

Attitude Towards Adopting Cloud Computing in the Saudi Banking Sector

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Abstract: Cloud computing plays a significant role in business organisations by offering many benefits and opportunities. However, the adoption of cloud computing involves some trepidation. The adoption of cloud computing in developing countries is still in the early phase. The bank sector in Saudi Arabia aims to benefit from opportunities offered by the cloud computing technology; however, some banks continue to hesitate in the implementation of this technology. Therefore, this study aims to investigate factors that influence the attitude of the Saudi Arabian bank sector towards adopting cloud computing. A model that incorporates factors derived from the literature is developed in this study to determine whether specific factors positively or negatively affect the attitude of the Saudi bank sector towards adopting cloud computing. A quantitative method is used and data are collected from decision makers and IT staff members in the Saudi bank sector. Results showed that factors of security and privacy exert a significant negative effect whilst factors of benefits and competition pressure demonstrate a significant positive effect on the Saudi bank sector attitude towards adopting cloud computing. Thus, cloud computing providers must focus more on negative influential factors to reduce the apprehension of the bank sector in adopting the cloud computing technology. In addition, the bank sector must also consider factors that can drive the adoption of cloud computing as well as opportunities and losses if this technology is rejected.

Keywords: Cloud computing; influential factors; attitude towards adoption; Saudi bank sector

1 Introduction

Cloud computing is an important innovation in the technological field that offers a distinctive way of delivering IT services to organisations and individuals [1]. This technological model can provide on-demand access to different computing services [2], plays an important role in organisations by reducing the cost of information technology services and allows users access to paid services anytime and anywhere [3].



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The term cloud computing was first used in 1997 and has been widely adopted in recent years [4]. Cloud computing is a paradigm shift for IT infrastructures and businesses [5–7] that has become an influential driver of technological and economic change in countries worldwide.

Several large and small organisations are reformulating their information technology strategies to embrace cloud computing. Organisations must consider the strategic importance of benefits, such as computational agility and scalability, provided by cloud computing [8–10].

Cloud computing nearly changed all systems in varying industries, including the banking sector. The banking sector can reap many benefits [11], such as the efficient use of resources [12] and achieving competitive advantage, with the adoption of cloud computing. [11]

Despite the many advantages of using cloud computing, the level of adoption differs for each country due to several challenges and threats associated with this technology [13–15]. Studies have indicated that some organisations are hesitant in adopting cloud computing [16,17]. Thus, organisations must consider benefits, risks and effects of cloud computing before making the decision to adopt this technology.

Saudi Arabia launched the National Transformation Programme 2020, which involves digital transformation, to build institutional capabilities required in accomplishing Vision 2030. Cloud computing is a key pillar of the digital transformation technology ecosystem [18] that encourages organisations to adapt to new technology strategies and offers additional choices on how to run their infrastructure, save costs and delegate liabilities [19,20]

The adoption of cloud computing in Saudi Arabia is still in its initial phase and the transformation from traditional technology to cloud computing faces many important challenges [21], such as security and privacy issues [6].

The Saudi bank sector may benefit from cloud computing due to its IT-heavy nature and on-going digitalisation changes [11]. Thus, this study aims to investigate factors that affect the attitude of the Saudi banking sector towards adopting cloud computing.

2 Research Problem

Although with the many benefits from using cloud computing, cloud computing in developing countries is still in its initial stages [22,23]. The bank sector in Saudi Arabia still hesitates to adopt cloud computing for many concerns. Studies on cloud computing adoption, particularly in the Saudi bank sector, are limited. Therefore, investigating factors that positively or negatively affect the attitude of the Saudi bank sector towards the adoption of cloud computing is necessary. The following research questions were formulated on the basis of this problem:

- What factors can positively influence the attitude of the Saudi bank sector towards adopting cloud computing?
- What factors can negatively influence the attitude of the Saudi bank sector towards adopting cloud computing?

3 Literature Review

Information technology can be a powerful tool in improving organisational performance and gaining competitive advantage [24]. Cloud computing is a new technological trend that has revolutionised the use of information technology [1].

Several definitions of the term cloud computing can be found in the literature. National Institute of Standards and Technology (NIST) defined cloud computing as ‘a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources

(e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction' [25].

NIST also explained the ways for providing cloud computing in the following deployment models:

1. Private cloud - A unique cloud designed particularly for a specific organisation.
2. Public cloud - Common type offered to the general public via the Internet.
3. Community cloud - Organisations with common goals and assignments share the same cloud.
4. Hybrid cloud - Organisation can combine public, private or community clouds. [25]

Five characteristics are required for a resource to be considered a cloud service, namely, resource pooling, on-demand self-service, measured service, broad network access and rapid elasticity. Software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS) are three versions of cloud service models [11,26].

Cloud computing is a paradigm that changes the way how hardware and software resources are used and managed and offers resources and capabilities as a service to customers through the Internet [27,28]. On-demand services are provided whilst performing operations that meet the unstable needs of the business [28]. The use of cloud computing can reduce the time and effort of applications and service maintenance and development of organisations [29–32]. Cloud computing has revolutionised numerous industries for several years [27] and changed information sharing and storage behaviour [32].

Many organisations still struggle with the successful adoption of cloud computing due to limited studies focusing on this technology [32,33].

3.1 Cloud Computing in the Banking Sector

The banking sector can be supported by acceptable cloud computing models that can be managed appropriately [34]. Financial institutions, such banks, can utilise cloud computing capabilities and features [28]. Cloud computing is a new trend that provides a novel way of managing different information systems, such as those used in the banking sector [35].

The banking sector operates in a highly competitive environment [11], and many banks typically incur high technology costs when their services change and they invest in technology to maintain competitiveness [36]. Therefore, cloud computing can motivate the banking industry to upgrade its system because the adoption of this technology allows the efficient on-demand access and upgrade of their hardware and software resources [36,37].

Cloud computing helps the bank sector enhance their performance [11] by completely changing their services and increasing the efficiency of the banking system [28]. Banks can benefit from the implementation of cloud computing [38] by responding to customer demands, interconnecting global financial systems and addressing economic uncertainties [11,12]. Despite the many benefits of cloud computing, the banking sector may face a number of key challenges, such as security and data location, which must be addressed before the adoption of this technology. [11,34,38]

3.2 Influential Factors of Cloud Computing Adoption

The emergence of cloud computing creates opportunities for many organisations to utilise cutting-edge information technologies [39]. The bank sector may adopt cloud computing to create a flexible banking environment that can respond rapidly to new business requirements and save costs because customers only need to pay for the functional consumption of services they use [24,40].

However, most studies have identified many issues, which become major hindrances in the adoption of cloud computing [24,29,30,32,41]. Security and privacy are key causes of delay in the adoption of cloud computing in the banking sector [11,27].

Although many large banks have confidently adopted the cloud technology, others are wary and have decided to wait until some challenges are solved [24]. Therefore, addressing different factors and critical issues related to the adoption of cloud computing is important [11].

Many studies have indicated factors that negatively or positively influence the adoption of cloud computing in many industries, including the banking sector. Tab. 1 showing four factors that frequently have been indicated, by previous studies and were emphasized by consulting some experts in the banking sectors, as factors that may affect adopting cloud computing positively or negatively. We classified these factors as hindering and driver factors of cloud computing adoption according to their positive or negative influence.

Table 1: Factors affection adoption of cloud computing

Category	Factors	Authors
Hindering Factors	Security	[3,5,14,23,24,28,42–59]
	Privacy	[3,23,42–49,51,52,57,60]
Driver Factors	Benefits	[4,13,14,16,23,46,48,54–56,58,59,61–70]
	Competitive Pressure	[4,10,16,17,29,37,45,55,56,62,64,66,67,71]

4 Research Model and Hypotheses

The model in this work is developed on the basis of factors extracted from previous studies. These factors are divided into two fundamental categories, as shown in Tab. 1, to examine their effect on the attitude of the Saudi Arabian banking sector towards adopting the cloud computing technology. The proposed model is shown in Fig. 1.

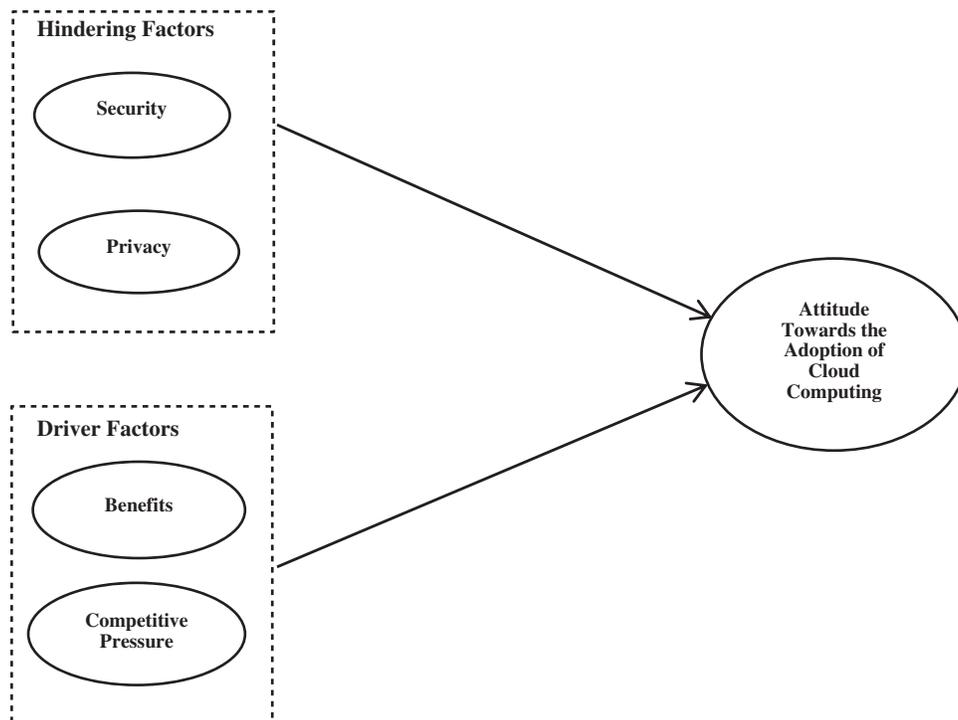


Figure 1: Research model

4.1 *Hindering Factors*

- **Security**

Security is a problem that influences the global acceptance of cloud computing [3,14,24]. The social infrastructure of the cloud poses a serious security problem that may hinder the adoption of this technology in many organisations [5]. Building a secure environment for services offered in cloud computing is the main drawback [14]. Particularly, banks hesitate because they cannot risk the danger of a security break [28].

H1: The security factor will have a significant negative effect on the attitude of the Saudi bank sector towards adopting cloud computing.

- **Privacy**

Privacy is the confidentiality of data and a major concern for users [3]. The incomplete control of information when stored and managed by a third party, such as a cloud computing environment, increases the risk of privacy in organisations [23]. Privacy concerns affect the decision of organisations to adopt the cloud [23].

Therefore, diverse security and privacy issues that continue to emerge may hinder the rapid adoption of cloud computing although this new computing paradigm has gained popularity in recent years [57]

H2: The privacy factor will have a significant negative effect on the attitude of the Saudi bank sector towards adopting cloud computing.

4.2 *Driver Factors*

- **Benefits**

Benefits of cloud computing increase its service market growth [13]. However, the knowledge level on benefits of cloud computing adoption is still low for different countries [68]. The adoption of cloud computing allows organisations to focus on their core business competencies [69] and improve the access of customers to advanced and efficient computing technology [13,70].

Many benefits can gain from adopting cloud computing [14], including the reduction of cost for the use of information technology services [23], fast completion of tasks and increased productivity and flexibility in organisations [8], can drive organisations to adopt cloud computing. Therefore, the perceived benefits of this new technology will positively affect an organisation's intention to adopt cloud computing [23].

H3: The benefit factor will have a significant positive effect on the attitude of the Saudi bank sector towards adopting cloud computing.

- **Competitive pressure**

Organisations consider competition a significant factor in adopting IT innovations [17,29] and aim to adopt up-to-date technologies to increase their market share, reduce cost and improve service delivery [29]. Therefore, organisations may outsource their IT infrastructure to address competitive pressures [17].

Competitive pressure is related to the level of competitiveness of an organisation in its external environment [37]. The adoption of cloud computing becomes an important strategy to compete in the market under competitive pressure [10], and organisations can benefit from countless operational efficiencies [64]. Competitive pressure is considered an important driver for technology adoption [55,62].

H4: The competitive pressure factor will have a significant positive effect on the attitude of the Saudi bank sector towards adopting cloud computing.

5 Research Methodology

This study aims to investigate factors that influence the attitude of the Saudi Arabian bank sector towards adopting cloud computing with a quantitative method. A questionnaire and convenience sample were used to gather data from respondents. The convenience sample is an approach that acquires easily accessed samples from respondents who are willing to participate [72]. The questionnaire was organised to obtain the respondent profile and use hindrance and driver factors as independent factors and attitude towards adopting cloud computing as the dependent factor. All independent and dependent variables were measured using a five-point Likert scale (1= strongly disagree, 2 = disagree, 3 = somewhat, 4 = agree and 5 = strongly agree). Objectives of the study were clearly explained to respondents using an information sheet at the beginning of the questionnaire. The SPSS tool was used to analyse data gathered from respondents.

Cronbach's alpha was used to measure the reliability of this study. The questionnaire demonstrated an acceptable Cronbach's alpha coefficient of over 0.75.

6 Results and Discussion

6.1 Respondent Profile

Sixty valid surveys were obtained from a sample size of 75. Approximately 78% and 22% of respondents were male and female, respectively. Nearly 62% of respondents were between 25 and 35 years of age. Around 58% and 53% of respondents held a bachelor's degree and had at least 6 years of work experience. The demographic statistics of respondents is presented in [Tab. 2](#).

Table 2: Descriptive statistics of demographic factors

Demographic factors	Frequency	%
<i>Gender</i>		
Male	47	78.3%
Female	13	21.7%
<i>Age</i>		
24 or less	2	3.3%
25 to 35	37	61.7%
36 to 50	20	33.3%
Above 50	1	1.7%
<i>Qualification</i>		
Diploma	12	20%
Bachelor	35	58.3%
Master	9	15%
Doctorate	4	6.7%
<i>Years of experience</i>		
5 years or less	28	46.7%
6 and above	32	53.3%

6.2 Analysis of the Effect of Factors.

Security

The respondent results related to security factors are presented in [Tab. 3](#). The overall respondent consensus (87% to 95% agree with the four questions on the security factor) indicated that security is a problem that causes worry in the bank adoption of cloud computing. These results are consistent with the findings of previous studies which indicated that the security is a problem and remains a challenge for organizations that adopt cloud computing [14,5]. Security issue is a challenge that banks must address in adopting cloud computing because banks aim to avoid the danger of a security break [24,28]. This finding supports **H1**.

Table 3: Results of the analysis of the effect of research factors

Factors	Items	Strongly Agree (%)	Agree (%)	Somewhat (%)	Disagree (%)	Strongly Disagree (%)
Hindering Security Factors	Security of data is a serious challenge that banks will face when adopting the cloud computing technology.	80	16.7	3.3	0	0
	Knowing how bank data are protected in the cloud computing environment is necessary.	86.7	11.7	1.7	0	0
	Cloud computing is not a secure place for bank data.	58.3	25	11.7	5	0
	The adoption of cloud computing technology in the bank will decrease the protection of bank data.	68.3	21.7	6.7	3.3	0
Privacy	Using cloud computing threatens the privacy of bank customer data.	35	11.7	16.7	30	6.7
	Using cloud computing will reduce bank data access control.	31.7	20	28.3	15	5
	Bank customers will be worried about unauthorised access to data in the cloud.	33.3	13.3	30	16.7	6.7
	The privacy of bank customer data is a serious concern when bank data are transferred to cloud computing.	33.3	20	31.7	13.3	1.7

(Continued)

Table 3 (continued).							
Factors	Items	Strongly Agree (%)	Agree (%)	Somewhat (%)	Disagree (%)	Strongly Disagree (%)	
Driver Factors	The adoption of cloud computing technology will improve the performance of bank processes.	56.7	26.7	15	1.7	0	
	Cloud computing improves the efficiency in accessing bank services anywhere and anytime.	58.3	31.7	10	0	0	
	Cloud computing technology is an attractive economic option for the bank sector.	66.7	30	3.3	0	0	
	The adoption of cloud computing will increase the efficiency and quality of services provided by the bank.	61.7	26.7	11.7	0	0	
	Using cloud computing technology reduces bank operation costs.	61.7	31.7	3.3	1.7	1.7	
Competitive Pressure	The management team of the bank thinks that the adoption of cloud computing will have a positive influence on their competitiveness.	55	35	10	0	0	
	The bank faces competitive pressure to adopt cloud computing.	45	40	15	0	0	
	Some of the bank's competitors have started using the cloud computing technology.	41	38.3	20	0	0	
	The bank may lose some of its customers if it rejects the adoption of cloud computing.	41.7	23.3	18.3	15	1.7	

Privacy

Four questions related to the privacy factor are shown in [Tab. 3](#). The respondent results related to these questions demonstrated that 46.6% to 53.3% of respondents have fears concerning privacy when cloud computing is adopted with a percentage between, whilst 16.7% to 31.7% were unsure and 14% to 37% disagree. More than 50% of respondents worried about privacy. This finding is consistent with the results of a previous study, which indicated that privacy is a key concern because users cannot have full control of information stored in the cloud computing environment [3]. The significant effect of privacy on the decision of organisations in adopting the cloud is a hindrance [23,57]. This finding supports **H2**.

Benefits

Five questions on the benefit factor are shown in [Tab. 3](#). Approximately 83.4% to 96% of respondents to these questions agreed to the benefits of using cloud computing, whilst 3.3% to 15% were unsure and 1.7% to 3.4% disagreed. These results were consistent with those of previous studies such that many benefits can be gained from adopting cloud computing [14]. Cloud computing can help organisations accomplish tasks rapidly, reduce costs and increase productivity and flexibility [8]. Organisations tend to adopt a new technology due to its perceived benefits [23]. Therefore, the perception of benefits will likely exert a positive effect on an organisation's intention to adopt cloud computing. This finding supports **H3**.

Competitive pressure

Four questions on competitive pressure are listed in [Tab. 3](#). Around 65% to 90% of respondents agree to the importance of competition pressure, whilst 10% to 18.3% are unsure and 0% to 16.7% disagree. These findings are consistent with the results of a previous study, which emphasised the importance of competition pressure as a driver of cloud computing adoption (34). The adoption of cloud computing under competitive pressure becomes an important strategy in maintaining competitiveness in the market [10], and organisations can benefit from the improved efficiency in operational processes [64]. Hence, competitive pressure is an important driver for technology adoption [55,62]. This finding supports **H3**.

6.3 Results of Model Variables

The questionnaire was utilised to confirm which factors affect the attitude of the Saudi bank sector towards adopting cloud computing. SPSS software was applied to analyse data collected from respondents. The results of the one-sample t-test are shown in [Tab. 4](#).

Table 4: Results of the one-sample t-test

<i>Categories</i>	Factors	p-value	Result
Hindering Factors	Security	<0.001	Statistically significant
	Privacy	<0.001	Statistically significant
Driver Factors	Benefits	<0.001	Statistically significant
	Competitive pressure	<0.001	Statistically significant

7 Conclusion

Cloud computing is a new and advanced technology service that continuously evolves and demonstrates many potential benefits, but serious issues still persist. The banking sector may still be unable to benefit from the cloud computing technology due to such issues. A model was developed in this study to investigate influential factors that may drive or hinder the attitude of the Saudi bank sector towards adopting cloud computing. The results indicated that security and privacy are factors that may hinder whilst benefits and competition pressure are factors that may drive the attitude of the Saudi bank sector towards the adoption of cloud computing. Hence, the Saudi bank sector needs a clear understanding of these factors for the implementation of this technology to maintain competitiveness and gain competitive advantage as well as address security and privacy challenges by collaborating with service providers of this technology.

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