

## The Implementation of Cloud Computing in SMEs: a systematic literature review of Critical Success Factors

Ali Salah Alasady<sup>1</sup>, Wid Akeel Awadh<sup>2</sup>, Hayder Salah Hashim<sup>3</sup>

<sup>1</sup>Department of Computer Science, University of Basrah

<sup>2</sup>Department of Computer Information System, University of Basrah

<sup>3</sup>Department of Financial and Banking Sciences, University of Basrah

**Abstract:** Cloud computing (CC) is a fast-growing technology and one of the most important technologies through which enterprises get digitalized. However, implementing and adopting an appropriate cloud service is a huge challenge and is also knowledge-intensive, needing high level of participation and ownership of IT units and business managers. Nevertheless, despite the fact that failures in cloud implementation projects can be avoided through knowledge of critical success factors (CSFs), research in this area is less often conducted, particularly in small and medium-enterprises. Thus, this paper makes contributions in this regard in theory and practice by identifying 21 CSFs through a thorough review of literature combined with interviews conducted among SMEs in Iraq. Consequently, a comprehensive model is derived as a starting point for cloud implementation in which the CSFs are assigned to the different parties involved in those projects.

### 1. Motivation

The impact of cloud computing (CC) on information and communication technologies is of great significance given the important role played by cloud computing in the digitalization of enterprises. Currently some organizations are seeking to derive technical and financial benefits of cloud computing by outsourcing applications, data, of the whole of the company's IT to cloud [35]. The dynamism and scalability of cloud computing resources makes it an attractive technology to organizations that are migrating to cloud computing which is equipped with internet-based services [34]. Nevertheless, there is an increase in the risk and uncertainty associated with the adoption of cloud services as a result of the increased proliferation of CC technologies and increasing number of cloud service providers (CSPs). More so, there is a great challenge associated with selecting and implementing ideal cloud services as it is knowledge intensive, and requires strong participation and ownership of business managers and IT units [44].

Regardless of the challenges that accompany cloud computing, there are a number of benefits that can be derived from it, some of which include low cost of entry, high level of scalability and flexibility, pay-as-go payment mode [9]. Although cloud services are flexible coupled with other huge benefits, organizations in Iraq are yet to embrace cloud technologies and have a different view about their adoption, thereby resulting in poor exploitation of the potentials of cloud computing by small and medium-sized enterprises.

Cloud computing is technology that brings about drastic increase in flexibility and responsiveness to change without the need for expensive hardware and software. Also, the cost of operation is usually minimal. For these reasons, it is ideal for SMEs to employ the use of cloud computing given that it allows them enjoy the benefits modern IT solutions at an affordable cost without heavy investment in development and related resources [22].

On the other hand, the implementation of new technology and systems in a company is accompanied by complexities and consumes much time, thereby increasing the risks encountered by companies in the implementation process. Thus, understanding the factors that enable the successful implementation of technologies and systems is critical to avoiding failed IT implementation projects [11, 25, 31]. In other words, it is of great importance to put into consideration the critical success factors during the implementation of a new technology or system, or even the upgrading of an extant system. When a company understands these factors, it helps in achieving the successful implementation of a system or technology, thereby reducing the risk that can be associated with the project.

Thus, this paper is aimed at identifying the critical success factors (CSFs) required for the implementation of cloud services in SMEs from the perspective of the user companies in Iraq. The first step in this study involved carrying out a systematic review of extant literature for the purpose of identifying CSFs for cloud implementation projects. Based on the CSFs identified through the literature review, interviews were conducted in Iraqi SMEs that have already adopted and implemented cloud solutions. Generally, the research questions guiding this study are as follows:

**RQ1:** What are the critical success factors of cloud service adoption and implementation discussed in the literature?

**RQ2:** Which specific critical success factors influence the implementation and adoption of cloud services in Iraqi SMEs from the user's perspective?

In order to achieve the objective of the study, the paper is organized as follows: the theoretical background of cloud computing alongside CSFs is briefly discussed in section 2. Section 3 presents the results of the system review of literature. Section 4 presents the methodology which highlights the method of data collection and followed by the presentation of the interview results. Section 5 presents the findings of the study. Lastly, the findings are summarized and presented alongside the conclusion and directions for future research are presented. The paper is concluded with implications for practice and research.

## 2. Background

### 2.1 Cloud computing

Cloud computing allows companies to access a common pool of scalable and managed IT resources on a rental basis (e.g., pay-per-use, pay-per-period). Also, the scalability with which resources such as storage, servers, networks, applications, and services are presented through the internet makes cloud computing desirable as no long-term capital expenditures or particular IT knowledge is required by the customer [10, 42, 45]. The emergence of cloud computing has led to changes in the manner in which IT services are managed and delivered over the internet by companies. With cloud computing, on-demand and ubiquitous network access to a common pool of managed IT resources is enabled. A broad definition of cloud computing which is given by the National Institute of Standards and Technology (NIST) has been widely adopted by researchers. This definition highlights five key features of cloud computing including broad network access, on-demand self-service, measured service, resource pooling, and rapid elasticity), three service models (Software-as-a-Service [SaaS], Platform-as-a-Service [PaaS], and Infrastructure-as-a-Service [IaaS]), and four CC deployment models (private, public, community, and hybrid) [21]. Cloud computing has emerged as an everyday phenomenon, particularly in IT departments of large firms [12, 13, 40].

### 2.2 Critical success factors

The main aim of conducting a research that investigates success factors is to explain why implementation projects fail or succeed. These factors explain failure or success of implementation using a number of factors that are referred to as critical success factors (CSFs). Since the emergence of research on critical success factors in the 1960s, there have been continuous investigations focusing on the identification of the critical factors. Consequently, research on CSFs has continued to advance in a wide variety of application domains regardless of how it is criticized [14]. Great consideration is given to CSFs in different application domains given the critical role they play in the success or failure of implementation projects. CSFs, in the domain of project management, are regarded as input factors that have direct or indirect influence on the success of the project [1]. In the domain of planning and development of information systems, the CSF approach is also employed in the adaptation of system development to the company's requirement [2]. More so, success factor research also looks into the subject of information systems' implementation. Many researchers have focused on CSFs in the implementation of ERP or SCM systems [3, 17, 26]. Despite the fact that CSF has been defined in different ways [6, 15, 30, 37], all the definitions project CSFs as critical element of companies or projects. Additionally, the use of different CSFs of an application domain can result in the derivation of practical recommendations for the management of a company [14].

## 3. Systematic Literature Review

### 3.1 Search approach

A systematic review of literature was carried out in this study with the aim of identifying relevant literature on success factors associated with the adoption and implementation of cloud services. Using the technique used by the authors in [43], the sources of related literature were defined as *AIS Electronic Library (AISel)*, *Business Source Complete (ebSCO)*, *Science Direct*, *Springer Link*. A wide variety of publications was explored by searching each database with the search string (derived from the scope of review in combination with a first screening of selected relevant publications) in title, abstract and keywords (see Figure 1). The search in *Business Source Complete* was limited to peer-reviewed publications and the search in *Science Direct* to the fields of business, management and accounting and computer science. In all databases, only papers written in English language were consulted.

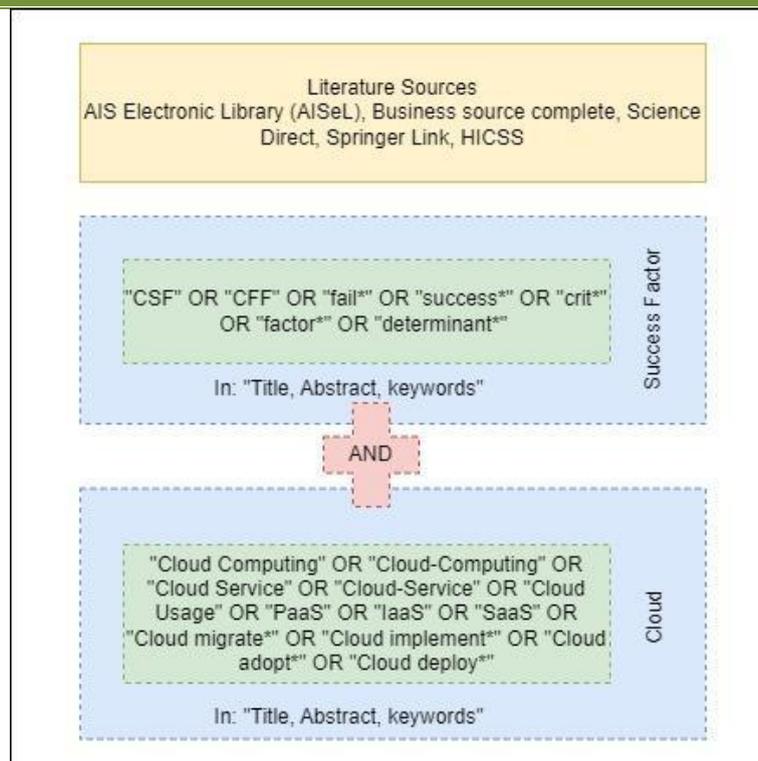
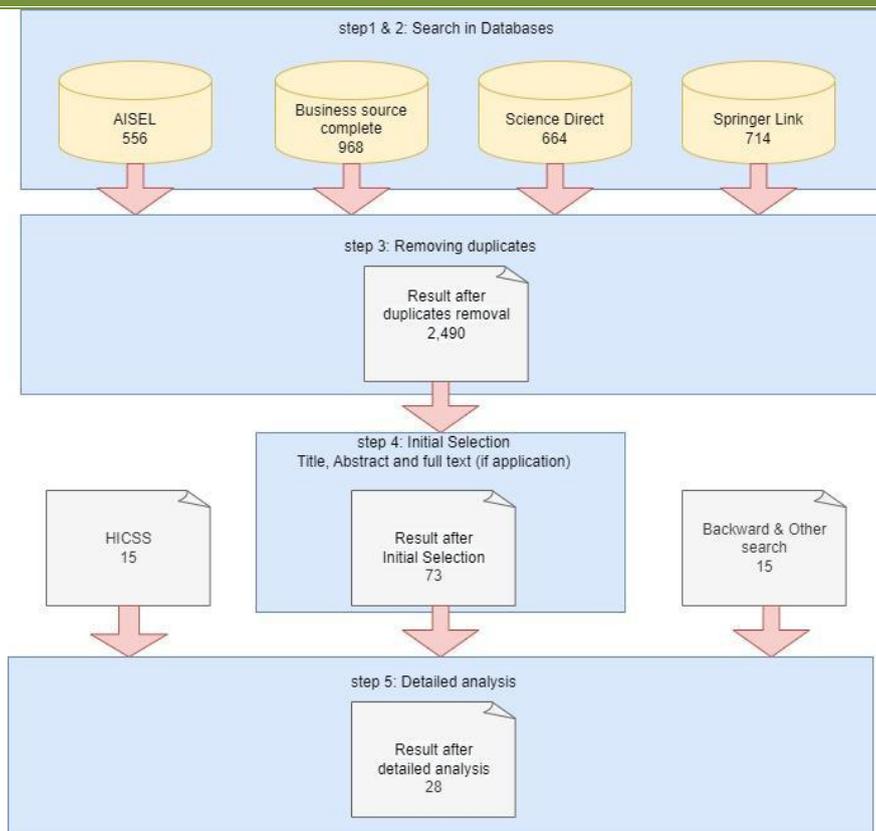


Figure 2 provides an overview of the different steps and results in terms of numbers regarding the literature review conducted. By using the predefined search terms, 2,902 publications were identified in the four databases (steps 1 & 2). Afterwards, the publications were filtered to exclude duplicates, a total number of 2,490 publications were remaining (step 3). The last step involved a thorough analysis of the remaining articles. In the final step, the remaining articles were thoroughly analyzed to enable the selection of the most relevant articles based on the abstract, title and brief review of the entire text (step 4). Here, all the authors participated in the review of the articles to establish their relevance to the study by examining the title, abstract, and keywords in relation to the research questions. A discussion on the remaining papers was carried out among the authors with the aim of comparing the different results obtained by the authors separately. Step 4 involved further reduction of the number of publications to 73 papers from all the databases. More so, 15 potentially relevant publications from the HICSS were identified based on the title. Furthermore, the remaining papers were examined in a backward manner, thereby producing 13 highly cited publications. A supplementary search provided two additional sources for further consideration.

In the fifth step, independent assessments of the articles were done by each author and the results were discussed. This step was aimed at identifying the articles that focus on CSFs for the implementation and adoption of cloud services. Thus, a manual search of the papers was carried out for the identification of CSFs by each author, independently. Based on the research questions of the study, the relevance of the articles were determined. Only papers that have at least one of the following foci remained for further detailed analysis: (1) concrete CSFs are explicitly pointed out and are the focus of the paper's investigation; (2) CSFs are explicitly pointed out but are not the focus of the paper's investigation; (3) CSFs are not explicitly mentioned but indirectly conclusions are made concerning CSFs. Consequently, the detailed assessment and discussion carried out by the authors led to the reduction of the articles to 27 relevant articles and eventual identification of CSFs.



### 3.2 Review results

Based on the results of the evaluation of papers, which showed that only papers had focused on CFSs, it is clear that the area of CFSs is underrepresented. In comparison to other CSF literature reviews (e.g., 320 papers focusing on ERP project CSFs [17]), only few researches have focused on CSFs. All the 27 papers identified were published between 2011 and 2017, with most of them published between 2013 and 2015. In terms of the methodologies used in these articles, the papers were made up of 8 surveys, 3 single- or multiple-case studies, and 17 non-empirical approaches (e.g., articles where CSFs were derived from chosen literature). Out of the 27 papers that were found, 21 were found to focus on cloud implementation projects. Figure 3 shows the summary of the frequency at which the 21 CSFs appeared in the literature. Nevertheless, only the most relevant were considered and discussed. The description of all 21 CSFs can be obtained from the authors upon request.

**Information security, data privacy, and compliance:** Based on the review carried out in this study, the most frequently mentioned CSFs for cloud adoption and implementation include compliance and the aspects of security and data protection. A key success factor for the development and implementation of cloud services and technologies is security. The purpose of compliance is to ensure that the activities and actions of the organization do not violate regulations, laws and social values [39]. In other words, compliance ensures that standards and regulations are upheld by companies. Compliance in cloud computing refers to the legally compliant usage of technology. Other two key aspects of cloud computing are data protection and security, and must be prioritized within the context of corporate compliance. IT security involves different measures taken to ensure that data of users are not used by unauthorized entities and to ensure loss of data does not occur. Such measures can be taken on various levels including, personnel, organizational, or technical measures. There are preventive measures that can be taken by cloud users and CSP to ensure IT security [24]. Protection of personal data is a key aspect of data protection. The location where the data center is domiciled is a crucial aspect of meeting country-specific requirements of data protection [24]. One of the ways through which security concerns can be addressed is by selecting private cloud as the delivery model [20].

**Vendor relationship and support:** also, a critical aspect is close cooperation and support from an experienced cloud service provider, particularly when the concerned companies are inexperienced and still at infancy stage

for the successful introduction of cloud service [41]. There must be focus for future cooperation with the cloud service provider during the process of selection [36]. Also, meetings must be held frequently between the client and the cloud service provider from the beginning to the end of project so as to ensure that the implementation of the system is done in a manner that meets requirements and that deployment is carried out in a low-risk environment [23]. More the cloud service provider must be a trusted one for the continuity and sustainability of operation and support; this is a crucial component of the cloud service provider and also a critical success factor [29].

**Technological competence and IT experience in companies:** just like vendor relationship and support, technological competence is critical to the successful implementation and adoption of cloud services in companies [36]. Technological competence is inclusive of different physical components like computers, as well as IT experts in the company. Both factors are the basis for building cloud applications [4]. The employees' knowledge and experience in the area of cloud computing enable an organization to successfully implement a cloud solution. The more advanced IT resources are, the easier the implementation of cloud solution [33]. Thus, advanced IT resources can influence the successful implementation of cloud services.

**Compatibility of cloud services with IT infrastructure:** the cloud service rendered to a company must be compatible with the IT infrastructure of the company. This way, there will be little or no need for customizations at the implementation stage. Therefore, the issue of compatibility must be prioritized during the selection of cloud services. During the early stage of deployment, localization of potential malfunctions and errors must be done so as to ensure that new applications are integrated into the IT landscape seamlessly [24]. More so, portability of data is another critical factor which companies should consider when using cloud services, because it minimizes reliance on the CSP, thereby reducing the lock-in effect [32].

**Cloud usage and performance monitoring:** for sustainable success of cloud solutions to be achieved, the costs and performance must be monitored [24, 41]. If the use of pricing models like usage- oriented price models (pay-per-use) is employed, the use of different monitoring tools should be employed in monitoring of the actual usage intensity so that the costs of cloud usage does not exceed the actual budget. The measurement can be performed by newly developed components or special tools that are provided by the cloud service provider [7, 29].

## 4. Interview study

### 4.1 Study design

An interview was conducted in order to ascertain the potential importance of the identified factors for SMEs, and to possibly identify more CSFs found in other researches. The interview was the step 2 of this study, whereby, an exploratory study design was used so as to validate the success factors identified in the literature through a comparison with the experience of practitioners. Given the nature of the study, the qualitative research approach was used as it considers expert experience, personal perceptions, motives, and background in a more thorough manner as compared to quantitative approach [27]. The use of semi-structured interview protocol was employed for the interview with the aim of ensuring comparability of the results obtained from the interview. Thus, based on thematic categorization, the 21 articles were divided into four themes including, organizational aspects, technological aspects, and company-related aspects. In this study, Iraqi SMEs that have already implemented cloud solutions and have therefore gained experience in the field of research were identified. This category of SMEs was selected to participate in the study because it is assumed that they have the experience required for the provision of relevant information that is useful for the implementation and operation of cloud solutions. The empirical aspect of the study involved interviewing employees who have direct or indirect involvement in the implementation project of a cloud service. Eleven experts were interviewed, and their position as well as companies where they work have been presented in Table 2 below.

Category	Success Factor
Aspects of project organization	<ul style="list-style-type: none"> <li>⊗ Clear project goals and objectives</li> <li>⊗ Project management</li> <li>⊗ Composition of the project team</li> <li>⊗ Project leadership</li> <li>⊗ Availability of resources</li> <li>⊗ Involvement of cloud service users and stakeholders</li> <li>⊗ User training</li> <li>⊗ Cloud service provider relationship and support</li> </ul>
Organizational aspects	<ul style="list-style-type: none"> <li>⊗ Top management support</li> <li>⊗ Acceptance/resistance regarding cloud services</li> <li>⊗ Change management</li> <li>⊗ Communication</li> </ul>
Company- related aspects	<ul style="list-style-type: none"> <li>⊗ Business process reengineering</li> <li>⊗ Compatibility with business goals and vision</li> <li>⊗ Technological competence and IT experience in the user company</li> </ul>
Technological aspects	<ul style="list-style-type: none"> <li>⊗ Definition of requirements and configuration effort</li> <li>⊗ Compatibility of cloud services with IT infrastructure</li> <li>⊗ Flexibility/development opportunities of the cloud service</li> <li>⊗ Information security, data protection/privacy and compliance</li> <li>⊗ Cloud service availability</li> <li>⊗ Contract management</li> </ul>

Table 1 Assignment of the success factors

Table 2: Overview of interview partners

Position	Industry Sector	Company category (according to [5])	Implemented Cloud Solution
MD	Training of audit personnel	Micro- enterprise	SaaS, public
IT	Financial Services	Medium enterprise	SaaS, public
DM	Personnel marketing, recruiting and personnel procurement	Small enterprise	SaaS, public IaaS, private PaaS, public
MD	Online marketing	Micro- enterprise	SaaS, public
MD	Visual communication	Micro- enterprise	SaaS, public IaaS, private
MD	Real estate industry	Micro- enterprise	SaaS, public
MD	Printing industry	Micro- enterprise	SaaS, public
MD	Rental and trade of RVs	Micro- enterprise	SaaS, public
MD	Renewable energy	Micro- enterprise	IaaS, private
MD	Removals and special transportation	Small enterprise	IaaS, private
MD	Management consultancy	Micro- enterprise	SaaS, public
MD – <i>Managing director</i> ; DM – <i>Department manager</i> ; IT – <i>IT manager</i>			

The recording of the interviews was done using a smart phone, and afterwards transcribed for analysis. The use of MAXQDA (version 12.2.1) was employed in preparing the textual content (transcripts) obtained from the interviews, and this involved reducing the text to the core statements. Subsequently, the core statements were categorized into four main categories. Combined with the qualitative content analysis, was an evaluation of the individual factors based on the responses of the interviewees. The use of a three-tier scale was employed, and this scale had been used in previous researches of similar nature, like ERP implementation projects [16] or SCM implementation projects [18]. The aim of using this approach is to be able to rank the CSFs that have been identified. The interviews were carried out from September 13 to October 5, 2017). In total, eleven interviews were conducted, and nine out of them were conducted over the phone while the remaining two were face-to-face interviews. The interviews lasted for 40 to 50 minutes each.

#### 4.2 Data analysis

The approach used for the content analysis is the qualitative content analysis which is carried out systematically in order to process the data through a step-by-step approach with theory-based category systems [19].

Interviewees were assigned the ratings *important* and *less important*, each with a score of two, one or zero points. CSFs rated as “important” were characterized by statements like “that was completely important for us” or “that was essential”. Factors that were mentioned as the biggest challenges or most important success factors also received the ranking *important*. Individual success factors that the interviewees had a neutral attitude to or were as described in the literature were assigned a *neutral* rating.

Table 3: Categorization and ranking of success factors (model adapted from [28, 38]).

Strategic			Tactical			
Critical Success Factors	Rank	Factor rating*	Critical Success Factors	Rank	Factor rating*	
Organizational	Corporate culture and environment	2	19	Technological competence and IT experience In the user company	15	10
	Compatibility with business goals and vision	4	17	User training	17	9
	Top management support	6	16	Communication	22	6
	Business process reengineering	6	16	Project management	25	5
	Acceptance/resistance regarding cloud services	8	14			
	Clear project goals and objectives	10	13			
	Project leadership	13	12			
	Cloud service provider relationship and support	13	12			
	Availability of resources	15	10			
	Change management	19	7			
Composition of the project team	22	6				
Involvement of cloud service users and stakeholders	22	6				
Techno logical	Information security, data protection/privacy and compliance	4	17	Definition of requirements and configuration effort	1	21

Flexibility/development opportunities of the cloud service	10	13	Cloud service availability	3	18
Cloud usage and performance monitoring	19	7	Compatibility of cloud services with IT infrastructure	8	14
Contract management	19	7	Data import/migration	17	9
*Factor rating: 2 – important factor; 1– neutral factor; 0– less important factor/maximum possible rating based on 11 interviews = 22					

Factors that were described by the interviewees as “not relevant” or “does not matter” were interpreted as *less important*. The overall score of each success factor was derived from the total number of assigned scores based on the assessment of the interviews. The result of this process was the ranking of the CSFs which can be construed as their relative importance. The highest score was assigned to the most important success.

#### 4.3 Results of the interview study

Qualitative content analysis was used to assign the statements of the interview partners to the different CSFs. At least one of the interviewees mentioned one of the 21 success factors identified in the literature. More so, no new success factors other than the ones found in the literature review were mentioned by the interviewees.

Further categorization of the individual factors was carried out through the use of a matrix that is characterized by four dimensions, namely, *strategically* and *tactically* as well as *organizationally* and *technologically* as used in [28, 38]. The corresponding matrix together with the 21 CSFs are presented in Table 3.

The *strategic dimension* focuses on core competencies of business that facilitate long-term achievement. The *tactical perspective* deals with business activities that are characterized by short-term activities. The *organizational dimension* focuses on a wide range of areas that have relevance in terms of usage and implementation. Depending on the given cloud solution, technical aspects are represented from a technological perspective [28, 38].

Based on the empirical findings of the study, the successful implementation and adoption of cloud solutions in SMES are influenced by five key factors which are outlined as follows:

- ☒ Definition of requirements and configuration effort
- ☒ Corporate culture and environment
- ☒ System availability
- ☒ Compatibility with business goals
- ☒ Information security, data privacy and compliance.

Nevertheless, if the factors with lower rankings are considered, external consultants are of little significance to the SMEs that participated in this study. Based on the literature review, the role of comprehensive *project management* is minor as perceived by the study participants. Furthermore, the following factors are categorized under the category of lower evaluation.

- ☒ Communication
- ☒ Stakeholder and system user involvement
- ☒ Project team composition
- ☒ Contract management
- ☒ Monitoring of cloud service and performance
- ☒ Change management

Based on the analysis carried out in this study, organizational factors are the most relevant factors to SMEs. It was found that 50% of the 12 most important success factors identified were organizational factors with a strategic orientation. Worthy of mention is also the fact that two out of the three most critical factors are technological factors with a tactical orientation. However, no organizational success factor was identified among the twelve factors identified.

---

---

## 5. Discussion

### 5.1 Characteristics of the CSFs

The 21 success factors identified in the literature and those identified during the interview were compared, and results of the comparison showed that twelve of the factors that were considered in the cloud projects were also described in the literature. However, some disparities were found in the remaining 14 CSFs in terms of their characteristics. These characteristics are described as follows:

The *Information security, data protection and compliance* success factors were not as strong in most companies as they should have been according to the literature analyzed. Most of the study participants considered compliance factor as an unimportant success factor. More so, most of the SMEs are yet to implement IT security measures to the level required in the literature. The perspectives of companies in terms of data privacy were different. Some of the companies perceived it to be a critical factor with great relevance, therefore taking measures recommended in the literature to protect the data and privacy of users. An example of such measures taken is the adoption of private cloud as the delivery model. Meanwhile, some of the companies expressed that they understood the risks associated with data privacy, but were not keen to adopt any measures geared towards privacy protection.

With regards the *Technological competence and IT experience* success factors, views expressed by the SMEs were different from those found in the literature. The interviewees expressed that they did not perceive high level of technological competence to be a critical factor for the successful implementation of cloud solutions. According to the interviewees, most the cloud solutions they opted for were intuitive and simple, not requiring vast experience in IT or high level of IT skills and knowledge. In terms of *Compatibility of cloud services within the IT infrastructure*, there was also disparity between the responses of the interviewees and what is contained in the literature. It was expressed that data portability was irrelevant for their SMEs, and that they had not taken any step towards addressing the lock-in effect.

The literature shows that user training factor is also inclusive of execution workshops, which is also believed by some interviewees. Often times, the use of materials is employed when the cloud service provider offers a training, and sometimes, there is no need to train the users of the system. It was found that, when there is a need or challenge, issues were addressed through ad hoc meetings. In terms of the *Involvement of stakeholders and system users*, some interviewees considered this factor a critical factor for successful implementation and adoption of cloud solutions, but some believed it was unnecessary because they were aware of the selected cloud service. In addition, the important factor of *Flexibility/ development possibilities of the cloud service* was not well-established through the interviews with the SMEs. It was also found that the deployment of third-party solutions and standardized programming interfaces was of no significance to any of the SMEs that participated in the study.

In terms of *Top management support*, disparities were observed between the companies. Most of the companies that participated in the study noted that the implementation of cloud solutions was carried out by the managing director who played the role of both initiator and manager of such projects. Meanwhile, some of the companies expressed that the management was aware of the implementation project, but were not active in initiating it or implementing it, and did not see the need to motivate their employees to participate. Thus, the management's lack of involvement is not perceived by the interviewees in a negative light. Business optimization was found to be a critical player in most companies just as found in the literature on the factor of *Business process reengineering*. Nevertheless, it was clear that the companies only adopted and adapted new cloud solutions as a step in the direction of business process optimization.

Also, the success factor of demanding *Contract management* in cloud computing was established in just few companies as found in the literature. Majority of the cloud solutions implemented by the SMEs were standard products with no drafts of contracts between the SMEs and the cloud service provider. However, the SMEs did not regard this as a major issue, because they expressed trust in the reliability and professionalism of the service providers, and as such, there was no need for the drafting of a contract specifically for the purpose of the given implementation project.

### 5.2 Importance of the CSFs

The differences between the relevance of the critical success factors found in the SMEs and the in the literature were identified by comparing the ranks of the factors. The top five and least five deduced from the literature and the empirical study are presented in Table 4. Based on the systematic review of literature, it can be concluded that the most important CSFs are *Information security, data privacy and compliance*. The aforementioned factors have been consistently and extensively discussed in the literature.

CSFs such as *Vendor relationship and support, Technological competence and IT experience, Compatibility of cloud services with IT infrastructure, and Monitoring cloud usage and performance* were

also among the top-ranked. Comparing this with the top five factors resulting from the interview partners' evaluation, the top five success factors also include only *Information security, data privacy and compliance*. Accordingly, the role of this factor is critical as found in the literature and in practice through interviews for the successful implementation and adoption of cloud services in SMEs. The other four factors that are considered important in the empirical study fall under the middle ranks category. This implies that, they are important to companies to a certain extent with varying degree of relevance,, but are not as important to the SMEs as represented in the literature. In addition to the CSF of *Information security, data privacy and compliance*, the factors of *Requirement definition and configuration effort, Corporate culture and environment, System availability* and *Compatibility with corporate goals* are also among the five critical factors identified through the interviews with SMEs.

In addition, there is a contrast between the importance assigned to some factors in the literature and responses of the interviewees from the SMEs. In the literature, factors like (*availability of resources, Data import/migration, Project managers*) have lower ratings, but are rated more important by the study participants and as such, fall under the category of middle-ranking.

Table 4: Comparison of the top five and bottom five factors

Rank	Literature review	Interview study
1	Information security, data protection/privacy and compliance	Definition of requirements and configuration effort
2	Cloud service provider relationship and support	Corporate culture and environment
	Technological competence and IT experience in the user company	
3		Cloud service availability
4	Compatibility of cloud services with IT infrastructure	Compatibility with business goals and vision
		Information security, data protection/privacy and compliance
22	Availability of resources	Composition of the project team
	Composition of the project team	Involvement of cloud service users and stakeholders
		Communication
25	Project leadership	Project management

### **5.3 Cloud implementation project model**

Given the extensive and complex nature of cloud implementation projects, it is necessary for companies to have a structured plan for the implementation of cloud. Thus, it becomes necessary for the different CSFs to be included in the concrete design of the project's procedure. Nevertheless, it is not mandatory for every factor to be included in a cloud project, given that the aim of every project is not the same (e.g., optimization of cost, high availability). There is a relationship between the critical success factors found in the literature and interview, thereby influencing the different entities like IT department, management board, and other stakeholders that have a role to play in the project.

A detailed model was designed with the aim of addressing this issue as starting point for cloud implementation projects (see Figure 4). It can be seen that the model is characterized by a complex character given that the different CSFs must be prioritized by different entities concurrently (those CSFs are written bold and in capital letters). Nevertheless, it is important to note that, there are some CSFS that have an effect on just one entity, which is either the client company or the cloud service provider, or the ones that have no direct influence on the entities, but instead are critical in nature (shown as an arrow below and boxes in the grey area at the top).

In summary, it is noteworthy that prior to the implementation and during the cloud projects' implementation, companies must understand the effect which the project has on each of the involved parties, as well as the various critical success factors that must be considered for cloud solution implementation.

## **6. Conclusion and limitations**

This study was carried out with the aim of identifying the critical success factors that influence or contribute to the success of projects that focus on the implementation of cloud solutions within SMEs from the perspective of the user company. The findings of this study provide rich insight on the implementation and adoption of cloud services in the companies that participated in this study. This study employed a combination of approaches in terms of methodology, thereby making great contributions to Information Science research as well as practice. Based on the perspective of the researcher, this study contributes to the area of cloud computing and critical success factors through the identification of 21 critical success factors obtained through systematic review of literature and from an interview conducted among Iraqi SMEs. The first research question was answered through a review of literature, and this review yielded CSFs that are crucial to the implementation and adoption of cloud solutions. The CSFS identified through this method are rarely analyzed. Based on this, the responses obtained from the interviews were used to answer research question 2 through an examination of the CSFs through interviews with SMEs. With regards to practice, the interviews conducted in this study provide in-depth understanding of the cloud implementation projects based on the views of 11 companies using cloud solutions.

Through the interview, all the factors identified in the literature were established. In other words, the factors found in the literature were the same with the ones found in the interview. For each of the factors found in the literature, the interviews provided strong evidence to support them. More so, companies will be able to facilitate their cloud implementation projects if they are able to integrate the critical success factors identified in this study into the cloud implementation project model (Fig 4). The article is limited by the method of research used. The sample is not representative due to the number of and method of selection of the companies. Thus, conclusions and generalizations cannot be made statistically from the study finding. Majority of the SMEs used were micro-enterprises; a different result may be found if larger companies within the SME class are investigated. More so, the contents of the interview within the setting if the empirical investigation and the factors' ranking would have been different if the companies were larger or companies of different type other than SMEs. Nevertheless, the use of qualitative research method was the best decision, given that the area of study has not received so much research attention. Thus, the qualitative research method is the best approach to gaining preliminary insight on the critical success factors for cloud project implementation and adoption in SMEs.

In order to achieve the long-term objective of the study, the results obtained from this preliminary study will be used for the next step of the study on perceptions of critical success factors. The previous study focused on investigating customer requirements and barriers of meeting customer requirements from the perspective of the cloud service providers [10]. Thus, the next stage of this study is aimed at determining the functional and technical requirements for the provision of cloud services from the perspectives of IT department and business department. Lastly, a framework for the selection and implementation of cloud services will be developed as an artifact in terms of design science research to facilitate the adoption of cloud services by cloud service providers and user companies.

---

---

## 7. References

- [1] Alias, Z., E.M.A. Zawawi, K. Yusof, and N.M. Aris, “Determining Critical Success Factors of Project Management Practice: A Conceptual Framework”, *Procedia - Social and Behavioral Sciences* 153, 2014, pp. 61–69.
- [2] Byers, C.R., and D. Blume, “Tying critical success factors to systems development”, *Information & Management* 26(1), 1994, pp. 51–61.
- [3] Denolf, J.M., J.H. Trienekens, P.M. (Nel) Wognum, J.G.A.J. van der Vorst, and S.W.F. (Onno) Omta, “Towards a framework of critical success factors for implementing supply chain information systems”, *Computers in Industry* 68, 2015, pp. 16–26.
- [4] Espadanal, M., and T. Oliveira, “Cloud Computing Adoption by Firms”, *MCIS 2012 Proceedings*, (2012).
- [5] EU Commission, *The new SME definition - User guide and model declaration*, European Commission, 2005.
- [6] Finney, S., and M. Corbett, “ERP implementation: a compilation and analysis of critical success factors”, *Business Proc. Mngt. Journal* 13(3), 2007, pp. 329–347.
- [7] Gholami, M.F., F. Daneshgar, G. Low, and G. Beydoun, “Cloud migration processes”, *Journal of Systems and Software* 120, 2016, pp. 31–69.
- [8] Giannakouris, K., and M. Smihly, “Cloud computing - statistics on the use by enterprises”, 2016. [http://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud\\_computing\\_-\\_statistics\\_on\\_the\\_use\\_by\\_enterprises](http://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing_-_statistics_on_the_use_by_enterprises)
- [9] Hedman, J., and X. Xiao, “Transition to the Cloud: A Vendor Perspective”, *HICSS 2016 Proceedings*, (2016).
- [10] Hentschel, R., C. Leyh, and A. Petznick, “Current cloud challenges in Germany: the perspective of cloud service providers”, *Journal of Cloud Computing* 7(1), 2018.
- [11] Jones, A., J. Robinson, B. O’Toole, and D. Webb, “Implementing a bespoke supply chain management system to deliver tangible benefits”, *The Intern. Journal of Advanced Manufacturing Technology* 30(9), 2006, pp. 927–937.
- [12] Kappelman, L., J. Luftman, E. Mclean, and V. Johnson, “Key Issues of IT Organizations and Their Leadership: The 2013 SIM IT Trends Study”, *MIS Quarterly Executive* 12(4), 2013, pp. 227–240.
- [13] Kappelman, L., E. McLean, V. Johnson, et al., “The 2016 SIM IT Trends Study”, *MIS Quarterly Executive* 16(1), 2017, pp. 55–83.
- [14] Kieser, A., and A. Nicolai, “Trotz eklatanter Erfolglosigkeit: Die Erfolgsfaktorenforschung weiter auf Erfolgskurs”, *Die Betriebswirtschaft* 62(6), 2002, pp. 579– 596.
- [15] Leidecker, J.K., and A.V. Bruno, “Identifying and using critical success factors”, *Long Range Planning* 17(1), 1984, pp. 23–32.
- [16] Leyh, C., “Critical success factors for ERP projects in small and medium-sized enterprises - The perspective of selected German SMEs”, *FedCSIS 2014 Proc.*, (2014).
- [17] Leyh, C., and P. Sander, “Critical Success Factors for ERP System Implementation Projects: An Update of Literature Reviews”, In D. Sedera, N. Gronau and M. Sumner, eds., *Enterprise Systems. Strategic, Organizational, and Technological Dimensions*. Springer International Publishing, 2015, 45–67.
- [18] Leyh, C., and J. Thomschke, “Critical success factors for implementing supply chain management systems - the perspective of selected German enterprises”, *FedCSIS 2015 Proceedings*, (2015).
- [19] Mayring, P., *Einführung in die qualitative Sozialforschung*, Beltz, Weinheim, Basel, 2002.
- [20] McGeough, B., and B. Donnellan, “Factors that affect the adoption of cloud computing for an enterprise.”, *ECIS 2013 Proceedings*, (2013).
- [21] Mell, P., and T. Grance, “The NIST definition of cloud computing”, *National Institute of Standards and Technology* 53, 2011.
- [22] Metzger, C., T. Reitz, and J. Villar, *Cloud Computing*, Carl Hanser Verlag, München, 2011.
- [23] Morgan, L., and K. Conboy, “Factors Affecting The Adoption Of Cloud Computing: An Exploratory Study”, *ECIS 2013 Proceedings*, 2013.
- [24] Münzl, G., M. Pauly, and M. Reti, *Cloud Computing als neue Herausforderung für Management und IT*, Springer Vieweg, Berlin, Heidelberg, 2015.
- [25] Ngai, E.W.T., T.C.E. Cheng, and S.S.M. Ho, “Critical success factors of web-based supply-chain management systems”, *Prod. Plann. & Control* 15(6), 2004, pp. 622–630.
- [26] Ram, J., and D. Corkindale, “How ‘critical’ are the critical success factors (CSFs)?: Examining the role of CSFs for ERP”, *Busin. Proc. Mngt Jour.* 20(1), 2014, pp. 151–174.
- [27] Recker, J., *Scientific Research in Information Systems*, Springer, Berlin Heidelberg, 2013.

- [28] Remus, U., “Critical success factors for implementing enterprise portals”, *Busin. Proc. Mngt Jour.* 13(4), 2007, pp. 538–552.
- [29] Repschläger, J., and R. Zarnekow, *Erfolgskritische Faktoren und Kundensegmente im Cloud Computing*, TU Berlin, Berlin, 2012.
- [30] Rockart, J.F., “Chief Executives Define Their Own Data Needs”, *Harvard business review* 57, 1979, pp. 81–93.
- [31] Rodriguez-Repiso, L., R. Setchi, and J.L. Salmeron, “Modelling IT projects success: Emerging methodologies reviewed”, *Technovation* 27(10), 2007, pp. 582–594.
- [32] Schirm, N., T. Frank, M. Henkel, and F. Bensberg, “Erfolgsfaktoren cloudbasierter Business Intelligence Lösungen”, *WI 2015 Proceedings*, 2015.
- [33] Şener, U., E. Gökalp, and P.E. Eren, “Cloud-Based Enterprise Information Systems: Determinants of Adoption in the Context of Organizations”, In G. Dregvaite and R. Damasevicius, eds., *Information and Software Technologies*. Springer, Cham, 2016, 53–66.
- [34] Sharma, R.M., “The impact of virtualization in cloud computing”, *International Journal of Recent Development in Engineering and Technology* 3(1), 2014, pp. 197–202.
- [35] Shawish, A., and M. Salama, “Cloud Computing: Paradigms and Technologies”, In F. Xhafa and N. Bessis, eds., *Inter-cooperative Collective Intelligence: Techniques and Applications*. Springer, Berlin, Heidelberg, 2014, 39–67.
- [36] Soliman, F., “Evaluation of Cloud System Success Factors in Supply-Demand Chains”, In F. Soliman, ed., *Business Transformation and Sustainability through Cloud System Implementation*. IGI Global, Hershey, PA, USA, 2015, 90–104.
- [37] Somers, T.M., and K. Nelson, “The impact of critical success factors across the stages of enterprise resource planning implementations”, *HICSS 2001 Proc.*, (2001).
- [38] de Sousa, J.M.E., *Definition and analysis of critical success factors for ERP implementation projects*, Barcelona, 2004.
- [39] Vehlow, M., and C. Golkowsky, *Cloud Computing Navigation in der Wolke*, PricewaterhouseCoopers, 2011.
- [40] Vehlow, M., and K.-F. Thier, *Cloud Governance in Deutschland*, PricewaterhouseCoopers, 2015.
- [41] Venkatraman, R., and S. Venkatraman, “Web-Based Services”, In *Information Resources Management Association, ed., Cloud Adoption in Enterprises*. IGI Global, Hershey, USA, 2016, 1848–1872.
- [42] Venters, W., and E.A. Whitley, “A critical review of cloud computing: researching desires and realities”, *Journal of Information Technology* 27(3), 2012, pp. 179–197.
- [43] Webster, J., and R.T. Watson, “Analyzing the Past to Prepare for the Future: Writing a Literature Review”, *MIS Quarterly* 26(2), 2002, pp. 13–23.
- [44] Winkler, T.J., and C.V. Brown, “Horizontal Allocation of Decision Rights for On-Premise Applications and Software-as-a-Service”, *Journal of Management Information Systems* 30(3), 2014, pp. 13–48.
- [45] Yang, H., and M. Tate, “A Descriptive Literature Review and Classification of Cloud Computing Research.”, *Communications of the AIS* 31(2), 2012, pp. 35–60.