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ENHANCING WORKFLOW OF PUBLIC INSTITUTIONS THROUGH THE E-GOVERNMENT SYSTEM IN THE IRAQI OIL SECTOR: AN EMPIRICAL STUDY

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ABSTRACT

Electronic Government has evolved through the previous two decades as a finding of rapid technological innovation and public sector response to the advantages of new systems. However, in developing nations, the development of e-Government is faced several complications. Iraq is among the developing nations that faced challenges in implementing e-Government initiatives. These challenges are represented by the lack of skilled human capital, poor infrastructure to apply ICT, and incompetent public institutions. Therefore, this study empirically examines an appropriate e-Management system model in the Iraqi oil sector.

The conceptual model was developed based on TOE framework combined with HOT-FIT model. The structural equation modelling was used to measure the conceptual model using of questionnaire data collected from employees in oil sector (n=588). The findings showed that, of the factors shaping technology, organisation, and environment, acceptance of all factors was significantly influenced by technology innovation but not organization culture and government regulatory support. Further, the acceptance of factors shaping human perspective was found to significantly affect adoption of information system in oil sector. The acceptance of technology innovation as mediation was found to significantly affect between all the factors of technology, organization, and environment with adoption of information system in oil sector except organization culture and government regulatory support. The acceptance of top management support, organization culture, and government regulatory support were found to significantly affect adoption of information system in oil sector. This study provides a broader base for theoretical and practical understanding of issues related to develop electronic management in oil institutions of Iraq and the government institutions in general.

Keyword: E-Government, E-Management System, Structural Equation Modelling, Oil Sector

INTRODUCTION

Today, institutions rely heavily on Information Systems (ISs) to conduct business, resulting in the development of e-Transactions in large ways. Al Mudawi, Beloff & White (2019) confirmed that the implementation of information systems in government are offers better services to citizens and increase efficiency in internal processes of government. In that case, governments who overlook the strengths of ICT tools may be incurred a significant competitive disadvantages. Acosta-Vargas, Lujan-Mora & Salvador-Ullauri (2017) indicate that the government responsibility is to build web that are accessible to every citizen and are easy to use. Thus, the abandonment of the web by users will be reduce when applied the simple design principle of having website and all his functions working well. However, Akgul (2016) noted that during the development process errors creep into the design of websites or managing the transactions either implicitly or explicitly. Despite

the importance of designing web interfaces in institutions, automating files and managing them electronically to complete transactions within the institution is the basis for developing information systems into a coherent management information system.

Electronic Management System (EMS) is a framework of tools for managing the transactions through creation, use, storage, and sharing of documents that are created throughout an organization (Abdullah, Mohammed, Maatuk & Elberkawi, 2019). Through EMS, it is accomplished administrative work within the organization and also monitor errors to reduce the administrative excesses (Elberkawi, EL-firjani, Maatuk & Aljawarneh, 2016). According to Alhawawsha (2017), putting and adopting in implementation an efficient and effective e-Management system is not an easy job. An institution of public sector seeking to adopt an effective e-Government system must first ensure that it evaluates its process model and select the most appropriate technology that help employees to execute government policy and meets the needs and expectations of the citizens. However, in developing countries, the development of e-Government is faced several complications and it was affected by many challenges (Meiyanti, Utomo, Sensuse & Wahyuni, 2018). In general, these challenges represented by the lack of skilled human capital, low standards of living, poor infrastructure to apply ICT, and incompetent public organisations (Deng, Karunasena & Xu, 2018). To effectively develop e-Government, many developing countries have implemented specific e-Government initiatives for making a full use of the potential benefits of e-Government (Al-Yawer & Ahmad, 2018). Therefore, e-Government reports clarified that the failure of e-Government initiatives are increased (Aladwani, 2016).

Iraq is not far from these cases. Since the beginning of the millennium, the Iraqi government has embarked on setting plans to adopt ICT in the government institutions to start implementing the e-Government project (Al-Yawer & Ahmad, 2018). However, the project still faced obstacles and failures (Mohammed et al., 2016); (Thabit & Jasim, 2019). The key goal of this research is to determine the factors that impact on the development of e-Management in in oil establishments of Iraq.

LITERATURE REVIEW

In the literature, scholars differed on the definition of e-Government. The most acceptable definition came from the United Nations. Its defines e-Government as “the use and application of information technologies in public administration to streamline and integrate workflows and processes, to effectively manage data and information, enhance public service delivery, as well as expand communication channels for engagement and empowerment of people” (UN, 2014). E-Government serves several domains and it focuses on helping different groups of employees, businesses, organizations, and citizens (Mohammed et al., 2013; Arfeen et al., 2017). Siau & Long (2005) stated that e-Government has external and internal interaction. For the internal interaction, government collaboration with other government agencies (G2G), or with their employees (G2E). For the external interaction, government collaboration with citizens (G2C), or with private enterprises (G2B). Therefore, e-Governments is considering as an integrated and sophisticated portal to serve users in the front office and connect internal governing in the back office as displayed in Figure 1.

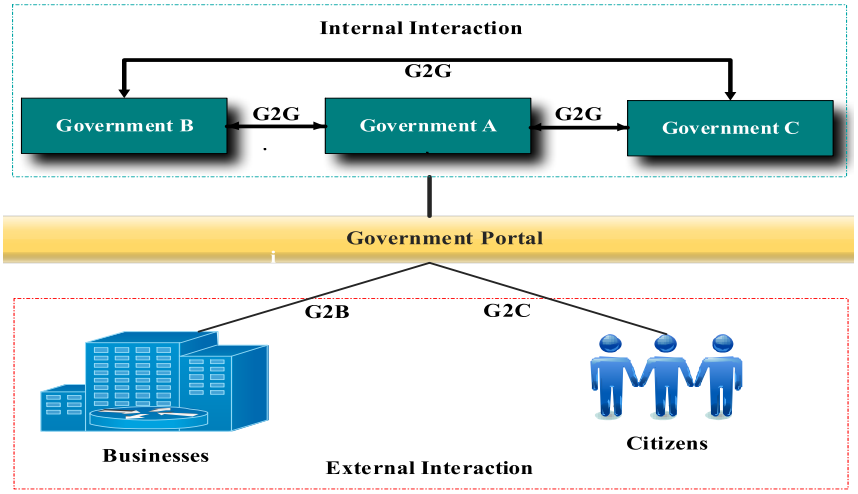

FIGURE 1
E-GOVERNMENT INTERACTION

Electronic Management of Institutions

The literature of IS defined electronic management (e-Management) as an important tool to improve the management transactions of the institution. According to Raho, Al-Ani & Al-Heeti (2015), the e-Management is defined as the ability to utilise ICT to develop the traditional administrative processes. E-Management provides management services by using ICT tools to institutions' clients across multiple business environments, industries, and platforms. It helps the institutions' clients implement the proven management and technical solutions through active operating environments. In general, the e-Management supports institutions to manage the institution aim of technology-enabled environments; and to develop the government's responsiveness to citizens; to develop the institution effectiveness and/or efficiency (Aritonang, 2017). According to Erinsakin, et al., (2020), several institutions are embarking on the initiatives of electronic business to support the institution's compete effectively in the marketplaces, because services and products have been changed in the markets over the internet world. Giotopoulos, Kontolaimou, Korra & Tsakanikas (2017) stated there are several enterprises could be extinction when they are not transforming themselves into an electronic commerce. Therefore, the e-Management is one of the important tools to success in the transformation of institution to the use ICT tools in the new marketplaces (Aritonang, 2017).

E-Management includes the processes that ensure the compliance of the business and information technology department to develop the ability for providing a good services, security, availability, which are important for e-Government success. In general, e-Government initiatives can face high failure rates if there is no effective electronic management (Sharma, Metri, Dwivedi & Rana, 2021). For example, Muñoz-Cañavate & Hípola (2011) clarified the main lines of e-Management implemented in Spain. The scholars discovered that the complication of the Spanish management system makes analysis the system is challenge because of the level of competence and independence of the government agencies and local governments. The result of analysed 17 regions of Spain proved that central government has a common framework of action which needs to improve. Therefore, a strategy was developed for the development of electronic management systems for municipalities and regions in Spain. This indicates that the development of e-Government system depends on determining the success factors within the work environment. Aritonang (2017) confirmed that the strategic planning can be enhancing by using e-Management

tools, therefore, the strategy will be more robust and valid using information and data on previous performance that providing by the MIS.

Iraqi E-Government

Iraq is among the developing countries that adopt e-Government initiatives to consolidate good governance and improve the efficiency of the public sector (Mohammed et al., 2012). Although more than sixteen years have passed since the implementation of the Iraqi e-government strategy, Iraq is still ranked 143 out of 192 countries. In the 2020 e-Government Development Index (United Nations, 2020), it lags behind most developing countries. The sharp decline in the United Nations e-Government development index in Iraq is mainly due to the fact that the development of information systems in public institutions is still in its initial stage (Mohammed et al., 2016; Salman et al., 2019). Although the Iraqi government has succeeded in developing government websites and providing a number of services to citizens such as e-Iraq portal, E-passport record, and E-form of driving test (Mohammed et al., 2016). However, many Iraqi ministries still use traditional methods of managing transactions such as the ministry of oil. Therefore, the development of information systems tools in Iraqi ministries, especially the Ministry of Oil, which is the main source for the Iraqi economy, needs to identify the factors that influence the discovery of a suitable communication channels among employees. Hence, the development of an e-Management model in the oil Ministry of Iraq is necessary to promote public sector performance and organize government transactions.

Theoretical Model and Hypotheses Development

Technology-Organization-Environment framework (Tornatzky & Fleisher, 1990) is selected here as the base theory of this study. This theory is measuring the factors that may influence technology innovation to develop information systems for institutions of oil sector. This theory was combined with other theory namely, Human-Organization-Technology fit model (Yusof, Kuljis, Papazafeiropoulou & Stergioulas, 2008). HOT-fit model assesses the compatibility between human-organization- technology in system implementation.

Studies in information system have measured the variables that impact of development and adoption new technology such as e-Government systems. The e-Government development is a more accurate measure of a nation's progress (Krishnan, Teo & Lymm, 2013). The three main factors that shape the e-Government development can be categorized into

1. Organization context
2. Technology context
3. Environment context (Krishnan, Teo & Lymm, 2017).

Previous studies reviewed revealed eight critical factors that scientists use frequently. These factors were categorized into three perspectives. Four factors formed the technological perspective (including IS infrastructure, security concern, data and Info. Integration, and system integration and compatibility). Two factors formed the organizational perspective (including top management support, and organisational culture). Two factors formed the environmental perspective (Including IT policies and Government regulatory support) (AlBar & Hoque, 2015; Maroufkhani et al., 2020).

In information systems literature, human perspective is one of the important aspect to develop information system. Coff (2002) described human perspective as skills, abilities, and knowledge have by person to use information systems. Therefore, Yusof, et al., (2008) confirmed that human perspective is central to assess information system adoption and development. Ochara & Mawela (2015) found that employee skills in ICT and access to ICT's have an important impact on

using e-Government products. Therefore, the critical success factors of human perspective must be determined to develop information systems in institutions. Ahmadi, et al., (2017); Esfahani, et al., (2018) confirmed "employees' IS knowledge" as the main path of the human perspectives adopt for implementation e-Government initiatives in public institution. While Lian, et al., (2014); Esfahani, et al., (2018) confirmed perceived technical competence, as the main path of the human perspective to adopt for implementation e-Government initiatives in public institution. Therefore, staff who have technology capability or sufficient innovation knowledge can help establishments to adopt an innovative technology successfully (Ahmadi et al., 2017; Esfahani et al., 2018). The four perspectives who design to develop a research model are described below

Technology Perspective

Technological dimension is one of the important dimensions to develop IS, according to Tornatzky, et al., (1990), the innovation characteristics of technology for adopting IS in institutions are identified through technological dimension. By reviewing the adoption of IS studies, four factors including IS infrastructure, data and information integration, system integration and compatibility, and security concern to be success variables that impact government's adoption of e-Management.

IS infrastructure referring to the presence or can be existence of database facilities and sophisticated telecommunication within the institution (Grover, 1993). Based on information systems literature, the key factor that frequently used to adopt information systems in the institutions is infrastructure. Krishnan, et al., (2017) indicated that the institution's technological strengths has a key role to adopt any type of technological innovation. In general, IS infrastructure is defined as a tangible resource that consisting several components for example software and hardware. (Ross et al., 1996; Sundram, Bahrin, Munir & Zolait, 2018) saw that make an information systems implementations more cost effective is depend on the sharable technology and platform, which are generated from IS infrastructure, therefore, it is necessary for integrating systems in the institution. Thus, the hypothesis will be formulating as:

H1 IS infrastructure has influence on technology innovation

Data integration facilitates information and data sharing within various government institutions and is categorized as significant variable in IS interoperability (Sulehat & Taib, 2016). Data integration is influenced by data maintenance, common data definitions, information management with other governmental agencies, and information management within organization (Kadadi et al., 2014). Data integration is based on the unified database and using common data for standardization the information for managing the administration systems. Previous studies have found that data inconsistency is considered as main challenge for information and data integration, which is impact on the development of IS platforms for reaching E-Government interoperability (Karlsson et al., 2017). Thus, the hypothesis will be formulating as:

H2 Data and information integration has influence on technology innovation

Compatibility is defined as "the degree to which an innovation is perceived as consistent with the values, experience and needs of potential units of adoption" (Rogers, 2003). Kwabena, Mei, Ghumro, Li & Erusalkina (2021) suggested that the adoption of an innovation will be boost by get a compatibility of an innovation with needs of an institution, experiences, and values. Furthermore, past studies mentioned that the compatibility considering as one of the key factors to adopt IS innovation in institutions (Thong, 1999; AlBar & Hoque, 2015; Maroufkhani et al., 2020). According to Thong (1999), the importance of compatibility lies in need for a small changes and modifications required to be implemented the new technology in the institution. Thus, the hypothesis will be formulating as:

H3 Compatibility has influence on technology innovation

Security concern is an incident in which a government agency or a firm loses personal records, sensitive data, or other information. Joshi, Aref, Ghafoor & Spafford (2001) indicated that security is the ability to prevent modification of information or unauthorized access during processing, transmission, or storage. Perez (2015) stated that data confidentiality and security is a key issue for government in relation to develop platforms. (Mohammed, Ibrahim & Ithnin (2016) proposed that important apprehension exists including security and confidentiality of information on IS platforms. Thus, an institution should be carefully assessing the pros and cons of applying IS and to recognise if the security concerns has an important impact the fitness of developing IS to e-Government implementations. Thus, the hypothesis will be formulating as:

H4 Security concern has influence on technology innovation

Organization Perspective

The adoption of technological innovation for institution can influence by the organizational characteristics (Tornatzky et al., 1990). Based on IS studies reviewed, there are two factors of organizational dimension mentioned as an important factors that impact on the process of adoption IS. These factors are organizational culture, and top management support.

Top management support refers to the managers are willing to allocate sufficient resources and encourage the initiative of developing e-Government. Ali, et al., (2021) stated that adoption of an innovation in institutions is depending on the support of the top management team, which they are drawing the strategy or policy for the institution. In fact, top management team are the link among organizational and individual technology adoption, therefore, the innovative leaders are more likely to support adoption a new technology in the institution. Prior literature of IS refers that top management as a key factor of organizational perspective for innovation adoption (Cruz-Jesus, Pinheiro & Oliveira, 2019; Ikumoro & Jawad, 2019). Thus, the hypothesis will be formulating as:

H5a Top management has influence on technology innovation
H5b Top management has influence on adoption of information system in oil sector

Organizational culture is defined as “the shared, basic assumptions that an organization learnt while coping with the environment and solving problems of external adaptation and internal integration that are taught to new members as the correct way to solve those problems” (Al-Alawi, Al-Marzooqi & Mohammed, 2007). In developing countries, the adoption of ICT is a challenging and a risky for institutions, because of the important impact of social boundaries and cultural (Aldraehim et al., 2013). Prior studies presented that the efficient adoption for IS in the institution is based on the organization’s culture and who will communicate with this institution (AlBar & Hoque, 2019; Suri & Abbott, 2013). In general, the organizational cultures like hierarchy, market, and clan effect on the use of ICT in the institution (Lopez-Nicolas et al., 2009). Thus, the hypothesis will be formulating as:

H6a Organizational culture has influence on technology innovation
H6b Organizational culture has influence on adoption of information system in oil sector

Environment Perspective

Environmental dimension have several factors that impact on the institution of adopting technological innovations (Tornatzky et al., 1990). Based on IS studies reviewed, there are two variables can impact on the adoption IS in institutions, which are IT policy, and Government regulatory support to be important variables that impact government's adoption of e-Management.

IT policies refer to the policies, standard legislations, security rules, legal protection, and privacy laws. Van, Kim, Lee & Gim (2019) stated that the new policies are essential for promoting e-Government assimilation in institutions. Therefore, institutions may abuse or discourage utilize of e-Government if does not design and applied a suitable regulatory framework. Cram, Proudfoot & D'arcy (2017) confirmed that a currently when several policies of information security they are ready for implementation, they are scoffed. Successful apply of ICT systems and services includes literally all customers and employees of the institution. Therefore, it is important for institution to have the plan and the policy, otherwise deliberate obstruction and organizational inertia will push the institution to fail. Thus, the hypothesis will be formulating as:

H7 IT policy has influence on technology innovation

Government regulatory support is how can government provision of related training, strategies, and availability of regulations could aid target clients to utilize certain technology innovation. Stieninger, et al., (2014) stated that government regulations can support institutions for adoption a special kind of technology. Government rules in terms of technological standards, legislation, and encouragement can increase the adoption of IS between companies (Imron et al., 2019). For example, (AlBar & Hoque, 2019; Monsreal-Barrera & Cruz-Mejia et al., 2020) illustrated that institutions encountering a high level of pressure and regulations from the government are potential to develop IS. Thus, the hypothesis will be formulating as:

H8a Government regulatory has influence on technology innovation.
H8b Government regulatory has influence on adoption of information system in oil sector

Technology Innovation

In the literature IS, several governments have the tendency to adopt an electronic management system to improve government processes, but there is a still need to investigate dimensions that effect the development of e-Management system (Al Shobaki et al., 2018). Krishnan, Teo & Lymm (2017) confirmed that the e-Government initiatives success depends on technology innovation. According to Tornatzky, et al., (1990), technology innovation depends on three dimensions including technology, organization, and environment, therefore, failure to consider these dimensions leads to a negative impact on the use of e-Government initiatives. In this study, eight factors have been selected to shape these dimensions; therefore, technology innovation is a mediator among the factors shaping technology innovation and adoption of information system of oil sector.

H9 Perceived technical competence of IS staff has influence on adoption of information system in oil sector
H10a, b, c, and d: Technology innovation serves as the mediator between factors shaping technology perspective (including IS infrastructure, data and information integration, system integration and compatibility, and security concern) and adoption of oil information systems.
H11a, and b: Technology innovation serves as the mediator between factors shaping organization perspective (including top management support and organizational cultural) and adoption of oil information systems.
H12a, and b: Technology innovation serves as the mediator between factors shaping environment perspective (including IT policies and government regulatory support) and adoption of oil information systems.

Human Perspective

Human dimension is an important context to evaluate and development information systems based on the HOT-fit model (Yusof et al., 2008). Based on IS studies reviewed, there are two human variables can impact on the adoption IS in institutions. These factors are perceived technical competence of IS staff, and employees' IS knowledge.

According to Lin, et al., (2011), when institution seek for adopting an innovation to manage their process, Staffs' technological competencies and/or capabilities playing a significant role to success this process. Ross, et al., (1996) saw that the IS department in the institution should have a powerful IS skills and competencies, this powerful of skills will help to solve any problems in the operations of the institution that depend on the ICT tools. Thus, the institution will undoubtedly have more powerful and certainty throughout the process of usage ICT tools, when IS staff in the institution has sufficient skills and knowledge for adopting new technology (Lian, et al., 2014). Therefore, IS a personnel play a significant role to develop IT applications in the institution (Salam & Ali, 2020). According to Ahmadi, Nilashi, Shahmoradi & Ibrahim (2017), several research are examine the human dimension including the IS staff capabilities. Thus, the hypothesis will be formulating as:

H13 Perceived technical competence of IS staff has influence on adoption of information system in oil sector

According to Ismail, et al., (2011), to achieve a substantial performance for the institution, the appropriate management of the employees has both legal importance and strategic for the institution because People (human resources or employees) are the most valuable asset of an institution. An institution that adopted an innovative technology successfully and gained benefits from it relied heavily on its staff having sufficient innovation knowledge or technology capability (Lin et al., 2011; Vagnani & Volpe, 2017). On the other hand, Hung, et al., (2010) stated that a lot of institutions delay their innovation adoption because of the technical knowledge and skill shortage that are needed in the process of development. Thus, those institutions have to wait until the sufficient technical expertise can be available. Therefore, if institutions possess employees with more knowledge of information systems, therefore, they will have tendency for adoption and development information systems (Hung et al., 2010; Kosasi, Vedyanto & Yuliani, 2018). Thus, the hypothesis will be formulating as:

H14 Employees' IS knowledge has influence on adoption of information system in oil sector

Based on the description above, there are ten independent variables, mediation variable, and dependent variable identified for this research. The current study attempts to adopt the e-OISS model to manage transactions in oil sector. Specifically, this study generates a framework comprising the following components: the factors that identify characteristics of technology perspective, organization perspective, environment perspective, and human perspective. For each element is chosen depend on the review of the associated literature. In this study, the conceptual framework generated (See Figure 2) is based on the TOE framework, and the independent variables that identify characteristics of human perspective are extracted from the HOT-FIT model. Technology innovation is a mediating variable and adoption of oil information system as the dependent variable. Figure 2 describes the conceptualization of the research framework for this empirical study.

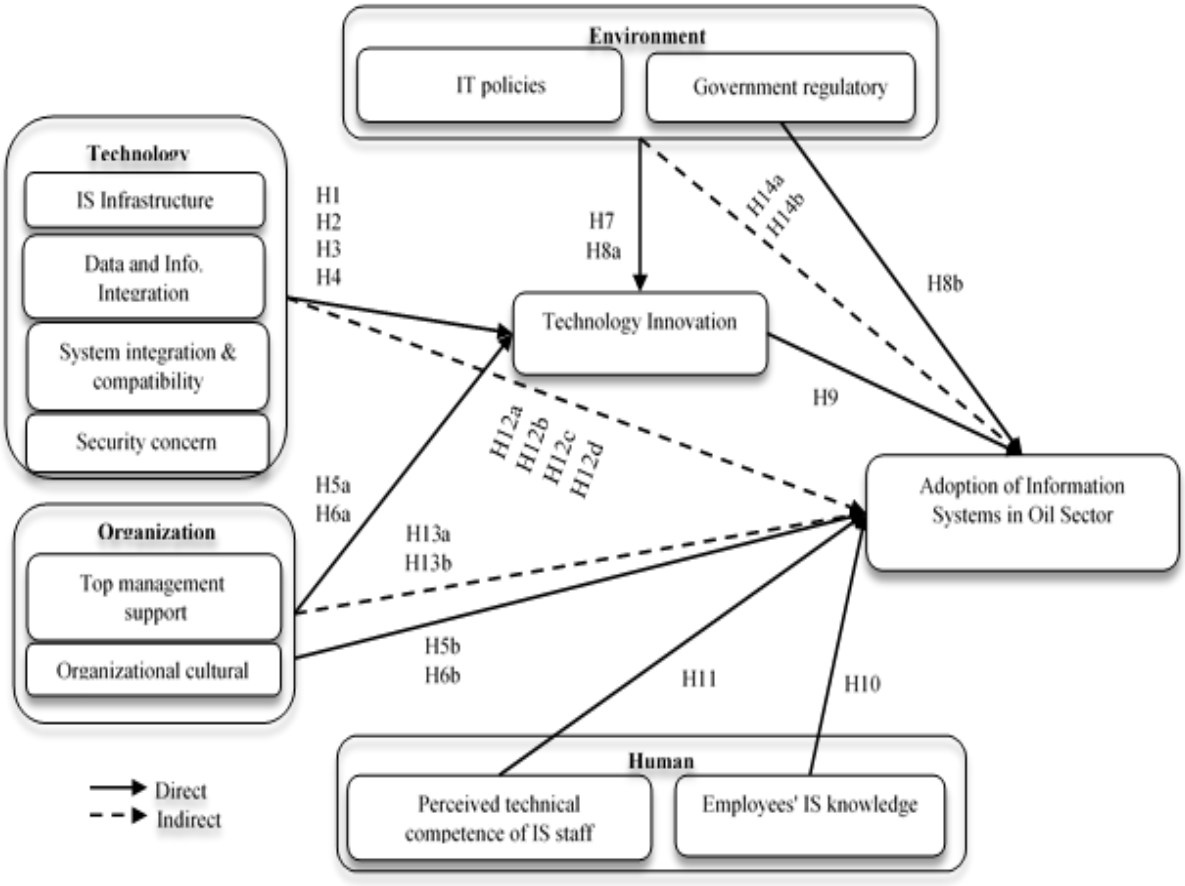

FIGURE 2
RESEARCH MODEL

METHODOLOGY

Sample Profile and Data Collection

This research aims to determine the factors that influence the adoption of the management information systems in the Iraqi oil sectors. In order to test the hypothesised relationships among variables in the proposed research model, a survey was conducted. This study was carried out in three main ministry of oil establishments in Iraq including the "Oil Product Distribution Company" (OPDC), "State Gas Filling and Services Company" (SGFSC), "State Company of Oil Projects" (SCOP). The target population for the study was employees in the ministry of oil. According to Ministry of Oil statistic for the three establishments, 38,862 employees in 2020 (MOO, 2020). A total of 588 employees participated in the research. The sample size of 588 is considered appropriate when the population constitutes millions (Sekaran & Bougie, 2019). Data were collected in June to July 2021. Demographic profile of participants are presented in Table 1.

Table 1
SAMPLE CHARACTERISTICS (N=588)

Demographic	Characteristics	Frequency	Percent%
Gender	Male	334	57.3%
	Female	251	42.7%
Age	20-30 years	155	26.3%
	31-40 years	158	26.9%

	41-50 years	181	30.8%
	51-60 years	94	16.0%
Marital Status	Single	130	22.1%
	Married	389	66.2%
	Widowed/Divorced	69	11.7%
Education	Some college	147	25.0%
	Undergraduate	321	54.6%
	Master	108	18.4%
	PhD	12	2.0%
Computer Skills	Yes	588	100.0%
	No	0	00.0%
Using e-government services	Yes	423	71.9%
	No	165	28.1%

There were more male respondents (57.3%) than females (42.7%). Meanwhile, almost 84% of the respondents were aged 50 and below. Two thirds of the respondents that participated in the questionnaire were married (66.2%). Moreover, majority (54.6%) of the respondents were with university degrees, and all of the respondents had computer skills. This indicated that the respondents in this study had computer self-efficacy and were knowledgeable about the using information systems. Finally, most of the respondents (71.9%) used e-Government services in general. This indicated that the respondents preferred to use e-Government services than other traditional way.

Measurement

The questionnaire was designed to examine the impact of factors shaping technology perspective, factors shaping organisation perspective, and factors shaping environment perspective towards technology innovation, and adoption information system in oil sector. Further, it also examining the influence factors shaping human perspective towards adoption information system in oil sector. All factors were examined by a five-point Likert-scale, and items were adapted from past studies to be suitable for the context of this study. Specifically, IS infrastructure was measured by six-item which were adapted from the study of Grover (1993). As to examine data and information integration three items adapted from Joseph (2015), and examine system integration and compatibility three items adapted from Grover & Goslar (1993). While, security concern was measured by four-item which were adapted from the study of King et al. (1994). Further, top management support was tested by five-item that adapted from (Lian et al., 2014; Gangwar et al., 2015). As to test organizational cultural three items adapted from (AlBar & Hoque 2019). Moreover, as to test IT policies three items adapted from Mohammed, et al., (2017), and examine government regulatory support three items adapted from Lai, et al., (2018). Perceived technical competence of IS was measured by three-item which were adapted from (Kuan & Chau 2001). As to test Employees' IS knowledge three items adapted from Hung, et al., (2010). Three-item were used in order to test technology innovation and Four-item were used to test adoption information system in oil sector which were adapted by following researches (Ghobakhloo et al., 2011; Lai et al., 2018).

RESULTS

Measurement model evaluation

The research model was tested using structural equation modelling by AMOS 24. The validity and reliability of the scales were analysed before examined the hypothesised relationships.

Convergent validity was tested by using the Average Variance Extracted (AVE) and the Composite Reliability (CR). These techniques are used to demonstrate how the items are related to each other; and, whether they can be in the same measurement. The acceptable value for AVE is 0.50 and 0.70 for CR (Hair et al., 2018). As showed in Table 2, AVE of each variable is more than 0.5 (0.563-0.748) and CR of each variable is more than 0.80 (0.750-0.865) which means the convergent validity is achieved. The recommended level for the standard loading of factors are 0.70 and 2 items (SC4 and OC3) are less than standard loading, therefore, they were removed. The Cronbach's Alpha values, which describes the degree to which a measure is error-free, range from 0.778 to 0.935 which were above the threshold of 0.7 as suggested by Hair et al. (2018), (See Table 2 and Table 3).

Table 2
THE FINDING OF COMPOSITE RELIABILITY TEST (N=588).

	EK	OIS	ISI	DII	OC	GRS	TI	SIC	TMS	SC	ITP	PTC
EK	0.776											
OIS	0.477	0.808										
ISI	0.198	0.288	0.760									
DII	0.301	0.353	0.174	0.822								
OC	0.268	0.400	0.273	0.169	0.865							
GRS	0.400	0.314	0.154	0.122	0.261	0.811						
TI	0.455	0.572	0.437	0.379	0.322	0.253	0.801					
SIC	0.273	0.288	0.058	0.222	0.116	0.160	0.330	0.856				
TMS	0.351	0.354	0.130	0.185	0.120	0.283	0.347	0.312	0.865			
SC	0.061	0.247	0.022	0.178	-0.072	-0.015	0.325	0.137	0.106	0.835		
ITP	0.308	0.385	0.321	0.174	0.487	0.283	0.560	0.186	0.200	0.034	0.750	
PTC	0.212	0.292	0.121	0.175	0.167	0.177	0.131	0.070	0.083	0.039	0.195	0.802

Table 3
THE RESULT OF FACTOR AND ITEM DESCRIPTION (N=588).

Factor and item description	Model and item indices				
	SL	CR	SMC	AVE	α
IS Infrastructure		0.872		0.577	0.876
ISI1: In our institution there is broad based availability of hardware and software to most departments.	0.685		0.469		
ISI2: In our institution we use networked applications rather than stand-alone applications.	0.744		0.553		
ISI4: The organization has a good Internet connection speed.	0.716		0.514		
ISI5: The organization is mature in using the Internet and related technology.	0.813		0.660		
ISI6: The organization needs cloud computing technology to meet its IS needs.	0.831		0.690		
Data and Information Integration		0.861		0.675	0.855
DII1: The institution's information systems help to share data with other information systems in the oil sector.	0.724		0.524		
DII2: The institution's information systems can share data with non-Internet applications in the institution.	0.882		0.777		

DII3: The institution's information systems share standardized data in the ministry of oil.	0.850		0.723		
System Integration and Compatibility		0.892		0.733	0.890
SIC1: MIS adoption is consistent with our Institution's goal	0.840		0.704		
SIC2: MIS adoption is compatible with our Institution's existing IT architecture hardware, software and networks	0.913		0.833		
SIC3: MIS can be integrated with other applications or systems in our Institution	0.813		0.661		
Security Concern		0.872		0.697	0.867
SC1: Information systems provide sufficient security controls	0.861		0.740		
SC2: The nature of the business data regularly exchanged between our institution and our partners requires a secured communication medium	0.918		0.844		
SC3: In information system, data is safeguarded from unauthorized changes	0.713		0.509		
Top Management Support		0.937		0.748	0.933
TMS1: Top management in our institution willingly supports the adoption of MIS.	0.807		0.652		
TMS2: Top management in our institution is aware of the benefits of MIS.	0.805		0.648		
TMS3: Top management in our institution has enthusiasm in adopting MIS.	0.925		0.856		
TMS4: Top management have policies that encourages usage of MIS initiatives to streamline, monitor and maintain enterprise's data flow.	0.866		0.750		
TMS5: Top management is likely to consider the adoption of MIS which is strategically important.	0.913		0.834		
Organizational Cultural		0.855		0.748	0.855
OC1: Our organization is very responsive and changes easily.	0.832		0.693		
OC2: There is a high level of agreement about how we do things in this organization.	0.896		0.804		
IT Policies		0.790		0.563	0.783
ITP1: There is a lack of security rules, policies and privacy laws.	0.569		0.325		
ITP2: Adequate legal protection supports post-MIS technology	0.836		0.701		

adoption.					
ITP3: The laws and regulations that exist nowadays are sufficient to protect the use of management information systems.	0.816		0.662		
Government Regulatory Support		0.851		0.657	0.845
GRS1: The governmental policies encourage us to adopt new information technology tools.	0.700		0.490		
GRS2: The government provides incentives for using information systems in government procurements and contracts such as offering technical support, training, and funding for management information systems use.	0.858		0.736		
GRS3: There are some business laws to deal with the security and privacy concerns over the management information systems technology.	0.863		0.744		
Technology Innovation		0.781		0.641	0.778
TI1: Technology can provide facile communication channels and tools for exchange information and assessing the public work in the institution.	0.771		0.566		
TI2: Technology can help improve performance and fast completing the transactions in the institution.	0.829		0.590		
Employees' IS Knowledge		0.750		0.602	0.935
EK1: Our employees are all computer literate.	0.850		0.714		
EK2: There are/were at least some management staffs who are/were computer experts.	0.694		0.487		
Perceived Technical Competence of IS		0.844		0.643	0.838
TPC1: Our IS staff has enough ability IS support.	0.782		0.611		
TPC2: Our IS staff has previous management information system experience.	0.858		0.737		
TPC3: Our IS staff has the expertise to support management information system	0.763		0.582		
Adoption Information Systems in Oil Sector		0.848		0.653	0.839
OIS1: Our institution intends to adopt information systems	0.884		0.780		

to manage and completing the transactions in the institution.					
OIS2: Our institution intends to start using management information systems regularly in the future.	0.849		0.721		
OIS3: Our institution would highly recommend management information systems for other institutions to adopt.	0.675		0.454		

Structural Model Evaluation

To evaluate the proposed conceptual model, the predicted relationships among the factors were examined by using a maximum likelihood estimation method. The structural model was run with 43 items to assess the relationship among the twelve factors. Only 37 items were presented in this model. The overall model fit indices were $\chi 2/df=1.279$, which is less than the criteria value of 3 as suggested by Hair, et al., (2018). Moreover, the very good fit of the model was supported by other indicators of goodness-of-fit (such as CFI=0.987, GFI=0.940, AGFI=0.925, and RMSEA=0.022). This indicates that the conceptual model fits the empirical data well. The results of the structural model with the standardized path coefficients are presented in Figure 3.

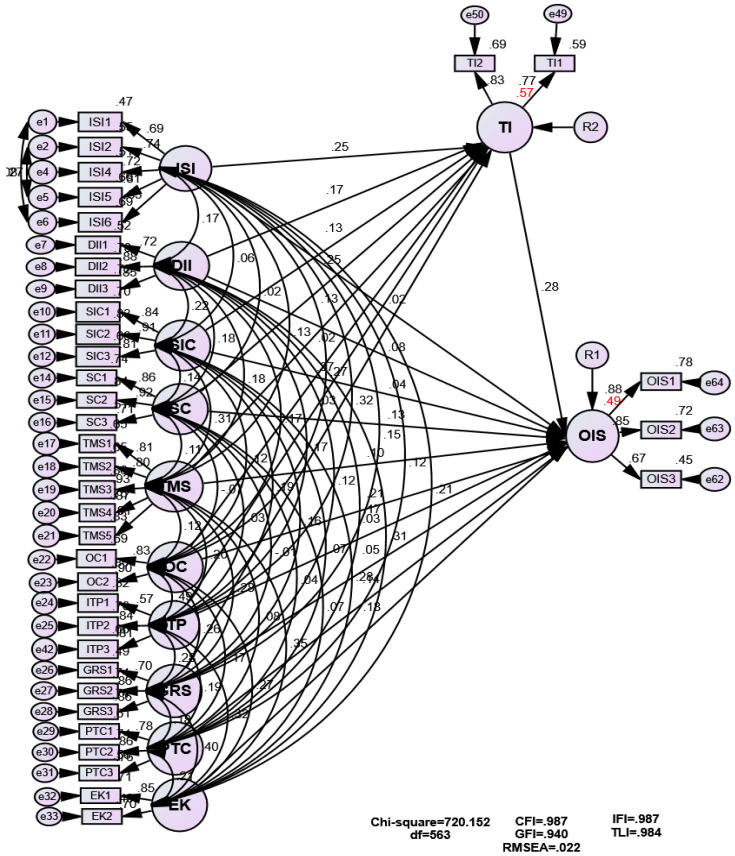

FIGURE 3
STRUCTURAL MODEL

Hypotheses Testing

The results of examined the structural model are presented in Figure 3. Twelve direct hypothesised and six indirect relationships between variables were found statistically significant. More specifically, Table 4 illustrated that technology perspective including IS infrastructure, data and information integration, system integration and compatibility, and security concern (H1, H2, H3, and H4) respectively, which predicts the positive influence of using the technology perspective on technology innovation, was supported (H1= b=0.262, p<0.001; H2=b=0.176, p<0.001; H3=b=0.132, p<0.05; and H4=b=0.250, p<0.001) respectively. Moreover, organization perspective including top management support and organizational cultural (H3 and H4) respectively, which predicts the positive influence of using the top management support on technology innovation, was supported (H5a= b=0.108, p<0.05). While organizational cultural was found to have an insignificant influence on technology innovation (H6a=b=0.020, p>0.751). Further, organization perspective including top management support and organizational cultural (H5b and H6b) respectively, which predicts the positive influence of using the organization perspective on adoption information systems in oil sector, was supported (H5b= b=0.093, p<0.05; and H6b= b=0.171, p<0.001) respectively.

Furthermore, environment perspective including IT policies and government regulatory support (H7 and H8) respectively, which predicts the positive influence of using the IT policies on technology innovation, was supported (H7= b=0.398, p<0.001). While government regulatory support was found to have an insignificant influence on technology innovation (H8a= b=0.069, p>0.224). On the other hand, organization perspective through government regulatory support factor (H8b) appeared to have a significant, positive impact on adoption information systems in oil sector (H8b= b=0.113, p<0.05). The findings also showed that technology innovation was found to have a positive influence on adoption information systems in oil sector; H9 was supported (b=0.221, p<0.01). In the same context, human perspective including employees' IS knowledge and perceived technical competence of IS (H10, and H11) respectively, which predicts the positive influence of using the human perspective on adoption information systems in oil sector, was supported (H10= b=0.151, p<0.05; and H11=b=0.127, p<0.01) respectively. Table 4 described the *P* value with the standardized path coefficients of hypothesized direct effects.

Table 4
EXAMINING RESULTS OF HYPOTHESIZED DIRECT EFFECTS OF THE VARIABLES

Path	Sta. Path Coefficient	P value	Status
H1: TI ← ISI	0.262	0.000***	Support
H2: TI ← DII	0.176	0.002**	Support
H3: TI ← SIC	0.132	0.014*	Support
H4: TI ← SC	0.250	0.000***	Support
H5a: TI ← TMS	0.108	0.010*	Support
H5b: OIS ← TMS	0.093	0.014*	Support
H6a: TI ← OC	0.020	0.751	Not Support
H6b: OIS ← OC	0.171	0.000***	Support
H7: TI ← ITP	0.398	0.000***	Support
H8a: TI ← GRS	0.069	0.224	Not Support
H8b: OIS ← GRS	0.113	0.045*	Support
H9: OIS ← TI	0.221	0.002**	Support
H10: OIS ← EK	0.151	0.029*	Support
H11: OIS ← PTC	0.127	0.006**	Support

Note: *Significant at 0.05 level, **Significant at 0.01 level and *** Significant at 0.001 level

The study also examined the mediation effect of the technology innovation through measured eight hypotheses. Table 5 explained that technology innovation has a mediation effect between technology perspective including IS infrastructure, data and information integration, system integration and compatibility, and security concern and adoption information systems in oil sector (H12a, H12b, H12c, and H12d) respectively, was supported (H12a= b=0.058, p<0.01; H12b= b=0.039, p<0.01; H12c=b=0.029, p<0.05; and H12d=b=0.055, p<0.01) respectively.

In addition, in term of organization perspective including top management support and organizational cultural, the findings showed that technology innovation had a mediation effect between top management support and adoption information systems in oil sector (H13a= b=0.024, p<0.05). While the findings also showed that the technology innovation as mediation between organizational cultural and adoption information systems in oil sector was an insignificant effect (H13b=b=0.004, p>0.753). In the same context, the result of measured the mediation effect of technology innovation between environment perspective including IT policies and government regulatory support showed that technology innovation have a significant mediation effect between IT policies and adoption information systems in oil sector, H14a was support (b=0.088, p<0.01). On the other hand, the results also illustrated that the technology innovation as mediation between government regulatory support and adoption information systems in oil sector was an insignificant effect (H14b=b=0.015, p>0.226).. Table 5 explained the *P* value with the standardized path coefficients of hypothesized indirect effects.

Table 5
EXAMINING RESULTS OF HYPOTHESIZED INDIRECT EFFECTS OF THE VARIABLES

Path	Direct Relation Estimate	P value	Indirect Relation Estimate	P value	Status
H12a: OIS →TI→ ISI	0.015	0.729	0.058	0.002**	Support
H12b: OIS →TI→ DII	0.059	0.261	0.039	0.003**	Support
H12c: OIS →TI→ SIC	0.027	0.482	0.029	0.015*	Support
H12d: OIS →TI→ SC	0.108	0.006**	0.055	0.002**	Support
H13a: OIS →TI→ TMS	0.093	0.014*	0.024	0.011*	Support
H13b: OIS →TI→ OC	0.171	0.000***	0.004	0.753	Not support
H14a: OIS →TI→ ITP	-0.026	0.671	0.088	0.002**	Support
H14b: OIS →TI→ GRS	0.113	0.045*	0.015	0.226	Not support

Note: *Significant at 0.05 level, **Significant at 0.01 level and *** Significant at 0.001 level.

DISCUSSION

The effect of technology innovation on adoption of information system in the institutions has long been known by scholars (Al Shobaki et al., 2018; Krishnan, Teo & Lymm, 2017). Actually, the influence of three perspectives of technology innovation including technology, organization, and environment have also measured by researchers (Awa & Ojiabo 2016; Ahmadi et al., 2017). However, this study illustrates the role of technology innovation factors through three dimensions, technology perspective, organization perspective, and environment perspective combined with human perspective on the adoption of information system in oil sector through tested the hypotheses model that developed based on TOE framework theory and HOT FIT model.

Findings from the structural equation model indicate that technology perspective including IS infrastructure, data and information integration, system integration and compatibility, and security concern have a positive effect on technology innovation. Moreover, technology innovation has a mediation effect between factors shaping technology perspective and adoption of information system in oil sector.

The influence of organization perspective on both technology innovation and adoption of information system in oil sector has long been known by researchers (AlBar & Hoque, 2019; Ikumoro & Jawad, 2019). Results from the study model indicate that factors shaping organization perspective have influence on both technology innovation and adoption of information system i oil sector. The hypotheses between top management support, and organizational cultural with adoption of information system in oil sector, as well as, top management support and technology innovation were supported except the hypothesis between organizational cultural and technology innovation which supported by past study conducted by Aldraehim, et al., (2013).

The influence of environment perspective on both technology innovation and adoption of information system in oil sector has long been known by researchers (AlBar & Hoque, 2019; Imron et al., 2019; Van, Kim, Lee & Gim, 2019; Cram, Proudfoot & D'arcy, 2017). Results from the study model indicate that factors shaping environment perspective have influence on both technology innovation and adoption of information system in oil sector. The hypotheses between government regulatory support with adoption of information system in oil sector, as well as, IT policies and technology innovation were supported except the hypothesis between government regulatory support and technology innovation which supported by past study conducted by Monsreal-Barrera, et al., (2020).

The influence of human perspective including employees' IS knowledge and perceived technical competence of IS have been measured on adoption of information system in this study. The impact of employees' IS knowledge on adoption of information system has long been known by researchers (Lin et al., 2011; Vagnani & Volpe, 2017; Kosasi, Vedyanto & Yuliani, 2018). In fact, the impact of perceived technical competence of IS on adoption of information system has also been known (See Ahmadi et al., 2017; Lian et al., 2014; Salam & Ali, 2020). However, this study explains the determinants of human perspective which influence adoption of information system in oil sector through the tested model, HOT-FIT model (Yusof et al., 2008). Results from the structural equation model indicate that both factors shaping human perspective, employees' IS knowledge and perceived technical competence of IS have a positive impact on adoption information system in oil sector.

The influence of technology innovation as a mediation is developed in the theory of TOE framework (Tornatzky & Fleischer, 1990), but the outcome of this mediation showed different results in this study. In the context of technology perspective, technology innovation serve as a mediating between factors shaping technology perspective and adoption of information system in oil sector. In the context of organization perspective, technology innovation serve as a mediating between top management support and adoption of information system in oil sector. On the other hand, the mediation effect of technology innovation between organizational culture and adoption of information system in oil sector was not support. In the context of environment perspective, technology innovation serve as a mediating between IT policies and adoption of information system in oil sector. But the mediation effect of technology innovation between government regulatory support and adoption of information system in oil sector was not support.

Although the model was found significant, the relationship in the rejected hypothesis is open to discussion. We followed the theories provided by literature while we were building our model, as explained within the study. However, no significant relationship was found between technology innovation and organizational cultural. One possible factor which may cause this result in the context of this study, the role of employees in developing information system. Due to the fact that

employees usually receive the information system from their top management or professional technicians, they may not have an impact on the way the information system is developed. In the same context, no significant relationship was found between technology innovation and government regulatory support. One possible factor which may cause this result in the context of this study is the role of government regulatory support in developing information system. Due to the fact that government support is through providing a suitable environment for the work of the system and not the development of an information system or a software.

CONCLUSION AND IMPLICATIONS

This study developed a research model based on TOE frame work combined with HOT-FIT model in order to examine the influence of factors shaping technology perspective, organization perspective, environment perspective, and human perspective on adoption of information system in oil sector. The conceptual model was validated by using a questionnaire of 588 employees in oil sector. The results revealed several theoretical and managerial implications. However, the major contribution of this study is to develop a comprehensive conceptual model to develop electronic management system in Iraqi oil institutions. The TOE framework explains the perspectives of the technology innovation (Tornatzky & Fleischer, 1990), while the related components of HOT-FIT model expresses the human perspective effect towards adoption of information system (Yusof et al., 2008). However, the offered model in this study offers a more comprehensive approach through considering the perspectives of technology innovation together with human perspective within the same model. The conceptual model brings a new approach to e-Management adoption by extending TOE framework and provides new insights to researchers who study information systems.

From a practical perspective, this study provides policymakers with a frame of reference to understand the influence of technology perspective, organisation perspective, environment perspective, and human perspective in adoption of information system. Electronic management is important for employees to improve and facilitate their work. Further, it is help to reduce administrative abuse and corruption. For this reason, the determinants provided by this study are valuable in terms of the practicality. They allow policymakers to understand the dynamic of transactions in the institution, and thus to develop better administration strategies.

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