EMPIRICAL STUDIES ON CLOUD COMPUTING ADOPTION: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Cloud computing is a major topic of discussion among IT professionals. This practice is a good alternative for higher education institutions of limited budget in operating their information system efficiently without spending high capital for infrastructure resource. According to the annual report of educational indicators of the Republic of Yemen, the education and training sectors in Yemen face several obstacles and challenges in delivering quality education to the entire population of the country; for example, limited infrastructure resources and IT budget, and lack of teaching staff, technical experts, and IT skilled personnel. This study aims to (1) review empirical studies on cloud computing adoption in general, (2) identify the influencing factors of cloud computing adoption, and (3) categorize these influencing factors into technological, organizational, environmental, and individual factors. The influencing factors of cloud computing adoption in the government and industrial and educational sectors are also reviewed. Cloud computing adoption in the educational sector is clearly demonstrated. A total of 50 models are reviewed and discussed. Findings show that theoretical and empirical studies on cloud computing adoption in the educational sector are few. Moreover, 18% and 82% of studies investigate factors related to cloud computing adoption in the educational and industrial sectors, respectively. Furthermore, 26% of studies use individual-level theory for cloud computing adoption, 61% use organizational level theory, and 13% integrate individual- and organizational-level theories.

Keywords: Cloud Computing, Cloud Computing Adoption, Higher Education Institution (HEI), Individual-Level Theory, Organizational-Level Theory.

1. INTRODUCTION

Cloud computing is a popular technology for delivering IT-related services and infrastructure. This practice is the result of advancements in several technologies, including hardware, system management, the Internet, and distributed computing [1]. Organizations have started to transform their IT strategy toward cloud computing due to the flexibility of cloud computing services and the economic benefits from cloud computing adoption [2]. According to the US National Institute of Standards and Technology, cloud computing has three service models: Infrastructure as a Service, Software as a Service, and Platform as a Service; cloud computing also has four deployment models: private cloud, public cloud, community cloud, and hybrid cloud [3].

Cloud computing is comparatively new to higher education institutions (HEIs). According to [4], cloud computing enables academic and non-academic staff as well as students and researchers of HEIs to access resources and services provided by the cloud service provider. In [5], the traditional educational system resource and maintenance, which are located onsite and owned by the HEIs, are reported to require high investments. HEIs with cloud computing adoption can reduce the cost associated with IT equipment maintenance and energy usage, as well as allow for virtualization of IT resources, such as operating system, server, storage device, or network resources [6]. According to the studies in [7], cloud computing is essential for distance and online education program, mobile learning, and e-learning.

HEIs can adopt three main cloud computing deployment models as follows: a) HEIs obtain the paid services provided by a cloud computing service provider [8], which is called Educational and Learning as a service [9]; b) HEIs form association among themselves to establish a cloud computing infrastructure [10]; c) HEIs...
create their own cloud computing environment which is called private clouds [11, 12].

According to the studies in [13-15], educational cloud is considered one of the most interesting cloud applications. Educational cloud harnesses the power of thousands of networked computers to allow collaboration among researchers and students, as HEIs can open their educational cloud infrastructure to be used by the public and private sectors for research purposes. Cloud computing possesses many unique and interesting characteristics which can encourage cloud computing adoption by HEIs. These characteristics are indicated by Lian, Yen [16] as follows:

- **Low cost:** The costs associated with cloud computing implementation or renting of cloud services are lower than acquiring and maintaining the required resources or services onsite. Thus, this implementation reduces the management cost in the long run.
- **Scalability:** Cloud computing offers dynamic scalability based on demand. Thus, organizations need to invest only on the required infrastructure and services.
- **Computing resource virtualization:** Computer resources can be utilized remotely; in this way, end users can access to computing resources from their devices anytime and anywhere without determining the actual physical location of the computer resources [17, 18].
- **High performance:** Super computing power, powerful data analysis capability, and large data storage capacity are provided.

HEIs in developing countries are currently facing several challenges in providing quality education to their entire population. These challenges are summarized as follows:

- **Limited funding to support the needs of educational and training institutions in terms of infrastructure and availability of placements for potential students.**
- **The current learning and teaching resources are distributed across education institutions not based on their needs but on personal reasons or rationales, thereby resulting in unbalanced development among the institutions.**
- **Qualified educators are currently located in a few specific areas; thus, imbalanced distribution of expertise among the institutions occurs.**
- **Lack of technical expertise to support, maintain, and operate the existing infrastructure in certain educational institutions.**

Therefore, cloud computing adoption can help address the challenges encountered by HEIs in developing countries in utilizing the traditional computing approach. Cloud computing adoption in HEIs in these countries is expected to help improve the education provisions to the current students in particular, and increase the literacy level of the nation in the long run.

Despite the benefits of cloud computing in the education environment, the study by Ercan [19] found that cloud computing adoption in the educational sector is very marginal at only 4%. Thus, the factors that affect the decision of HEIs to adopt cloud computing should be understood to determine the main reasons and rationales behind the adoption. This understanding can assist HEIs in developing countries that plan to adopt cloud computing to be well prepared and well planned. This study aims to (1) review empirical studies on cloud computing adoption in general, (2) identify the influencing factors of cloud computing adoption, and (3) categorize these influencing factors into technological, organizational, environmental, and individual factors. In this study, 1) empirical studies on cloud computing adoption are discussed, 2) the influencing factors of cloud computing adoption are identified, and 3) these influencing factors are categorized into technological, organizational, environmental, and individual factors.

2. **THEORIES OF ICT INNOVATION ADOPTION**

Adoption theories can be ontologically categorized into two different units of analysis: individual (micro level) and organization (macro level). For individual level, many theories in the field of adoption and acceptance of the technology exist. In [20], eight models and theories in the field of individual acceptance are mentioned as follows: theory of reasoned action (TRA), technology acceptance model (TAM), unified theory of acceptance and use of technology (UTAUT), theory of
planned behavior (TPB), PC utilization model, motivational model, and combined TAM and TPB. These models mainly aim to determine which factors affect user adoption and usage behavior [21]. In [22], theories and models employed in studying ICT adoption and post-adoption behaviors of individuals are identified as TRA, TAM, TPB, Technology Acceptance Model 2, and UTAUT. For firm level, several theories, such as TOE and DOI, are applied to study the technology adoption at the organizations.

3. RESEARCH METHOD

The systematic literature review (SLR) approach is adopted in this study. In particular, seven online databases, namely, Science Direct, Emerald, IEEE Xplore, Springer link, AISel, ACM, and ProQuest, are used in the literature search using the keywords “cloud computing” with “adoption,” “diffusion,” or “acceptance,” as well as the entire string of keywords. The revised search returns a sensible number of studies, from which relevant empirical studies are selected. The inclusion criteria are as follows: (1) behavioral studies that investigate and collect data, (2) works that focus on cloud computing adoption in the industrial and educational sectors, and (3) papers that are written in English. The exclusion criteria are as follows: (1) studies that do not investigate factors related to cloud computing adoption, (2) technical studies, and (3) studies in non-English language. Table 1 shows details of the search according to the criteria discussed earlier.

<table>
<thead>
<tr>
<th>Database</th>
<th>Total of research</th>
<th>No. of excluded studies</th>
<th>No. of selected studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Springer Link</td>
<td>133</td>
<td>126</td>
<td>7</td>
</tr>
<tr>
<td>Emerald</td>
<td>27</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Science Direct</td>
<td>108</td>
<td>100</td>
<td>8</td>
</tr>
<tr>
<td>IEEE</td>
<td>64</td>
<td>57</td>
<td>7</td>
</tr>
<tr>
<td>ACM</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>AISel</td>
<td>122</td>
<td>115</td>
<td>7</td>
</tr>
<tr>
<td>ProQuest</td>
<td>22</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>484</td>
<td>434</td>
<td>50</td>
</tr>
</tbody>
</table>

The study identifies and classifies all factors into four groups: technological factors, which depict the external and internal technologies relevant to organization [23, 24]; organizational factors, which indicate the characteristics and resources of a firm that constrain or facilitate the adoption innovation [25]; environmental factors, which describe the external factors to the higher education that affect the cloud computing adoption [25-28]; and individual factors, which refer to individual characteristics of employees, such as behavior, intention, attitude, and interaction with the firm.

The identified factors are validated using a semi-structured interview method from [26]. Five IT experts in Yemen are interviewed to identify the significance of the said factors from the IT expert perspective. The semi-structured interview method can assist in exploring the influencing factors of ICT adoption [29], and the results can serve as a basis for the survey study.

4. LITERATURE REVIEW

The initial literature search returns 484 relevant studies. After the screening based on the inclusion criteria, only 50 relevant papers are shortlisted. Then, the influencing factors of cloud computing adoption as discussed in these papers are classified into four groups, namely,
technological, organizational, environmental, and individual factors. Appendix A presents the 50 studies selected on the basis of the inclusion criteria.

5. RESULTS AND DISCUSSION

Appendix A shows that 18% of studies investigate factors related to cloud computing adoption in the educational sector [30-36], while 82% investigate factors related to cloud computing adoption in the industrial sector. This finding indicates that empirical studies on cloud computing adoption in the educational sector are few. Furthermore, the educational sector shows hesitation and reluctance in adopting cloud computing despite the perceived benefits. Figure 1 shows the number of studies in the industrial and educational sectors.

Figure 1: Empirical Studies In The Industrial And Educational Sectors.

The literature review shows that most studies on cloud computing adoption concentrate on the organizational level, followed by the individual level. However, a few studies combine the individual and organizational levels. According to the SLR results, 61% of empirical studies use organizational-level theory, 26% use individual-level theory, and 13% integrate individual- and organizational-level theories (Figure 2).

Figure 2: Studies Using Individual- And Organization-Level Theories.

Furthermore, 34% of studies use TOE framework, 22% use TAM, 5% use TBP, and 3% use TRA theory. These results show that most studies focus on decision makers with the ability to adopt cloud computing and ignore the people who handle the technology. Thus, studies integrating individual- and organizational-level theories are few.

The SLR results show that 80% of studies are quantitative exploratory studies, 12% are qualitative exploratory studies, and 8% are a mix of both. Figure 3 shows the studies using the quantitative, qualitative, and mixed approach.

Figure 3: Qualitative And Quantitative Studies.

Most of the studies are conducted in developed countries whereas a few studies are conducted in developing countries, as shown in Figure 4. This finding indicates that awareness regarding the
benefits of adopting and using cloud computing in developing countries is insufficient. The semi-structured interview method is adopted from [26]. In particular, IT experts are interviewed to identify the significance of the said factors from the perspective of IT experts in Yemen. Table 2 presents the significant variables obtained from the interview with IT experts in Yemen.

The results serve as a basis in developing a conceptual framework for cloud computing adoption in the higher education of Yemen.

On the basis of the literature review and the similarity of factors, the influencing factors are divided into four groups: technological, organizational, environmental, and individual.

Table 2: Variables For Their Relative Importance

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Factors</th>
<th>Description</th>
<th>Theory/Model Adopted</th>
<th>Level of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological-related</td>
<td>Relative advantage</td>
<td>It indicates to the degree to which innovation is perceived as being more beneficial than its predecessor [37].</td>
<td>DOI/TOE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compatibility</td>
<td>It refers to the extent to which an innovation is perceived as consistent with the existing values, past experience and needs of potential adopter[37].</td>
<td>DOI/TOE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complexity</td>
<td>Complexity is defined as “the degree to which an innovation is perceived as relatively difficult to understand and use [37].</td>
<td>DOI/TOE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data concern</td>
<td>Data concern is seen as audit-ability, data confidentiality, data storage security loss of data and breach of privacy in the business operations [33].</td>
<td>TOE</td>
<td>Organizational</td>
</tr>
<tr>
<td>Organizational-related</td>
<td>Top management support</td>
<td>Indicates to the attitude of top management support toward the technology and the level of support devoted for the adoption[33].</td>
<td>TOE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technology-readiness</td>
<td>defined as ‘managers’ perception and evaluation of the degree to which they believe that their organization has the resources, commitment, awareness and governance's adopt IT [38].</td>
<td>TOE</td>
<td></td>
</tr>
</tbody>
</table>
6. CONCLUSION

Cloud computing is a new technology for providing IT services which contain rental resources located in the cloud. Most tasks at present are increasingly conducted online, such as checking emails, social media communication, editing and writing documents, collaboration, watching videos, and creating images and personal documents. In this study, the trend of research on cloud computing adoption is examined. This study mainly aims to show the current state of research endeavors in cloud computing adoption in the educational sector, determine any gaps, identify and categorize the influencing factors of cloud computing adoption, and propose a conceptual model for future direction. Cloud computing is increasingly being adopted, especially by many educational institutions. Cloud computing is adopted in the educational sector mainly because of financial reasons. Many factors affect the behavior of the decision makers, IT manager, and IT staff in adopting cloud computing, especially in the educational sector in Yemen. These influencing factors are identified through semi-structured interview method and are categorized into four dimensions: technological, organizational, environment, and individual factors. Although all efforts are made during the literature search in seven major databases, this review cannot be considered a comprehensive study because of the diverse outlets of cloud computing publications and the large number of journals around the world.

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[86] Ross, V.W., Factors Influencing the Adoption of Cloud Computing by Decision Making Managers. 2010: ERIC.
## Appendix A: Influencing FACTORS OF CLOUD COMPUTING ADOPTION.

<table>
<thead>
<tr>
<th>Author</th>
<th>Factors</th>
<th>Approach</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>[45]</td>
<td>Technological (T)</td>
<td>Organizational (O)</td>
<td>Environmental (E)</td>
</tr>
<tr>
<td></td>
<td>Relative advantage</td>
<td>Complexity</td>
<td>Compatibility</td>
</tr>
<tr>
<td></td>
<td>university size</td>
<td>university age</td>
<td>Socio-cultural</td>
</tr>
<tr>
<td>[36]</td>
<td>Scalability</td>
<td>Availability</td>
<td>Security risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[46]</td>
<td>Perceived Convenience</td>
<td>Trust</td>
<td>Software Functionality</td>
</tr>
</tbody>
</table>
| [31] | • Relative advantage  
• Complexity  
• Compatibility  
• Technology readiness  
• Institutional size  
• Perceived barriers  
• Regulatory policies  
• Service provider support | • Theories used:  
- Technology Acceptance Model (TAM).  
Method:  
- A quantitative study using questionnaire  
Respondents:  
(119) CIO and IT managers in U.S universities  
Theories used:  
- Technological, Organizational and Environmental (TOE) framework | The findings showed that all factors are statistically significant in determining cloud computing adoption except relative advantage, regulatory policy, and service provider support. |
| [32] | • Perceived security  
• Perceived Reliability  
• Perceived benefits  
• PU  
• PEOU | • Method:  
A quantitative study using questionnaire  
Respondents:  
(217) higher education in USA  
Theories used:  
- Technology Acceptance Model (TAM).  
- Technological, Organizational and Environmental (TOE) framework | The results showed that all factors have a significant correlation to cloud computing adoption. |
| [47] | • Relative advantage  
• Compatibility  
• Privacy Concerns  
• Vendor lock-in  
• Complexity  
• Top management support  
• Regulatory policies  
• Government pressure  
• Peer pressure | • Method:  
A quantitative study using questionnaire  
Respondents:  
(33) responses of IT decision maker in higher education in KSA.  
Theories used:  
- Technology Acceptance Model (TAM).  
- Technological, Organizational and Environmental (TOE) | Three factors were found significant in this context study: Relative Advantage, Data Privacy and Complexity are the most Significant factors. |
| [35] | • security concerns  
• privacy concerns  
• vendor lock-in  
• Transfer skill  
• vendor reputation  
• attitude  
• perceived behavioral control (PBC)  
• subjective norm  
• PEOU  
• PU  
• voluntariness | • Method:  
A quantitative study using questionnaire  
Respondents:  
(225) students at a leading private university in Taiwan.  
Theories used:  
- Theory Planed Behavior (TPB).  
- Technology Acceptance Model (TAM).  
- Technology Acceptance Model (TAM). | The results show that a person’s attitude toward cloud applications, subjective norm, and perceived behavioral control have direct impacts on the person’s behavioral intention to use the applications. Meanwhile, privacy and security concerns, concerns about vendor lock-in, perceived vendor reputation, perceived usefulness, perceived |
ease of use, and perceived transferability of previously learned computer skills, have indirect impacts on behavioral intention.

| Method: | A quantitative study using questionnaire |
| Respondents: | (478) students at medium size university in Taiwan |

The results found that all factors have significantly positive effects on the intention to use cloud computing.

| Method: | A quantitative study using questionnaire |
| Respondents: | (305) organizations from different industries in Ghana. |
| Theories used: | - Technological, Organizational and Environmental (TOE). |

The results showed that all factors have significant effect on adopt cloud computing except compatibility, firm size, scope size and regulatory support.

| Method: | A quantitative study using questionnaire |
| Respondents: | (189) IT executives of companies in USA. |

The result revealed that advancement, recognition and satisfaction from accomplishments, top management support, diminishment of personal image, and pattern of technology readiness have a positive influence on business intentions to adopt cloud computing services.

<p>| Method: | The results showed that all |</p>
<table>
<thead>
<tr>
<th>Method</th>
<th>Respondents</th>
<th>Theories used</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>A qualitative study using Semi-structured Interviews.</td>
<td>(15) Firms in Australia.</td>
<td>Technological, Organizational and Environmental (TOE), Diffusion of Innovation theory (DOI), Actor Network Theory (ANT).</td>
<td>The results showed that all factors were positively related to intention to adopt cloud computing.</td>
</tr>
<tr>
<td>A quantitative study using questionnaire</td>
<td>(192) Malaysian banking customers which already using online banking services.</td>
<td>Technology Acceptance Model (TAM), Diffusion Theory Model (DTM).</td>
<td>The results showed that PU, PEOU, attitude toward cloud, reduce cost, and trust have a significant influence customers’ behavioral intention to adopt cloud computing.</td>
</tr>
<tr>
<td>A quantitative study using questionnaire</td>
<td>(1000) president companies in Taiwan.</td>
<td>Technological, Organizational and Environmental (TOE).</td>
<td>The results showed that all technology, organizational, environment, and human have a significant influence on adoption cloud computing in healthcare organization in KSA.</td>
</tr>
<tr>
<td>A quantitative study using questionnaire</td>
<td>(201) IT specialists, health professional, and administrative in Saudi health care organization.</td>
<td>Technological, Organizational and Environmental (TOE), Human, Organization, Technology (HOT-fit).</td>
<td>The results showed that all technology, organizational, environment, and human have a significant influence on adoption cloud computing in healthcare organization in KSA.</td>
</tr>
</tbody>
</table>
| [54] | **Reduction cost**  
|      | **Remote access**  
|      | **Security**  
|      | **Managerial innovativeness**  
|      | **Personnel innovativeness**  
|      | **Method:**  
|      | A quantitative study using questionnaire  
|      | **Respondents:**  
|      | (74) CIO in Greek firms.  
|      | **Theories used:**  
|      | -Diffusion of Innovation (DOI).  
|      | -Organizational Capability.  
|      | The results indicated that reduction cost, remote access and personnel innovativeness had a significant effects towards intention to adopt cloud computing while security and managerial innovativeness had insignificant effect to intent to adopt cloud computing.  
| [55] | **Relative advantage**  
|      | **Complexity**  
|      | **Security**  
|      | **Top management support**  
|      | **Funding**  
|      | **Firm size**  
|      | **Method:**  
|      | A quantitative study using questionnaire  
|      | **Respondents:**  
|      | (326) out of (347) consisting (Directors, IT staff, and middle manager IT) in 9-1-1 dispatch center in USA.  
|      | **Theories used:**  
|      | -Technological, Organizational and Environmental (TOE).  
|      | The result indicated that all factors had significant determinants of adoption cloud computing except complexity and security.  
| [56] | **Relative advantage**  
|      | **Complexity**  
|      | **Compatibility**  
|      | **Organizational size**  
|      | **structure**  
|      | **culture**  
|      | **Method:**  
|      | A quantitative study using questionnaire  
|      | **Respondents:**  
|      | (118) information technology manager from qualified USA hospitals  
|      | **Theories used:**  
|      | -Technological, Organizational and Environmental (TOE).  
|      | -Diffusion of Innovation (DOI).  
|      | The findings revealed that all factors had significant correlation with public cloud adoption intent.  
| [57] | **Complexity**  
|      | **Telework**  
|      | **IT infrastructure**  
|      | **Electronic interconnection**  
|      | **Data warehouse and mining**  
|      | **Mobile service**  
|      | **IT outsourcing**  
|      | **IT investment reduction strategy**  
|      | **Innovation orientation strategy**  
|      | **Process innovation strategy**  
|      | **Skill of IT personnel**  
|      | **Method:**  
|      | A quantitative study using questionnaire  
|      | **Respondents:**  
|      | (676) European firms from six European countries (Germany, France, Italy, Poland, Spain, UK).  
|      | **Theories used:**  
|      | -Leavitt’s Diamond framework.  
|      | The result indicated that all factors had a significant effects on the propensity to adopt cloud computing.  
| [58] | **Complexity**  
|      | **Top management**  
|      | **Trading partner**  
|      | **PU**  
|      | **Method:**  
|      | The results showed that relative advantage, compatibility,
<table>
<thead>
<tr>
<th>Method</th>
<th>Respondents</th>
<th>Theories used</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A mix method using interview and questionnaire</td>
<td>(280) companies in IT, manufacturing and finance sectors in India.</td>
<td>- Technological, Organizational and Environmental (TOE). - Technology Acceptance Model (TAM)</td>
<td>- Complexity, Technology readiness, top management, and training and education as important variables for affecting cloud computing adoption using perceived ease of use (PEOU) and perceived usefulness (PU) as mediating variables. Also, competitive pressure and trading partner support were found directly affecting intention of cloud computing adoption.</td>
</tr>
<tr>
<td>A qualitative study using interview.</td>
<td>(21) Indian cases were studied by interacting with respondents having similar profiles (i.e. CIOs, CTOs, systems managers and technology heads.</td>
<td>- Diffusion of Innovation theory (DOI). - Technological, Organizational and Environmental (TOE). - Technology Acceptance Model (TAM).</td>
<td>The study showed that all factors have a significant influence on the adoption of cloud – based services.</td>
</tr>
<tr>
<td>A quantitative study using questionnaire.</td>
<td>(51) Respondents comprising of government CIO, government senior management and IT decision makers in South Africa.</td>
<td>- None</td>
<td>The findings revealed that the majority of the respondents showed concern regarding the availability and privacy of data. The environmental factors that were of the most importance to respondents were adoption strategies of cloud computing implementations as well as the provision of usage guidelines and regulatory requirements in organizations.</td>
</tr>
</tbody>
</table>

- Compatibility
- Cloud concern security
- Support
- Technology readiness
- Training and education
- Pressure
- Competitive pressure
- PEU
- Top management support
- Vendor credibility
- PU
- PEOU
- Availability
- Privacy
- Lack of control of data
- Multitenancy
- Cyber attacks
- System performance
- Difficulty to integrate with in-house system
- Not enough ability to customize
- Difficult to bring
- Lack of approved cloud standard.
- No national cloud computing policy.
- No national, local or agency cloud adoption strategy.
- Regulatory requirements.
- Trans-border information flow.
- Lack of specialist public sector local vendors.
| back in-house | Electricity availability. | Method: A quantitative study using questionnaire. Respondents: (257) mid-to-senior level decision-making business and IT professionals from arrangements of UK end-user organizations. Theories used: -Technological, Organizational and Environmental (TOE). |
| Lack of support from vendors | Broadband connectivity. | |
| Lack of compatibility with proprietary software | Sustainability and carbon efficiency. | The results showed that competitive pressure, complexity, technology readiness, and trading partner pressure have a significant effect on adopt cloud computing. |
| Poor IT infrastructure currently in place | Top management support | |
| | Trading partner pressure | |
| Electricity availability. | Competitive pressure | |
| Broadband connectivity. | |
| Sustainability and carbon efficiency. | |

| [62] Relative advantage | Interoperability | The results showed the technological factors (except complexity) and organizational nature seem to be positively influencing the adoption of cloud in the public sector whereas environmental factors seem to be making the adoption decision difficult and lengthy. |
| Complexity | Focus on key business processes | |
| Compatibility | More organization | |
| complexity | Meet security standards | |
| | Meet environmental standard | |
| | Transparency of processes standards | |
| | Bureaucracy | |
| | Political matters | |
| | Legal issues | |
| | |

<p>| Method: A quantitative study using questionnaire. Respondents: (140) librarian &amp; information specialist from 700 members in Israeli library and information science. Theories used: |
| [63] Threat | computer use | The results showed that all factors have significant correlations towards behavior intention to use cloud computing except threat. |
| challenge | social media use | |
| openness to experience | |
| self-efficacy | |
| personal innovativeness | |
| self-efficacy | |
| PEOU | | |</p>
<table>
<thead>
<tr>
<th>Reference</th>
<th>Trust in e-government</th>
<th>Social influence</th>
<th>Performance expectancy</th>
<th>Effort expectancy</th>
<th>Facilitating condition</th>
<th>Method</th>
<th>Respondents</th>
<th>Theories used</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>[64]</td>
<td>Trust in e-government</td>
<td>Social influence</td>
<td>Performance expectancy</td>
<td>Effort expectancy</td>
<td>Facilitating condition</td>
<td>Method: A quantitative study using questionnaire.</td>
<td>(251) valid responses for adoption cloud computing based e-invoicing, a novel e-government service in Taiwan.</td>
<td>Theories used: -Unified Theory of Acceptance and Use of Technology (UTAUT).</td>
<td>The findings indicate that effort expectation, social influence, trust in e-government, and perceived risk have significant effects on the intention to use cloud computing.</td>
</tr>
<tr>
<td>[65]</td>
<td>Social influence</td>
<td>Social influence</td>
<td>Performance expectancy</td>
<td>Effort expectancy</td>
<td>Facility condition</td>
<td>Method: A quantitative study using questionnaire.</td>
<td>(381) Health care IT professionals in hospitals in USA.</td>
<td>Theories used: -Unified Theory of Acceptance and Use of Technology (UTAUT).</td>
<td>The results found that performance expectancy and effort expectancy have a significant and positive influence on behavioral intent to adopt cloud computing based file storage and that facilitating conditions has a significant and positive influence on use behavior. The experience moderator had moderating effects on performance expectancy and social influence and the gender moderator had a moderating effect on facilitating conditions.</td>
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<tr>
<td>[66]</td>
<td>Availability</td>
<td>Top management support</td>
<td>Compliance with regulation,</td>
<td>Competitive pressure</td>
<td>Trading partner pressure</td>
<td>Physical location</td>
<td>Method: A qualitative study using semi-structured interviews.</td>
<td>Respondents: (20) IT experts at different organizations in Saudi Arabia.</td>
<td>Theories used: -Technological, Organizational and Environmental (TOE). -Diffusion of Innovation Theory (DOI).</td>
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<tr>
<td>[67]</td>
<td>Relative advantage</td>
<td>Employees IS knowledge</td>
<td>External support</td>
<td>Competitive</td>
<td>-decision maker innovativeness (H)</td>
<td>Method: A quantitative study using</td>
<td>The results of regression analysis reveal that decision maker’s knowledge about cloud computing</td>
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<tr>
<td>[68]</td>
<td>Performance (PRF)</td>
<td>Top management support</td>
<td>Perceived ease of use (PEOU)</td>
<td>Method: A quantitative study using questionnaire.</td>
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<td>[69]</td>
<td>Compatibility</td>
<td>Top management support</td>
<td>Perceived ease of use (PEOU)</td>
<td>Respondents: (87) firms in south Africa by targeting decision makers with IT responsibilities in their firms</td>
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<tr>
<td></td>
<td>Complexity</td>
<td>Absorptive capacity</td>
<td>Perceived usefulness (PU)</td>
<td>Theories used: Instructional theory. Absorptive capacity theory.</td>
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<td></td>
<td>Compatibility</td>
<td>Adequate Resource</td>
<td>CIO Innovativeness</td>
<td>Respondents: (106) medical centered and metropolitan hospitals in Taiwan by targeting CIOs.</td>
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<td>Data Security</td>
<td>Costs</td>
<td>Technical competence</td>
<td>Theories used: Technological, Organizational and Environmental (TOE). Human, Organization, Technology(HOT-fit).</td>
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<td></td>
<td>Relative advantage</td>
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<td>The findings showed that the most critical factors are: data security, Technical competence, Costs, Top Management Support and complexity toward adoption cloud computing. Among four dimensions, the most important one is Technology followed by Human (individual), organizational and environment.</td>
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<td>Reference</td>
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<td>[70]</td>
<td>A qualitative study using interview.</td>
<td>(5) IT experts in the healthcare sector in Jordan.</td>
<td>-Technological, Organizational and Environmental (TOE).</td>
<td>The results found that there are technological, organizational and environmental factors affecting adoption of integrated cloud-based E-health record.</td>
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<td>[71]</td>
<td>A quantitative study using questionnaire.</td>
<td>Respondent survey in Spain, Netherlands, Austria, Norway, Portugal and Belgium</td>
<td>Technological, Organizational and Environmental (TOE).</td>
<td>The findings showed that all factors were the most important factors for cloud computing adoption.</td>
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<td>[28]</td>
<td>A quantitative study using questionnaire.</td>
<td>(369) firms in Portugal by targeting CIOs, directors, Senior IS manager.</td>
<td>Technology Acceptance Model (TAM), Theory of Reason Action (TRA).</td>
<td>The results show that relative advantage, complexity, technological readiness, top management support and firm size have a direct effect on a firm’s adoption cloud computing while security concern and cost saving have indirect effect.</td>
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<td>[72]</td>
<td>A quantitative study using questionnaire.</td>
<td>23 government central ministries, 39 regional government offices and 31 government supported research in South Korea</td>
<td>Technology Acceptance Model (TAM), Theory of Reason Action (TRA).</td>
<td>The findings showed that user intention and behavior is affected by perceived feature of cloud service.</td>
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<td>Method</td>
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<td>Theories used</td>
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<td>[26]</td>
<td>A mix method using questionnaire and interview.</td>
<td>(15) different SMEs and service providers in the north east of England.</td>
<td>Technological, Organizational and Environmental (TOE).</td>
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<td>[73]</td>
<td>A mix method using interview and questionnaire.</td>
<td>(30) respondents in small and medium businesses in Singapore.</td>
<td>-Non</td>
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<td>[74]</td>
<td>A quantitative study using questionnaire.</td>
<td>(669) global IT executives and other senior executive decision makers from 24 global enterprises.</td>
<td>-Technological, Organizational and Environmental (TOE).</td>
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<td>[75]</td>
<td>A quantitative study using questionnaire.</td>
<td>(105) out of 250 IT managers and decision makers in organizations that have implemented or were in the process of implementing cloud computing in USA.</td>
<td>-Technology Acceptance Model (TAM). -Theory Behavioral Planed (TBP).</td>
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<td>[76]</td>
<td>• cloud security</td>
<td>• cost effectiveness</td>
<td>• IT compliance</td>
<td>Method: A quantitative study using questionnaire.</td>
<td>The results indeed indicate management’s perception of security, cost-effectiveness and IT compliance factors significantly influence the decisions to adopt cloud computing.</td>
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<td>[77]</td>
<td>• Relative advantage</td>
<td>• Organization’s attitude toward using technology</td>
<td>• Vendor Credibility</td>
<td>Method: Case study approach was used for this study.</td>
<td>The results suggest that decision to adopt cloud computing depend on factors such as relative advantage, PU, PEOU, vendor credibility, organization’s attitude toward using technology.</td>
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<td>[78]</td>
<td>• Result demonstrability</td>
<td>• experience</td>
<td>• subjective norms</td>
<td>• Image</td>
<td>The results of study showed that all factors have significant effect to intent to use cloud computing.</td>
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<td>[79]</td>
<td>• Compatibility</td>
<td>• Top management support</td>
<td>• Coercive pressure</td>
<td>Method: A quantitative study using questionnaire.</td>
<td>The results indicated that all independent factors have a positive impact on predictors of IT decision makers’ intent to adopt cloud computing except organizational size.</td>
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<td>Source</td>
<td>Theories used</td>
<td>Method</td>
<td>Respondents</td>
<td>Findings</td>
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<td>[80]</td>
<td>Technological, Organizational and Environmental (TOE). Diffusion Innovation Theory (DOI).</td>
<td>A quantitative study using questionnaire</td>
<td>(221) expert IT decision makers from different U.S. industries</td>
<td>The results revealed that these factors emerged as significant determinants of IT managers' interest in adopting cloud computing. Except organizational size.</td>
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<td>[81]</td>
<td>Technological, Organizational and Environmental (TOE). Diffusion Innovation Theory (DOI). Institutional Theory.</td>
<td>A quantitative study using questionnaire</td>
<td>(327) companies in Germany.</td>
<td>The results showed that 39% of German Internet start-up companies currently use cloud computing in their business activities. Another 56% of respondents are familiar with cloud computing technology, but do not use in practice. Only 5% have never heard of cloud computing and 3% heard about CC but don’t know what it is.</td>
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<td>[82]</td>
<td>Diffusion Innovation Theory (DOI).</td>
<td>A qualitative study using semi-structured interview.</td>
<td>(19) professionals IT in organization in Taiwan</td>
<td>The result showed that the primary concern of IT professionals were on IT development environment, compatibility of cloud computing adoption with companies’ existing policy, relative advantage and business need. The results also suggested that most of IT companies in Taiwan would...</td>
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</table>
| [83] | • Compatibility  
• Complexity  
• Relative advantages  
• Observability  
• Trialability  
• Demonstrable Result |  | • Voluntariness | Method: A quantitative study using questionnaire.  
Respondents: 151 from (3,897) small business leaders in U.S.  
Theories used: -Diffusion Innovation Theory (DOI). | not adopt cloud computing until uncertainties associated with cloud computing. 
| [84] | • Relative advantage  
• Compatibility  
• Complexity  
• Top management support  
• Technology readiness  
• Firm size  
• Trading partner pressure  
• Competitive pressure |  |  | The results of the study indicated a high correlation between all of the predictor variables and the intent to use cloud computing, except for voluntariness.  
| [85] | • Perceived accessibility  
• Perceived scalability  
• Perceived security  
• Perceived cost-effectiveness  
• Institutional influences  
• Growth options  
• Abandonment options  
• Deferral option  |  |  | The results showed that relative advantage, top management support, firm size, competitive pressure, and trading partner pressure characteristics have a significant effect on the adoption of cloud computing.  
| [86] | • The need of cloud computing  
• Security effectiveness  
• Reliability  
• cost effectiveness |  |  | The results showed that institutional influences had a significant effects on the technological characteristics factors towards intention cloud computing. 
Method: A quantitative study using questionnaire.  
Respondents: (101) IT professional from (124) participants who were employed in managerial positions in Singapore.  
Theories used: -Institutional theory - Real Option Theory (ROT).  
The A strong positive relationship was found between each of these four independent variables: and the dependent variable; the management interest in adopting cloud Computing technology |