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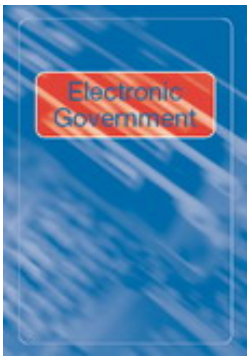

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Moderating role of government policy in electronic government adoption among Algerian petroleum companies

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Abstract: E-government is a global trend that accelerates across countries, which affiliates firm's internal and external connections and transactions, resulting in firm's transparency and efficiency. However, interoperability within organisations is limited and ineffective in developing countries like Algeria. Thus, the current study examines the factors influencing e-government adoption using the DOI and TOE frameworks, which encompasses IT infrastructure, security, top management support, organisational culture, awareness, and training. This research also examines the role of government policy as the moderating effect between the interrelationships. Stratified sampling was used to test the hypotheses. The data were collected through a survey from 170 top management executives of petroleum companies in four regions of Algeria (South, North, West, and East). SPSS version 26.0 and PLS-SEM 3.3.3 were used to analyse the data. The findings indicated that only IT infrastructure and top management support influencing e-government adoption. Only security and training were moderated by government policy, whereas awareness was negatively moderated. The findings of this study will assist researchers, policymakers, and Algerian petroleum companies in prioritising the improvement of IT infrastructure and top management support to enhance e-government adoption in Algeria.

Keywords: DOI; TOE factors; e-government adoption; Algeria; petroleum companies.

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1 Introduction

The information and communication technology (ICT) revolution has altered numerous facets of contemporary society worldwide. Similarly, on a global scale, this revolution has altered how governments communicate with citizens, businesses, institutions, employees, and other stakeholders (Lee, 2010; Rokhman, 2011). Reforming and digitising the public sector is necessary to increase efficiency, effectiveness, accountability, and transparency while improving communication and access to information for stakeholders (Al-Shafi and Weerakkody, 2009; Christofi et al., 2019).

As a result of this technological advancement, government organisations' affiliations have been constrained to reconsider their internal and external connections and transactions. As a result, governments' administrative processes must be transformed into electronic systems in order to achieve sustainable development. Al-Sobhi et al. (2010) demonstrated that governments worldwide are attempting to develop an electronic mechanism (electronic government) within their organisations and institutions in order to replace less reliable traditional services with more reliable ones. E-government is critical in order to accomplish these objectives. It is critical for nations to fully leverage e-government to remain competitive in the globalised 21st century (Glyptis et al., 2020).

The e-government aims to increase transparency, accountability, and sensible governance (Rehman et al., 2016). It is expected to improve citizen services, consolidate ties with business and industry, citizens' empowerment across information access, and rationalise government administration. It may result in a reduction in corruption and an increase in transparency, as well as increased convenience, revenue growth, and cost savings.

Numerous researchers have recognised the benefits of e-government. It entails a greater degree of transparency and the ability to combat corruption (Ismail et al., 2020); cost savings (Suzuki and Suzuki, 2020); time savings (Gilbert et al., 2004); economic

growth (Azim et al., 2020); and sustainable development (Azim et al., 2020; Othman et al., 2020). However, without effective e-government, it becomes more challenging to achieve government growth, economic expansion, poverty alleviation, citizen wealth, and sustainability (Del Giudice et al., 2019; Hanna, 2010; Saxena, 2018).

E-government is a global trend accelerating in developed and developing countries (Napitupulu and Sensuse, 2014). Additionally, the Algerian government recognises the critical importance of electronic government in order to maximise the benefits of foreign trade opportunities. Algeria must boost its effectiveness and implement a market-based customs system to comply with World Trade Organization (WTO) standards (Ayashi and Brahimi, 2015). According to some scholars, it is critical to examine e-government among Algerian businesses, particularly the petroleum industry (Gunawong and Gao, 2017; Vakeel and Panigrahi, 2018). Algeria's economy is highly dependent on petroleum exports, and a possible decline in oil prices would jeopardise the country's growth (Hamzaoui, 2020). Consequently, the government must authorise substantive policy changes and strengthen non-petroleum sectors, including information technology and e-government, to avert a potential crisis. Like other emerging economies, Algeria struggles with low-quality e-government services, with some essential services being unavailable. Recently, several projects have been made to integrate ICT into Algerian public institutions by establishing web portals for specific institutions. However, by 2013, the e-Algeria 2013 project had stalled and been declared a failure (Benhamed, 2013). The e-Algeria program fails due to its implementation (Rym, 2015).

Previous studies have recognised numerous issues as crucial elements to consider when adopting e-government. Previously published research (Alajmi et al., 2020; Pathak et al., 2019) argued that fostering technological, organisational, and environmental (TOE) factors would improve e-government governance while influencing government decision-makers and policymakers.

Numerous prior studies have documented numerous such business failures due to poor e-government implementation and an inability to adopt e-government, especially in developing countries (Aladwani, 2016). Algeria was chosen as the focal point of the current study for various factors. First is due to its size as Africa's largest country. Second, its geographic and demographic diversity range from heavily populated areas with robust ICT resources to the nearly deserted Sahara. Last, due to an unfinished e-government project (Idoughi and Abdelhakim, 2018). By focusing on a single sector of the Algerian government, namely the petroleum sector, which accounts for the majority of the national economy and is in desperate need of operational transformation, the study identifies critical factors affecting the e-government implementation.

The United Nations uses the e-government development index (EGDI) framework to rank member states on three dimensions: availability of online services, communication networks, and human resources (UNDESA, 2003; Pathak et al., 2019). Algeria was ranked 131st in the 2010 E-Government Growth Index (EGDI) out of 193 countries. Algeria's E-Government has been regressing year after year. Algeria was ranked 132nd in 2012 and 136th in 2014 by the United Nations, out of 193 countries (UNDESA, 2010, 2016). Algeria's situation deteriorated further in 2016, dropping to the 150th position (UNDESA, 2016). Algeria's ranking improved slightly to 130th in 2018 (UNDESA, 2018). It demonstrates the critical nature of additional research into e-government adoption and implementation in Algeria.

To address the aforementioned issues and gaps, this study examines how TOE factors influence e-government adoption, particularly among Algerian petroleum companies.

Similarly, this study adds to the body of knowledge by examining the moderating effect of government policy on the correlation between TOE factors and the adoption of e-government. The DOI theory motivated the current study, which examined technological factors such as information technology infrastructure and security. While organisational factors such as top management support and organisational culture are considered, environmental factors such as awareness and compliance with training are considered. The current study fills a gap in the existing literature by examining the impact of e-government adoption on Algerian petroleum companies.

1.1 Research motivation

The United Nations uses the EGDI framework to rank member states on three dimensions: availability of online services, communication networks, and human resources (UNDESA, 2003; Pathak et al., 2019). Algeria was ranked 131st in the 2010 E-Government Growth Index (EGDI) out of 193 countries. Algeria's E-Government has been regressing year after year. Algeria was ranked 132nd in 2012 and 136th in 2014 by the United Nations, out of 193 countries (UNDESA, 2010, 2016). Algeria's situation deteriorated further in 2016, dropping to the 150th position (UNDESA, 2016). Algeria's ranking improved slightly to 130th in 2018 (UNDESA, 2018). It demonstrates the critical nature of additional research into e-government adoption and implementation in Algeria.

2 Factors affecting e-government adoption and hypotheses development

2.1 Technological factors

Technological factors encompass all relevant and available technologies to the firm, including those in use today and those that are available but not yet in use. Numerous technological factors have been identified as influencing the implementation of any e-initiative, but particularly e-government. Two variables are proposed in this category: IT infrastructure and security (Tornatzky et al., 1990).

2.1.1 IT infrastructure

Infrastructure refers to the combination of operating systems that are accessible to an organisation both internally and externally and enables the provision of reliable and secure electronic services for procedures and the operation of internet-based businesses (Ang et al., 2001; Al-Omari and Al-Omari, 2006). IT infrastructure is defined as all aspects of information technology, including hardware, software, communication, communication networks, software applications, legacy systems, and the organisation's current technology and electronic systems. While access to adequate information technology infrastructure is necessary for introducing new internet technologies, insufficient access to information technology during the infrastructure development process may impede internet technology adoption (Joseph and Kitlan, 2008).

The integration of information and knowledge through IT infrastructure has been argued to be a necessary component of e-government adoption (Sook-Ling et al., 2015). Following that, Dombeu et al. (2014) argue that it is critical to first understand the current state of infrastructure and policies in order to forecast a country's entire e-government

initiative accurately. Similarly, Khamis and van der Weide (2017) asserted that IT infrastructure is at the heart of e-government, as adequate IT infrastructure is a prerequisite for e-government adoption. Server information includes tools for managing data and content, application development, hardware, operating systems, and system management platforms (Khamis and van der Weide, 2017; Khayyat and Lee, 2015). As a result, IT infrastructure in developing countries such as Algeria requires extensive analysis.

In contrast, Hassen et al. (2020), who conducted previous studies in Algeria, did not consider technology resources to be crucial variables in the adoption of e-government in Algeria but did identify IT infrastructure as a major factor for e-government adoption. Thus, the critical role of information technology infrastructure in the implementation of e-government in developing countries such as Algeria warrants further investigation (Riyadh et al., 2019). As a result, the current study stipulated the following:

H_1 IT infrastructure positively influences Algerian petroleum companies' e-government adoption.

2.1.2 Security

Björklund (2016) evaluated website security and emphasised the importance of addressing security concerns more comprehensively in order to increase business acceptance. The lack of security concerns has been identified as a significant hindrance to e-government adoption (Kumar et al., 2017). Among technical impediments, the primary impediment to technology usage, particularly the Internet, is security concerns (Bett, 2018; Joia, 2004; Rahman et al., 2014; Rana et al., 2015; Trkman and Turk, 2009).

Numerous previous studies (Allen et al., 2005; do Canto Cavalheiro and Joia, 2014; Joshi and Islam, 2018; Kumar et al., 2017) have identified security concerns as a significant barrier to internet use and e-government adoption. Furthermore, it is acknowledged as a significant impediment to citizens and businesses adopting e-government. Several prior studies even highlighted that even there is no issue regarding the system security, government should ensure the security standards through laws and legislations, in order to maintain a positive relationship with users (Almaiah and Nasereddin, 2020; Althunibat et al., 2021). Therefore, security concerns must be addressed in order to improve business involvement in e-government activities (Lean et al., 2009). Likewise, Algerian researchers also considered security (Dakhane and Henni, 2018; Nabil and Abdelhakim, 2014). They discovered that another critical factor affecting Algeria's E-Government implementation is security. The following hypothesis is proposed as a result of the current study:

H_2 Security is positively influencing the Algerian petroleum companies' e-government adoption.

2.2 Organisational factors

In this study, organisational factors refer to an organisation's characteristics and resources that connect its organisational structures to its employees. This factor affects the adoption of e-government in a variety of ways. Prior research has established critical factors, including top management support and organisational culture.

2.2.1 Top management support

Support from top management is associated with the willingness of top management to provide both resources and the level of authority necessary to ensure a project's success (Pinto and Slevin, 1987). According to Murphy et al. (2006), top management's favourable attitude toward e-government, in general, is the indicator of an organisation's support for e-government adoption. Prior research has established that top management support is vital to the development of e-government project adoption (Abed, 2020; Zeglat et al., 2014; Gangwar et al., 2015; Haneem et al., 2019; Kagoya and Mbamba, 2021; Mousa, 2020; Mukred et al., 2021; Riyadh et al., 2019; Twizeyimana and Andersson, 2019).

Top management could provide department and business unit managers with several guidelines regarding technology opportunities and risks (Barki and Hartwick, 1989). Similarly, Faaeq et al. (2014) identified top management support as a critical factor in e-government adoption and deployment. Such assistance is required to ensure management commitment to providing resources and fostering an organisational climate conducive to e-government adoption. Additionally, it is critical for overcoming impediments and resistance to change (Venkatesh et al., 2016).

Guemide and Benachaiba (2012a, 2012b) emphasised the critical role of top management support in implementing e-government in Algeria. They contended that e-government facilitates decision-making and resource allocation in Algeria. Additionally, they demonstrated that implementing e-government effectively would benefit the nation's education, research, and development needs. Likewise, they stated that e-government would assist businesses in identifying issues and potential solutions. As a result, the current study hypothesised the following:

H_3 Top management support positively influences Algerian petroleum companies' e-government adoption.

2.2.2 Organisational culture

Numerous issues related to organisational culture can affect the adoption of e-government (Willar et al., 2016). Governments should be prepared for any dynamic circumstances that may arise and pursue alternative strategies for implementing e-government (Jackson and Wong, 2017). According to Razmjooei et al. (2018), public culture development is qualitatively distinct from physical infrastructure development. Carter et al. (2016) asserted that e-government entails paradigm and cultural shifts, as well as possible resistance from organisational cultures. Thus, organisational culture significantly influences how businesses adopt new electronic initiatives, such as e-government (Al-Refaie and Ramadna, 2020; Aladwani, 2016; Pederson, 2016; Ziemba et al., 2016).

In recent years, information systems researchers have begun to investigate the effect of culture on the implementation and dissemination of information systems. Prior research (Khaldun et al., 2019; Ndegwa et al., 2017) has also looked at the effect of organisational culture on new technology adoption. These studies established that organisational culture is predictive of technology adoption, including e-government adoption (Chanasuc and Praneetpolgrang, 2008; Dasgupta and Gupta, 2009; Seng et al., 2010; Shaukat and Zafar, 2010).

Organisational culture is inextricably linked to Algerians' daily lives. Regrettably, Algerians prefer to adhere to tradition over embracing change and adopting a more advanced system (Faradji, 2012; Zerhouni, 2016). This type of issue also occurred during the transition to electronic government. They prefer to resolve their issues in person at a government office rather than incorporating e-government into their daily lives. Thus, organisational culture is investigated as a factor in Algerians' implementation of e-government. Additionally, it is necessary to determine whether it has an impact on Algerians' e-government implementation. The following hypothesis was formed as a result of these findings:

H_4 Organisational culture positively influences Algerian petroleum companies' e-government adoption.

2.3 Environmental factors

Numerous studies demonstrate that a variety of enablers, including complex network interconnected systems and security, encourage employees to adopt e-government (Kettani, 2014), infrastructure, and legal framework (Srivastava and Teo, 2004). External environment factors such as industry structure and the presence or absence of technology service providers are considered. Thus, environmental factors refer to any unrelated factor to a specific organisation. Environmental factor variables include awareness and training.

2.3.1 Awareness

While usability is critical for e-government, there is still a lack of knowledge about its usability (Kirui and Kemei, 2014). Numerous researchers (Almarashdeh and Alsmadi, 2017; Almaiah and Nasereddin, 2020) have established that awareness is a critical factor in citizens' adoption of e-government. They demonstrated that without awareness, implementing e-government systems will be ineffective. Awareness increases people's confidence and motivation to use e-government (Almaiah et al., 2020). The rapid advancement of e-government technologies and operations has highlighted the critical need for organisations that lack critical technical information to raise awareness (Khamallag et al., 2016). Salwani et al. (2009) discovered that awareness has a more significant impact on the adoption stage of e-government than environmental factors. Additionally, the literature indicates that one of the primary concerns associated with the involvement and use of new technologies is an insufficient awareness of the technology's existence (Abu-Shanab, 2017; Al-Sai and Abualigah, 2017; Alenezi et al., 2017).

While Algeria is aware of the potential economic benefits of ICT and e-government, its awareness and response to e-government implementation have taken a different path (Chaabna and Wang, 2015). Due to a lack of credit cards and trust in the banking sector, a lack of awareness of their consumer rights and responsibilities, a lack of knowledge about the benefits and risks of e-government, and a lack of interesting web content in the local language Arabic, Algerian users continue to prefer traditional channels for purchasing products and services (Chaabna et al., 2014). Regardless of the Algerian situation, prior research has shown that awareness is crucial in implementing e-government. As a result, the following hypothesis was proposed:

H_5 Awareness is positively influencing the Algerian petroleum companies' e-government adoption.

2.3.2 Training

Training is defined in this paper as activities conducted by a business to develop and maintain basic skills for e-government usage, as well as to retain IT experts who can help improve e-government implementation (Wairiuko et al., 2018). Employees and managers are expected to undergo training in order to be prepared to adapt to changing conditions in dynamic and novel environments (Abunadi, 2013). While some governments have their own IT staff, the training they receive may not be adequate to prepare them to develop web-enabled applications that pertain to industry standards. Due to the complexity of new technology, public sector organisations have increased their training commitment (Ebrahim and Irani, 2005). It is because training play a significant role in ensuring high self-efficacy for users, and for that reason the e-government should create some training programs for users to enhance their skilled human, and hence, become more likely to adopt e-government services (Almaiah et al., 2020). As a result, educating and training employees about new technologies enables them to be more adaptable to change (Fakhoury and Aubert, 2017).

H_6 Training is positively influencing the Algerian petroleum companies' e-government adoption.

2.4 Government policy

A policy is a guiding principle that serves as the foundation for establishing organisational regulations (Yusuf et al., 2016). It encompasses actions that have the ability to influence or direct decision-making. Additionally, it serves as a guide for forming judgments in the aftermath of an assigned event in accordance with management goals, objectives, and philosophies. Hanum et al. (2020) bolster this argument by emphasising the critical function of government policy in fostering the adoption of e-government. They discovered that government policy has a sizable impact on the adoption of e-government. One plausible explanation is that government policies serve as important indicators of an organisation's readiness for e-government adoption (Al-Rawahna et al., 2018; Dwivedi et al., 2017; Rodrigues et al., 2016).

Considerable research on government policy has been conducted in a variety of fields, with inconsistent findings regarding the use of information systems and their constituents as dependent, independent, and moderating variables. Some recent studies (Teklu, 2020; Duan, 2019; Hanum et al., 2020; Alghushami et al., 2020; Orji et al., 2020; Park and Kim, 2021) have established that government policy has a sizable impact on information system adoption. On the contrary, numerous previous studies have discovered that government policy has a negative or non-existent effect on IS adoption (Hsu and Lin, 2016; Gui et al., 2020; Hassen et al., 2020; Klug, 2014; Oliveira et al., 2014; Udoka and Orok, 2017; Wiradinata, 2018).

Given the contradictory findings exploring the effects of government policy on IS adoption, the current study will employ government policy to moderate TOE and e-government adoption, as Rehman et al. (2012) suggest. They emphasised the critical nature of enacting government policy in order to enhance awareness and comprehension

of TOE factors, including security and awareness. As a result, it is worthwhile to investigate the moderating effect of government policy on the relationship between TOE factors and the adoption of e-government by Algerian petroleum companies. As a result, the hypotheses included the following:

H_{1a} Government policy moderates the relationship between IT infrastructure and the Algerian petroleum companies' e-government adoption.

H_{2a} Government policy moderates the relationship between security and the Algerian petroleum companies' e-government adoption.

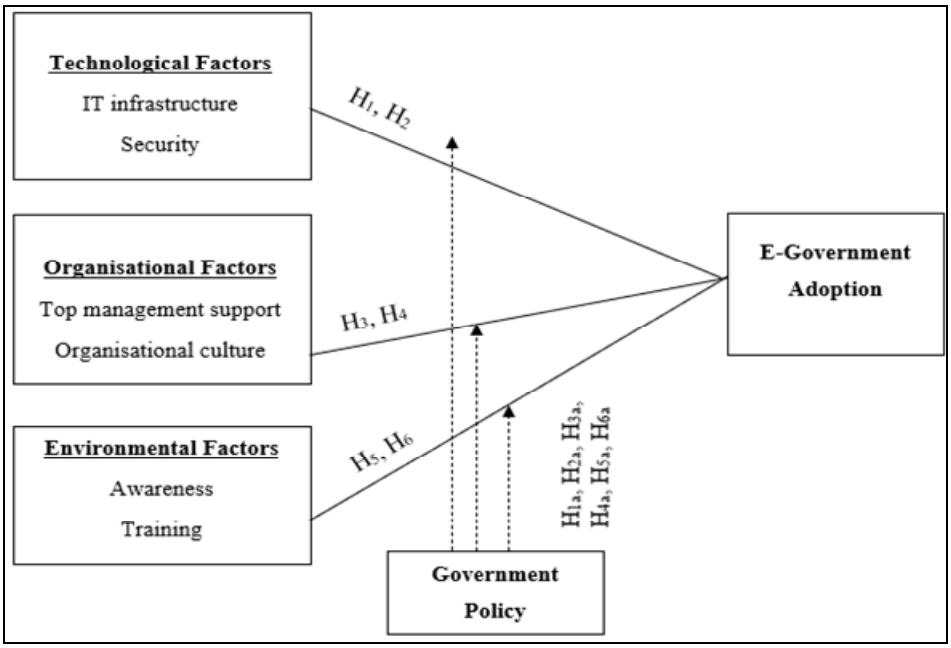
H_{3a} Government policy moderates the relationship between top management support and the Algerian petroleum companies' e-government adoption.

H_{4a} Government policy moderates the relationship between organisational culture and the Algerian petroleum companies' e-government adoption.

H_{5a} Government policy moderates the relationship between awareness and the Algerian petroleum companies' e-government adoption.

H_{6a} Government policy moderates the relationship between training and the Algerian petroleum companies' e-government adoption.

Figure 1 Research framework



3 Research methodology

This research is based on an empirical examination of petroleum companies in Algeria that are engaged in e-government adoption activities. The Ministry of Energy and Mines

provided the sample frame with a list of firms. The current study gathered 170 respondents from Algerian petroleum companies (n = 32), South (n = 115), East (n = 13), and West (n = 10).

To ensure the variables were measured in a valid and reliable manner, validated scales from previous research were used for all constructs in the current study. IT infrastructure is quantified using (Ramamurthy et al., 1999) items. Security is quantified using items from Fulford and Doherty (2003) and Jones and Beatty (1998). Top management support and organisational culture as organisational factors were adopted from Denison and Mishra (1995) and Sutanonpaiboon and Pearson (2006), respectively. The items of Papazafeiropoulou et al. (2002) are used to assess awareness. Training items were taken from Norris (1999). As for the government policy items, Zhu et al. (2006) items were adopted as the moderator of the current study. Finally, the adoption of e-government is measured using items from Zhao et al. (2008) that assess the extent to which petroleum companies have adopted e-government, with higher scores indicating greater satisfaction. All independent variables were quantified using a scale with poles ranging from strongly disagree (1) to strongly agree (5). While for dependent variables, the range is from not using them at all (1) to always using them (5).

IBM SPSS version 26.0 was used to assess the reliability and regression of the measurement items for each construct. This process involved distributing 170 questionnaires to managers and above at Algerian petroleum companies. The questionnaire was designed for respondents to complete in order to represent their organisation. Following that, reliability and regression analyses were conducted on the data collected as part of the measurement to determine the internal consistency of each construct. After determining the reliability and regression coefficients for the returned questionnaire, the data will be analysed using partial least squares (PLS) 3.3.3 to ascertain the true relationship between TOE factors and Algerian E-Government adoption. Likewise, we also investigated the moderating effects of government policy on the relationship between TOE and e-government adoption.

4 Results

4.1 Descriptive analysis

A total of 300 questionnaires were distributed among managers level and above of petroleum companies. One hundred seventy responses were, however, obtained. Most companies were operating between five to ten years (n = 51), more than 15 years (n = 50), less than five years (n = 36), and between 11 and 15 years (n = 33). 57.1% of the petroleum companies are citizen-owned with an approximate annual sales turnover of 3,000,000–9,900,000 DZA. 48.2% of the companies have overall 100–499 employees with up to five IT staff in the company, and less than 5% of their annual budget is allocated for IT. 28.2% of all companies considers themselves to be the industry leader and close follower in terms of internet usage. Additional demographic data can be found in Table 1.

Table 1 Descriptive analysis of respondents

Variable	*Classification of variables*	*Frequency (N = 170)*	*Percent*
Position in company	Owner/proprietor	8	4.7
	Managing director/chief executive officer	33	19.4
	Senior manager	90	52.4
	Manager	39	22.9
Gender	Male	135	79.4
	Female	35	20.6
Age	30 years old	32	18.8
	30–39 years old	61	35.9
	40–49 years old	55	32.4
	>50 years old	22	12.9
Level of education	Diploma	19	11.2
	Bachelor's degree	68	40.0
	Master's degree	77	45.3
	PhD	6	3.5
Access the internet	About an hour a day	5	2.9
	1 to 2 hours a day	9	5.3
	2 to 3 hours a day	25	14.7
	More than 3 hours a day	131	77.1

4.2 Measurement model

There are eight constructs and 50 measures, which are also known as items or indicators in this study's specified model. The internal consistency reliability, convergent validity, and discriminant validity were all examined when evaluating the measurement model. Hair et al. (2017) and Ramayah et al. (2018) proposed assessing convergent validity using factor loadings, composite reliability (CR), and average variance extracted (AVE).

Table 2 Measurement of constructs validity and reliability

Variable	*Composite reliability (CR)*	*Average variance extracted (AVE)*
IT infrastructure	0.862	0.557
Security	0.763	0.518
Top management support	0.881	0.651
Organisational culture	0.888	0.503
Awareness	0.883	0.716
Training	0.942	0.732
Government policy	0.947	0.782
E-government adoption	0.963	0.629

All reflective constructs had CR greater than 0.7, indicating that they all had a high internal consistency and reliability level. The AVE from all constructs is used to determine their convergence validity (AVE). These values are greater than 0.5, indicating

a high degree of convergent validity for the measure of all reflective constructs. The Fornell-Larcker criterion and cross-loadings are used to determine discriminant validity. The square root of each construct's AVE should be greater than the coefficient of correlation of the construct with the other constructs in the model, according to the Fornell-Larcker criterion.

Figure 2 Assessment of structural model (see online version for colours)

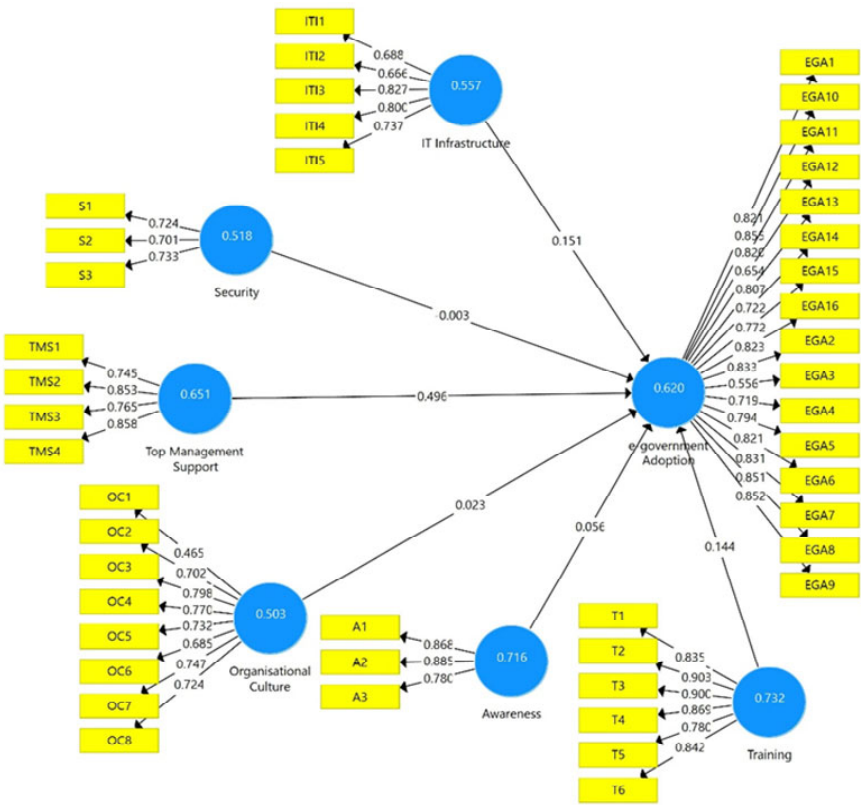


Table 3 Fornell-Larcker criterion, construct correlations and discriminant validity/mean and standard deviation

	A	*GP*	*ITI*	*OC*	*S*	*TMS*	*T*	*EGA*
Awareness	0.846							
Government policy	0.544	0.884						
IT infrastructure	0.468	0.456	0.746					
Organisation culture	0.680	0.554	0.572	0.709				
Security	0.456	0.487	0.629	0.511	0.719			
Top management support	0.521	0.591	0.451	0.602	0.497	0.807		
Training	0.637	0.654	0.561	0.715	0.487	0.566	0.856	
E-government adoption	0.493	0.546	0.495	0.549	0.447	0.688	0.561	0.787

4.3 Structural model: hypothesis testing

This section summarises the structural model evaluation's findings. Hair et al. (2017) characterises a five-step evaluation procedure for the structural model:

1 evaluate the structural model for collinearity

2 evaluate the path coefficient

3 evaluate the R^2 level

4 evaluate the effect size f^2

5 evaluate the predictive relevance Q^2.

The lateral collinearity test is depicted in Table 3. All of the variables' inner VIF values were less than 3.3 or 5.0. As a result, no issue of lateral multicollinearity was observed in this study.

Table 4 Collinearity statistics of structural model (inner VIFs)

	E-government adoption
Awareness	2.120
Government policy	2.086
IT infrastructure	2.003
Organisation culture	2.809
Security	1.900
Top management support	1.931
Training	2.757
Awareness	2.120

This study developed six direct hypotheses to explain the relationships between the constructs. T-statistics were generated for all paths using the SmartPLS 3.3.3 bootstrapping function to determine the significance of each predictor. Table 4 indicates that two relationships were found to be positive and significant, with a t-value ≥ 1.645, based on the path coefficient assessment.

Specifically, IT infrastructure ($\beta = 0.151$, $p < 0.05$) and top management support ($\beta = 0.496$, $p < 0.05$) were discovered to be significantly related to e-government adoption. As a result, H_1 and H_3 were supported. The strongest influence on e-government adoption was found to be top management support.

On the other hand, security ($\beta = –0.003$, $p < 0.05$), organisational culture ($\beta = 0.023$, $p < 0.05$), awareness ($\beta = 0.056$, $p < 0.05$), and training ($\beta = 0.144$, $p < 0.05$), were discovered to be insignificantly related to e-government adoption. As a result, H_2, H_4, H_5, and H_6 were all rejected.

The combined effect of all variables can result in a variation of 60.2% in e-government adoption. The current study's model has an R^2 value of 0.612, indicating that the interaction of all independent variables can account for 61.2% of the variation in e-government adoption. The Q^2 values were used to assess the model's predictive

relevance. These values were obtained through a blindfolding procedure with a seven-degree omission distance. The value for Q^2 was 0.314, indicating a high predictive relevance for the path model.

Table 5 Structural model assessment

	Relationship	*Direct effect (β)*	*Standard error*	*T-statistics*	*P-value*	*Decision*	R^2	f^2	Q^2
H_1	IT infrastructure → e-government adoption	0.151	0.077	1.985	0.025	Supported	0.536	0.025	0.314
H_2	Security → e-government adoption	–0.003	0.065	0.041	0.484	Not supported		0.000	
H_3	Top management support → e-government adoption	0.496	0.065	7.582	0.000	Supported		0.230	
H_4	Organisation culture → e-government adoption	0.023	0.096	0.238	0.406	Not supported		0.001	
H_5	Awareness → e-government adoption	0.056	0.082	0.689	0.246	Not supported		0.000	
H_6	Training → e-government adoption	0.144	0.088	1.642	0.051	Not supported		0.011	

4.4 Moderating effect

This section provides an analysis of the moderating effect of government policy. The moderating effect of government policy on the relationship between IT infrastructure, security, top management support, organisational culture, awareness, training, and adoption of e-government was examined by formulating six hypotheses. To accomplish this, the interaction effect between the moderator and the predicting variables was examined.

Table 6 summarises the results of the moderating effect assessment. According to the results of several interaction effects, the t-values for the interaction terms exceeded 1.645, and the p-value was less than 0.05. The outcome of the current study implies a strong correlation between government policy and the level of security, awareness, and training required for e-government adoption. As a result, H_{2a} and H_{6a} were found to support the postulated hypotheses. On the other hand, H_{5a} was found to be statistically significant in the negative direction.

Meanwhile, there is no evidence that government policy has moderated the relationship between IT infrastructure, top management support, and organisational culture and e-government adoption. As a result, H_{1a}, H_{3a}, and H_{4a} are rejected.

Figure 3 Assessment of moderating effect (government policy) (see online version for colours)

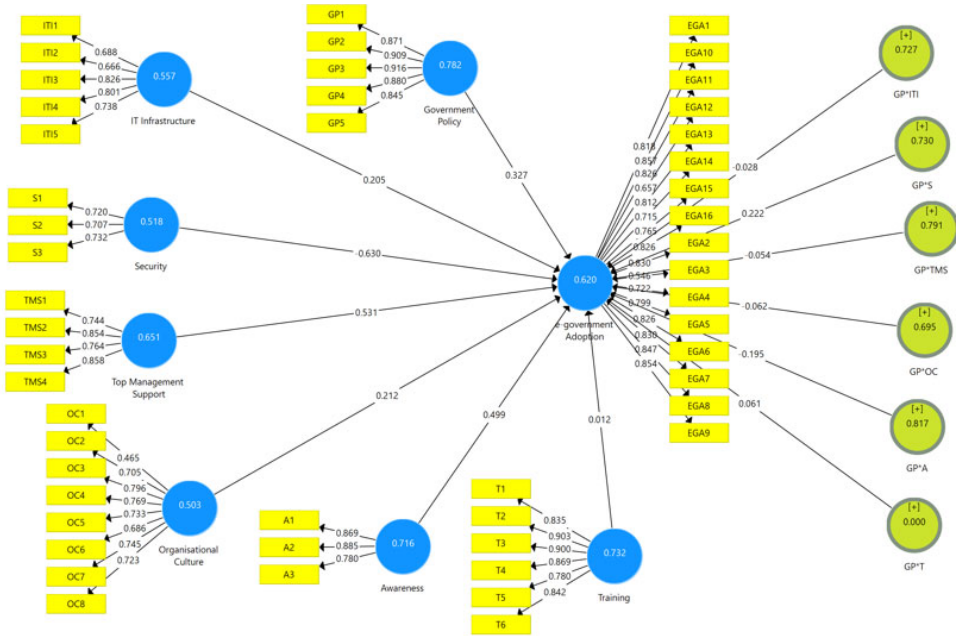


Table 6 Moderator assessment

	Relationship	*β*	*Std. error*	*T-statistic*	*P-value*	*Result*
H_{1a}	GP * ITI → EGA	–0.028	0.080	0.350	0.726	Not supported
H_{2a}	GP * S → EGA	0.222	0.078	3.284	0.005	Supported
H_{3a}	GP * TMS → EGA	–0.054	0.097	0.555	0.579	Not supported
H_{4a}	GP * OC→ EGA	–0.062	0.112	0.554	0.580	Not supported
H_{5a}	GP * A → EGA	–0.195	0.087	2.843	0.025	Supported
H_{6a}	GP * T → EGA	0.061	0.015	3.498	0.001	Supported

5 Discussion

The findings indicated that TOE variables, especially concerning technology and organisation, were critical for increasing e-government adoption. However, not all dimensions have a significant impact on the adoption of e-government. Specifically, it was discovered that only one dimension of technological factors, namely IT infrastructure, influenced the adoption of e-government by Algerian petroleum companies. A plausible reason It is because IT infrastructure enables citizens to access information, increases the utility of services (Ziemba et al., 2014; Glyptis et al., 2020), reduces business costs, and improves service efficiency and transparency (Chipeta, 2018). Algeria's IT infrastructure, on the other hand, is still in its infancy, with low internet penetration and a low percentage of internet users even in comparison to neighbouring countries (Chellali and Qashi, 2014; Hussein and Pusatli, 2017). With the benefits of IT infrastructure demonstrated through e-government adoption, the current

study concluded that the better the IT infrastructure provided to users, the greater the adoption of e-government by Algerians, particularly petroleum companies. The effort could result in an increase in internet speed, an upgrade to the fixed-line network, and a reduction in internet costs (Benaida and Namoun, 2018). This finding is consistent with a large body of prior research in other developing countries, such as UAE (Alharmoodi and Lakulu, 2020) and Kenya (Wairiuko et al., 2018; Wanyembi et al., 2018).

Additionally, one dimension of organisational factors, top management support, was found to influence the adoption of e-government by Algerian petroleum companies. More precisely, the current study's findings indicate that top management support is the most significant factor influencing businesses' adoption of e-government, implying that Algerian businesses should prioritise top management support when implementing e-government. Top management support relates to leaders' pledges and commitments to embrace e-government technologies, enables their adoption and application, and fosters a secure environment conducive to user engagement in e-government activities (Alrawabdeh, 2014, 2017; Alshehri and Drew, 2010; Ntulo and Otike, 2013; Alrawabdeh, 2014). The significant influence of top management support on the e-government initiative can be explained culturally (Riyadh et al., 2019). Since Algeria is a high-power-distance country, thus, top management support could assist in implementing e-government successfully. The result of the current study corroborating findings from prior studies in India, Taiwan, Germany, Netherlands, and Iraq (Gupta et al., 2017; Lian et al., 2014; Meijer, 2015; Rehouma and Hofmann, 2018; Riyadh et al., 2019).

On the other hand, this study's findings reveal that security, organisational culture, awareness, and training had an insignificant effect on Algerian E-Government adoption. According to the findings, security had no effect on e-government adoption which was consistent with previous research on information system adoption in Jordan (Alabdallat and Alhawari, 2021; Al-Zoubi et al., 2011) and Malaysia (Haneem et al., 2019). Previous research has established that the security dimension has no discernible effect on e-government adoption, owing to the numerous security flaws in the e-government website. It could be due to numerous instances of confidential data being leaked. Similar to the Algeria case, it has long been known that internet privacy is unprotected by law. Algerians also face issues related to a lack of consumer protection legislation in electronic commerce, such as personal information misuse, bank account or credit card fraud. Furthermore, the laws governing the protection of authors' and producers' intellectual property rights are ineffective (Chaabna et al., 2014). As a result, security is still a minor factor in Algerian petroleum companies' e-government adoption.

Ineffective organisational cultures obstruct the implementation of e-government in developing countries, like Indonesia and Philippines (Batara et al., 2017), India (Chopra et al., 2021), Germany (Rehouma, 2020), and USA (Zhang et al., 2005). The current finding corroborates the findings of Mohtaramzadeh et al. (2018). They discovered that organisational culture had no noticeable effect on an organisation's willingness to adopt e-government. It could be because cultural differences have a differential effect on how firms adopt the technology. Different organisational cultures may have varying underlying values, assumptions, and expectations, all of which can have an effect on technology adoption in firms, either directly or indirectly. Organisational culture has a negative effect on how businesses adopt e-government in Algeria. It is because Algerian businesses' organisational cultures are incapable of determining the extent to which an IT

application meets their needs, which has a detrimental effect on the effectiveness of e-government adoption.

Consistent with Eyupoglu and Kaya's (2020) findings, by considering respondents' demographics, the current study discovered that awareness had little effect on the adoption of e-government by Algerian businesses. It demonstrates that the vast majority of Algerians are unfamiliar with the concept of electronic government. Even if they are aware, they are less likely to choose it first. Additionally, Algerians' cash culture may dissuade them from using electronic payment in order to avoid transparency (Zerhouni, 2016). This insignificant correlation between awareness and adoption of e-government is consistent with prior research in several countries, such as, Sudan (Abaza and Saif, 2015), Cyprus (Eyupoglu and Kaya, 2020; Glyptis et al., 2020), and Indonesia (Idris, 2016).

Finally, this study examined another environmental factor dimension, namely training. Contrary to expectations, it revealed no effect of training on the adoption of e-government. According to Bhaskar et al. (2020), even managers were not trained on how to use e-government. They expressed a desire for continued training and technical support to ensure continuous use of e-government. Additionally, despite receiving some basic training on how to use the e-government system, Algerian companies' employees were unable to catch up despite daily updates to e-government websites with new features. Thus, Hypothesis 6 is not supported and in line with the findings of India (Bhaskar et al., 2020), Kenya (Makau et al., 2015), Egypt (Rasmy et al., 2005), and Nigeria (Shagari, 2018).

On the contrary, government policy constrained its influence on security, awareness, and training on the topic's relationship to e-government adoption. Implementing e-government raises plenty of legal and policy issues, both for users and providers (Paquette et al., 2010). When it comes to adopting e-government, a well-defined government policy should contribute to the consistency of data protection laws (Dutta et al., 2013). Thus, as Seifu et al. (2017) indicate, government policies should be implemented to increase citizens' security and willingness to adopt e-government.

Contradict with the previous research (Al-Refaie and Ramadna, 2020; Reichheld and Schefter, 2000), which argued that government policy was incapable of implementing necessary strategic actions to increase citizens' awareness of the e-government's advantages, the current research identified that government policy moderated the relationship between awareness and adoption. As a result of Algeria's unsupported government policy, it makes sense for the government to educate citizens about the benefits of e-government in order to increase its adoption in Algeria, particularly among petroleum companies.

Finally, the study's findings confirm that government policies should prioritise training, which will result in the improved implementation of e-government. Government policy can establish the institutional framework and values required for the widespread adoption of e-government, for example, through training and consulting (Park and Kim, 2021). Additionally, government policy is believed to aid businesses in reducing inefficiencies, limited capacity, and undertrained staff associated with the adoption of e-government processes (Al-Mamari et al., 2013; Lau et al., 2008) while also providing financial support and policy stability (Tom et al., 2019).

6 Research implication

Theoretically, this research contributes to the body of knowledge on e-government adoption in the public sector by developing and validating a comprehensive conceptual framework that considers all significant determinants of e-government adoption by public sector organisations in Algeria's petroleum companies. TOE factors all play a role. This study contributes to the body of knowledge by demonstrating that various levels of IT infrastructure and top management support have varying effects on G2B, including e-government adoption. Furthermore, it demonstrates the TOE framework's suitability for analysing the factors affecting Algeria's adoption of e-government.

From a managerial perspective, the findings can assist Algerian petroleum companies in better comprehending the process of e-government implementation. Algerian petroleum companies should prioritise developing and demonstrating TOE factors, particularly IT infrastructure and top management support, in order to accelerate the adoption of e-government. Additionally, the study's findings will benefit government agencies and decision-makers, particularly those responsible for e-government services. The study enables them to ensure that organisations participate actively in e-government implementation.

7 Limitations and future research

While this study contributes significantly to the literature, it is necessary to consider the study's limitations when interpreting the results and conclusions drawn. To begin, this study focused on a single sector of the Algerian economy, namely petroleum companies, because they are the primary source of economic growth in Algeria. Additional research could be conducted in other industries or even on how Algerian SMEs adopt e-government. It is consistent with the Algerian government's objective of increasing the economic contribution of small and medium-sized enterprises.

The current study, which took a different approach, was quantitative in nature. Future researchers may employ qualitative or mixed methods techniques, generating distinct themes and conclusions. Additionally, because the current study examined e-government adoption at the corporate (organisational) level, a future study may look at individual-level e-government adoption.

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