; trust on the government enhances the positive impact of perceived usefulness of innovative e-government services on citizens' adoption of innovative e-government services; trust on the government as affected by perception of legitimacy enhances the positive impact of perceived usefulness of innovative e-government services on citizens' adoption of innovative e-government services; and finally, adoption of innovative e-government services will increase when citizen will have more trust on the government and highly positive perception about key institutions of the government.

RESEARCH CONTRIBUTIONS

Theoretical Contributions

Although the concept of innovative e-government is present in Pakistan since from last two decades, yet appreciable or considerable growth in this phenomenon is not recorded. In the post-COVID-19 world, need for Innovative e-government services has emerged in the world of technological governance and services (Singh et al., 2021). Many previous studies (Haider, Shuwen, & Burdey, 2016; Rehman et al., 2016; Shareef, Kumar, Kumar, & Hasin, 2009; Waseem & Shaikh, 2019) had tried to figure out the reasons and challenges that contributed as a hurdles towards its progress. These studies and other existing literature had tried to provide evidences for major innovative e-government project's failures. Within these debates, researchers had shown reasons like low internet usage, poor literacy rate in country, lack of trust on government, old technology and discontinuing democracies for bellowed innovative e-government services in the country. Although, these facts are true and logical with practical figures,

Figure 5. Plot of interaction between perceived usefulness, perception of legitimacy, and trust on the government



but yet existing models of failure of innovative e-government projects and their adoptions shows one end of the picture. As evident the existing models in literature (Liu et al., 2014) are mostly narrow in scope due to their focus on macro-level factors rather than focus on micro-level perspectives. The customer side in innovative e-government projects establishment and even in lateral academic researchers is either completely ignored or received little attentions. A complete comprehensive study on innovative e-government adoptions representing all its facets, challenges and obstacles is still missing (Heeks & Bailur, 2007; Rehman et al., 2016). The present study was aimed to fulfill the need of proposing more strong, acceptable and theoretical comprehensive model for innovative e-government adoptions. Based on the narratives presented above, this research was tried to share the reasons about customer’s intentions to adopt innovative e-government projects and services. The study also tried to provide in-depth understanding on why several innovative e-government projects fails from citizen’s view and perceptions with the help of both quantitative and qualitative data analysis.

This study has key theoretical implications for the TAM and innovative e-government adoption literature. One such implication relates to the fact that trust in government and perception about legitimacy plays critical role in innovative e-government adoption services. We find that when trust and perception about legitimacy is high it enhances the positive impact of perceive usefulness on adoption of innovative e-government services. Therefore our studies illustrates that citizens who have high level of trust and have positive perception about legitimacy they find innovative e-government services more useful and adopt these services. By looking at the micro level factors for adoption of innovative e-government projects our research contributes to Technology Acceptance Model (TAM) applicability in a developing country, Pakistan context.

Practical Implications

Our research has several implications for practice. Every government would like to have successful online projects that not only help the government systems but also facilitate the citizens. Although, innovative e-government services are theorized to reduced cost, improve services, be more responsive

to citizens, and improves accountability (Warkentin et al., 2002). But due to the slow pace of adoptability of innovative e-government projects, scholars now debate about the potential of innovative e-government projects and the failure of adoption due to low citizens' interest (Janssen et al., 2013); even to the preference to turning back to the traditional channel selection (Reddick & Anthopoulos, 2014) question the sustainability of innovative e-government projects (Paulin, 2015). Thus, we tried to identify the influencing factors that may help increase practical utility of the innovative e-government projects. We found that in addition to providing digitized services to the citizens, it is imperative for the government to build trust of the government and legitimacy of the government institutions. There are many facets of these influencing factors, the cultural role, legitimacy perception, and the trust on the government institutions, is fundamental to the adoption process.

Mere implementation of digitalized services may not bring required results. Trust on the government and the legitimacy of government institutions are likely to enhance adoption of innovative e-government services. Thus, government officials and the private partners that assist government institutions must be aware of the role of legitimacy perception of the citizens and their trust on the government in adoption of the digitalized government services, and must take into account imperative role of the trust on the government and legitimacy perception when developing strategies. Thus, governments should focus on building trust and legitimacy perception in the citizens as without trust and legitimacy citizens will be reluctant to use the e-services offered by the government. Therefore, it is advised to mobilize those citizens who may be more open to adoption due to their affiliation to current government or the leaders running the country. These citizens will communicate success stories to the others and each success story will grow the intention of the citizens to use digitalized services of the government by positive word of mouth communication. In order to build trust of the government and legitimacy of the government institutions, government officials can enact public offices guarantees, improve their social characteristics, and spread this positive information through public word of mouth communication.

CONCLUSION

This study provided new insights into the relationship between perceived usefulness of innovative e-government services, trust on the government, perception of legitimacy, and intentions to adopt innovative e-government services. The results of this research revealed that citizens are likely to adopt innovative e-government services when they perceive that innovative e-government services are useful. However, perception on the government when coupled with perceived usefulness of innovative e-government services enhances citizens' adoption of innovative e-government services. Similarly, trust on the government as affected by perception of legitimacy when couple with perceived usefulness of innovative e-government services will also enhance chances of citizens' adoption of innovative e-government services. However, when trust on the government and perceptions of legitimacy are high, chances are also high that citizens' will adopt innovative e-government services.

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COMPETING INTERESTS

All authors of this article declare there are no financial or non-financial competing interests.

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