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Exploring Sustainability in Cloud Computing Adoption among SMEs in Nepal: A Conceptual Model

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Abstract

A route to greater cost-effectiveness competitive advantage and operational efficiency is being increasingly taken by Nepal's SMEs through cloud computing. However, the question of how long-lasting cloud computing adoption is complex and influenced by several factors that extend beyond its initial installation. This study looks into the variables that affect Nepalese small and medium-sized enterprises (SMEs) ability to use cloud computing sustainably. This research attempts to identify key determinants of sustainable cloud computing adoption byanalyzing a variety of factors including trust, security & privacy, sharing & collaboration, ease ofuse, and cost reduction. The research contextualizes its findings using the Technology Organization Environment (TOE) framework and the Diffusion of Innovations (DOI) theory. Based on firm size moderating these relationships the results show significant correlations between the identified factors and cloud computing sustainability. The results offer valuable perspectives for policymakers and business executives seeking to augment the adoption of cloud computing in Nepal.

Keywords: Cloud Computing, SMEs, Sustainability, Cost Reduction, Ease of Use, Reliability, Security & Privacy, Trust, Sharing & Collaboration

Introduction

The operational landscape of small and medium-sized enterprises (SMEs) worldwide has undergone significant transformation due to the swift progress of information and communication technology (ICT). Cloud computing is one of these innovations that has becomea key technology giving SMEs the chance to improve service delivery cut expenses and increase operational efficiency. Cloud computing enables businesses to function with more flexibility andagility by providing scalable resources and services that can be accessed online (National Institute of Standards and Technology 2011). SMEs can scale their operations cut costs and improve collaboration with cloud computing at a lower cost (Duan et al. 2012). Cloud services allow businesses to access computing resources like storage processing power and software on-demand in contrast to traditional IT infrastructure which

necessitates large capital investments. Because cloud technology solves important issues like data storage remote access and operational efficiency its adoption among SMEs has increased as a result. In markets that arebecoming more dynamic, these skills are essential for preserving a competitive advantage (Gangwar et al., 2015).

SME growth and employment are two important aspects of the Nepali economy that SMEs play. According to Shakya and Pandey (2017), there is a great deal of potential for these businesses to overcome several operational challenges by implementing cloud computing including low financial resources and outdated technology. Although cloud computing has many potential advantages many SMEs in Nepal find it difficult to implement due to a lack of knowledge budgetary limitations and worries about data security (Ghobakhloo et al. 2022). The Covid-19 pandemic has made digital transformation even more crucial and forced companies all over the world to reevaluate their operational plans. To ensure resilience and business continuity this shift has led many SMEs in Nepal to look into cloud computing (World EconomicForum 2022). However, several factors influence how long SMEs adopt cloud computing including cost savings, usability dependability, security and privacy, trust, and the extent of sharing and cooperation. Firm size may also have a moderating effect on how these factors affect sustainability. This study aims to explore the factors influencing cloud computing adoption among SMEs in Nepal with a focus on the opportunities and challenges presented by this technology. The study aims to provide policymakers, stakeholders, and SME owners with useful information by analyzing these dynamics. The adoption of cloud computing can be encouraged by these findings which will eventually help Nepal's economy undergo a digital transformation.

Contextual Problem

Small and medium-sized enterprises (SMEs) businesses in Nepal continue to adopt cloud computing at a relatively low rate despite the technology's acknowledged advantages. Numerouscontextual issues that impede the successful integration of cloud technologies into business operations can be blamed for this underutilization. One of the main obstacles is that SME managers and owners don't know enough about cloud computing. Many Nepali SMEs arehesitant to invest in cloud solutions because they are unaware of the benefits that these solutions provide (Pokharel 2018). In Nepal, SMEs are vital to the country's economy as they generate a substantial number of jobs (Shakya and Pandey 2017). Their inability to afford new technologies and problems with operational scalability pose many obstacles though for them to adopt new ones. These constraints limit their ability to compete globally and sustain long-term growth. Withits scalable infrastructure flexibility and affordable IT resources, cloud computing presents a viable alternative (Duan et al. 2012). However, several contextual factors both internal and external to the businesses have an impact on the successful adoption and sustainabilityof cloud computing among SMEs.

Financial constraints are a major obstacle to cloud adoption in Nepal. Small and medium-sized businesses (SMEs) usually have limited funding and highinterest rates make it even more difficult to invest in cloud services and infrastructure (Pandey 2004). More difficulties are also brought about by the regulatory framework. While worriesabout the security of sensitive data in the cloud persist SMEs are made uneasy by unclear policies surrounding data protection and privacy (Dhakal, 2018). In Nepal, frequent disruptions and slow internet speeds can result in operational downtime which deters SMEs from adopting

cloud solutions so stable internet access is essential for cloud-based operations (Uprety 2020). Contextual barriers highlight the need for focused interventions to help SMEs become more competitive and digitally transformative by increasing their knowledge of cloud computing making them more accessible and ensuring data security. SMEs also face difficulties stemming from their initial assumptions regarding security and cost.

Moreover, many SMEs are unsure whether their organizational capacity particularly in terms of human resources and technological know-how is sufficient to fully leverage cloud computing (Bajwa et al., 2017). These concerns are particularly acute in a nation like Nepal where technological infrastructure and expertise are frequently lacking. The degree to which cloud computing can assist SMEs in fostering innovation collaborating more effectively and increasingefficiency will determine how long-term their adoption of cloud computing will last (Sultan 2013). Nonetheless, there is still a dearth of information on how environmental elements like company size industry, and market dynamics affect how long-term cloud computing adoption is in developing nations like Nepal. It is essential to understand the particular barriers and facilitators of cloud adoption in this context if you want to guide SMEs toward informed sustainable technology techniques. To better understand these factors this study will examine how they affect cloud computing sustainability among SMEs in Nepal. The size of the firm will be a moderating factor in the process of looking at crucial factors such as usability, cost savings, security, and trust. The study intends to provide suggestions on how SMEs can guarantee the long-term viability of cloud computing and overcome adoption hurdles by concentrating on theseareas.

Research Objectives

The study focuses on understanding the relationship between key factors cost reduction, ease of use, reliability, sharing and collaboration, security and privacy, trust, and sustainability, and how they influence cloud computing adoption. Cost reduction is expected to be a primary motivator for cloud adoption, as cloud services allow SMEs to minimize upfront capital investments in IT infrastructure, replacing them with more flexible, pay-as-you-go solutions. This aspect is particularly relevant for smaller SMEs with limited financial resources, and thus, understanding how cost influences adoption decisions is central to the study.

Additionally, the research examines the role of ease of use in cloud adoption. Many SMEs, especially those with limited IT expertise, are more likely to adopt cloud technologies if they are easy to implement and integrate into existing business processes. By analyzing how ease of use affects cloud adoption, the study aims to identify whether more intuitive and user-friendly cloud solutions could encourage higher adoption rates among SMEs.

Reliability is another critical factor considered in the study. Cloud services must provide dependable and uninterrupted access to business applications and data, especially for SMEs seeking to streamline operations and enhance efficiency. Downtime or disruptions in cloud services can undermine an SME's trust in cloud technologies, which leads to the inclusion of trust as another important variable. Trust plays a crucial role in how SMEs perceive cloud service providers, especially when it comes to data security and service reliability. SMEs need to trust that their cloud service providers will keep their data secure and provide consistent service.

The study also explores security and privacy concerns, which remain a major barrier for many SMEs considering cloud adoption. In a world where cyber threats are increasingly prevalent, SMEs are often cautious about entrusting sensitive data to external cloud providers. This research will investigate how concerns over data breaches, unauthorized access, and privacy violations influence SME decision-making regarding cloud computing. Another important factor under investigation is sharing and collaboration, as cloud technologies offer enhanced opportunities for real-time collaboration across teams, locations, and even partners. Understanding how SMEs perceive the benefits of collaboration through cloud solutions can help determine whether this feature is a significant motivator for adoption.

Finally, the study explores whether firm size moderates the relationships between these factors and cloud adoption. Larger SMEs may have greater financial and technical resources, making it easier to adopt cloud solutions, whereas smaller SMEs may struggle with limited capacity and face more significant barriers. By considering firm size as a moderating factor, the research seeks to uncover the extent to which different-sized SMEs experience the challenges and benefits of cloud adoption differently.

In conclusion, this study aims to provide a conceptual framework for understanding the variables that influence sustainable cloud computing adoption among SMEs in Nepal. By examining cost, ease of use, trust, security, and other key factors, the research hopes to offer valuable insights that can guide SMEs in leveraging cloud computing for long-term operational success. Additionally, the study will contribute to policy discussions by highlighting the role of government and cloud service providers in supporting SMEs' digital transformation. The outcomes of this research will serve as a foundation for future empirical studies and practical recommendations to enhance the sustainability and competitiveness of SMEs in Nepal.

Research Questions

The following are the research questions which align with the research objectives:

RQ-1: Is there a relationship between cost reduction, ease of use, reliability, sharing and collaboration, security, privacy, trust, and sustainability in the SME that are adopting cloud computing?

RQ-2: Does firm size moderate the relationships between cost reduction, ease of use, reliability, sharing and collaboration, security and privacy, trust, and sustainability in SMEs adopting cloud computing?

Significance of the Study

SME businesses in Nepal are sustainably adopting cloud computing and this study has the potential to shed light on this adoption. SMEs are essential to the nation's economic growth because they raise GDP and create jobs in large quantities (Shakya and Pandey 2017). Unfortunately, a lot of SMEs struggle with resource scarcity operational inefficiencies, and technology adoption which hurts their ability to compete and survive. With its capacity to provide scalable economical and effective IT solutions cloud computing has the potential to address these issues (Duan et al. 2012). The purpose of this study is to provide SMEs with insights that can improve their operational efficiency and innovation by identifying the critical factors influencing the adoption of cloud computing in a sustainable manner.

Although cloud computing has been the subject of much research in developed economies little is known about how widely adopted and sustainable it is in developing nations such as Nepal. Bajwa et al., (2017) state that particular attention must be paid to the particular difficulties faced by SMEs in Nepal such as their limited access to dependable internet worries about data security and a lack of technical knowledge. This study aims to close this gap by investigating the effects of contextual factors on cloud computing adoption and sustainability in the Nepali context including cost ease of use security trust and firm size.

Additionally, DOI theory and the TOE framework are two more ways that this study advances our understanding. The study examines the moderating role of firm size in cloud computing adoption and sustainability offering SMEs of different sizes a more nuanced understanding of the process. According to Gangwar, Date, and Ramaswamy (2015), the results of this study will be advantageous not only for SMEs but also for policymakers' cloud service providers and researchers who aim to improve the usability and efficiency of cloud computing in developing nations. Finally, this research has significant practical implications for SMEs in Nepal. By selecting cloud solutions that fit their specific business needs and by being aware of the factors that encourage the adoption of sustainablecloud computing SMEs can improve their competitiveness and long-term sustainability.

Scope and Limitations

The goal of this study is to identify the key factors that influence the long-term adoption of cloud computing among small and medium-sized enterprises (SMEs) in Nepal. By examining how these factors impact cloud computing adoption, the study aims to develop a conceptual framework that helps SMEs make more informed decisions about adopting cloud technologies. Additionally, the study incorporates firm size as a moderating variable. The size of an SME can influence how it perceives the benefits and challenges of cloud adoption. By exploring how firm size moderates the relationship between key factors and cloud adoption, this research provides insights that are specific to the varying needs of different-sized SMEs.

The theoretical foundation of the study is based on the TOE framework and DOI theory. The TOE framework helps to analyze how technological, organizational, and environmental factors influence adoption, while the DOI theory explains how innovations like cloud computing spread within businesses. Together, these frameworks offer a comprehensive approach to understanding cloud adoption dynamics in SMEs. By focusing on the unique context of Nepal, this study aims to provide insights into how SMEs in similar developing regions can overcome these obstacles.

Limitations

The study is limited to SMEs in Nepal, which may reduce the generalizability of the findings to other regions or countries. While Nepal offers a valuable case study for developing countries, cloud adoption factors in other nations may differ due to varying economic, technological, or regulatory environments. Future research could expand this scope to include SMEs from other developing countries for more comprehensive results. While the study includes SMEs from various sectors, it may not capture the nuanced needs of specific industries. For example, the cloud computing requirements of manufacturing

firms might differ significantly from those in the retail or service sectors. Future research could delve deeper into sector-specific analyses to account for these variations.

The research employs a cross-sectional design, gathering data at a single point in time. This limits the ability to observe how cloud adoption trends evolve or how external factors, such as technological advancements or regulatory changes, affect long-term adoption. A longitudinal study would provide better insights into how these dynamics unfold. The study relies on self-reported data from surveys and interviews, which may introduce response biases. Participants might overestimate or underestimate factors such as ease of use or cost savings. While interviews help provide context and mitigate some biases, the reliance on self-reported data remains a limitation. This study assumes that the SMEs surveyed have some level of technological maturity, which may not be the case for all firms. SMEs that are not yet digitized or are at the early stages of technology adoption might face additional hurdles that are not fully addressed in this study.

In conclusion, while this research provides a valuable exploration of the factors influencing cloud adoption in Nepalese SMEs, the limitations outlined suggest areas for future research. Expanding the geographic scope, focusing on sector-specific challenges, and incorporating longitudinal methods would enhance the generalizability and depth of future findings.

Literature Review

A brief overview of recent cloud computing literature is given in this chapter. The scalability affordability and adaptability of cloud computing solutions have revolutionized the way small and medium-sized enterprises (SMEs) leverage technology. Increased sharing and cooperation cost savings, ease of use, security and privacy dependability, and trust are the key benefits of cloud adoption for SMEs. The moderating firm size which also affects adoption in cloud computing is also explored in the literature.

Cloud Computing and SMEs

The way that businesses especially small and medium-sized enterprises (SMEs) access and use technology has been completely transformed by cloud computing. Cloud computing as defined by the National Institute of Standards and Technology (NIST) offers shared pools of reconfigurable computing resources (e.g., networks, servers, storage, applications, and services) that require little management work and can be quickly provisioned and released (Mell and Grance 2011). Significant advantages of cloud computing for SMEs include reduced costsscalability improved collaboration and flexibility (Duan et al. 2012). Because of these advantages cloud computing can be a useful tool in helping small and medium-sized businesses (SMEs) overcome resource and technological limitations. A growing corpus of work has centered on understanding the technological organizational and environmental elements that affect the adoption of cloud computing (Gangwar et al., 2015). This literature review examines the key factors that influence SMEs' adoption of cloud computing with a focus on dependability security privacy trust sharing and collaboration as well as cost savings. Additionally, themoderating impact of firm size is taken into account.

Cost Reduction and Cloud Computing Adoption

Cost savings are a primary justification offered by SMEs for their adoption of cloud computing. By outsourcing their IT infrastructure to the cloud SMEs can replace the costly upfront capital expenditure required for servers and software with a more adaptablepay-as-you-go model (Marston et al (2011). Duan and colleagues (2012), discovered that the financial burden associated with buying and maintaining hardware is one of the main reasons SMEs are drawn to cloud computing. Furthermore, Sultan (2013) argues that cloud computing increases the accessibility of cutting-edge technology to a broader market thereby boosting the competitiveness of smaller businesses against larger ones. However, because of their perception of ongoing subscription costs especially over the long term some SMEs are still reluctant to fullycommit to cloud adoption.

Ease of Use and Adoption Sustainability

A key element in cloud computing's uptake and sustainability is its ease of use. Technologies with a reputation for being complicated or challenging to incorporate into current business procedures are less likely to be adopted (Venkatesh et al., 2003). Large IT departments are rare in SMEs and many business owners may lack technical expertise. As such their preference tends to be for cloud solutions that are simple to use and maintain. In particular for SMEs with limited IT capabilities cloud computing adoption is significantly influenced by the easeof use as noted by (Gangwar et al., 2015). Technology adoption may behampered by the need for significant customization or training, particularly in places like Nepal where resources are scarce.

Security and Privacy Concerns

Security and privacy concerns are a major deterrent to the widespread use of cloud computing. Businesses especially those in developing nations frequently have doubts about the security of putting critical company information on the cloud. The literature has extensively documented the apprehension people have regarding cyberattacks, data breaches, and unauthorized access to sensitive information (Shakya and Pandey 2017). According to Bajwa et al (2017), small and medium-sized enterprises (SMEs) might not fully comprehend the security features that cloud service providers offer even though these providers usually have strong security measures in place. Therefore, the advantages of implementing cloud computing may be outweighed by perceived security risks, particularly for SMEs that handle sensitive customer data or intellectual property.

Reliability of Cloud Services

Reliability is a key factor affecting how long-term cloud computing adoption can be sustained. To be able to rely on cloud services small and medium-sized enterprises (SMEs) need to have faith in their minimal disruptions and downtime. The degree to which businesses trust cloud service providers is frequently correlated with service reliability. Sultan (2013) contends that sustaining long-term use of cloud services requires a high degree of reliability. SMEs may turn back to conventional in-house IT solutions if they frequently encounter outages or performance problems which would undermine the long-term viability of cloud adoption.

Trust in Cloud Providers

When it comes to SMEs that might lack the technical know-how to evaluate the security and functionality of cloud services their trust is essential to their adoption of cloud computing (Gangwar et al., 2015). Factors like reputation transparency and third-party certifications help to establish trust in cloud service providers. The ability of suppliersto secure their data ensure continuous operations and offer trustworthy customer service is essential for SMEs. Since smaller companies tend to be less willing to take on risk than larger ones. Sultan (2013), emphasizes that one of the biggest barriers to adoption may be a lack of confidence in cloud providers.

Sharing and Collaboration

By enabling real-time data and application sharing across locations cloud computing fosters greater business collaboration. This can boost SMEs' output and effectiveness, especially in industries where remote work and teamwork are essential (Marston et al. (2011). Cloud services like Microsoft 365 and Google Workspace have completely changed how companies communicate and work together on projects. Bajwa along with others. (2017), point out that to enhance internal communication and external partner collaboration SMEs are progressively implementing cloud solutions. The simplicity and security of resource sharing playa major role in cloud computing adoption.

Firm Size as a Moderator

The adoption of cloud computing is moderated by firm size. As per Shakya and Pandey (2017), cloud computing services can be adopted and maintained by larger SMEs due to their greater financial and technological resources. However, the barriers associatedwith risk aversion expertise and cost may be more substantial for smaller SMEs. According to Gangwar et al (2015), firm size can influence how beneficial people view cloud computing. Bigger businesses are better equipped to take advantage of cloud computing's scalability and flexibility. This study investigates the relationship between the critical factors andthe long-term sustainability of cloud adoption in SMEs with a particular focus on the function of firm size.

Conceptual Framework of the Study

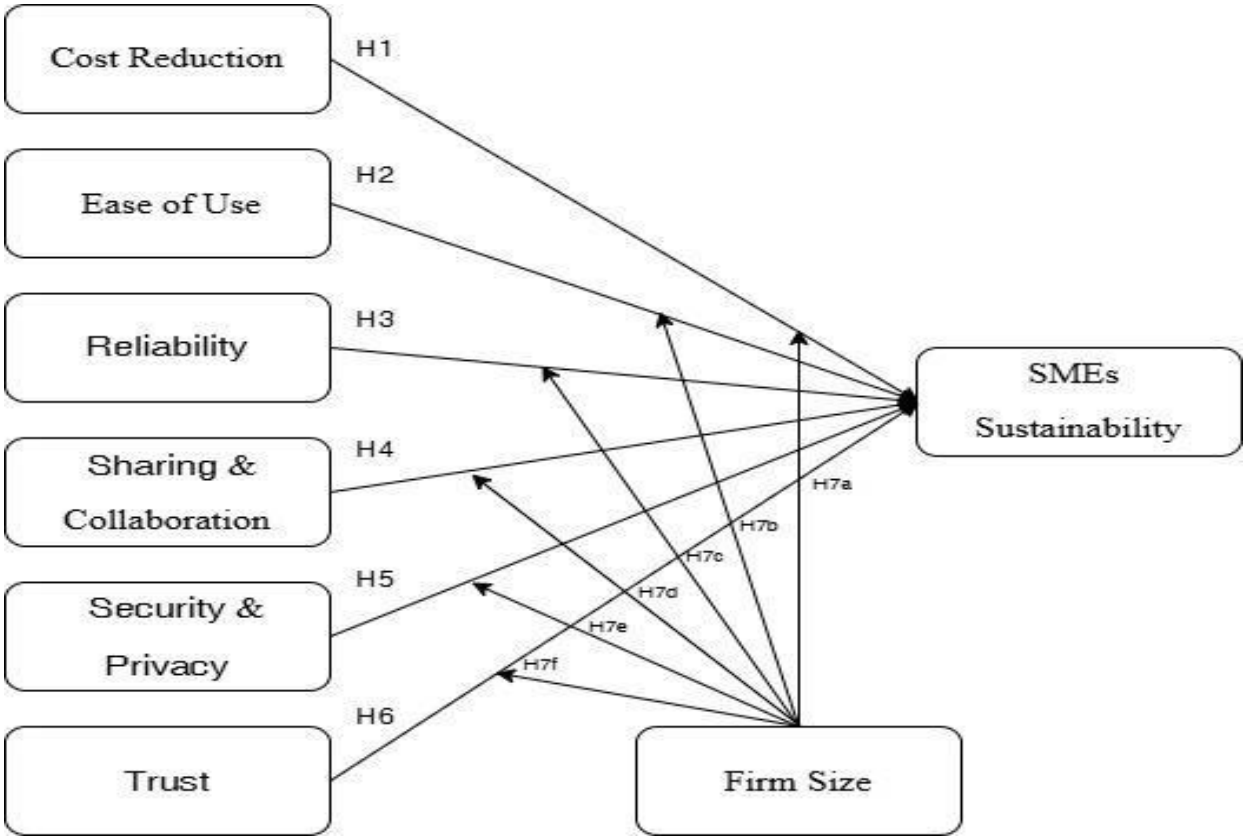

Figure 1.1: Theoretical Framework of the study

To examine cloud computing adoption in SMEs the framework integrates the Diffusion of Innovations (DOI) theory with the Technology-Organization-Environment (TOE) framework. The TOE framework studies technology aspects that influence cloud adoption such as cost savings user-friendliness dependability security trust and sharing and cooperation. With firm sizeserving as a moderator in this model the DOI theory explains how innovations spread. This integrated approach clarifies how cloud computing can support SMEs in continuing to be sustainable.

Research Hypotheses

The following research hypotheses have been developed to investigate the factors influencing the sustainability of cloud computing adoption among small and medium-sized enterprises (SMEs) in Nepal. They are based on the literature review and the conceptual framework developed for this study.

H1: There is a significant relationship between cost reduction and sustainability in the SMEs that are adopting cloud computing.

H2. There is a significant relationship between ease of use and sustainability in the SMEs that are adopting cloud computing.

H3. There is a significant relationship between reliability and sustainability in the SMEs that areadopting cloud computing.

H4. There is a significant relationship between sharing, collaboration, and sustainability in the SMEsthat are adopting cloud computing.

H5. There is a significant relationship between security, privacy, and sustainability in the SMEs that are adopting cloud computing.
H6. There is a significant relationship between trust and sustainability in the SMEs that are adopting cloud computing.
H7a: Firm size moderates the significant relationship between cost reduction and sustainability in SMEs adopting cloud computing, with the relationship being stronger in larger firms compared to smaller firms.
H7b: Firm size moderates the significant relationship between Ease of use and sustainability in SMEs adopting cloud computing, with the relationship being stronger in larger firms comparedto smaller firms.
H7c: Firm size moderates the significant relationship between Reliability and Sustainability in SMEs adopting cloud computing, with the relationship being stronger in larger firms comparedto smaller firms.
H7d: Firm size moderates the significant relationship between sharing, collaboration, and sustainability in SMEs adopting cloud computing, with the relationship being stronger in larger firms compared to smaller firms.
H7e: Firm size moderates the significant relationship between Security privacy and sustainability in SMEs adopting cloud computing, with the relationship being stronger in larger firms compared to smaller firms.
H7f: Firm size moderates the significant relationship between trust and sustainability in SMEs adopting cloud computing, with the relationship being stronger in larger firms compared to smaller firms.

Research Methodology

The research methodology describes the procedure and approach that will be used to lookinto the factors that affect Nepalese SMEs' long-term adoption of cloud computing. For this studysurveys and a quantitative research design are used to gather data from SMEs in Nepal. Because it enables the methodical investigation of correlations among numerous variables a quantitative approach is appropriate (Creswell 2014). In particular, this research will investigate how factors like cost savings simplicity of use security privacy trust sharing and cooperation impact the long-term viability of cloud computing adoption among SMEs and test the hypotheses derived from the literature review.

The study examines cloud computing adoption by integrating the Diffusion of Innovations (DOI) theory with the Technology-Organization-Environment (TOE) framework. The TOE framework highlights three contexts—technological, organizational, and environmental- that influence the adoption of technology (Tornatzky and Fleischer 1990). Meanwhile, the DOI theory focuses on the diffusion of innovations over time and among different user groups (Rogers 2003). These models provide a solid theoretical foundation for analyzing how SMEs in Nepal are utilizing and maintaining cloud computing.

Survey Method

In quantitative studies, the survey method is a popular research technique for obtaining standardized data from a large population. This study on the adoption of cloud computing amongSMEs in Nepal used the survey method to gather empirical data that could be statistically analyzed. To investigate relationships between variables this method comprised obtaining primary data from a representative sample. Specifically, a descriptive

survey approach was selected focusing on a careful analysis of the population sample to derive broad conclusions.

Several benefits of the survey approach were its capacity to enable widespread participation without regard to time or place and the generalizability of the results to a wider range of respondents. The survey approach was chosen because it was quick and easy to administer could reach respondents spread out over different regions and were economical. Using online survey tools like Google Forms further improved the administrative convenience of conducting surveys.

Survey Questionnaire

The survey's objective is to ascertain the views and experiences of small and medium-sized enterprises (SMEs) regarding the adoption of cloud computing in Nepal. The questions are based on constructs such as cost reduction, simplicity of use, security and privacy, trust cooperation, and sustainability which are mentioned in the research framework.

A five-point Likert scale with 1 denoting strongly disagree and 5 denoting strongly agree is used in each question to elicit responses from respondents. This method is frequently employed in quantitative research to quantify respondent's subjective opinions (Pallant 2013). The survey questionnaire used in this study is a self-administered, structured set of questions designed to address the research questions and hypotheses. Section A consists of five constructs that are geared to the respondent's socio-demographic information such as gender, age, educational background, job title, and years of experience. Section B of the questionnaire consists of items that are related to the independent variables, moderating variables, and dependent variables.

Population

In this study, the highest-ranking personnel in Nepali small and medium-sized enterprises (SMEs) businesses make up the population. These people are usually involved in organizational strategy and technology adoption decision-making processes. To ensure that respondents have sufficient exposure to the organization's operations and technology use the population's inclusion criteria include employment in a registered SME in Nepal and with a minimum of one year of experience in the current role.

Unit analysis and Sampling Frame

The unit of analysis in a research project is the main topic being looked into or examined in depth. Employees of small businesses in Nepal serve as the unit of analysis for this study which examines the factors influencing the adoption of cloud computing among SMEs. Inparticular, the top-ranking staff members who participate in technology adoption decision-making processes are the main subject of attention. This choice is significant because these individuals possess the knowledge and authority to influence the adoption of cloud computing solutions within their organizations. Understanding the perspectives and experiences of these key decision-makers is necessary to identify the factors that promote or hinder cloud adoption. The goal of thestudy is to gather data by focusing on particular employees that can be applied to the greater category of SMEs in Nepal (Yin 2018). A sampling frame is a list or database from which a sample is drawn (Creswell, 2014). It is critical that the sampling frame accurately represents the population

to ensure the generalizability of the research findings. For this study, the sampling frame will consist of a comprehensive list of SMEs in Nepal across various sectors, such as manufacturing, retail, services, and agriculture.

Sampling Design

A crucial component of research methodology is the sampling design which describes theprocess for choosing a representative sample of the population for data collection and analysis.To allow for the generalization of research findings the sampling design aims to guarantee that the sample chosen accurately reflects the features of the population being studied (Saunders, Lewis and Thornhill, 2016). The potential population for this study is SMEs in Nepal who are already using cloud computing technologies or are planning to use them in the future. This study shall use a non-probability sampling technique. Non-probability sampling technique is often considered more reliable than other sampling techniques and hence it can be used to derive useful information related to the population. Within the non-probability sampling category, this study specifically used the Convenience sampling approach. By enabling researchers to collect data fast and without the need for elaborate sample frameworks or a sizable financial commitment convenience sampling aids in the development of early insights and hypotheses (Etikan, Musa and Alkassim, 2016).

Sampling Size

To get accurate and legitimate results the right sample size must be chosen. A minimum sample size of 400 participants is intended to guarantee adequate statistical power for theanalysis per the recommendations from earlier research. Due to its size possible non-responses can be accommodated while major effects and relationships within the data can be found (Hair et al., 2019). Four hundred participants will make up the study's sample. The sample size of at least 300 is recommended to achieve robust statistical analysis according to recommendations from statistical literature which is how this number was determined (Stevens, 1996). With the diversityof the SME sector in Nepal, it is important to have enough power to identify important relationships and effects in the data which is why a sample size of 400 was chosen. The sample size that is selected considers the study's statistical power. A power analysis showsthat a power of 0. 80 obtained with a sample size of 400 is generally regarded as adequate to detect medium to large effect sizes (Cohen, 1988).

Measurement Instruments

To ensure that the data gathered for a research study is valid consistent and reliable measurement instruments are crucial tools. The study will employ measurement instruments to evaluate the dependent variable (SMEs sustainability) the moderator variable (firm size) and the independent variables (cost reduction ease of use reliability sharing collaboration security & privacy and trust). These constructs will be measured using a structured survey questionnaire which is the primary data collection tool.

Operationalization of Constructs

Operationalization, in brief, is the process of locating and measuring the constructs or variables needed to carry out the study. To be tested empirically, a construct needs to be operationalized to allow for hypothesis testing. The operationalization of the constructs in the study is based on these variables and they significantly influence the adoption of

cloud by small and medium businesses in Nepal. Determining how a study's constructs will be measured and observed is the first step in operationalization. Key constructs in this research will be operationalized based on pre-established measurement scales. These constructs include the dependent variable (SMEs sustainability) the moderator variable (firm size) and the independent variables (cost reduction ease of use reliability sharing collaboration security & privacy and trust).

Measurement Scale

In this study, a traditional method that adheres to accepted survey research procedures will be the measurement scale in the survey questionnaire which provides predetermined response options for questions posed. According to Babbie (2016), the Likert scale is a useful toolfor recording attitudes and perceptions because it enables respondents to express how much they agree or disagree with different statements. To verify the validity and reliability of the measuringinstruments a pilot study comprising fifty members of the target population was conducted. The primary objective of the pilot study was to evaluate the questionnaire items' comprehensibility relevance and clarity.

Coding Scale

To arrange and quantify qualitative data for analysis methodically a coding scale is crucial in research. A coding scale will be used primarily for categorical variablesin this study on the factors affecting sustainability in cloud computing among SMEs in Nepal, especially for the moderator variable (firm size) and any survey questions with open-ended answers. A key instrument for turning qualitative data into quantitative measurements is the coding scale used in this investigation. By systematically categorizing responses the research aims to uncover meaningful patterns and insights related to cloud computing adoption among SMEs in Nepal. According to Becker and Brymans (2012), recommendations a lot of researchers have started using the five-point Likert-type scale. To facilitate computational analysis, the measurement scales are pre-coded this topic is covered in the following section.

Pilot Study

A pilot study is a preliminary investigation to assess the time cost procedures and viability of a research project before the main study is conducted. As stated by Van Teijlingen and Hundley (2001), it enables researchers to test their instruments improve their methodology and pinpoint any possible problems that might crop up in the course of their larger study. Part of the research on the factors influencing cloud computing sustainability among SMEs in Nepalwill include a pilot study to ensure the validity and reliability of the survey instruments. The main study's design and methodology were informed by valuable insights gleaned from the research pilot study. A total of 50 survey questionnaires were distributed and 45 respondents returned the questionnaire, resulting in a response rate of 90%. The response rate was within the range of the minimum sample size advised by earlier researchers who recommended between 15 and 30 participants for pilot studies (Cavana et al. 2001). The readability relevance and clarity of the questionnaire items were to be assessed as part of the pilot study. Cronbach's alpha was used to assess the instrument's reliability values ranged from 0.910 to 0.945 indicating a high degree of internal consistency for all variables.

Data Collection

Data collection is a crucial step in the research process because it involves gathering the information needed to evaluate and resolve the research problem. The accuracy and consistency of the data collected directly affect the validity of the research findings. Information gathered directly from the source by the researcher with a particular goal in mind is referred to as primary data and the primary goal will be to collect data. The purpose of the survey instrument was to gather information on a range of topics on SMEs' adoption of cloud computing. The study of the data collection tool will be a survey with pre-made questions set up in Google Forms. After being collected the data will be organized and securely stored in a database to guarantee confidentiality and integrity.

Data Analysis

Data analysis which comprises converting collected data into insightful knowledge that can inform decisions and improve understanding of the study problem is a crucial step in the research process. Examining the factors influencing cloud computing sustainability among SMEsin Nepal this study will employ a range of quantitative analysis techniques. The survey replies will be coded for convenience in analysis and relevant statistical software as SPSS will be used for analyzing the data. Offering a comprehensive understanding of the factors influencing Nepalese SME's adoption of cloud computing was the aim of this study's data analysis procedure. By combining a variety of descriptive and inferential statistical techniques with potent data visualization tools the research aimed to generate important insights that can direct future practices and policies.

Conclusion and Implications of the Study

This study aims to provide a thorough conceptual analysis of the factors influencing the sustainable adoption of cloud computing among small and medium-sized enterprises (SMEs) in Nepal. By integrating well-established theories, such as the Technology-Organization-Environment (TOE) framework and the Diffusion of Innovations (DOI) theory, the study will present a conceptual model that highlights key determinants like cost reduction, ease of use, security, trust, and collaboration. Additionally, firm size is identified as a critical moderating factor that influences how SMEs navigate the cloud adoption process.

Implications of the Study

The aim of the conceptual framework presented in this study has important implications for multiple stakeholders, including business leaders, policymakers, and cloud service providers. Below are the key implications:

Implications for Business Leaders (SMEs)

For SME owners and decision-makers, this study will underscore the importance of considering key factors such as cost efficiency, ease of use, and security when adopting cloud computing. Cost reduction remains one of the most attractive features of cloud adoption, allowing businesses to access scalable IT solutions without significant upfront investment. However, businesses must also address trust and security concerns by selecting cloud providers with strong security measures and data protection policies. Firm size plays a crucial role, as larger SMEs are better positioned to adopt cloud solutions sustainably due to greater financial and technical resources. Smaller firms, on the other hand, need to be more strategic

in their adoption efforts by prioritizing solutions that are affordable, secure, and easy to integrate.

Implications for Policymakers

The study aims to offer critical insights for government officials and policymakers who seek to promote digital transformation in developing economies. Given the importance of cloud computing in enhancing the operational efficiency of SMEs, policymakers should focus on creating a supportive environment for cloud adoption. This includes implementing clear regulatory frameworks that address data privacy and security concerns, as well as offering financial incentives such as tax breaks or subsidies for SMEs adopting cloud technologies. Additionally, policies aimed at improving digital infrastructure and internet accessibility across the country are essential for enabling more widespread cloud adoption, especially in rural and underserved areas.

Implications for Cloud Service Providers

For cloud service providers, this study will highlight the need for developing tailored solutions that address the specific needs of SMEs in developing countries like Nepal. Providers to ensure that their services are affordable, user-friendly, and secure, particularly for smaller firms with limited technical expertise. Building trust through transparency and third-party certifications can help overcome the hesitation many SMEs have regarding cloud adoption. Service providers should also focus on offering training and support services to help SMEs integrate cloud solutions into their existing operations.

Implications for Future Research

This conceptual study also aims to lay the groundwork for future empirical research on cloud adoption. Future studies can test the proposed relationships in real-world settings, examining how these factors influence adoption across different sectors or regions. Additionally, researchers can explore the role of other variables, such as government support or technological literacy, in shaping cloud adoption in developing countries.

Conclusion

In conclusion, this study aims to provide a conceptual roadmap for a better understanding of the sustainable adoption of cloud computing among SMEs in Nepal. By focusing on critical factors like cost, trust, and security, as well as the moderating effect of firm size, the study will offer valuable insights that can guide both future research and practical decision-making. The adoption of cloud computing holds tremendous potential for SMEs, enabling them to compete in an increasingly digital world. However, to ensure long-term success, both businesses and policymakers must address the challenges and leverage the opportunities presented by cloud technology.

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