

AN EXPLORATORY STUDY ON THE FACTORS AND BARRIERS TO CLOUD COMPUTING ADOPTION BY SMALL AND MEDIUM-SIZED ENTERPRISES IN KUWAIT

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ABSTRACT

PURPOSE: This study aims to examine the relevance of factors that research has identified as barriers to the widespread adoption of cloud computing, particularly for digital transformation and IT adoption by small and medium-sized enterprises (SMEs) in Kuwait.

DESIGN/METHODOLOGY/APPROACH: This research investigates the independent economic factors, such as the level of trust in an organisation and the importance of cost saving, and social factors affected by cultural factors, such as the power distance between a superior and their subordinates and the desire to avoid uncertainty. The impact of cyber security and IT complexity on business-to-business IT adoption will also be examined. The research has also identified moderators, such as the effect of fairness and organisational (procedural and distributive) justice, as important predictors of IT diffusion in a sector.

FINDINGS: Based on our findings, the overall aim of our study is to provide a general macro and micro strategy to enable the development, usage, and adoption of cloud computing in Kuwait for SMEs. Our findings suggest that all socio-economic factors in the form of trust in supervisor, economic factors in the form of cost saving, the social-cultural factors in the form of power distance and uncertainty avoidance, justice in the form of procedural justice, security factors in the form of cyber security, and technical knowledge in the form of complexity do have an effect on the adoption of cloud computing for SMEs. The results suggest the strong need to look at the adoption of cloud

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computing from an interdisciplinary perspective, encompassing not only the technical side but the socio-economic and behavioural side of cloud computing adoption.

KEYWORDS: *Cloud Computing; Digital Transformation; Small and Medium-Sized Enterprises; Technology Adoption*

INTRODUCTION

The growth and development of cloud computing is one of the most critical emerging technologies in the past decade, together with artificial intelligence (AI) and augmented reality (AR). Many information systems and technology companies emerged and capitalised on the growth of this new form of technology to ride the wave of innovation, and Kuwaiti companies are being challenged to adopt cloud computing to accelerate innovation. Companies such as Amazon, Microsoft, Huawei, and Google initiated new business channels to cater to the growing need for cloud computing around the world (Dutta and Dutta, 2019). In tandem with the growth of cloud computing emerged the development of high-end 5G telecommunication technology; this plays a vital role in enabling the cloud computing infrastructure. Kuwait is one of the few countries in the region to have developed its 5G infrastructure (*Arab Times*, 2022). Unfortunately, the diffusion of cloud computing has not been growing alongside the development of enabling 5G infrastructure. Therefore, we wish to explore the factors and barriers to the development and growth of cloud computing in Kuwait among small and medium-sized enterprises (SMEs).

The study examines the relevance of factors that research has identified as barriers to the widespread adoption of cloud computing technology, particularly for IT adoption by businesses in Kuwait. The motive for the study is based on our observation that business-to-consumer technology adoption, such as the use of IT platforms for food delivery and taxi services, is much further along in Kuwait than business-to-business (B2B) IT adoption. Therefore, since the provision of cloud computing is rapidly advancing the B2B IT adoption sector in the world, understanding the relevant barriers in this sector will greatly advance the knowledge of the barriers to widespread IT adoption for innovation purposes by organisations in Kuwait. Further, the Kuwait private sector is dominated by small and medium-sized family enterprises, so what we learn about cloud computing adoption will have applicability to many other countries where SMEs are the drivers of technology adoption and innovation.

The structure of this paper is as follows. The next section is the literature review that delves into various factors and barriers influencing the widespread adoption of cloud computing by SMEs. This is followed by the research framework, while the methodology and research findings are expounded upon and discussed in the next section. The discussion and conclusions section of the paper summarises research contributions and outlines potential directions for future investigations.

Literature Review

The effective deployment of new technologies requires an understanding of both technological and social aspects; studies should undertake both socio-economic and socio-technical system

analysis lenses to understand the barriers to cloud computing adoption. Therefore, to merge the socio-economic aspect with the technological aspect, we will explore the how the following factors impact the adoption of cloud computing:

- the human factors in the form of trust (Gibreel *et al.*, 2018, 2015; Lyons, 2021; Xu and Mahenthiran, 2021);
- economic factors in the form of cost saving (Xu and Mahenthiran, 2021);
- social cultural factors in the form of power distance and uncertainty avoidance (Hofstede, 2011; Yoo *et al.*, 2011);
- justice in the form of procedural justice (Kim and Park, 2017; Lyons, 2021);
- security factors in the form of cyber security (Xu and Mahenthiran, 2021); and
- technical factors including the complexities of adopting cloud computing (Xu and Mahenthiran, 2021).

The adoption of cloud computing by small and medium-sized enterprises (SMEs) is considerably influenced by the level of power distance between superiors and subordinates. This observation aligns with Hofstede's cultural dimensions theory that highlights the impact of power distance on organisational behaviour and decision-making (Hofstede, 2002). Gangwar *et al.* (2015) highlighted the importance of top management commitment as a critical determinant in the adoption of cloud computing. This suggests that the attitudes and behaviours exhibited by organisational leaders significantly influence the decision-making process surrounding the adoption of cloud computing technology.

It was also established by Kumar *et al.* (2017) that the adoption of cloud computing by SMEs is significantly influenced by the perceived benefits; in turn these are shaped by the power dynamics inside the organisation. It was also discovered that organisational characteristics play a substantial role in influencing the decision to embrace cloud computing services. This implies that power dynamics and hierarchical structures within SMEs might have an impact on the process of adopting such services (Gutiérrez *et al.*, 2015). Neicu *et al.* (2020) showed evidence that the perceived quality of cloud computing services has a beneficial impact on employee satisfaction inside SMEs. This suggests that the adoption of cloud computing can be influenced by the perceptions of both superiors and subordinates.

Alsafi and Fan (2020) emphasised the absence of government assistance as a significant obstacle hindering SMEs from embracing cloud computing. This observation suggests that external variables, such as power dynamics within society, can impact the decision-making process of SMEs regarding the adoption of cloud computing. The findings of Agus Pramuka and Pinasti (2020) provide support for the notion that the perceived usefulness and ease of use have a favourable impact on the attitudes of SMEs towards cloud-based systems. This suggests that the perceived advantages and obstacles, which are impacted by power dynamics, can significantly affect the decisions made about the adoption of such systems.

In summary, the extent to which individuals perceive a hierarchical power distance between leaders and employees inside SMEs has a notable impact on the adoption of cloud computing. The impact of this phenomenon can be observed in the various elements at the organisational, social, and individual levels that contribute to the formation of attitudes, commitment, and perceptions of the advantages and obstacles associated with the adoption of cloud computing.

The role of procedural fairness is of utmost importance in mitigating the influence of power distance and uncertainty avoidance on the adoption of cloud computing by SMEs. Gangwar *et al.* (2015) highlight the need to comprehend the factors that influence the adoption of cloud computing; this is in line with the necessity to understand the mediating function of procedural justice. Alshamaileh *et al.* (2013) emphasise the significance of competitive pressure and observability as determinants of cloud computing adoption. This underscores the need of procedural justice in addressing the impacts of power distance and uncertainty avoidance.

Yaseen *et al.* (2023) conducted a study that examines the various factors that impact the adoption of cloud computing inside SMEs. The authors suggest that these characteristics are connected to the mediating influence of procedural fairness, particularly in relation to power distance and uncertainty avoidance. The research conducted by Khayer *et al.* (2020) highlights the significance of utilising the importance-performance map analysis as a means of evaluating the role of procedural fairness in mediating the influence of power distance and uncertainty avoidance on the adoption of cloud computing. Asiaei and Ab Rahim (2019) utilise the Technology-Organisation-Environment (TOE) framework to establish a foundation for comprehending the intermediary impact of procedural justice within the framework of power distance and uncertainty avoidance. Kumar *et al.* (2017) have also identified important aspects, such as perceived benefits and concerns, that are pertinent to the mediation of power distance and uncertainty avoidance through procedural justice. On the social aspect from the perspective of the effect of procedural justice on information sharing, a study by Gibreel *et al.* (2023) pointed out that trust in the supervisor dramatically affects the perception of procedural justice and, in turn, helps in information sharing in a setting of high uncertainty avoidance.

In addition to the main human, social, and economic factors, such as the level of trust, cost saving, and social-cultural factors, such as the power distance between a superior and their subordinates and the desire to avoid uncertainty as well as studying the impact of IT complexity, we also explore if fairness and organisational (procedural and distributive) justice are important predictors of IT diffusion in the B2B sector. The dependent variable is the cloud providers' performance measures, including questions to measure the satisfaction of the users with cloud computing providers; this includes both local and international providers such as Microsoft, Google, Amazon, and Huawei.

The research study strives to fill the knowledge gap in B2B IT adoption using cloud computing, specifically among SMEs in less developed countries. For example, we will identify factors that users and IT developers in Kuwait perceive as barriers to the development of cloud computing to streamline and upgrade their supply chains. We also study the user perspectives from several aspects, including trust, security, socio-economic factors, and justice. To our knowledge of the state-of-the-art literature, no research study has explored these factors' importance to SMEs in the Gulf Cooperation Council (GCC) region that consists of the six most wealthy oil and gas producing countries of Saudi Arabia, Kuwait, Bahrain, UAE, Oman and Qatar.

RESEARCH FRAMEWORK AND HYPOTHESES

The objective of this research is to explore the factors and barriers to the development of cloud computing adoption by SMEs in Kuwait. We explore the human factors in the form of trust, economic factors in the form of cost saving, social-cultural factors in the form of power distance and uncertainty avoidance, organisational fairness in the form of procedural justice, security factors in the form of cyber security, and technical knowledge in the form of complexity. The study aims of to provide general macro and micro strategies to enable the development, usage, and adoption of cloud computing by Kuwait SMEs. In the research model shown in Figure 1, there are seven research hypotheses that are based on eight constructs. These constructs have been previously developed, tested, and validated in many studies conducted in the US and China.

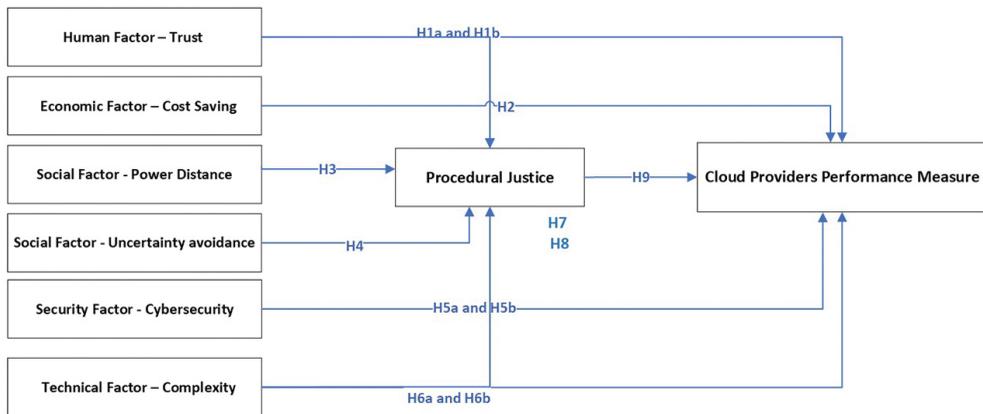


Figure 1: The Factors and Barriers to the Development of Cloud Computing Adoption by SMEs

Source: Constructed by authors

Table 1 shows the construct's name, the number of items in each construct, and the most recent study that used the construct to study user satisfaction or performance. All questions in the survey used a Likert scale from 1 to 7.

Factors/Construct	Type	Source
Human Factor—Trust	Independent	(Xu and Mahenthiran, 2021)
Economic Factor—Cost Saving	Independent	(Xu and Mahenthiran, 2021)
Social Factor—Power Distance	Independent	(Yoo <i>et al.</i> , 2011)
Social Factor—Uncertainty avoidance	Independent	(Yoo <i>et al.</i> , 2011)
Security Factor—Cybersecurity	Independent	(Xu and Mahenthiran, 2021)
Technical Factor—Complexity	Independent	(Xu and Mahenthiran, 2021)
Cloud Providers Performance Measure	Dependent	(Xu and Mahenthiran, 2021)
Justice – Procedural Justice	Mediator	(Parker <i>et al.</i> , 2014)
<i>Source:</i> Constructed by authors		

Based on the research model in Figure 1, the formal hypotheses tested using a sample of Kuwaiti SMEs are given below:

- **H1a:** The level of trust significantly influences the adoption of cloud computing by SMEs.
- **H1b:** The level of trust significantly influences the perceived procedural justice by SMEs.
- **H2:** The perceived level of cost savings have an impact on the adoption of cloud computing by SMEs.
- **H3:** The social-cultural factor, the perceived level of power distance between superiors and subordinates has an impact on the adoption of cloud computing by SMEs.
- **H4:** The social-cultural factor, the level of employee uncertainty avoidance has an impact on the adoption of cloud computing by SMEs.
- **H5a:** The factors that contribute to the level of threat of cyber security have an impact on the adoption of cloud computing by SMEs.
- **H5b:** The factors that contribute to the level of threat of cyber security have an impact on the perceived procedural justice by SMEs.
- **H6a:** Technical knowledge, specifically the perceived level of IT complexity, has an impact of the adoption of cloud computing by SMEs.
- **H6b:** Technical knowledge, specifically the perceived level of IT complexity, has an impact of perceived procedural justice by SMEs.
- **H7:** Procedural justice mediates the effect of power distance on cloud computing adoption by SMEs.

- **H8:** Procedural justice mediates the effect of power uncertainty avoidance on cloud computing adoption by SMEs.
- **H9:** The perceived procedural justice has an impact on the adoption of cloud computing by SMEs.

METHODOLOGY AND DATA ANALYSIS

With the help of a consulting company, an online web questionnaire was developed, pilot tested, and the data were collected. The survey was conducted during the first six months of 2023, and participants were managers of SMEs in Kuwait. The data were analysed using both SPSS and AMOS. After cleaning the data and removing questionnaires that were not completed, 82 questionnaires were used for the analyses.

Of the total respondents, 55% were female, and 45% were male. In terms of level of management, 11% were at senior management level or equivalent, 21% were at middle management level or equivalent, 27% were frontline management or higher than beginner level, 30% were lower-level or entry-level management, and 'others' was 11%.

Preliminary data analysis used the following steps. In the first phase, we considered Kaiser-Meyer-Olkin (KMO) and Bartlett's tests. The KMO measure of sampling adequacy resulted in 0.68 (above 0.60 is acceptable) (Allen *et al.*, 2010). For Bartlett's test, the results were significant (0.000); a Bartlett's result less than <0.001 is significant. In the second phase, we analysed the measurement model for convergent and discriminant validity. For convergent validity, items with factor loadings below 0.5 were excluded. The remaining item loadings were greater than 0.6 (Hair *et al.*, 2013). In discriminant validity, all factors with cross-loading were resolved. Cronbach's alpha, a method for measuring internal consistency, was consistently above 0.80. The alpha coefficients for the scales were: Cloud Providers Performance Measure 0.60, Trust (in Supervisor) 0.81, Cost 0.54, Power Distance 0.92, Uncertainty Avoidance 0.86, Complexity 0.80, Security Concerns 0.84, Procedural Justice 0.80, and Cost 0.82. In the case of model fit, CMIN/DF was 1.011; this is within the threshold between 1 and 3 (Hu and Bentler, 1999). RMSEA was 0.012 and was within the range for the cut-off criteria. CFI was 1.000, SRMR was 0.015, which are all within the appropriate threshold. We therefore conclude that the model fit is good.

Table 2 presents the model results for the hypothesis tests using confirmatory factor analysis. The estimated p-value and status of the hypothesis are stated as either supported or rejected. The table also showcases all the independent variables and their interaction with the dependent variable. Furthermore, the estimated p-value and status of the hypothesis are stated as either supported or rejected.

Table 2: Results for Hypothesis Testing

Independent	Hypothesis	Dependent	Estimate	Signif	Status
Trust	H1a→	Cloud Providers Performance Measure	0.373	***	Supported
Trust	H1b→	Procedural Justice	0.281	***	Supported
Cost	H2→	Cloud Providers Performance Measure	0.177	**	Supported
Power Distance	H3→	Procedural Justice	0.337	***	Supported
Uncertainty avoidance	H4→	Procedural Justice	0.544	***	Supported
Cybersecurity	H5a→	Cloud Providers Performance Measure	0.366	***	Supported
Cybersecurity	H5b→	Procedural Justice	0.077	***	Supported
Complexity	H6a→	Cloud Providers Performance Measure	-0.500	***	Supported (inverse)
Complexity	H6b→	Procedural Justice	0.252	**	Supported
Power Distance → Procedural Justice	H7→	Cloud Providers Performance Measure	0.140	***	Supported
Uncertainty Avoidance → Procedural Justice	H8→	Cloud Providers Performance Measure	0.226	***	Supported
Procedural Justice	H9→	Cloud Providers Performance Measure	0.415	***	Supported
Significance of Estimates: *** p < 0.001 ** p < 0.010 * p < 0.050					
Source: Constructed by authors					

DISCUSSION AND CONCLUSIONS

Based on the size of the path coefficients, in ascending order of importance, in the direct effect analysis, we find that the economic factor associated with perceived level of cost savings has the lowest positive association with the users' perception of the performance of the cloud computing providers; this is followed by the human factor subordinates' trust in their supervisors, and employees' cyber security concerns. As per the social factor of power distance and uncertainty avoidance's indirect effect on performance of cloud computing providers, the result yielded significance that could coincide with the reluctance of some SME managers to try information systems early on and propose them to their own managers. This issue has also been a concern in the UK for TelephoneSystems.Cloud. In an online article by the Enterprise Talk Bureau, entitled *Technophobia threatening the future of SMEs*, Juliet Moran (Technical director, TelephoneSystems.Cloud) pointed out: "Technology may seem scary, but decisions should never be based on what leaders are comfortable with", and that "Rather, the decision to change should be based on what will most benefit a company, aka the effectiveness of a system for operations, efficiency, and profitability". Moran also pointed out that "The business owners that have seen earlier technological opportunities have had the advantage of accessible and streamlined systems and are now taking huge strides in the post covid climate".

On the benefit of adopting cloud computing or VOIP technology, Juliet pointed out “It can be used for many benefits, including expanding customer base, improving internal and external services, minimizing admin, optimizing markets, and streamlining communication threads” (Enterprise Talk Bureau, 2023).

Therefore, we believe more communication and awareness of the benefits of cloud computing could encourage managers to introduce and propose new technologies within SMEs. Furthermore, SMEs’ senior managers could help empower junior managers by allowing the testing and usage of new technology to reduce the effect of uncertainty avoidance of trying new technologies.

More importantly, the perceived level of IT complexity negatively and significantly affects users’ perception of the performance of cloud computing providers. Therefore, more important than cost saving, the most important non-technical factor on which SMEs in Kuwait should focus is encouraging managers to try new technology and discuss it in the context of their SMEs with the senior managers or co-workers. This will likely affect both the employees’ trust in their superiors and the perceived level of organisational fairness towards adopting information systems as compared to initiating a marketing campaign or a PR campaign that might garner more attention than the usage of information systems in SMEs. Also, as highlighted in the literature review, managing the level of IT complexities to reduce the anxieties of employees in SMEs can go a long way to promoting the adoption of cloud computing that is considered essential for organisational innovations facilitated by technology.

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BIOGRAPHY



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Dr Luay Tahat has a Master's degree and a PhD in Computer Science, and has been an Associate Professor at Gulf University for Science and Technology since 2008. He has over 15 years of professional mobile networking experience, having served as the lead Mobile Network Solution Architect at Nokia in the USA. His versatile career includes roles at AT&T, Lucent Technologies/Bell Labs, and IBM, contributing to software development, system engineering, and solution architecture. Dr Tahat has published over 40 research papers in renowned conferences and journals. His expertise spans Software Engineering, Model-Based Testing, Mobile Network Solutions, and Network Management Architecture.