An Empirical Study on the Affecting Factors of Cloud-based ERP System Adoption in Iraqi SMEs

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***Abstract*—This paper aims to investigate the main factors that have an impact on the adoption of cloud-based enterprise resource planning (ERP) among small- and medium-sized enterprises (SMEs) in the Republic of Iraq using TOE, DOI, and HOT-fit as a theoretical framework. Data was collected from 136 decision maker senior executives, and IT managers in SMEs in the Republic of Iraq. A web-based survey questionnaire was used for data collection processes. The research model and the derived hypotheses were tested using SPSS and SmartPLS. The findings indicate several specific factors have a significant effect on the adoption of cloud-based ERP. This conclusion can be utilized in enhancing the strategies for approaching cloud-based ERP by pinpointing the reasons why some SMEs choose to adopt this technology and success during the adoption phase, while others still do not go forward with the adoption. This study provides an overview and empirically shows the main determinants logistical factors that might face SMEs in the Republic of Iraq. The findings also help SMEs consider their information technologies investments when they think to adopt cloud-based ERP.**

***Keywords*—SMEs; TOE; DOI and HOT-fit frameworks; Cloud-based ERP; ICT; SmartPLS; SPSS**

I. Introduction

Business competitiveness can be improved and can provide a significant benefit for businesses when using information and communication technologies (ICTs) [1]. One of the types of businesses are small and medium sized enterprises (SMEs) [2]. SMEs are an important part of every country's economy because they provide most new jobs and drive technical advancement. SMEs account for a more significant proportion of all businesses and GDP than any other sector[1]. SMEs have historically played an essential role in contributing to the economic development of many countries worldwide. SMEs are playing a critical role and considered essential in the world's economies, providing jobs, adding value, and stimulating innovation[1].

However, SMEs face various logistical challenges and determinants compared to large corporations. They have less budget allocated and fewer staff [3], making their computing environment less complex than equivalent large enterprises. Moreover, SMEs face requirements similar to those experienced by larger companies. Therefore, SMEs need to improve their service level to achieve the targeted goals of the company. According to [2], SMEs will be expected to modify various logistics to suit the needs of their information technology (IT) departments. Thus, SMEs need to use IT technologies to achieve a higher level of competence and efficiency. The use of enterprise resource planning (ERP) systems offers SMEs numerous tangible benefits. Improving competitive organizational position in the market is considered the most interesting benefit when implementing ERP systems. According to [4], ERP provides a real-time infrastructure for a company's back-end systems, including (purchasing, marketing, sales and inventory, procurement, finance, and human resources) (p.1). However, utilizing standard ERP has several disadvantages for businesses; for instance, on-premise ERP require excessive expenses in terms of initial investments [5]. The author in [6] believed that one of the criteria for SMEs to select ERP systems is to check the affordability. Therefore, there was a need for cloud ERP systems that were lower in cost and less time consuming than traditional ERP systems, and that is where ICT can be an asset.

Due to dramatic business changes, there has been globally widespread use of ICTs among various size enterprises, specifically SMEs. The author in [1] found the use of ICTs by SMEs impacts livelihoods and reduces vulnerabilities. Moreover, applying ICT innovatively in SMEs within most developing countries will increase the opportunity to create jobs. Cloud computing technology is an ICT that helps organizations leverage new IT development at an affordable cost. It has grown in importance as a source of new business service innovations. SMEs will better utilize their limited IT resources by using cloud computing to increase IT system stability and scalability. Therefore, SMEs have been identified as the main beneficiaries of cloud computing [7].

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[1]https://www.oecd.org/industry/C-MIN-2017-8-EN.pdf

In this regard, the field of ERP has seen an evolution through the development of cloud-based ERP systems [2]. Cloud ERP system enables users to transfer and share information in real-time due to its three-layer architecture [4]. Moreover, cloud ERP can be used without IT infrastructure requirements; all updates are reported and processed immediately by the providers [8]. Thereby, cloud-based ERP is a cost-effective alternative to traditional ERPs. As a result, adopting these solutions would be highly beneficial to SMEs.

Cloud-based ERP solutions offer various significant benefits to SMEs due to their cost and time effectiveness. Cloud services enable SMEs to save money by extending the flexibility and agility of internal and external operations while also lowering manufacturing costs. Additionally, the ERP market has expanded with the advent of cloud-based ERP solutions [2]. Cloud ERP systems in past few years are gaining more attention in the market, especially among SMEs, however, it has been recognized that SMEs have low motivation toward the adoption of this technology [9] due to failure of implementation after the adoption of cloud ERP system. The author in [10] stated that SMEs' decision makers face failure after cloud ERP implementation due to lack of knowledge and experience. Therefore, it is critical to identify the factors and recognize the issues leading to implementation failure through the adoption stage. To have a successful adoption, decision makers are required to understand and evaluate the factors affecting the adoption of cloud ERP.

Although several studies have attempted in the past to assist decision-makers in addressing their worries about cloud ERP adoption, it's worth noting that most of these proposed frameworks and models have several limitations. Because present models and frameworks primarily focus on the operational and tactical levels, the frameworks and models themselves are limited (that is, they do not encompass many perspectives). Moreover, there was a lack of research and studies on the factors that affect the use of cloud-based ERP in developing Middle East countries [11]. Additionally, most past studies have been undertaken in developed countries and the North Asia Pacific region [12]. Very few studies have been conducted to study the factors affecting cloud ERP adoption in developing nations, notably among SMEs in the Republic of Iraq. The adoption of cloud ERP systems in the Republic of Iraq is still at an early stage. To the best of the author's knowledge, no previous study has investigated the factors that may influence an SME's decision to adopt a cloud ERP system in the private sector in Iraqi SMEs. Therefore, this study aims to address the abovementioned gap by examining the factors influencing the adoption of cloud ERP in Iraqi SMEs from the perspective of decision-makers. The study addresses the following research questions:

- What are the critical factors leading to the adoption of cloud-based ERP system in Iraqi SMEs?
- How can the relationships between the factors and the adoption of cloud-based ERP can be modelled?

The study integrates three relevant frameworks, which were the Diffusion of innovation (DOI), the technology organization environment (TOE) framework and technology, human, and organization (HOT-fit) framework. Based on these frameworks and due to the dynamic nature of cloud ERP, a multidisciplinary approach is required to explain the decision-making aspects impacting cloud ERP adoption. This study proposes an integrated model to identify the main factors that will encourage or prevent SME decision-makers in Iraq from moving on to cloud-based ERP systems, using web-based survey system for data gathering. This paper is organised as follows. The literature review of the cloud-based ERP and the problem area following by prior research studies are presented in Section II. In Section III we present our research model and the theoretical frameworks that has been used. The research hypothesis of the research model is presented in Section IV. The Methodology of the study is located in Section V. In Section VI, the findings of our study are presented. Section VII and Section VIII contain the discussion and the contribution. We conclude the paper in Section IX with a conclusion, limitations and future work.

II. Literature Review

A. Cloud-based ERP

Cloud computing's popularity has accelerated in recent years [13]. Additionally, the concept of ERP adoption (particularly for on-premise systems) has been extensively investigated. Nevertheless, over the last six years, cloud-based ERP (also known as cloud ERP) has gained popularity [14]. Cloud ERP is defined in this section as software applications that integrate business processes and transaction-oriented data across an organization via a model that enables ubiquitous, convenient, on-demand network access with minimal management effort or service provider response. For decades, ERP systems have been adopted as industry-standard software that satisfies business requirements. With the advent of cloud infrastructure, ERP software vendors are aggressively investing in cloud-based ERP systems, and this deployment model is gaining traction as a practical method of delivering ERP software [15]. Cloud-based ERP systems enable businesses to rent their whole ERP system landscape from various service providers, including software and infrastructure providers.

Future SME growth was significantly correlated with (Internet of Things) implementation. Investments in technology could help SMEs develop more rapidly than previously anticipated. SMEs must use technical innovations and e-commerce products to increase their competitive advantage [2]. With regard to SMEs, similar studies supporting the usage of radio-frequency identification technology to address the idea of technical advancements within SMEs. As a result, technical innovations in relation to the adoption of cloud-ERP systems would be extremely beneficial in accelerating the growth of SMEs.

Cloud-based ERP systems arose in the mid-2000s as an alternative to on-premise ERP systems, particularly for handling upgrades and maintenance operations [16]. Cost pressures on enterprises have led to an increase in the use of cloud computing solutions [17]. The use of cloud services is growing as the cost of these systems falls. Cloud-based ERP system is broadly classified into three categories: SaaS (software-as-a-service), IaaS (Infrastructure-as-a-server) and Hybrid cloud ERP [8].

B. Prior Research Studies in Cloud ERP Adoption

The use of cloud-based ERP systems by SMEs would contribute to their growth by addressing issues and enhancing their competitiveness [2]. Because cloud ERP would increase productivity and efficiency while also lowering electricity costs, it is a more cost-effective option [10].

Numerous studies have been undertaken to evaluate the benefits and challenges that businesses encounter when implementing cloud ERP in their businesses [9] [18]. Some researchers have concentrated on cloud ERP adoption in various locations such as Europe, the United States, Australia, and Asia [19] [20]. Others have concentrated on the acceptance of cloud ERP in various industries such as banking, healthcare, and manufacturing [11] [21] [22].

The author in [2] investigated the key logistical determinants of cloud ERP adoption in SMES in developing Middle Eastern countries in order to improve cloud ERP approach strategies by examining why some SMEs embrace this technology while others do not. The DOI and TOE theoretical frameworks were used to investigate 14 variables in this study. Although the study contributes to the adoption of cloud ERP, the study model did not include the human context. The author in [23] investigated the difficulties of cloud ERP implementation. They also investigated the primary advantages of issues encountered during cloud-ERP installation. However, their study was not focused on the adoption phase. The author in [24] examined the factors influencing cloud ERP adoption by manufacturing SMEs in Nigeria. The TOE framework and the DOI theory was used to develop a theoretical model and validated the factors using quantitative analysis. Their findings indicated that cost savings, compatibility, and data privacy are the primary and most significant elements influencing the technological background for cloud ERP adoption. However, they ignore decision makers factors. The author in [25] investigated the reasons for SMEs in developing countries' unwillingness to use Cloud ERP. The study has examined several factors that lead to the reluctance of Cloud ERP based on individual, innovation and organizational characteristics from twenty SMEs in Namibia. This study has some limitations regarding the number of data collected. Moreover, the study covered the SMEs during the implementation phase.

The author in [26] conducted a study that incorporated the TOE framework. He tried to ascertain the variations in TOE characteristics between firms that implemented Cloud ERP systems and those that did not. However, the study had no intention of researching any organization's size, and the responders to the results were not decision-makers within the firm. The author in [19] created a theoretical model utilizing the TOE framework and hypothesized the effect of critical factors on the intention of SMEs in Malaysia, to use cloud-based ERP systems. However, their findings have no noticeable effect on cloud-based ERP adoption. Their findings are ambiguous and have limitations when it comes to decision makers' characteristic determinants. The author in [11] combined the TOE and DOI frameworks to construct a model for examining the factors driving cloud ERP system adoption in Saudi Arabian organizations. Their study had limitations that it did not consider critical variables such as security and privacy, nor did it take into account the characteristics of decision-makers that could influence cloud adoption. The author in [18] explored the challenges to cloud ERP adoption in Pakistani SMEs using a qualitative methodology in association with unstructured interviews. According to the study, ten potential barriers to the adoption were identified the primary issues to determine whether to accept or reject cloud ERP solutions. However, their analysis excluded human features and relied entirely on qualitative data.

Furthermore, while most of previous studies emphasize the technological aspects of cloud ERP, they overlook the human and organizational aspects [12]. Even though some concepts of cloud computing technology are universal, others will differ due to different contexts and country requirements. Cloud ERP adoption also varies by country and industry. Although the researchers identify cloud ERP as a global IT phenomenon, they also emphasize that the factors influencing the adoption of cloud ERP play different roles in different economic environments. Human factors such as the characteristics of decision makers differ from country to country, even if the countries are located in the same region. Despite the importance of cloud-based ERP usage and its role to enhance the company's performance, there was a lack of research and studies on the factors that affect the use of cloud-based ERP in developing Middle East countries [11].

In summary, this study found that the preceding research on cloud-ERP adoption and its factors is twofold. First, the majority of the research has focused on the benefits and limitations of cloud ERP adoption, the development of cloud ERP frameworks, and the variables influencing cloud ERP implementation from a service's perspective in developed countries. However, few studies have been conducted on organizational perspectives, notably those of decision-makers or end-users, which are crucial for business cloud ERP adoption. As a result, numerous research uses the TOE paradigm to investigate the cloud-ERP implementation issue. Secondly, prior studies have emphasized the significance of technological, organizational, and environmental factors in cloud ERP adoption. The adoption of cloud ERP, however, varies depending on the human factors across industrial sectors. For instance, factors that may affect SME adoption decisions made by decision-makers have not been sufficiently examined in conjunction with other aspects in prior studies.

III. Theoretical Framework

A. Research Model

There is a tendency toward merging several frameworks or theories. In order to better explain adoption in the context of cloud-based ERP, the majority of academics combine two or more theories. The complementarity of various existing theories on technology adoption makes this approach applicable. DOI, TOE, and HOT fit theories complement one another to thoroughly understand the major determinants of technologies [22]. The TOE, DOI, and HOT-fit frameworks are the most influential theories in cloud service adoption studies in organizations [22]. The TOE framework is based on the organizational level theory, which provides a multi-perspective framework by incorporating internal and external elements [27]. They also identified three institutional contexts

of the TOE framework, including the technological, organizational, and environmental contexts, which impact the adoption of technological innovations. The author in [28] defined DOI as a process for decreasing uncertainty, and he provided attributes that aid in reducing uncertainties about a technological invention. They are the following: Relative Advantage, Compatibility, Complexity, Trialability, and Observability. The author in [29] presented HOT-fit as an evaluation paradigm for health information systems. HOT-fit evaluates HIS systems on three dimensions (technology, human, and organization), arguing that user attitude and competence also affect technology adoption.

The present study comprises four dimensions that influence cloud-ERP adoption: Technological context, Organizational contexts, Environmental context, and Human context. Fig. 1 illustrates the research model.

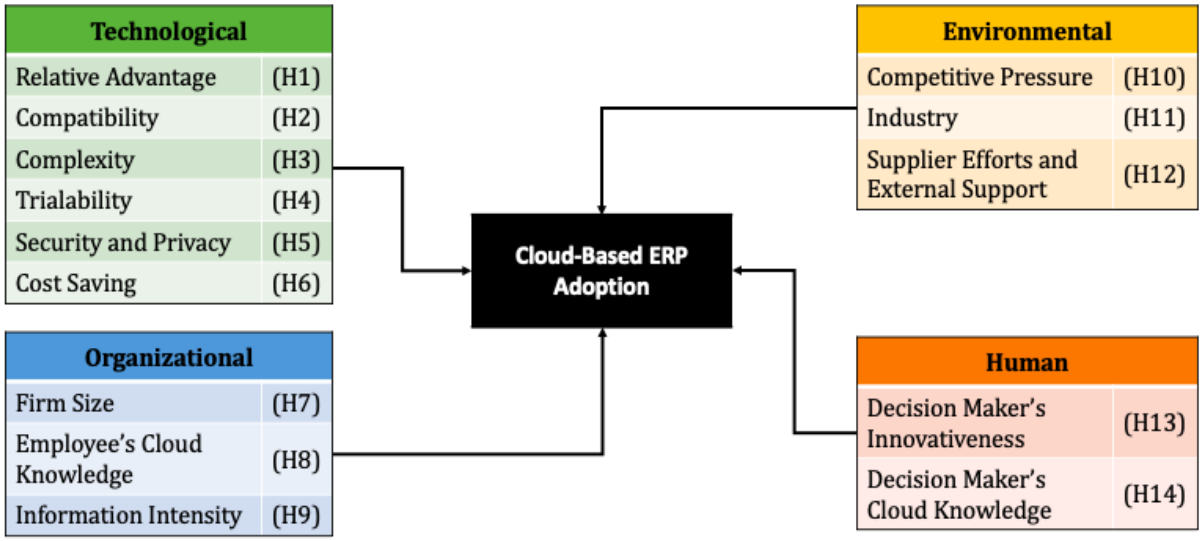

Fig. 1. Research model.

IV. Research Hypothesis

A. Technological Context

The technological context in the original TOE framework referred to both internal and external technologies critical to a company [30]. The technological context has been developed by combining the DOI attributes and the technology dimension of TOE framework.

The most influential factors in the innovation adoption have been adopted to create the technological contexts, include: relative advantage, compatibility, complexity, trialability, security and privacy, and cost saving.

The Relative Advantage (RA) factor relates to determining if cloud ERP systems will benefit the indicated SME more than other technologies. This factor is a substantial and favorable influence in the choice to use cloud ERP [13]. According to [31], a company is more likely to adopt cloud ERP in its operations if it recognizes the potential benefits of cloud ERP over other traditional types of ERP. Moreover, RA has been identified as a significant element and is wholly associated with adopting IT innovations [32]. It was discovered that relative advantage has a considerable and beneficial effect on cloud service adoption in Lebanese SMEs [33].

Compatibility (CAT) is defined as the degree to which new technology is compatible with an organization's principles, current demands, and historical traditions. The author in [9] identified compatibility as a critical aspect in adopting innovation in cloud ERPs. While CAT was identified as a critical factor in the adoption of cloud services by SMEs [34]. However, it was not shown to affect cloud service adoption in Saudi Arabian higher education institutions [35].

Complexity (CEX) is a term that refers to how difficult innovation is to learn, use, and adopt. The more easily a business can integrate with technology, the more rapidly it may be accepted when innovation is primarily intended to add value to the business. Adopting new technology, such as cloud ERP Services, may present obstacles for SMEs, such as the need to modify current processes [36].

Trialability (TRA) has been viewed as a crucial necessary element of adopting new technology [7] [37] [38]. TRA is essential for early adopters than late adopters, as the latter can profit from the previous experience as a benchmark of the innovation's performance.

Security and Privacy (SP) are described as (the extent to which cloud computing is seen as more secure than other computer ideas) [34]. The SP of an organization's data are significant obstacles to shifting data to the cloud. One of the most frequently mentioned concerns concerning cloud-based services is the cloud's security and privacy. The term (cloud security and privacy) relates to various issues, including the cloud's confidentiality and integrity [39].

The Cost Saving (CT) of cloud ERP is defined as (the extent to which decision-makers view the entire cost of employing cloud ERP to be less than the cost of on-premise ERP). Cloud services support innovation by lowering IT investment costs and total IT capital expenditure [33]. The cost was shown to be a significant factor in determining whether to utilize cloud services by Australian SME's [38]. These considerations lead to the following hypotheses:

- H1: Relative advantage (RA) will positively influence the decision to adopt Cloud ERP within SMEs.
- H2: Compatibility (CAT) will positively influence the decision to adopt Cloud ERP within SMEs.
- H3: Complexity (CEX) will negatively influence the decision to adopt Cloud ERP within SMEs.
- H4: Trialability (TRA) will positively influence the decision to adopt Cloud ERP within SMEs.
- H5: Security (SP) and Privacy concerns will positively influence the decision to adopt Cloud ERP within SMEs.
- H6: Cost Saving (CT) will positively influence the decision to adopt Cloud ERP within SMEs.

B. Organizational Context

The organizational context relates to the organization's properties and the resources available to foster innovation. In the context of cloud ERP, successful cloud ERP adoption requires the organization to endure both technical and organizational changes. The organizational context in this study includes firm size, employee's cloud knowledge, and information intensity.

The Firm Size (FS) has a significant impact on how quickly a technology innovation is being adopted. Numerous studies have demonstrated that an organization's size can positively influence its adoption of cloud services [7] [37]. The author in [37] demonstrated that the effect of certain variables varied according to organization size.

Numerous studies have discovered that employee's cloud knowledge (ECK) play a significant role in technology adoption decisions [7] [33]. Employees' understanding of similar prior experiences can be viewed as showing the similarity between current practice and prior experience. As a result, an organization's employees' cloud knowledge and experience could be referred to as its technological capability. To use the ERP system through the cloud, staff must acquire both cloud-related expertise and prior ERP system experience.

Information Intensity (INI) is defined as the degree to which a business's product or service contains information. The term (information intensity) relates to the amount of information available within a business service. Businesses in various areas require varying levels of information; for example, financial brokers require access to the most up-to-date information. According to [40], INI positively affects the adoption of cloud services because the cloud can provide up-to-date and appropriate information. According to [41], information intensity increases innovation adoption. Based on the discussion above, the following hypotheses are proposed for this study:

- H7: Firm size (FS) will positively influence the decision to adopt Cloud ERP within SMEs.
- H8: Employee's knowledge/Experience (ECK) will positively influence the decision to adopt Cloud ERP within SMEs.
- H9: Information Intensity (INI) will positively influence the decision to adopt Cloud ERP within SMEs.

C. Environmental Context

The environmental context refers to the location of the firm as indicated by the industry type. The researcher found several factors, including competitive pressure, industry type, and supplier effort and external support that might influence an organization's decision to adopt cloud ERP.

Competitive Pressure (CP) refers to the degree to which an enterprise is under pressure from other external partners, such as competitors within the market [2]. Numerous studies have demonstrated the effect of competitive pressure on technology adoption, such as cloud ERP, in SMEs [26] [42], while other empirical studies have revealed no relationship between competitive pressure and technology adoption [7] [11].

The organization's industry sector (IN) has a significant impact on whether or not it decides to implement new technology [7]. Since firms in different sectors have varying business needs, those that depend on technology are much more willing to adopt a technology invention such as cloud ERP. It has been claimed that the industry in which a business operates affects the information processing requirements of the business, which in turn affects the firm's decision to adopt new technology.

Supplier effort and External support (ES) is described as the amount of assistance in integrating an information system [7]. In the context of cloud ERP, external support refers to assistance provided by cloud server providers, government policies, and legal safeguards to assist SME decision-makers in adopting cloud ERP. Because cloud ERP is seen as new in developing countries, there is a lack of information and existing work on cloud ERP engaging SMEs [11]. Thus, the following hypotheses are proposed:

- H10: Competitive pressure (CP) will positively influence the decision to adopt Cloud ERP within SMEs.
- H11: Industry sector (IN) which SME operate will positively influence the decision to adopt Cloud ERP within SMEs.
- H12: Supplier efforts and external computing support (ES) will positively influence the decision to adopt Cloud ERP within SMEs.

D. Human Context

Before adopting any IT project, the human factors should be considered since it affects the successful acceptance of innovative technology [29]. According to [22], the human

context was selected as the most crucial context for adopting cloud services. The following human factors are:

Decision Maker's Innovativeness (DMI) is defined as the degree to which decision-makers are willing to experiment with innovative and perhaps risky solutions [43]. The innovativeness of decision-makers is measured by their willingness and ability to experiment with new technologies that have not yet been thoroughly explored in their industry [44]. Previous studies have found the innovativeness of decision-makers to be a positive factor for cloud services adoption [7] [22] [44]. Studies highlighted that if the individuals are critical decision-makers in the company, personal innovativeness can help identify who will adopt an innovation first [7].

Possessing sufficient knowledge about new technology is the first stage in adopting. According to [45], the CEO's knowledge of information systems (DMC) has a beneficial effect on IS/IT adoption. The technological knowledge and skills of the decision-maker will influence the decision to adopt an IT innovation. SME will have more trust if the decision-maker has proper knowledge and skills on cloud ERP. As a result, the following hypothesis is generated:

- H13: Decision Makers' innovativeness (DMI) will positively influence the decision to adopt Cloud ERP within SMEs.
- H14: Decision Makers' cloud knowledge (DMC) will positively influence the decision to adopt Cloud ERP within SMEs.

V. METHODOLOGY

A. Scope, Sampling and Measurement Instrument

The purpose of this study is to investigate the primary determinants and variables impacting a SME's decision makers to adopt cloud ERPs in Republic of Iraq. This study's target respondents were composed of the decision-makers (Owners, CIOs, CEOs, IT executives, and IT managers) belonging to SMEs. The participants who are either (Owners, CIOs, CEOs) or heading departments (IT executives and IT managers), directly involved and responsible for technology acquisition and policy decisions for their SMEs. Managers are presumed to be the decision-makers or contributors to decision-making for adopting new technologies in their enterprises. Although the researchers were able to gain a list of private enterprises from the Ministry of planning website in the Republic of Iraq, several issues were encountered when validating the frame, such as the list not being up to date, the list not specifying the location of the SMEs, a larger number of these enterprises being already closed, inactive numbers, duplication of firms or duplicated phone numbers, and these enterprises not specifying if the enterprises were small or medium-sized. After several iterations and cleaning of this list, 300 unique and validated phone numbers of enterprises were identified, which were considered the core of the sample frame. Each SME in the sample met the following criteria: must be in Baghdad governorate; and must not have more than 30 employees. SMEs in Baghdad government were chosen because they are in a better position to understand current IT operations, increase in growth rates and future trends for their enterprises [11]. The questionnaire was prepared in English and subsequently translated into Arabic, as the study was conducted in Iraq, where Arabic is the official language. A web-based survey was utilized due to various benefits, including quicker distribution, a more professionalism, affordability, and an improvement in response rate.

Pilot study was necessary to revise the wording, structure, content, arrangement, layout, simplicity, and clarity of the survey instrument [46]. 50 samples from the total sample frame were conducted for the purpose of pilot study. The feedback from the pilot study was necessary to enhance the questions and test respondents' comprehension and clarity before administering the actual survey.

Since the data was analyzed using SEM, this research has determined the sample size according to [47] rule, which indicate the sample size in SEM must equal the larger 10 times the largest number of formative indicators used to measure a single construct. The number of leading indicators utilized for measuring a single construct is 12 for RA; therefore, the sample size is 120 (10*12).

Since the sample size of 120 is required for this study, 180 questionnaires were given to respondents to eliminate a questionnaire shortage caused by various factors (missing, ignoring, and incomplete). One hundred fifty-five (155) decision-makers responded to our email and completed the survey, representing an 86.1 percent response rate. Thus, it was acceptable for a web survey that was sent via e-mail/internet [48].

Eleven (11) of 155 respondents were rejected because significant areas of the questionnaires were incomplete. Moreover, eight (8) responses were eliminated since they were ineligible to participate in the survey due to not meeting the criteria. 136 completed surveys were left for the study.

An email was sent to every decision-maker contained a link to the online survey, which was conducted using Google Forms, as well as a cover letter describing the study's aim. The survey contained a definition and description of various terms used in the questionnaire to enhance the validity of the response. A first and second reminder was given to all decision-makers interested in participating in this research study, both by email and separated by a few weeks to ensure the completion of the survey. In total, 75 items for 14 constructs in the survey came from prior studies and literature which was modified by the researcher to fit the context of cloud-based ERP adoption. The survey is divided into two main parts. Part one seeks the demographic information from the respondents; this part also relates demographic information to the respondent's organization as shown in Table I. This part of the questionnaire was related to fundamental questions about the firm, such as whether the SME has adopted on-premise ERP or cloud ERP. Also, questions regarding businesses size, industry, and market scope were included. Part two was about the core constructs developed in the proposed model, which contained the questions used for studying the four contexts, namely technological, organizational, environmental, and human, assessed by five Likert-type items.

TABLE I. DEMOGRAPHIC INFORMATION

Variable	Frequency	Percentage	Variable	Frequency	Percentage
Position			***Cloud ERP awareness***		
Owner	44	32.4	High awareness	77	56.6
CEO	12	8.8	Low awareness	59	43.4
IT Manager	25	18.4	***Firm Size***		
IT Executive	35	25.7	1 - 9 Employees	47	34.6
Other	20	14.7	10 - 30 Employees	89	65.4
Gender			***Industry Type***		
Male	117	86	Technology	31	22.8
Female	19	14	Telecommunications	14	10.3
Age			Energy	9	6.6
20 - 25	18	13.2	Construction	13	9.6
26 - 30	72	52.9	Oil, Gas and Petrochemicals	9	6.6
31 - 35	22	16.2	Manufacturing	12	8.8
36 - 40	14	10.3	Pharmaceutical	6	4.4
41 and above	10	7.4	Education	11	8.1
Education Level			Financial services	7	5.1
Diploma	18	13.2	Private healthcare and services	5	3.7
Bachelor	79	58.1	Entertainment/media	4	2.9
Masters	28	20.6	Transport, Distribution and Logistics	3	2.2
Doctoral	11	8.1	Consumer Packaged Goods	7	5.1
Work Experience			Business trading	5	3.7
0-5	13	9.6	***ERP System Type***		
6-10	64	47.1	On-premise ERP	44	32.4
11-15	24	17.6	Cloud ERP	32	23.5
16-20	26	19.1	None	60	44.1
+21	9	6.6			

B. Data Analysis

The partial least squares (PLS) path modelling approach was used for this work because it is more appropriate for predictive and exploratory research [48]. PLS-SEM is chosen as the most acceptable approach because this study was designed to predict the influencing factors among the specified variables and to analyze their impacts on adoption within the proposed model.

To analyse the data, SmartPLS software was used, which is one of the most well-known software applications for PLS-SEM [49]. Statistical Package for the Social Science (SPSS) software was used to analyze demographic and institutional data, such as industry and market size. In addition, the instrument's reliability was also tested using Cronbach's alpha technique.

VI. FINDINGS

A. Reliability and Validity

The reliability and validity were measured first. The reliability of data was evaluated using composite reliability and the alpha coefficient. The composite reliability (CR) values ranged from 0.860 to 0.957 and Cronbach's Alpha values ranged from 0.757 to 0.951. Table II shows that all constructs are regarded to have adequate internal consistency reliability were above the acceptable 0.7 threshold.

Validity was measured by considering convergent and discriminant validity. The author in [47] defined convergent validity as the degree of correlation between two measures of the same construct. This study assessed the convergent validity using the AVE [50]. Convergent validity is permitted when AVE is at least 0.5. The study's measuring approach has good convergent validity since all AVE values meet the minimum requirement of 0.50 as shown in Table II [50].

TABLE II. CONSTRUCT CONSISTENCY AND RELIABILITY

Constructs	AVE	CR	CA
AD	0.875	0.934	0.859
RA	0.649	0.957	0.951
CEX	0.747	0.898	0.832
CAT	0.653	0.917	0.888
TRA	0.776	0.932	0.904
SP	0.686	0.945	0.933
CT	0.666	0.952	0.944
IN	0.741	0.895	0.824
ES	0.755	0.939	0.919
CP	0.793	0.920	0.871
ECK	0.831	0.951	0.933
INI	0.720	0.885	0.810
FS	0.786	0.917	0.866
DMI	0.673	0.860	0.757
DMC	0.875	0.934	0.859

The author in [51] defines discriminant validity as the degree of difference between two notions. The discriminant validity of constructs is assessed by the [52] criterion, HTMT and cross-loadings of construct items. The discriminant validity of a construct is supported when the square root of its AVE is greater than its correlation with other constructs [52]. The discriminant validity of a measurement model is determined by the item loadings and the square root of the construct's AVE. The square roots of AVE, shown in Table III, were larger than their corresponding correlation, showing that our data had good discriminant validity.

The HTMT is a new technique for determining discriminative validity in contrast-based SEM. HTMT is the average of all correlations of indicators across combinations that measure different structures relative to each other. The author in [53] suggested that HTMT values below 0.85 indicated distinct combinations. Table IV shows all HTMT values below 0.85. As a result, discriminatory structures were provided.

TABLE III. FORNELL-LARCKER CRITERION

	AD	RA	CEX	CAT	TRA	SP	CT	IN	ES	CP	ECK	INI	FS	DMI	DMC
AD	**0.935**														
RA	0.799	**0.806**													
CEX	0.56	0.686	**0.864**												
CAT	0.599	0.753	0.776	**0.808**											
TRA	0.515	0.643	0.459	0.622	**0.881**										
SP	0.691	0.724	0.611	0.732	0.691	**0.828**									
CT	0.786	0.692	0.687	0.751	0.62	0.775	**0.816**								
IN	0.461	0.651	0.515	0.597	0.561	0.726	0.626	**0.861**							
ES	0.62	0.772	0.518	0.625	0.732	0.767	0.735	0.817	**0.869**						
CP	0.509	0.676	0.478	0.56	0.757	0.731	0.652	0.716	0.796	**0.891**					
ECK	0.522	0.705	0.615	0.719	0.671	0.732	0.68	0.682	0.701	0.759	**0.912**				
INI	0.405	0.551	0.481	0.621	0.421	0.557	0.536	0.448	0.401	0.392	0.591	**0.849**			
FS	0.464	0.515	0.513	0.627	0.396	0.442	0.538	0.445	0.405	0.429	0.42	0.398	**0.887**		
DMI	0.531	0.606	0.5	0.605	0.687	0.674	0.579	0.603	0.723	0.66	0.63	0.406	0.448	**0.82**	
DMC	0.796	0.732	0.694	0.745	0.614	0.804	0.596	0.604	0.73	0.626	0.672	0.542	0.537	0.568	**0.829**

TABLE IV. HTMT

	AD	RA	CEX	CAT	TRA	SP	CT	IN	ES	CP	ECK	INI	FS	DMI	DMC
AD															
RA	0.791														
CEX	0.646	0.757													
CAT	0.679	0.712	0.745												
TRA	0.563	0.676	0.521	0.682											
SP	0.76	0.628	0.681	0.503	0.732										
CT	0.594	0.642	0.762	0.627	0.652	0.788									
IN	0.532	0.734	0.607	0.691	0.637	0.639	0.708								
ES	0.69	0.631	0.588	0.69	0.783	0.729	0.797	0.731							
CP	0.572	0.797	0.554	0.634	0.523	0.797	0.724	0.646	0.779						
ECK	0.566	0.746	0.697	0.785	0.709	0.776	0.725	0.767	0.756	0.749					
INI	0.463	0.611	0.568	0.737	0.485	0.628	0.65	0.542	0.459	0.45	0.672				
FS	0.52	0.563	0.598	0.706	0.425	0.484	0.592	0.519	0.449	0.482	0.454	0.466			
DMI	0.649	0.705	0.621	0.725	0.546	0.706	0.676	0.766	0.665	0.518	0.739	0.505	0.529		
DMC	0.773	0.639	0.777	0.428	0.649	0.657	0.655	0.683	0.793	0.697	0.719	0.611	0.596	0.664	

B. Hypothesis Testing

Bootstrapping is a statistical approach used in SmartPLS to evaluate the correlations (paths) between dependent and independent variables. The structural model was constructed to identify the path relationship among the variables. The study tests the relationship between endogenous and exogenous variables via the path coefficient (β) and t-statistics.

The study found that RA (β=0.100, p=0.005, t=2.853), CAT (β=0.106, p=0.036, t=2.100), TRA (β=0.138, p=0.005, t=2.835), SP (β=0.166, p=0.004, t=2.893), CT (β=0.137, p=0.001, t=3.236), FS (β=0.152, p=0.037, t=2.561), ECK (β=0.105, p=0.034, t=2.125), IN (β=0.185, p=0.016, t= 2.411), ES (β=0.116, p=0.025, t=2.255), DMI (β=0.113, p=0.032, t=2.147), and DMC (β=0.125, p<0.001, t=3.611) have a significant impact on the Adoption Decision (AD) of cloud ERP. However, CEX (β= -0.003, p=0.949, t=0.064), INI (β= -0.016, p=0.823, t=0.224), and CP (β= -0.034, p=0.432, t=0.787) have no significant impact on the Adoption Decision (AD) of cloud ERP. Table V indicated the result of the hypothesis.

The T-statistic was used to determine the contribution of independent constructs to the predictor of the dependent construct, AD. The items' t-values ranged from 0.224 to 3.611, reaching the level of significance. All structural model relationships were statistically significant when the p-value <0.05 and the t-value >1.96. Except for the paths between (CEX, INI, and CP) and AD, where the CEX (t=0.064, p=0.949), INI (t=0.224, p=0.823), and CP (t=0.787, p=0.432), all of which did not meet the recommended value; thus, these paths this path were not significant.

VII. Discussion

The purpose of the first study question was to identify the factors that influence an SME's decision to adopt a cloud-based ERP system in Iraqi SMEs. This research question was answered based on the literature review related to the adoption of cloud-based ERP. A comprehensive literature review on cloud ERP system, SMEs, trends, strategies, and frameworks for cloud-based ERP system in different sectors was conducted. Moreover, the cloud-based ERP system was critically reviewed the existing and the use of cloud-based ERP system in the SME sector. Literature deeply emphasizes the importance of technological, organizational, environmental, and human characteristics while conducting technology adoption studies. To identify and confirm the critical factors affecting the adoption of the cloud ERP system, data was collected and examined quantitatively. Based on the analysis, eleven factors out of fourteen were found to influence the adoption in SMEs. The findings in each context are discussed as follows:

A. Technological Context

Regarding RA, CAT, TRA, SP and CT the findings indicate they are significantly influence cloud-ERP adoption in SMEs. The findings are consistent with some previous studies [11] [24] [34] [38] [54]. Conversely, this finding was inconsistent with that obtained by [2]. These results may strongly contribute to the adoption of cloud ERP in SMEs through utilizing these factors of influence. In regard of CEX, the findings indicate it was not significant to the adoption of cloud-ERP. The result of CEX was consistent with the result from [2].

B. Organisational Context

In regard to FS and ECK, the results were consistent with several previous findings from cloud ERP adoption studies which report the significant positive influence the adoption [11] [24] [54]. Contrary to expectations, this study did not find a significant relationship between INI and cloud-ERP adoption. The findings of INI were inconsistent with [40], which indicates that cloud services can make the best use of information intensity and thus influence positively.

C. Environmental Context

Unexpectedly, CP did not significantly affect cloud-ERP adoption. This result was consistent with previous studies [2] [22]. In contrast, [24] and [11] found that CP has a significant impact in association with cloud-ERP adoption.

IN and ES were statistically significant for cloud-ERP adoption in SMEs in Iraq. In terms of IN, the finding of this study is consistent with the finding of some previous studies [7] [54]. However, it is inconsistent with those of [38], which indicates that cloud services can be understood in the context of an overall business's strategy based on agility and responsiveness. In terms of ES, the result is consistent with those of [26] [38] [42], which they found that the factor was positively associated with adoption in SME. In addition, [26] implied that the availability of vendor (external) support could be a vital factor that encourages SMEs' adoption of the cloud ERP system.

D. Human Context

Interestingly, two predictors in the form of DMI and DMC were found as statistically significant influences in ERP adoption decisions. The findings of DMI and DMC are consistent and similar to the findings of some previous studies [21] [22] [24], which found that the factor was positively associated with adoption in SME.

TABLE V. Results of Hypotheses and Relative Paths

Path	β	t-values	p-values
RA→AD	0.100	2.853	0.005
CAT→AD	0.106	2.100	0.036
CEX→AD	-0.003	0.064	0.949
TRA→AD	0.138	2.835	0.005
SP→AD	0.166	2.893	0.004
CT→AD	0.137	3.236	0.001
FS→AD	0.152	2.561	0.037
ECK→AD	0.105	2.125	0.034
INI→AD	-0.016	0.224	0.823
CP→AD	-0.034	0.787	0.432
IN→AD	0.185	2.411	0.016
ES→AD	0.116	2.255	0.025
DMI→AD	0.113	2.147	0.032
DMC→AD	0.125	3.611	0.000

Following the second study question and to meet the study's objective, the research proposed an integrated model to identify the main factors that could encourage or prevent SME decision-makers from moving on to cloud-based ERP systems. The initial model integrates the critical factors from the literature review as the main factors that may impact the SME's intention to adopt cloud-based ERP. This research integrates three theoretical frameworks (DOI theory, TOE framework, and HOT-fit framework) to develop the conceptual research model. To refine and confirm the factors in the cloud-based ERP adoption model, the study utilized quantitative methods. A questionnaire survey was used to test the proposed model and confirm the identified factors for the cloud-based ERP adoption. Eleven of the fourteen hypotheses were eventually supported. Both study questions were answered, and study objectives were achieved.

VIII. Contribution

A. Theoretical Contribution

Based on a review of the literature and to the best of the researchers' knowledge, this study is the first exploratory study that combines DOI, TOE and HOT-fit in identifying the determents that will affect the adoption of cloud ERP in a developing Middle Eastern nation, particularly, the Republic of Iraq. It aimed to determine the significant link between technological, organizational, environmental, and human context; and the adoption decision of cloud-based ERP in Iraqi SMEs. The effect of several factors, such as relative advantage, compatibility, complexity, trialability, security and privacy, cost saving, firm size, employee's cloud knowledge, information intensity, supplier efforts and external computing support, competitive pressure, industry, decision maker's innovativeness, and decision maker's cloud knowledge towards cloud ERP adoption is an important topic that should be considered further in the future. The results also provide further support for the utility of the TOE, DOI and HOT-fit in technology adoption such as cloud ERP.

B. Practical Contribution

For SMEs' decision-maker and cloud service providers, the outcomes of this study can be effectively applied. Cloud service providers can use the research model to improve their knowledge about why certain SMEs decide to adopt new technologies while others in the SME sector do not, since cloud service providers need to be aware of typical issues experienced in SMEs when deciding on a new adoption of cloud services. This will be a guide to assess the cloud-based ERP system, providing the SMEs' decision-makers the opportunity to trial this solution before the actual implementation and thus improve the awareness of cloud services. Moreover, SMEs (decision-makers) will evaluate the cloud services (cloud-based ERP systems) before their actual use, allowing them to check the level of compatibility and complexity with their existing system. This study exposes that the decision-makers of some enterprises in the private sector still lack enough knowledge to make an informed choice. Therefore, the decision to adopt this technology depends not only on the decision-maker's lack of innovation, and the adoption requires both innovativeness and knowledge to adopt technological innovations. As a result, the outcomes of this study will give practical instructions for the effective adoption of cloud ERP in Iraq, as well as help other emerging economies in similar situations prepare for and implement cloud ERP services.

C. Academic Contribution

Compared with other models of the adoption decision study, the proposed model is intended to be more comprehensive where it falls in the adoption decision phase of the cloud ERP life cycle by assessing the decision to adopt the system by identifying the factors that influence the decision to adopt cloud ERP. This study will open opportunities for more research and enhance the constructs further to clarify the adoption of cloud-based ERP systems in SMEs. The results confirmed that the proposed model fitted the situation well with the data. Therefore, the developed model is seen as valid and can contribute significantly to explaining the adoption of the cloud ERP system. Additionally, the study contributes to the Iraqi innovations technology and enterprises literature by identifying the significant variables that affect SME adoption of the cloud-based ERP systems. A long-ignored decision-makers characteristic is introduced that integrates variables pertinent to a human context.

IX. Conclusion

Enterprises facing business issues have demonstrated a significant desire for cloud ERP. Yet, research on the variables impacting the adoption of cloud ERP, particularly in the growing Middle Eastern nations, is scarce. This report sheds light on the variables that SMEs' decision makers must consider before adopting cloud ERP, with a focus on the challenges faced by decision makers of Iraqi SMEs from different business scopes. The literature review served as the foundation for this study's integrated conceptual model, which was then developed and put to the test, utilizing quantitative research. Therefore, it is anticipated that this research will advance theory, methodology, and practice. The researchers studied the body of literature on the adoption of cloud ERP, the TOE framework, the theory of innovation characteristics (DOI) and HOT-fit framework. The study also provided an in-depth analysis of the present relevant theories and indicated the initial (technological, organizational, environmental, and human) influences on the adoption of cloud ERP. The TOE framework, DOI theory and HOT-fit framework were specifically cited as the best suitable theories for creating a conceptual model for SMEs adopting cloud ERP. Eleven factors (RA, CAT, TRA, CT, SP, FS, ECK, IN, ES, DMI, AND DMC) were found to be significant determinants factors of cloud-ERP adoption. Three factors (CEX, INI, and CP) were insignificant. The findings of this study will enhance the adoption of cloud ERP in the Republic of Iraq and other developing middle Eastern countries. The cloud vendors and SMEs' decision maker will benefit from the findings in overcoming obstacles and effectively adopt cloud ERP.

This study endeavoured to investigate the impact of the most notable factors in the adoption of cloud ERP rather than including a complete list of all possible influencing factors. Future studies could examine at more variables and see how they affect the adoption of cloud ERP. Second, this study was conducted in the Republic of Iraq, the findings of which

cannot represent the overall situation of a developing country. Moreover, data were obtained in a specific governorate, SMEs in Baghdad, limiting the generalizability of the findings. Further research should be done to collect data from different developing countries and additional research could expand the scope of the study by examining another governorate within the Republic of Iraq. Third, the decision makers answered questions based on their observations, work experiences, and ICT understanding. Thus, the data collected may not be sufficiently objective. However, due to the nature of this study (exploratory research), the quality of the collected data is acceptable. Finally, the sample selection was quite limited and must be expanded in future work.

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