Perceived Usefulness and Ease of Use of E-Government to Generate Trust and Intention to Use by Citizens

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Abstract

Public institutions across the world use technology to meet new society's needs. Citizens are connected now, they have access to information in real time, they demand new types of services. Governments need digital tools to meet these new challenges and to contribute to their nation's development, enabling the delivery of technological services and solutions that lead to digital transformation. This research aims to determine the impact of perceived usefulness and the usability of e-government concerning citizen's trust when using public online services. We applied a questionnaire to 361 citizens users of public online services in Tamaulipas, Mexico, using SmartPLS statistical software. The main results indicate that perceived usefulness, ease of use as well as trust have a strong influence on the citizens' intention to use public online services, which could be considered by the administrations in the design of e-government online services projects or initiatives. We consider the present study findings may help the public and academic sector in the study and design of strategies that help them in the development of e-government public policies focused on building effective e-government solutions allowing for the future development of nations.

Keywords: Perceived usefulness, ease of use, trust, intention to use, e-Government

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Introduction

Information technologies (IT) represent an essential tool in the new era of globalization (Martins et al., 2019), in which public and private organizations have made use of them in their work, becoming an essential tool to reach effective management. In government, IT represents an essential element in terms of citizen service through the use digital or online services; the use and demand of online services have increased because of a greater reach in the possession and use of smart mobile devices by citizens (Al-Naimat & Fraihat, 2020). In this sense, it has been pointed out that most countries are showing interest in the design and implementation of citizen-centered electronic government (e-government) initiatives, granting access to public services that are compatible with different mobile devices, impacting in a higher level of acceptance among users/citizens (Al-Sakran & Alsudairi, 2021).

E-government is defined as the use that public administration gives to information technologies, accompanied by a change in structures that impact the internal operation of the government to make the delivery of services more citizen-efficient (Alzahrani et al., 2016). It is crucial to consider that there is a series of elements immersed in the adoption of e-government services, such as access to technological infrastructure, experience using digital media, Internet access, and trust, in which this last one plays a fundamental role within the field of scientific research regarding the adoption and use of government information systems (Carter et al., 2016).

There is evidence about the success of the implementation of digital services initiatives by governments in different developed countries (United Nations, 2020); however, this is not the case for countries with emerging economies since they present a high rate of failure in implementation. As some researchers have stated, it is not surprising that the success of these initiatives depends mostly on the experience, adoption, and perception of citizens in their use (Carter & Bélanger, 2005; Al-Naimat & Fraihat, 2020).

However, the implementation of online services entails a series of critical challenges (Glyptis et al., 2020), such as low participation of society and low levels of adoption, which experts consider as a limitation of successful implementation of e-government (Al-Hujran et al., 2015). Therefore, studies on prediction and intention to use an information system (IS) as well as research on digital services technological acceptance, represent a fundamental element for efficient e-government initiative design, as it can help to reduce costs, risks, and the probability of failure as they provide government agencies and citizens mutual benefits (Carter et al., 2016; Chen & Aklikokou, 2020). According to information from the Organization for Economic Cooperation and Development on Latin America and the Caribbean Digital Government Index report (OECD, 2019), there is important progress regarding Internet use. By 2018, around 68% of the population used the Internet, representing twice the rate from 2010. Likewise, information reported by the Program for the International Assessment of Adult Competencies (PIAAC), belonging to the OCDE Program for the Assessment of Adult Competencies (OECD, 2020),

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points out that 73% of the citizens use the Internet to collect information, for 69% use it for e-mail, and less than 10% of the citizens use it for more advanced tasks. Another vital piece of information found in the report is that less than half of the participants between 15 and 65 years old reported having basic notions in the use of IT. In the same report, the Economic Commission for Latin America and the Caribbean (CEPAL, 2021) estimates that the on line participation in Mexico, referring to citizens use of IT in terms of public services, reaches a region index above 0.594, contrasting other countries like Denmark, Finland, and Korea web sites that reach a citizens participation index of 0.999 and 1 point, as the highest scores worldwide.

Moreover, the crisis resulting after the SARS-Cov-2 pandemic has turned IT into a key performance element in all sectors of society (Dey et al., 2020). Now is the time when digital tools have become (in some contexts) the only way to deliver services in government, industry, and education, where information safety and protection are a priority. Using IT is essential now as governments need to protect data and guarantee information while at the same time, they face the urge to offer trustworthy services, with easy access to society. This is how IT has surpassed the borders and eliminated commerce barriers with the use of the Internet.

In Latin America, citizens demand digital services and access to IT; these two have been popular topics in public administrations in terms of design and incorporation of e-government initiatives. According to Roseth et al. (2018), face-to-face procedures represent around 89% of the services offered by governments. In Mexico, e-government initiatives like public online digital services and procedures include deploying a one-stop-shop, a digital platform offering digitalized procedures and services in different levels and areas of government. In this sense, the Mexican government implemented the National Digital Strategy initiative (Mexico-Digital, 2018) and recognized e-government as an alternative to reduce corruption, promote real-time online transactions and increase tax collection. Additionally, e-government is an opportunity to make public administration more efficient, reduce administrative burdens through technology, and provide improved public services to citizens (United Nations, 2020).

Citizen adoption of information systems (IS) is a crucial element in searching for a successful e-government implementation (Alzahrani et al., 2016). The main purpose of the current study takes its base in the essential elements of the Technology Acceptance Model (TAM) (Davis, 1989). The goal is to take the TAM's focus in determining the influence of perceived usefulness and perceived ease of use of e-government services to generate trust and to influence the user's intention to use an e-government services portal. This way, the findings will help analyze the viability and understanding of adoption of e-government strategies. For the above, a questionnaire is designed and validated, applied to citizens who make constant use of online services, to analyze later the data collected with Structural Equations Modeling (SEM) and verify or reject the hypotheses raised to generate the main conclusions and contributions to knowledge.

Literature Review

Within the search of answers to measure citizens' acceptance and use of technology, the TAM studies the user's technology acceptance through two main factors: perceived usefulness and perceived ease of use. According to Al-Hujran et al. (2015), these variables are widely accepted because of the evidence in the elaboration of constructs for the analysis and evaluation of the prediction and intention to use different information systems. This model refers to the user's interaction or experience in using an IS or technology for the first time, the decision of how and when to use it is influenced by the intervention of a series of different factors (Davis & Venkatesh, 1996). In the TAM, Davis (1989) suggests that within the acceptance of IT, three important elements intervene: attitude, intention, and behavior of the user that together with usefulness and the perceived ease of use, can predict the acceptance in the use of a certain technology.

TAM is one of the most widely used models worldwide for predicting the success or failure of information technologies by end-users. However, it is necessary to recognize the theoretical and methodological limitations of the new realities of the digitalized world and understand how many studies carry out this approach without making real contributions to knowledge by not delving into causal models (Bagozzi, 2007). Li et al. (2020) criticize that TAM is not robust enough for emerging technologies such as artificial intelligence or the Internet of Things. Venkatesh et al. (2003) state that it only focuses on two variables: perceived usefulness and perceived ease of use, ignoring current factors such as the mandatory use of technologies in institutions, virtual reality, or commerce based on computer social media. Similarly, Chuttur (2009) criticizes that questionnaires focus on perceptions and that this is often not the reality experienced by users, an idea shared by Lee et al. (2011) by stating that these perceptions evolve, even from one day to the next.

It is essential to consider that TAM has not maintained its original shape but has evolved through the contributions of various researchers (Davis & Venkatesh, 1996; Venkatesh et al., 2000). According to the context of its application, variables have been added, and in the case of e-government, trust is added to measure the acceptance of online public service systems (Chen & Aklikokou, 2020; Santhanamery & Ramayah, 2018).

a. Perceived usefulness

Perceived usefulness refers to how much the user considers the use of an information system will provide help and obtain benefits regarding the performance of their work (Davis, 1989). It is probably the most important factor that infers users' intention to continue using a certain e-government service (Tsui, 2019). The construct perceived usefulness has also been pointed out and has been proposed as an intermediary of the dependent and independent variables within the use of the TAM; therefore, both the empirical and theoretical value can predictively influence within any research model and not only causally (Oentoro, 2021).

In this sense, various studies have established the importance of perceived usefulness in the intention to use an e-government service (Hamid et al., 2016). However, some studies show that perceived usefulness does not significantly correlate to the use of e-government services (Buyle et al., 2018). Therefore, its evaluation is important to know the relationship of the perceived usefulness in the intention to use e-government systems by the citizens and characterize the study phenomenon to increase the positive perception of the usefulness of e-government services by citizens (Wang et al., 2016).

b. Perceived ease of use

Meanwhile, perceived ease of use refers to the perception that a person has simplicity in the use of a certain computer system that does not represent any effort (Davis, 1989). Chen and Aklikokou (2020) indicate that this variable substantially affects the intention to use e-government services. However, there are also studies in different contexts through the application of TAM, such as the one carried out by Alotaibi et al. (2017), in which the relationship of perceived ease of use is not significant with the intention of using e-government services, at least within the context of the Saudi government.

These findings are not surprising. According to the theory in technological advances, using an easy-to-handle IS would be ideal for anyone. However, it cannot be ignored that not all users have access to technological resources, and many of those that do, do not have a basic knowledge about how they work; therefore, perceived ease of use represents a fundamental aspect within the development of e-government platforms, as it is a crucial aspect in the use of online services. In this sense, Davis (1989) points out that both perceived usefulness and perceived ease of use are among the variables with the most significant influence on the use of IS as they try to explain whether users intend to use IS they believe will help them perform better in some activity related to their work.

c. Trust

Within the studies of the use and adoption of e-government services, trust has been pointed out as a variable with influence on the citizen (Rana et al., 2017), some include it as a major determinant of dependence and acceptance, mediating the citizen's beliefs towards automation and their intention of use (Khan et al., 2020). Pavlou (2003) found that within the use of technological platforms and the Internet, users present a certain degree of uncertainty, so they seek a certain guarantee that their interaction and, if it is the case, their online transaction is safe. Therefore, research shows that through the generation of trust, e-government has the potential to improve transparency and accountability since electronic services are usually adopted only if citizens consider them trustworthy. This factor can be fundamental in developing and implementing successful e-government projects (Abdelhakim & Idoughi, 2021), since users who have a perception of confidence in using a particular IS/IT tend to gain a greater willingness to adopt e-government services. Therefore, citizens can efficiently perform such services online when they perceive a certain degree of confidence in using a computer system (Sharma et al., 2020).

Building up trust represents an essential aspect in the relationships among government, citizens, and the use of digital online services, as trust, impacts the use of those online services (Carter et al., 2016), that is, if the intention is to substitute traditional in site public services in government offices by online services, these should show commitment and responsibility to keep the promise to deliver them efficiently and effectively (Alzahrani et al., 2016), but if citizens' level of trust is low, the tendency to mistrust in government policies and performed actions will also be low (Turel et al., 2008).

Trust in e-government makes it possible to significantly predict the intention to use online services (Sharma et al., 2020). Therefore, to achieve the success of these services among citizens, it is required to provide personal information that the government will use and for which it will have specific access privileges, which may cause some resistance and will generate in citizens a certain degree of doubt regarding the benefits related to the use of the services. In this context, studies have shown that trust in government can influence the intention to make transactions with the e-government services website (Carter & Bélanger, 2005).

d. Intention to use

According to Davis (1989), the intention towards use refers to the degree to which a certain user conceives plans to carry out a certain level of behavior in the future, that is, when they find themselves in a situation of choice between two or more behavioral alternatives, the intention is situated between two limitations: the one conditioned towards the use of a particular element to be evaluated or opting for the non-use of that element (Nzaramyimana & Susanto, 2019), in such way, the intentions to use of these two alternative behaviors indicated as examples are mutually dependent (Konerding, 1999).

It has been stated that this construct predicts an individual's behavior in the use of technologies (Vahdat et al., 2021). Therefore, the intention to use can determine the behavior regarding the actual use of a specific service by users (Ahmad & Kirmani, 2020).

Regarding the case of the adoption of e-government services, the expectation around the adoption and use of these services is influenced by the user's perceptions of the benefits to be obtained: perceived usefulness and their perception of how much it is easy to operate these procedures online, perceived ease of use (Mensah et al., 2017), as a result, these attitudes subsequently lead to the intention to use e-government services (Tsui, 2019).

This research involves the intention to use of the citizens regarding e-government services to determine the influence of the perceived usefulness and perceived ease of use to generate trust; so, the original variable of TAM of actual use has been withdrawn. In the same way, the attitude variable has been excluded, since in the analysis of the literature, the various studies argue that this variable has a partial effect playing a role as mediator of the effect of perceived usefulness on the intention to use, which has been excluded in TAM updates (Davis &

Venkatesh, 1996). Trust has been integrated into the model as a predictor of the intention to use (Pavlou, 2003; Carter & Belanger, 2005), and therefore, the following hypotheses are established:

H_1. Perceived usefulness of the citizens about e-government online services promotes the Intention of their use.

H_2. Perceived usefulness of the citizens towards online services, allows the development of citizens' Trust in e-government.

H_3. Perceived ease of use by the citizens towards online services, generates Trust in the citizens in the operation of the e-government.

H_4. Perceived ease of use by the citizens of e-government online services influences their Intention to use these services.

H_5. Trust of the citizens towards e-government online services is an adequate way to increase the Intention of use.

Method

Technologies are an essential part of any type of organization, public entities are not exempt from this situation, but rather, they are forced to adapt their performance to the new realities of the digital and globalized world. The objective of this research took the TAM as a reference to determine the influence of perceived usefulness and perceived ease of use of e-government in the generation of trust and their relationship with intention to use online public services by the citizens. This study is important, since, according to the analysis and review of the literature, the existence of studies at the international level that support the proposed theoretical model can be observed, however, in the specific case of Mexico, the analysis on the subject is still scarce and e-government research is weak, hence the importance of conducting studies on the subject.

In order to achieve the above, a questionnaire has been developed, which takes its foundations in the works of Davis et al. (1989), Jian et al. (2000), Venkatesh et al. (2000), McKnight et al. (2002), Legris and Collerette (2003), Gefen et al. (2003), Van Slyke (2004), and Böhm et al. (2009), written in English and used in other contexts, in such a way that adjustments were made to apply it to the context and study environment in Mexico. It is important to state that only some items were taken from some constructs, which form the variables that make the model, as are perceived usefulness, perceived ease of use, trust and the intention to use, coupled with information of a general nature related to demographic aspects of the respondent. The scale used for the instrument is a 5-point Likert type, where 1. Totally disagree, 2. Somewhat agree, 3. Neither agree nor disagree, 4. Somewhat agree and 5. Totally agree. The scale's adaptation was designed based on the experiences of the analysis carried out and considering the population of this Mexican state. Users have different ages and diverse academic levels, and the 7-point Likert scale has more options to choose from and, therefore, can confuse and discourage respondents.

Subsequently, the instrument was sent to two experts on the subject for their evaluation, obtaining observations and the elimination of some items, as well as the adequacy in the wording of some others, which allowed to give a greater validity of the instrument. A pilot test was then carried out with 30 citizens who use e-government services, to validate the instrument and make it understandable for its application.

To achieve the goal, the literature on the dependent and independent variables was analyzed and they were operationalized as follows:

- Perceived usefulness: speed, personal value, effectiveness, interactivity
- Perceived ease of use: ease, clarity, understanding, use, information consultation
- Trust: reliability, paperwork, security, sharing information
- Intention to use: continuous use, desire for interaction, information exchange, information search

The universe of research subjects is difficult to determine as there is no public information that could serve to define citizens who use e-government as there are no government offices that provide this data (National Institute of Statistics and Geography, the National Institute of Transparency, or the Access to Information and Protection of Personal Data), for this reason, a number greater than 100 cases was considered that allowed the potential of the SmartPLS software to be developed and the results are of acceptable quality.

E-government is the next step in the evolution of information technologies, especially with the Internet. In this research, the fieldwork was carried out in the state of Tamaulipas located in the northeast of Mexico. Regarding the sample, a non-probabilistic one was chosen for convenience. This data collection approach is less costly, saves time, and provides relatively easy access to the target population; unfortunately, this latter approach is not representative of the general population and can bias the data by focusing on a particular group of respondents (friends, students, etc.). It can also lead to a low confidence interval, so these aspects were carefully considered during data collection, and as such, it will not affect descriptive or inferential analysis. To achieve it, written requests were sent to contact some of those in charge of the government in the state of Tamaulipas, explaining the need for support to apply the instrument to citizens who carried out government procedures in the facilities they preside, and letting them know that the purpose of the activity was exclusively for academic purposes.

Before applying the survey, the subjects were asked if they were users of the web site of the Secretary of Finance of the Tamaulipas government for online payment of services, and based on their response, they continued or not with the online questionnaire. A favorable response was obtained, which allowed the application of the instrument. The data collection resulted in 361 valid instruments, and the normalization and validation analysis of the data obtained was carried out. All those who responded were made aware that their information would be treated confidentially and anonymously.

The data analysis, in its first part, is through descriptive statistics and in a second moment, inferential analysis through Structural Equation Modeling (Partial Least Squares - PLS). When executing the PLS algorithm, it was necessary to eliminate items that did not have the minimum load, in Trust (Tru3) and Intention to use (Inten2, Inten3), for which, the model was executed again to improve it (Hair et al., 2019). Therefore, with the 361 questionnaires and in conjunction with the SmartPLS software parameters of a subsample of 5000 subsamples, the trust interval method used is Bias-Corrected and accelerated (BCa) Bootstrap, a one-tailed test type and a significance level of 0.05, the crossovers of variables, the correlation matrix, factor loadings, the Average Variance Extracted (AVE), t-statistic, the explained variance (R^2), the effect size (f^2), the standardized path coefficients (β), Heterotrait-Monotrait Ratio (HTMT) and the Standardized Root Mean Square Residual (SRMR) were obtained in order to validate the values, and to verify their consistency, homogeneity, heterogeneity, and thus to demonstrate the five proposed hypotheses.

Results

Before beginning the discussion of the results achieved, taking into account that many of the benefits of TAM have been described, to find constructive academic criticism, the following are some studies, primarily focused on limitations mainly government corruption, the digital divide, and the citizen's exclusion, that have been conducted regarding e-government and TAM in emerging economies: Rana et al. (2015) include variables such as trust and the digital divide experienced in countries like Brazil and India. Al-Hujan et al. (2015) present that the main limitations of e-government in Latin America are internet access and digital skills. Dwivedi et al. (2017) analyze the low utilization of computers for e-government (India), emphasizing the application of mobile platforms.

Based on the above, it is now necessary to move on to statistical analyses that lead to an analysis of what was found about the reality of emerging countries, in this case, Mexico:

Regarding the sex of the respondents, the female sex predominates with 60% compared to 40% of the male sex. The age range, the highest percentage are people between 31 and 40 years old with 31.4%, followed by those between 41 and 50 years old with 27.7%, 22% between 21 and 30 years old, 11% of 50 years or more and finally, are those people under 20 years old, they represent 7.9%. Regarding marital status, the results show that 50.6% are married people, 36.4% are single, 6.8% are divorced, 5.1% live in a common-law union and finally, 1.1% are widowed. The level of studies, the majority have a university-level with 89%, followed by 9.9% from high school, 0.6% with junior high and, only 0.6% with primary level.

The inferential analysis is carried out with SmartPLS 4 (Ringle et al., 2022) which is an ideal tool for research in information technology since it allows evaluation it in two stages (Hair et al., 2019): a) model measurement (psychometric properties of the scale used to mediate a variable) and b) the estimation of the structural model (the strength and direction of the relationships between the variables).

a. Validation of the measurement model

- Item reliability: it is examined with factor loadings (λ) or simple correlations. To accept an item, it is necessary to have a value greater than 0.707 (λ^2, 50% of the variance is explained) (Chin, 1998). The results show acceptable values in its 17 reflective indicators (Table 1, Column 2). The load factors are in the range of 0.824 to 0.917, exceeding the minimum recommended.
- Internal consistency (composite reliability): it is measured by Cronbach's alpha (minimum value of 0.7), and the Fornell and Larcker (1981) statistic of 0.707. Table 1 Column 3 indicates that this validation is correct when it exceeds the accepted minimums.

- Convergent validation: it is carried out through AVE, which requires a value greater than 0.50 (more than 50% of the variance of the variable/construct is provided by its items) (Fornell & Larcker, 1981). It can only be applied to reflective items, as in this research. The results of the evaluation are adequate, in Table 1 Column 5, AVE in the four constructs exceeds the minimum required value of 0.500. Their values range between 0.747 and 0.803. Likewise, resampling was carried out with 5000 subsamples to obtain the t-statistic values, the results in Table 3, Column 3, show that four out of five hypotheses have the necessary elements to be accepted.

- Discriminant validation: for this evaluation, the HTMT statistic is used, which corresponds to the average of the *heterotrait-heteromethod* correlations concerning the average of the *monotrait-heteromethod* correlations and requires values less than 0.90, optimal values would be less than 0.85 (Henseler et al., 2015), Table 2 places the results as favorable. Another element in this validation is the Dijkstra-Henseler indicator (rho_A), which exceeds the recommended minimums of 0.7 (Table 1, Column 7).

Table 1. Individual Reliability of item loading and convergent validity of coefficients

Variable Item (Loading)	Composite Reliability	Cronbach alpha	AVE	R^2	rho_A
Perceived usefulness PerU1 (0.824), PerU2 (0.845), PerU3 (0.879), PerU4 (0.888), PerU5 (0.884)	0.937	0.915	0.747	Not apply	0.919
Perceived ease of use Ease1 (0.810), Ease2 (0.903), Ease3 (0.893), Ease4 (0.887), Ease5 (0.874)	0.942	0.922	0.764	Not apply	0.924
Trust Tru1 (0.903), Tru2 (0.873), Tru4 (0.891), Tru5 (0.917)	0.942	0.918	0.803	0.690	0.919
Intention to use Use1 (0.872), Use2 (0.887), Use3 (0.888)	0.914	0.859	0.779	0.654	0.866

Note: Not apply, responds to the fact that the variables Perceived usefulness and Perceived ease of use, the R^2 is not used since they are and represent the combined effects of the independent (exogenous) variables on dependent (endogenous) variables (Hair et al., 2019).

Table 2: Heterotrait-Monotrait Ratio (HTMT)

	Trust	Ease of use	Intention to use	Perceived usefulness
Trust				
Ease of use	0.891			
Intention to use	0.884	0.827		
Perceived usefulness	0.799	0.869	0.749	

b. Validation of the structural model

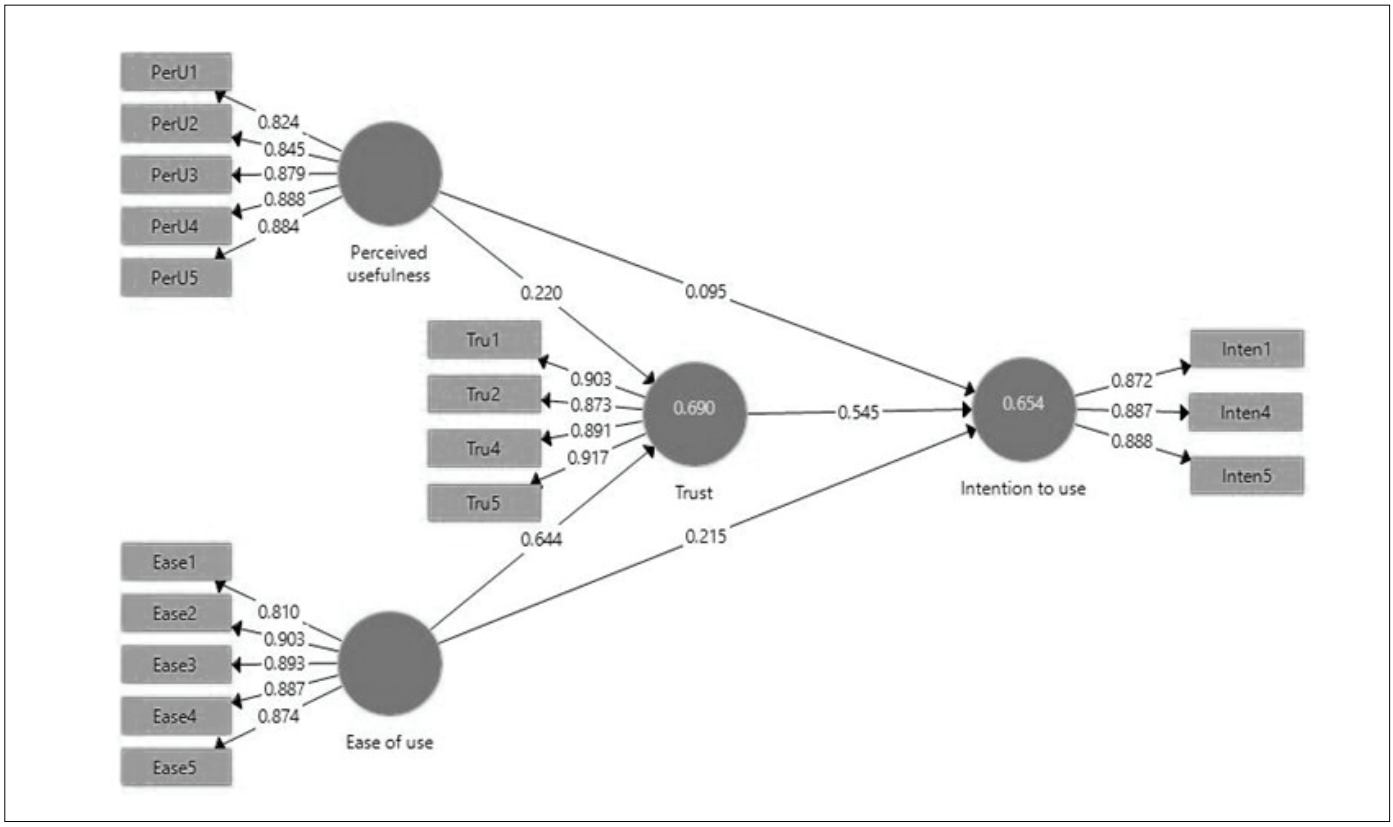
Two basic indexes are used for this assessment: explained variance or coefficient of determination (R^2) and standardized path coefficients (β). The R^2 provides an index of the predictivity of the independent (exogenous) variables and β are the arrows in the nomogram (PLS graph) that link the variables in the internal model, and it is obtained in the same way as multiple regression. To do this, Chin (1998) proposes that β should reach at least a value of 0.2 and ideally be above 0.3, and R^2 at a level of 0.67 represents a substantial effect, 0.33 moderate and 0.19 weak. Also, the significance (t-statistic) must be less than 0.05 ($p<0.05$) and for a subsample of 5000 from one tail (Hair et al., 2019): t (0.05; 4999) = 1.645, which represents * $p<.05$; t (0.01; 4999) = 2.327, which represents ** $p<0.01$, and t (0.001; 4999) = 3.092, which represents *** $p<0.001$. Added to the above, is the index f^2, which is used to know if the independent variable has a substantial impact on the dependent variable and its guidelines according to Cohen (1988): 0.02, 0.15, and 0.35 represent a small, moderate, and large effect respectively.

Table 3 shows the evaluation of the model, and the hypotheses based on the literature review and Figure 2 details the PLS nomogram.

Table 3. Hypotheses test results

Hypotheses	f^2	β	t-statistic	p-values	Remarks
H_1. Perceived usefulness → Intention to use	0.009	0.095	1.264	.103	Not supported
H_2. Perceived usefulness→Trust	0.056	0.220	3.247	.000	Supported
H_3. Ease of use → Trust	0.479	0.644	10.318	.000	Supported
H_4. Ease of use → Intention to use	0.032	0.215	2.830	.000	Supported
H_5. Trust → Intention to use	0.267	0.545	7.537	.000	Supported

Figure 2: Evaluated research model



Discussion

Figure 2 graphically shows the results obtained from the model, which allows the evaluation and interpretation of the hypotheses raised. In the proposed model, the variables of the Technological Acceptance Model were used by Carter et al. (2016) in a study to measure the adoption of digital services of licenses and vehicles of the offices of the government in the United Kingdom and the vehicular department of the southeast in the United States of America, where the results make clear the critical aspect of both variables in the study: perceived usefulness and perceived ease of use and their impact in the actual use of e-government services. In the same way, the variable trust from the model proposed by Pavlou (2003) is integrated, which predicts the acceptance of electronic commerce users, and as the digital services of e-government, they use information technologies and the Internet for transactions and the author emphasizes in his study that both electronic commerce and electronic government share certain dimensions that characterize them such as: a) the use of technology to carry out transactions, b) environmental uncertainty, due to the spatial and temporal separation between user and company or government, and c) reliability in the infrastructure that allows the transaction.

In this same sense, Alzahrani et al. (2016) used the DeLone and McLean model to analyze the acceptance of e-government systems and integrated trust as a variable. That way the relationships that are presented with the proposed model, respond not only to a single theory but to the integration of different models used to measure the acceptance of information systems that are specifically integrated to measure acceptance of digital e-government services, which in turn represents an opportunity for future research.

Hypothesis 1 established that the perceived usefulness of the citizen about e-government online services promotes their intention to use, which is rejected, as it can be observed in Table 3, it shows a coefficient β of 0.095, a t-statistic of 1.264, and a significance value above 0.05; therefore, these results show that there is no significant relationship between these two variables, these results agree with what was found by Rifat et al. (2019), who concluded that perceived usefulness does not impact on the intention to use of the citizens to adopt government services in Bangladesh. These results allow us to understand that perceived usefulness by the citizen is not significantly related to the increase in their intention to use the information system, that is, the fact that online public services represent help and the obtention of a performance benefit (Davis, 1989) does not represent a direct incentive that encourages the intention regarding the use of e-government services by the citizen.

Hypothesis 2 is accepted, regarding whether the citizen's perceived usefulness towards online services allows the generation of trust towards the use of online services, since the values show a coefficient β of 0.220, and a t-statistic 3.247*** with an acceptable level of significance ($p<0.001$). This result differs from what was presented by Herzallah and Mukhtar (2016), in which no significant relationship was found between these two variables. However, it agrees with the

study carried out by Santhanamery and Ramayah (2018), who found a positive and significant relationship between perceived usefulness and trust. Therefore, the results obtained allow us to understand that perceived usefulness in the use of online systems increases the levels of trust and security the citizen has for performing online tasks such carrying out electronic payments, procedures, as well as for the granting of personal information to conduct online transactions.

Hypothesis 3 is accepted, in terms of proving that perceived ease of use by the citizen towards online services generates trust in the citizens in terms of e-government online services. The values show a coefficient β of 0.644, and a t-statistic of 10.318***, which shows that there is a relationship between the perceived ease of use and the trust of the citizen towards e-government services. These results agree with the findings of Nofal et al. (2021), in which the ease of use variable has a positive and significant relationship towards trust. These results explain that perceived ease of use by the citizen in the use of online services increases the level of trust in the use of the public services web portal.

Hypothesis 4 establishes that perceived ease of use by the citizen of the e-government online services influences the improvement of the intention to use these services, which is accepted since the coefficient β reached a value of 0.215, and a t-statistic of 2.830**. These results agree with the finding of Hamid et al. (2016), in which they point out that perceived ease of use maintains a positive and significant relationship in the intention to use the information system. Therefore, it can be understood that perceived ease of use of online procedures and services is positively related to the increase in the intentions to use the public web services portal.

Finally, hypothesis 5 is accepted, as it refers to the relationship of trust of the citizens towards the e-government online services and how it means to increase the intention to use them since it presents a coefficient β of 0.545, and a t-statistic of 7.537***. This result agrees with the findings of Ramos et al. (2018) in which the variable trust is significantly related to the intention to use the IS. This explains that the more trust the citizen has in the use of online public services, the intention to use them will be greater.

Conclusions

The impacts caused by the SARS-Cov-2 virus pandemic have increased the use of information technologies as part of a comprehensive solution in the development of the new normal. Public and private organizations have made use of technological tools to provide efficient, reliable, and innovative services that have an impact and influence acceptance by society. Governments are no exception. The measures to prevent the spread of the virus have led to the search and development of innovative solutions using information technologies to respond to the demands of citizens, regarding the procedures and services offered by governments.

These results show that governments need to consider factors such as perceived usefulness, perceived ease of use, and trust in terms of citizens' intention to use e-government services. Administrations should consider some aspects when planning to design their e-government strategy and implement digital services. They need to take into consideration that the citizen undergoes a new digital era, they have access to faster, more efficient services in less time, this represents the challenge to offer services that meet their trust expectations towards the use of the website. As a result, citizens' use of e-government strategies, will impact the administration with greater transactions, greater flow of payments, an increase in the completion of procedures and services and at the same time, it will facilitate the citizens' confidence in e-government and personal data exchange flows will also improve, in this sense, the ease that the citizen perceives from the website will favor in the same way to the use of public digital services.

This research provides action guides for governments to define strategies that increase the usefulness and ease of use of digital services to promote the transaction and use of online procedures, which can be achieved by facilitating interaction with the website through clear, intuitive content, simple searches, with simple information that facilitates its use and promotes trust and at the same time, process timing becomes more efficient, without waiting periods, or long lines, that is, they imply less effort in comparison to traditional processing.

As mentioned above, governments would have to ensure that their citizens' trust in the digital services site increases and improves to facilitate their adoption, involving key processes that impact citizen security and allow them to perceive appropriate management of their information, with appropriate security measures to meet relevant trust expectations.

As a result of the foregoing, the promotion and encouragement of the use of e-government digital services depend to a great extent on the experience that the user may perceive, in such a way that if this experience offers an environment of achievement, where the processes are carried out successfully, reliably, safely, expeditiously, with transactions that are achieved in the expected times, this will, in turn, generate a satisfied user who is willing to use the technology and trusts its use, while promoting it. Otherwise, a user who cannot obtain the experience they are looking for is a user who will avoid using technology, since the effects are not as desired, thus reducing the adoption of online services.

Another interesting aspect is regarding the issue of perceived usefulness, although citizens do not consider it as a direct incentive regarding their intention to use electronic government services, perceived usefulness does play an important role towards the intention to use through trust. It can be inquired that the system can be perceived as very useful, however, this does not encourage its use. However, if the system provides citizens with trustworthiness, these intentions will be positive regarding the use of government digital services.

The findings shown in this research may be useful for those in charge of planning, developing, and implementing digital services within government structures, to maintain synergy regarding the improvement of services provided by governments, facilitating interaction, promoting the use of the e-government systems by increasing citizens' levels of trust to adopt more services offered by government entities.

Therefore, these findings are important for governments, as they are a resource for administrations in terms of considering the provision of digital services that are not only useful but also generate trust in citizens. This way, governments can carry out successful implementation of e-government services.

Limitations: the results cannot be generalized to other areas of the country, validation is required in other contexts, other citizens, and other ways of implementing e-government practices, considering the social conditions of each region or country, it is also necessary to include current variables such as social media, artificial intelligence, and word-of-mouth among digital users. Likewise, the questionnaire can be administered randomly to achieve greater external validity. The data collection was only done in some government institutions, therefore, it would be interesting if future studies include other public entities, as well as being able to contemplate other variables that can complement the model used here. Finally, this analysis does not stem from a simple, established model of technology acceptance and e-government; it is even necessary to incorporate theories that are appropriate for these realities, such as Diffusion of Innovations (DOI) theory and Theory of Reasoned Action (TRA).

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