Selection of Cloud Service Providers: A Fuzzy-set Qualitative Comparative Analysis Approach

Mohammad Alamgir Hossain[1[0000-0002-4292-8478]], Alvedi Sabani[1[0000-0001-6628-8092]], Sachithra Lokuge[2[0000-0003-4558-687X]], Yee Ling Boo[1[0000-0001-7188-9597]] and Shahriar Kaisar[1[0000-0002-8103-0900]]

[1] RMIT University, Melbourne VIC 3000, Australia
mohammad.hossain@rmit.edu.au
alvedi.sabani@rmit.edu.au
yeeling.boo@rmit.edu.au
shahriar.kaisar@rmit.edu.au
[2] University of Southern Queensland, Springfield Lakes QLD 4300, Australia
sachithra.lokuge@unisq.edu.au

Abstract. Selection of a cloud service provider (CSP) is an important decision for businesses that make long-term investments. Notably, this process is a complex decision that involves assessing multiple criteria where more than one condition jointly may dictate the decision. In addition, the selection decision can be explained with more than one equally effective configuration of conditions. Moreover, the causal configurations for predicting the rejection of a CSP are unique and may not mirror opposites of the causal configurations of the selection of a CSP. Prior studies commonly apply traditional regression-based linear modeling techniques and thus far, these techniques do not fully capture the complexity of CSP selection but rather identify the individual and isolated effects of the conditions. This study fills the gap by proposing a new configuration framework, which posits that CSP selection does not depend on individual conditions, but on their specific configurations. The configurational model has been validated using fuzzy-set qualitative comparative analysis method. The results suggest three configurations to select and reject a CSP in conjunction with the implications to research and practice.

Keywords: Cloud Computing, Cloud Service Provider, Configuration, fsQCA.

1 Introduction

In recent times, Cloud Computing has become increasingly popular and vital for businesses, as it enables them to efficiently consume and utilize computing resources over the web [1]. In order to perform Cloud Computing, users[1] take support from cloud service providers (CSPs) to handle their computing utilities (e.g., infrastructure, storage, computing power, and software applications) [2, 3]. A CSP vendor leases different types of cloud-based services (e.g., IaaS, PaaS, and SaaS) that are dynamically provisioned based on customer's demand. A wide variety of customized and reliable

[1] Both individuals and businesses can be the users; however, our focus is the latter.

computational services are hosted on servers maintained by the CSPs, allowing users to access them from anywhere, replacing the on-premises information technology (IT) commitments [4].

With the rapid growth of cloud services in recent years and the continuously evolving market, businesses must evaluate their specific needs to select the most suitable CSP. "Given the vast diversity of these offers, the choice of the most appropriate CSP became a dilemma that confuses most cloud customers" [4, p. 71851]. For many users, "it is very difficult to choose the suitable cloud services" [5, p. 7015] as there are several competing CSPs, it is quite a complex task.

When selecting a CSP, users value the technical attributes including security, accessibility, and more [6]. Similarly, the non-technical or non-functional i.e., operational criteria e.g., performance, quality of support, and reputation must also be assessed to meet the service levels as set in the service specifications [5]. When selecting a CSP, users look at a wide range of service attributes that, in response, support multiple functional objectives [7]. Even though the selection of a CSP is a multi-criteria decision making (MCDM) process [4, 8], "most of the existing work assumes that the service attributes are independent of one another, while in reality, there are interdependencies between attributes" [7, p. 148]. In other words, while selecting a CSP, users do not look at one attribute but a combination of them. For instance, users do not decide on a CSP solely based on the cost [9] but take security into consideration as well [10]. Thus, "consideration of the interdependent relationship between selection criteria is critical for rational decision-making" [7, p. 148]. Nonetheless, several studies applied MCDM methods e.g., analytical hierarchical process (AHP) [e.g., 4, 5, 8], yet the joint effects of the attributed could not be explained. "Thus, more advanced techniques need to be explored to model the relationships between multiple attributes and enable service selection based on mutually interdependent criteria" [7, p. 148].

Against this backdrop, this study investigates: "Which configurations of technical and operational attributes explain the selection of CSP?" This study does not provide a process to select the most appropriate CSP [4]. Rather, it focuses on identifying the features a CSP should possess for users to select that CSP. We collected data from individuals who make CSP selection decisions in various industry sectors. To answer our research question, we have applied a fuzzy-set qualitative analysis (fsQCA) technique. The fsQCA excels in identifying complex, non-linear configurations of criteria that influence an outcome. MCDM methods typically assume linear relationships between criteria, whereas fsQCA allows for the exploration of interactions and dependencies among criteria that may not be apparent in traditional MCDM approaches. Furthermore, fsQCA provides a unique capability to identify necessary and sufficient conditions for an outcome. It can determine which combinations of criteria are necessary (must be present) and sufficient (alone or in combination) for a particular outcome, providing a more nuanced understanding of the decision-making process.

This study has several theoretical and practical implications. We respond to the research call of Sun, Dong [7]. From the practical perspective, this study provides an explainable guide to users on how to best bundle their products in combination of different service attributes. Thus, this will lead to enhance the efficiency of the CSP selection process of an organization.

2 Identifying the Attributes of CSP Selection

2.1 Identifying the Attributes of CSP Selection

Extant literature has identified several attributes important for CSP selection. For example, Godse and Mulik [8] suggest the following criteria for SaaS selection: functionality, architecture, usability, vendor reputation, and cost. Other studies group them under functional and non-functional service attributes [e.g., 5]. From a literature review, Sun, Dong [7] identified five *functional* attributes including functionality, accessibility, usability, scalability, and resource distribution. In addition, prior research highlighted functional attributes such as performance, reliability, portability, and customizability as important attributes for CSP selection [11, 12]. On the contrary, the *non-functional* quality of services "is considered the most significant attribute for appropriate service selection" in cloud computing [5, p. 7015]. Sun, Dong [7] identified payment, performance, security, and reputation as the non-functional aspects of CSP estimation. Among them, payment is considered by most of the service selection studies, which is typically represented by the price or pricing models. In addition, reputation, level of support, service variety, rapport, and geolocation are also considered as important for CSP selection [2, 13].

From extant studies, the attributes important for CSP selection can be grouped into two major categories: technical and operational attributes. The technical attributes refer to the technical aspects of cloud services. The *technical* attributes include performance, security, accessibility, scalability, reliability, usability, portability, and customizability of the CSP. The *operational* attributes refer to the attributes and considerations related to the operational aspects of the provider's services such as reputation, pricing, level of support, service variety, resource distribution, and subscription flexibility. Considering these attributes enables organizations to make informed decisions when selecting a CSP that aligns with their specific needs and requirements.

2.2 Identifying the Conditions for Configurational Model

Theoretically, all these 14 attributes identified from literature in section 2.1 can be included in a configurational model. However, in the fsQCA method, the truth table (discussed in section 4.4) computes 2^k possible configurations (or combinations) to predict an outcome variable, where k represents the number of conditions (i.e., attributes or attributes). Hence, for 14 attributes, it will be impractical to evaluate 16,384 possible configurations. Therefore, using a convenient sampling technique, we conducted a survey involving 29 small to medium-sized enterprises (SMEs) to assess, identify, and prioritize the relative importance of the technical and operational attributes in CSP selection. Subsequently, these identified attributes formed the variables for formulating the configurational model. In particular, the survey was designed with a questionnaire consisting of the technical and operational attributes, along with their definitions. The respondents were asked to rate each attribute using a three-point scale of "not important" (=3), "somewhat important" (=2) and "very important" (=1) in selecting a CSP. The results of the survey are summarized in Figure 1 where the attributes are ranked in descending order of their mean values. The mean of the mean values is 2.1 and the average of the highest (2.7) and the lowest (1.6) of mean rating values of all attributes included in the survey is 2.2. Therefore, 2.2 is identified and used as the cut-off value. In other words, those attributes that have mean values greater than 2.2 are considered as relevant conditions[2] for our configurational model to explain the selection of CSP. Thus, we identified four technical conditions (i.e., reliability, performance, security, and usability) and three operational conditions (i.e., reputation, pricing, and service capability), which are used as the variables to formulate the configurational model for selecting a CSP.

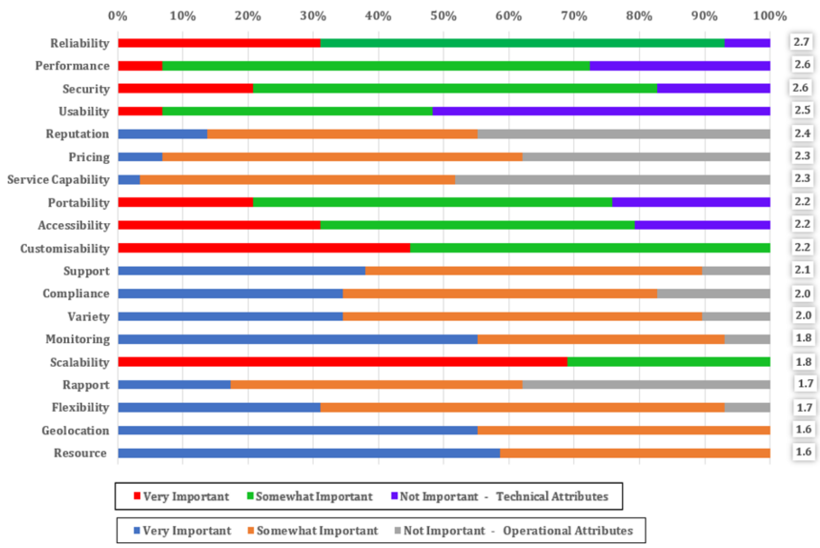


Fig. 1. Prioritizing the attributes affecting the selection of CSP

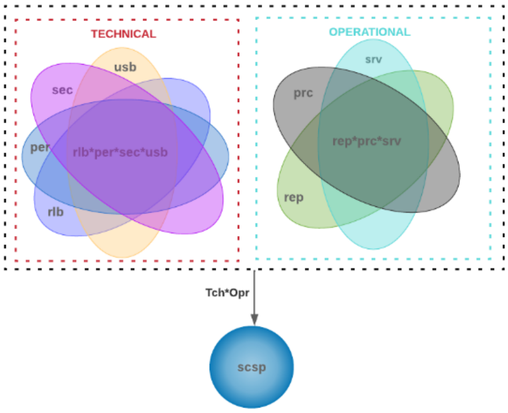
3 The fsQCA Model

3.1 Structuring the CSP Selection Problem

Based on the literature, we postulate that the selection of a CSP is a complex decision where asymmetrical relationships between technical and operational attributes may exist [14]. Our configurational research model is presented in Fig 2 as a Venn Diagram [15]. In summary, our theoretical foundation is based on the argument that configurations between the technical and operational attributes affect the selection of a CSP: [scsp = *f*(rel,per,sec,usb,rep,prc,srv)]. Alternatively, the rejection of a CSP becomes: [~scsp = *f*(rel,per,sec,usb,rep,prc,srv)], where "~" denotes negation. Simply, selection of a CSP is a 'bundle' of technical and operational attributes.

[2] In configurational models, the antecedent factors (i.e., independent variables) explaining a dependent variable are called "conditions" and the dependent variable is called as "outcome variable."

Fig. 2. The configurational model of cloud service provider selection.



3.2 Measures and Data Collection

All the measures of the variables have been adopted from established studies. *Reliability* is the ability of a cloud service to perform its intended function continuously and consistently over a period, without failure or interruption [11]. We measure *reliability* using items from [16, 17]. *Performance* is a measure of how efficiently a CSP can deliver computing resources, such as processing power, storage, and network connectivity [7]. We measure *reliability* and *performance* using items from [16, 17]. *Security* defines the practices, technologies, and policies that a CSP employs to restrict the access of resources and protect data, applications, and infrastructure from intruders [5, 8, 11]. The *security* feature allows to restrict the access of resources and helps in protecting the data from intruders. *Security* has been measured with scales from [16]. *Usability* is the ease with which users can interact with and use cloud-based services, applications, and resources [18]. The items of *usability* are adapted from [8]. *Reputation* – the perceived trustworthiness, reliability, and quality of a CSP [19] – is measured from [8, 16]. *Pricing* denotes the cost structure of cloud services, which typically include usage-based fees, subscription fees, or a combination of both [9]. Its items are adapted from several scales [8, 11, 17, 20]. *Service capability* is the vendor's ability to manage and deploy various tangible (e.g., physical IT infrastructure components, human IT resources) and intangible (e.g., knowledge assets, customer orientation) IT resources to provide the service [21, 22]. The items of *service capability* are taken from [19, 23]. Finally, *CSP selection* is measured with the items adapted from [24, 25]. All items, presented in appendix A [26].

The data for this study was gathered utilizing a convenient through an electronic survey, specifically targeting SMEs. Among the participants, the majority (68%) fell within the age bracket of 31 to 45 years, indicating a prominent presence of mid-career professionals. Following this, 25% of respondents were aged between 46 and 60, highlighting a seasoned demographic. A smaller portion of the participants (3.5%) were in the age range of 21 to 30, while an equivalent percentage represented individuals over 60 years old, representing a diverse age range. Around 66% of participants were affiliated with organizations with over 100 employees, signifying a preference for cloud adoption among more established enterprises. Within this spectrum, 12.5% were associated with organizations having 50 to 100 employees, indicating a moderate-sized segment. Additionally, 21.5% of respondents were connected to organizations with fewer than 50 employees, representing the small businesses. Various industry sectors were encompassed in the survey, including agriculture, consulting, education, healthcare, retail, food and beverages, manufacturing, construction, and property.

4 Application of fsQCA for CSP Selection

Before we proceed to the fsQCA procedure, we check the measurement properties of the variables. All items' loadings are higher than 0.6, and the internal consistency of all constructs (composite reliability and Cronbach's alpha) are higher than the acceptable level of 0.7 [27] (see Appendix A). In addition, the average variance extracted (AVE) for every variable is greater than 0.5. For discriminant validity, the Heterotrait–Monotrait ratio of correlations (HTMT) values of all constructs are significantly ($p< 0.05$) lower than the threshold of 0.85 [27].

4.1 Data Calibration

The fsQCA analysis was carried out using the software fsQCA 3.0 [28] from www.fsqca.com. We followed the guidelines from [e.g., 29, 30, 31]. During data calibration, to determine the degree of membership for each variable, three anchors are defined, denoting 'full membership' (fuzzy score = 0.95), 'full non-membership' (fuzzy score = 0.05), and the 'crossover point' (fuzzy score = 0.50) [32]. We rescaled the latent variable scores into fuzzy values (values between 0 and 1) [30]. It requires calibrating the standardized latent variable scores between -3 (i.e., full-set non-membership) and 3 (full-set membership), whereby 0 (zero) is the crossover point (intermediate-set membership) [30].

4.2 Assessment of the Necessary Conditions

"[A] necessary condition implies that the outcome of interest does not occur in the absence of the respective condition" [33, p. 4]. A condition is considered as "always almost necessary" if the consistency score exceeds the threshold level of 0.80 [14]. Based on this, statistically, three conditions namely *reliability*, *usability*, and *reputation* individually are found to be the necessary condition for selecting a CSP (see Table 1). It can be interpreted that a CSP is not selected without the presence of these factors. However, except *reputation,* the other two conditions are not present in every configuration for selecting a CSP and therefore are not considered as necessary conditions (see Table 2). Alternatively, no single variable comes out as a necessary condition for rejecting a CSP.

Table 1. The necessary conditions for selecting a CSP.

Condition	Selection of a CSP		Rejection of a CSP	
	Consistency	**Coverage**	**Consistency**	**Coverage**
Reliability	0.816	0.741	0.697	0.697
Performance	0.755	0.779	0.758	0.739
Security	0.773	0.791	0.730	0.706
Usability	0.833	0.844	0.708	0.678
Reputation	0.840	0.846	0.698	0.664
Pricing	0.784	0.802	0.735	0.710
Service Capability	0.786	0.809	0.743	0.723

4.3 Assessment of the Sufficient Conditions

We need to develop a truth table to identify the sufficient conditions. Analyzing the truth table, following Mattke, Maier [29, p. 560], we use "a raw consistency threshold of at least 0.75" and a proportional reduction in inconsistency (PRI) threshold higher than 0.50. Given the small sample size, we set the frequency threshold to 1. "[A] sufficient condition means that the outcome occurs whenever the respective condition is present" [33, p. 4]. All our consistency values are greater than 0.8 and the raw coverage values are above 0.2 [30], indicating significantly valid configurations for the outcome variables (i.e., SCSP). We present the diagrammatic representation of the sufficient solutions for modelling selecting and rejecting a CSP, as outlined in Table 2.

Table 2. The sufficient conditions for selecting a CSP.

Conditions	Selecting a CSP			Rejecting a CSP		
	C1	**C2**	**C3**	**~C1**	**~C2**	**~C3**
Reliability	●					⊗
Performance		●	●		⊗	⊗
Security			●			
Usability				⊗	⊗	
Reputation	●	●	●		⊗	
Pricing	⊗			●		●
Support Capability	●	●				
Raw Coverage	0.591	0.579	0.590	0.711	0.658	0.658
Unique Coverage	0.074	0.007	0.006	0.010	0.004	0.002
Consistency	0.931	0.921	0.911	0.918	0.956	0.919
Solution Coverage	0.722			0.879		
Solution Consistency	0.894			0.857		

Key: ● indicate the presence of a condition, ⊗ indicates its absence, and blank space refers to a "do not care" condition (i.e., either present or absent).

4.4 Findings and Discussion

Most of the studies dealing with CSP adoption mainly focus on the individual and main effects of various antecedents [7]; they have commonly applied symmetric and regression-based analysis methods (e.g., structural equation modeling). Regression-based models suggest that a predictor variable needs to be both necessary and sufficient to achieve the desired outcome. This is not plausible. Let us first discuss that an antecedent may be necessary but is rarely sufficient for predicting an outcome. Our study finds that *the reputation* of a CSP is a necessary condition for the selection of a CSP. However, *reputation* is not sufficient for selecting a CSP as it needs to be combined with either attribute e.g., reliability. Then, a sufficient condition may not necessarily be a necessary condition. For instance, according to C2, the presence of *performance*, *security*, and *reputation* are sufficient in explaining selection of a CSP; however, while *security* is absent, the selection of that CSP may still be high if *support capability* is high (C3). It suggests that *security* is not a necessary but a sufficient condition, which conventional regression-based models cannot explain.

Not only the technical attributes but also the operational attributes of CSP are considered while selecting or rejecting a CSP. In other words, selection, or rejection of a CSP is not dependent merely on technical or operational attributes of CSP but on their specific configurations. As such, this study contributes to providing specific guidelines for CSP selection process.

Our analysis finds three different combinations of attributes that are individually sufficient to select a CSP. By looking at these different configurations, a CSP can bundle the attributes differently for different users. Among these configurations (i.e., C1 – C3), C1 has the largest raw coverage and unique coverage as well as high consistency, meaning that it is empirically the most relevant and important configuration for selecting a CSP. C1 suggests combination of high *reliability* with high *reputation* and *support capability* with low *pricing*, where *performance*, *security*, and *usability* are 'do not care' conditions. C2 is the next statistically significant configuration that prescribes that if *performance*, *security*, and *reputation* of a CSP are high, users do not care if the other four attributes are present or not. This can be because reputation and security create a perception that overshadows the rest of the attributes. Finally, C3 suggests that CSPs should combine high *performance* and *security* with high *reputation*, where the other attributes do not matter. This is especially applicable for businesses that possess sensitive data.

We find three configurations (~C1 – ~C3) that consistently can be responsible for rejecting a CSP. Configuration ~C1 has the highest coverage, and hence is the most significant configuration explaining the rejection of a CSP. ~C1 suggests that high *pricing* and low *usability* is sufficient for a user to reject a CSP, where the other attributes are not considered at all. Additionally, according to ~C2, low *performance* and low *usability* along with low *reputation* of a CSP are sufficient for a user to reject a CSP where the presence or absence of the other attributes do not matter. This is a reminder for the CSP to improve the quality of their services. Complementary to ~C1, our last configuration i.e., ~C3 suggests that low *reliability* and low *performance* along with high *pricing* may lead to rejecting a CSP, where the presence or absence of the other technical or operation attributes do not make any difference. Similar to ~C1, if the price is high, the likeliness of rejecting a CSP will be invariably high.

5 Implications and Limitation of the Study

There are several theoretical implications. *First*, the utilization of the configurational model in this study contributes to the evolving theory of decision-making in information systems (IS). It highlights the relevance of a configurational perspective in understanding complex decision processes, emphasizing the need to move beyond linear, single-factor models. *Second*, by showcasing the utility of the configurational model in the context of CSP selection, this study opens doors for the cross-domain application of configurational models in IS research. Researchers can explore the adaptability of these models in various decision-making scenarios beyond CSP selection, enriching the theoretical foundations of IS. These theoretical implications not only underscore the significance of our study within the IS literature but also encourage scholars to further investigate the complexities of decision-making processes and the configurational dynamics that underlie them. In doing so, we contribute to broader theoretical advancements in the field of IS.

Furthermore, there are also several practical contributions to this study. *First*, our study shows that the use of the configurational model can help facilitating the decision making to select as well as reject a CSP. This enables users to examine strengths and weaknesses of candidate CSP services and compare them with respect to appropriate conditions. *Second*, the findings of the study will immensely increase the quality of the CSP selection decision, especially the method we have suggested in this study will invariably add value to organizations, especially the CSP providers. Business users too can make informed decisions that will enable successful and suitable CSP selection for their respective organizations. The study informs managers that while reputation is important when selecting a CSP, there are other attributes that will influence the decision. In addition, researchers can use our methodical approach in other decision problems including selection of security service and data analytics providers.

Despite the implications, our study has several limitations. *First*, even though the sample size is suitable for fsQCA method, a larger sample may increase the validity of the findings. Also, longitudinal studies can be undertaken to assess the longevity and efficacy of CSP selections over time. *Second*, it is important to note that the choice between fsQCA and traditional MCDM methods should be based on the nature of the problem, the type of data available, and the specific research or decision-making context. In cases where problems are more quantifiable, traditional MCDM methods may remain more appropriate. Yet, researchers can extend the methodical approach developed in this study to address analogous decision challenges within the IS domain (e.g., selection of security service providers). *Third*, the data collection will be extended to include multiple industries that will improve the generalizability of the study findings. *Finally*, we agree the selection decision is a process; future studies may focus on the process of CSP selection decision.

References

1. Walther, S., et al. *Exploring Subscription Renewal Intention Of Operational Cloud Enterprise Systems-A Socio-Technical Approach*. in *European Conference on Information Systems*. 2013. Utrecht, The Netherlands: AIS.
2. Salim, S.A., et al., *Moving from Evaluation to Trial: How do SMEs Start Adopting Cloud ERP?* Australasian Journal of Information Systems, 2015. **19**: p. S219-S254.
3. Walther, S., et al., *Exploring organizational level continuance of cloud-based enterprise systems*, in *European Conference on Information Systems*. 2015, AIS: Münster, Germany.
4. Youssef, A.E., *An integrated MCDM approach for cloud service selection based on TOPSIS and BWM*. IEEE Access, 2020. **8**: p. 71851-71865.
5. Kumar, R.R., S. Mishra, and C. Kumar, *A novel framework for cloud service evaluation and selection using hybrid MCDM methods.* Arabian Journal for Science and Engineering, 2018. **43**: p. 7015-7030.
6. Lang, M., M. Wiesche, and H. Krcmar. *What are the most important criteria for cloud service provider selection? A Delphi study*. in *European Conference on Information Systems*. 2016.
7. Sun, L., et al., *Cloud service selection: State-of-the-art and future research directions.* Journal of Network and Computer Applications, 2014. **45**: p. 134-150.
8. Godse, M. and S. Mulik. *An approach for selecting software-as-a-service (SaaS) product*. in *2009 IEEE International Conference on Cloud Computing*. 2009. IEEE.
9. Rahimi, M., et al., *Toward the efficient service selection approaches in cloud computing.* Kybernetes, 2022. **51**(4): p. 1388-1412.
10. Nagahawatta, R., et al., *Security and Privacy Factors Influencing the Adoption of Cloud Computing in Australian SMEs*, in *Pacific Asian Conference on Information Systems*. 2021, AIS: Dubai.
11. Xu, H. and S. Mahenthiran, *Users' perception of cybersecurity, trust and cloud computing providers' performance.* Information & Computer Security, 2021. **29**(5): p. 816-835.
12. McKinney, V., K. Yoon, and F.M. Zahedi, *The Measurement of Web-Customer Satisfaction: An Expectation and Disconfirmation Approach.* Information Systems Research, 2002. **13**(3): p. 296-315.
13. Walther, S., et al., *Should We Stay, or Should We Go? Analyzing Continuance of Cloud Enterprise Systems.* Journal of Information Technology Theory and Application (JITTA), 2018. **19**(2): p. 57-88.
14. Ragin, C.C., *Redesigning social inquiry: Fuzzy sets and beyond*. 2008: University of Chicago Press.
15. Pappas, I.O., et al., *Explaining user experience in mobile gaming applications: an fsQCA approach.* Internet Research, 2019.
16. Benlian, A., M. Koufaris, and T. Hess, *Service quality in software-as-a-service: Developing the SaaS-Qual measure and examining its role in usage continuance.* Journal of management information systems, 2011. **28**(3): p. 85-126.
17. Garg, S.K., S. Versteeg, and R. Buyya. *Smicloud: A framework for comparing and ranking cloud services*. in *2011 Fourth IEEE International Conference on Utility and Cloud Computing*. 2011. IEEE.

18. Sedera, D. and S. Dey, *User expertise in contemporary information systems: Conceptualization, measurement and application.* Information & Management 2013. **50**(8): p. 621–637
19. Schneider, S. and A. Sunyaev, *Determinant factors of cloud-sourcing decisions: reflecting on the IT outsourcing literature in the era of cloud computing.* Journal of Information Technology, 2016. **31**(1): p. 1-31.
20. Tricomi, G., et al., *Optimal selection techniques for Cloud service providers.* IEEE Access, 2020.
21. Bharadwaj, A.S., *A resource-based perspective on information technology capability and firm performance: an empirical investigation.* MIS Quarterly, 2000. **24**(1): p. 169-196.
22. Lokuge, S., et al., *Organizational readiness for digital innovation: Development and empirical calibration of a construct.* Information & Management, 2019. **56**(3): p. 445-461.
23. Wulf, F., M. Westner, and S. Strahringer, *Cloud Computing Adoption: A Literature Review on What Is New and What We Still Need to Address.* Communications of the Association for Information Systems, 2021. **48**(1): p. 44.
24. Song, C.-h., S.W. Kim, and Y.-w. Sohn, *Acceptance of public cloud storage services in South Korea: A multi-group analysis.* International Journal of Information Management, 2020. **51**: p. 102035.
25. Shiau, W.-L. and P.Y. Chau, *Understanding behavioral intention to use a cloud computing classroom: A multiple model comparison approach.* Information & Management, 2016. **53**(3): p. 355-365.
26. Bouranta, N., L. Chitiris, and J. Paravantis, *The relationship between internal and external service quality.* International Journal of Contemporary Hospitality Management, 2009. **21**(3): p. 275-293.
27. Hair Jr, J.F., et al., *A primer on partial least squares structural equation modeling (PLS-SEM)*. 2021: Sage publications.
28. Ragin, C., *User's Guide to Fuzzy-Set/Qualitative Comparative Analysis 3.0*. 2018, Irvine, California: Department of Sociology, University of California.
29. Mattke, J., et al., *Qualitative Comparative Analysis (QCA) In Information Systems Research: Status Quo, Guidelines, and Future Directions.* Communications of the Association for Information Systems, 2021. **50**.
30. Rasoolimanesh, S.M., et al., *The combined use of symmetric and asymmetric approaches: partial least squares-structural equation modeling and fuzzy-set qualitative comparative analysis.* International Journal of Contemporary Hospitality Management, 2021. **33**(5): p. 1571-1592.
31. Pappas, I.O. and A.G. Woodside, *Fuzzy-set Qualitative Comparative Analysis (fsQCA): Guidelines for research practice in Information Systems and marketing.* International Journal of Information Management, 2021. **58**: p. 102310.
32. Woodside, A.G., *Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory.* Journal of Business Research, 2013. **66**: p. 463-472.
33. Ide, T. and P.A. Mello, *QCA in international relations: A review of strengths, pitfalls, and empirical applications.* International Studies Review, 2022. **24**(1): p. viac008.

Appendix A. The measures of the variables.

Attributes	Measures
Reliability CR: 0.70 AVE: 0.52	Most of the times, … 1. ... [your provider] operates without failure. 2. ... [your provider] provides services at the promised time. 3. ... [your provider] fulfils the obligations to the contract. 4. ... the services of [your provider] are accurate/error-free.
Performance CR: 0.93 AVE: 0.81	Most of the times, … 1. ... the service response time of [your provider] is quick. 2. ... the performance of [your provider] is stable. 3. ... [your provider] meets most of the end-user requirements. 4. ... the services of [your provider] are available (e.g., no system crash).
Security CR: 0.89 AVE: 0.67	1. As far I know, [your provider] has anti-virus protection. 2. As far I know, all data are encrypted in [your provider]. 3. As far I know, [your provider] ensures data confidentiality. 4. As far I know, [your provider] has secure data centers.
Usability CR: 0.81 AVE: 0.53	1. [Your provider] has a simple user-interface for its contents. 2. [Your provider] has a simple layout for its contents. 3. The services of [your provider] are well organized. 4. Overall, using the services of [your provider] is easy.
Reputation CR: 0.89 AVE: 0.73	1. I believe that [your provider] has high brand value. 2. When it comes to user problems, [your provider] shows a sincere interest in solving them. 3. [Your provider] provides support that is tailored to individual needs. 4. Overall, I believe that [your provider] has a good reputation.
Pricing CR: 0.81 AVE: 0.51	1. The annual subscription cost of [your provider] is high. 2. The acquisition cost (i.e., subscription cost) of [your provider] is high. 3. The on-going cost of [your provider] is high. 4. The financial charges [your provider] are high. 5. The cost of using the service of [your provider] is significantly higher than buying and deploying relevant hardware and software by us. 6. Overall, [your provider] is expensive.
Service Capability CR: 0.89 AVE: 0.63	1. [Your provider] possesses a wealth of technical proficiency in delivering efficient cloud solutions. 2. [Your provider] employs industry best practices, leveraging the latest advancements in cloud technology. 3. [Your provider] consistently upgrades their capabilities to ensure they are well-equipped to address customers' dynamic demands of cloud computing. 4. [Your provider] exhibits a strong command of cloud processes, enabling them to streamline deployment, management, and monitoring procedures. 5. [Your provider] demonstrates a deep understanding of cloud architecture.
CSP Selection CR: 0.91 AVE: 0.77	1. We use cloud services from [your provider] in our business operations. 2. Our business plans to continue to use cloud services from [your provider]. 3. I will recommend [your provider] to others.