DETERMINANTS OF CLOUD COMPUTING ADOPTION AMONGST SMES IN THE UK TECHNOLOGY SECTOR.

Abstract

Cloud computing has become a transformative technological model for businesses, offering flexibility, scalability, and cost-effectiveness. However, the embracing of cloud solutions amongst small and medium-sized enterprises (SMEs), particularly in the UK technology sector, has been varied. This research aims to identify and examine the significant determinants influencing cloud computing adoption among SMEs in this dynamic industry. Grounded in the Technology-Organization-Environment (TOE) framework, the study employed a quantitative methodology, surveying 102 SMEs across software development, IT services, and emerging technologies. The findings revealed that technological factors (IT infrastructure compatibility, technical skills), organizational factors (top management support, financial resources, employee readiness), and environmental factors (competitive pressures, industry practices) significantly influenced cloud adoption decisions. Notably, organizational factors emerged as the strongest predictor, followed by technological factors, while environmental factors had a weaker but significant impact. The regression model states that 59% of the variance in cloud adoption is explained. The study provided insights into the evolving priorities and shifts in factor importance between early and later cloud adopters. Recommendations are offered for SMEs, cloud providers, policymakers, and industry bodies to facilitate successful cloud migration journeys for technology SMEs in the UK. This research contributes to the understanding of the factors driving the adoption of cloud computing.

Key words: Cloud computing, SME,

Introduction

Cloud computing has emerged as a transformative technological paradigm reshaping how organisations leverage computing resources and information technology capabilities. At its core, cloud computing enables ubiquitous, convenient, and on-demand network access to a shared pool of configurable computing resources like networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell and Grance, 2011; Liu et al., 2018; Marston et al., 2011). This utility-based model of computing as a service delivered over the internet is disrupting traditional on-premises IT infrastructure models. For organizations, especially small and medium enterprises (SMEs), cloud computing offers several potential benefits, making its adoption highly compelling (Benlianetal., 2018). It enables cost-

efficient pay-as-you-go pricing models without heavy upfront capital outlays on hardware and software licenses (Carcary et al., 2014; Messerschmidt and Hinz, 2013; Low and Hsueh, 2012). Cloud solutions provide scalable flexibility to adjust resource capacities dynamically per evolving business demands (Bildosola et al., 2015).

According to studies by Duarte (2023), about 60 % of large corporations currently operate most of their workloads on the cloud compared to 25% of SMEs. The dichotomy exists despite SMEs growing recognition of the essence of cloud solutions as offering a competitive edge through enhancing their innovation capabilities, access to advanced technological innovations such as artificial intelligence and machine learning, and market responsiveness. (Trigueros-Preciado et al., 2013, Alshamaila et al., 2013). The delay in cloud adoption among SMEs has been caused by various technological, organizational, and environmental challenges they face compared to their larger enterprise counterparts (Chou, 2015; El-Gazzar, Hustad and Olsen, 2016)). In terms of technology, several factors have influenced the migration process such asambiguous legal compliance issues, privacy issues, security issues, network dropouts when streaming over the cloud, and a lack of technical personnel to effectively run a cloud environment (Oliveira et al., 2014; Lal and Bharadwaj, 2016). Similarly, at the company level, some factors might slow down the cloud projects such as cloud strategy roadmap, employee resistance to change, poor top management planning, inadequate financial support and lack of adequate skills among the workforce in the organization (Alshamaila et al., 2013; Gangwar et al., 2015). 'The other factors influencing cloud adoption among SMEs include the technology hubs, industry forces in the geographic area, data-related laws and regulations, and vendor support ecosystems (Amini and Bakri, 2015; Borgman et al., 2013).

Research Rationale

Despite early research identifying several environmental, technological, and organizational factors impacting the cloud adoption decisions among Small and Medium Enterprises, notable gas still warrants further investigation, particularly in contexts of corporations in the innovation-driven technology sectors such as digital products, software, and IT services.

First, most of the prior cloud adoption studies have focused on traditional industry sectors such as professional services, manufacturing, and retail. Nevertheless, employing SMEs in the field of technology reveals priorities and concerns that could influence cloud migration strategies in its actors. They mainly found the ability based on the technical skill and advanced technology that helps to shape the readiness level of the company.

Secondly, most of the earlier initial investigations have relied on databases from other continents such as Europe, the Middle East, and Asia. As such, more research and empirical evidence based on

localized and evolving factors influencing cloud adoption by SMEs in the UK, particularly in the technology sector, remain to be determined. Some of the factors that define SMEs include their characteristics, and the regulatory policies of the country, the market competition, and the level of development of a certain regions infrastructure.

Research Aim

This study aims to identify and examine the significant determinants influencing the adoption of cloud computing technologies and solutions amongst SMEs operating specifically in the technology sector within the UK market.

Research Objectives

1. To quantify the influence of determinants related to innovation characteristics (security concerns, cost issues, relative advantage, complexity, compatibility), technology context (technology readiness), organisational context (top management support), and environmental context (competitive pressures, regulatory support) on cloud computing adoption among technology SMEs.
2. To measure and compare the relative importance and impact scores of innovation characteristics, technology context, organisational context, and environmental context determinants on cloud adoption decisions within the technology SME sector.
3. To statistically analyse and compare the significance scores of innovation characteristics, technology context, organisational context, and environmental context determinants between early adopters and later adopters of cloud computing among the target population of technology SMEs.

Research Questions

1. What is the relative impact (measured quantitatively) of key technological barriers (e.g., integration readiness, skills), organisational challenges (e.g., security concerns, high management support), and environmental factors (for example; competition, regulations) on cloud computing adoption among SMEs in the UK technology sector?
2. How do the effectiveness scores of technological factors (e.g., integration readiness, skills), organisational factors (like., top management support, security concerns), and environmental factors (e.g., competition, regulations) quantitatively differ in shaping cloud adoption decisions between early adopters and later adopters of cloud computing among technology SMEs?

3. What are the statistically significant differences in the perceived importance and prioritization scores across technological, organizational, and environmental cloud adoption factors between early adopters and later adopters among technology SMEs?

Literature Review

Independent Variables: Overview

The independent variables under investigation in this study represent a diverse array of factors that shape the adoption of cloud computing technologies among small and medium-sized enterprises (SMEs) operating within the United Kingdoms dynamic technology sector. These influential elements can be broadly categorised into three overarching domains: the technological context, the organisational context, and the environmental context.

Technological Context

The technological context comprises both the internal and external technological aspects that may exert a profound impact on an institutions decision to embrace cloud computing solutions. According to insights from a comprehensive analysis of the literature (Oliveira et al., 2014; Gangwar et al., 2015), several key technological aspects have arisen as key determinants:

Integration Readiness

This factor, whereby Borgman et al. (2013) and Low et al. (2013) assesses the compatibility of an SMEs current information technology environments and systems to that of cloud solutions. The predictor also looks at the degree of closeness or simplicity of the various steps entailed in achieving a technological integration between these distinct technological domains. Even if conflicts may present daunting technical problems, the desire by a firm to interface can make cloud initiatives easier and smoother compared to what seems to be portrayed.

Organizational Context

Organizational context includes aspects relevant to the companys resources, internal traits, and strategies that may affect its decision to adopt cloud computing technologies. Some of the vital organisational factors identified in the literature include:

Top Management Support

The degree to which the companys top management team recognizes the importance of adopting cloud computing and offers the necessary leadership, resources, and support for its adoption.

Environmental Context

The environmental context comprises external factors that might influence an organizations decision to adopt cloud computing technologies. These factors are typically beyond the direct control of the company and include:

Competitive Pressures

The degree to which an enterprise perceives a need to adopt cloud computing solutions to retain its competitive edge within its industry or market segment.

Regulatory Environment

The impact of governmental regulations, policies, and data protection laws on an organizations ability to adopt and utilize cloud computing solutions, particularly regarding data privacy and security concerns (Nusseibeh, 2011).

Dependent Variables: Overview

The dependent variable in this study is the adoption of cloud computing solutions by SMEs operating in the UK technology sector. According to Al Shamaila et al., 2014 Cloud computing adoption can be conceptualized as the decision-making process and subsequent implementation of cloud computing technologies within an organization.

Types of Cloud Computing Solutions

Cloud computing solutions can be categorized into three main types

a) **Software as a Service (SaaS)**

In this model, software applications and services are delivered over the Internet by a cloud service provider, eliminating the need for organizations to install and maintain the software on their infrastructure (Louis, Jansen and Mintchev 2019).

b) **Platform as a Service (PaaS)**

This model provides a cloud-based platform for organizations to develop, run, and manage applications without the need to maintain the underlying infrastructure.

c) **Infrastructure as a Service (IaaS)**

This cloud computing framework features servers, networking, and storage components that are stored in Claude (Bhardwaj, Jain and Jain 2010). Companies and individuals access these services on a “pay-as-you-go” basis.

Dimensions of Cloud Computing Adoption

Cloud computing adoption can be measured and evaluated in several dimensions, including adoption level, cloud service model, cloud governance and management, cloud deployment model, and cloud migration strategy.

Adoption Level

This refers to the extent to which an organization has adopted and integrated cloud computing technology into its operations, ranging from minimal adoption to comprehensive cloud migration.

Cloud Deployment Model

Choosing a cloud deployment architecture requires assessing the advantages and disadvantages of the private, public, and hybrid natures. Each nature has its security, control, and cost.

Cloud Service Model

It refers to the specific type of cloud service an individual or a company chooses, depending on their needs or preferences. Therefore, they can choose either SaaS, PaaS, or IaaS, depending on what each service provides that fulfils their preferences.

Cloud Migration Strategy

Cloud Migration strategy is the procedure and schedule of moving the current infrastructure, applications, and data to the cloud. However, this procedure model deviates from one user to the other based on the gradual change, swiftness of the application, and rapid migration.

Cloud Governance and Management

Cloud governance and management is a dimension that emphasizes the policies, procedures, and strategies designated by the organization to virtually supervise and control its cloud computing resources (Andrikopoulos et al., 2013). The dimension does this while ensuring security, adherence, and optimal use of resources. As Rong et al., (2013) and Mijac Picek and Stapic (2013) highlight, effective cloud governance and management frameworks are important for companies to reduce cloud computing adoption-associated risks and challenges.

Theoretical Framework

This research is based on the Technology Organisation Environment (TOE), a predictive theoretical model that was developed by Tornatzky and Fleischer in 1990. It is an important paradigm which provides the lens of comprehension when it breaks down fragments that affect the use of cloud computing technologies by SMEs in the technology industry of the United Kingdom. According to Tornatzky and Fleischer, an organizations decision to adopt new technology is influenced by three

key contexts: Depending on the area, it can be generally classified into technological, organisational, and environmental. (Lippert and Govindarajulu, 2006). From these contexts, one can develop an overall plan by comprehending the loyalty of the factors that make up an organisation, and their roles as to why they have decided to embrace cloud computing solutions

Technological Context

According to Lin and Chen (2023), technological context refers to the internal and external technologies applicable to the organization, which comprises the existing technologies in use and new technologies that are available for adoption. As Ahmed (2020) and Lin and Chen (2023) assert, this context encompasses factors such as readiness for cloud integration, technical skills, security concerns, and cost issues in the cloud adoption realm.

Organizational Context

The organizational aspect includes the characteristics and resources of the firm, including its size, structure, management support, and organizational readiness (Lin and Chen, 2023). When it comes to cloud computing adoption, factors such as top management support, organizational readiness, employee resistance, and organizational size and resources play a significant role.

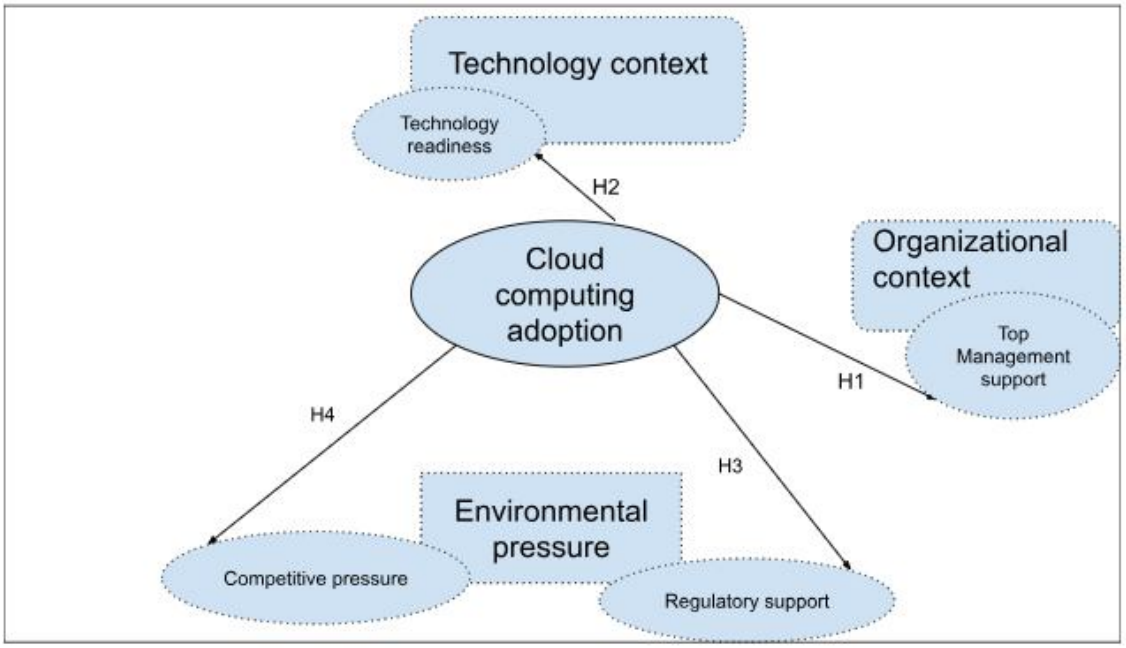
Environmental Context

While an organization must achieve its goals and objectives, achieving them will depend on what surrounds it. Such factors include external factors like industry characteristics, competitive pressures, and government regulations (Chou, 2015). As Ahmed (2020) asserts, when it comes to the context of cloud computing adoption, factors such as competitive pressures, regulatory environment, vendor support and ecosystem, and industry trends and best practices are relevant.

Conceptual Framework and Hypotheses Development

Based on the theoretical foundation provided by the TOE framework and the identified independent and dependent variables, a conceptual framework can be developed to illustrate the hypothesized relationships between the various factors and cloud computing adoption among SMEs in the UK technology sector.

Figure 1: Conceptual framework



The conceptual framework depicts the independent variables (technological context, organizational context, and environmental context) and their respective factors influencing the dependent variable (cloud computing adoption). With such ideas, hypotheses can be derived from this framework, which will guide the empirical investigation and analysis of the relationships between the independent and dependent variables, contributing to a deeper understanding of the factors influencing cloud computing adoption among SMEs in the UK technology sector. Such hypotheses are.

1. Technological factors, including integration readiness, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.
2. Organizational factors, including top management support, and organizational readiness, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.
3. Environmental factors, including competitive pressures and regulatory environment, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.

Empirical Review

This section will focus on incorporating the current empirical literature on the link available between dependent variables (cloud adoption) and independent variables (technology, environmental, and organizational context) with a focus on the UK technology sector.

Technological Context and Cloud Computing Adoption

The study conducted on cloud adoption and technological context by Oliveira et al. (2014) examined the determinants of cloud adoption in the service and manufacturing industries. Oliveira et al. (2014) noted that the significant determinants of whether a corporation chooses to migrate to the cloud include the companys compatibility with existing systems, cloud technologies perceived benefits, and technological readiness.

The study focused on Northeast Egland-based small and medium enterprises by Alshamaila et al. (2013), who found that technological readiness, potential security concerns, and cloud solutions perceived benefits as predictions of cloud adoption. Perhaps, these technological dimensions emerged as critical predictors shaping cloud adoption decisions among the SMEs studied.

The SMEsperceptions around the ease of use, the usefulness of cloud technologies, and current technological readiness are highly predictive of their intentions to adopt cloud computing solutions. This was explored by Gangwar et al. (2015) while exploring the predictors of cloud adoption through an integrated theoretical framework integrating the TOE (Technology-organization environment framework) and TAM (Technology-acceptance model).

These studies provide critical aspects of the importance of technological contexts in promoting cloud migration among SMEs across diverse geographic regions and industries. Determiners such as expertise, compatibility, skills, cost and benefit analyses centred on cloud capabilities, and security risk assessments emerge as critical factors.

Organizational Context and Cloud Computing Adoption

In a study examining the effect of corporate factors on cloud computing use in SMEs, Alshamaila et al. (2013) discovered that the extent of support from the top administrative, organizational preparedness and size of the firm was very influential in determining the level of use of cloud computing by SMEs in the northeast of England. Moreover, top management support and perceived organizational readiness were noted by Gangwar et al. (2015) as important determinants of cloud computing adoption. As stated by Trigueros-Prneciado et al. (2013), it is still possible to identify several key concerns that hinder cloud computing adoption by industrial SMEs; these are the resistance of employees fed from their management, alack of sufficient support from the top management and lack of technical support. In their study of Malaysian SMEs use of cloud computing, Amini and Bakri (2015) found that factors in the organization such as the readiness of the organization and more significantly, the support from the top management were very valid. This cross-sectional study could have benefited from a more detailed analysis of the organisational factors

affecting cloud computing adoption in technology SMEs in the UK: the organizations dynamics and the priorities of these firms could differ significantly compared with other industries, both factors that could underscore the importance of further research on this topic. The two previous studies presented here provide useful information on the organisational factors that explain cloud computing adoption.

Environmental Context and Cloud Computing Adoption

The impact of environmental factors on SMEsadoption of cloud computing has also been examined in the literature. For example, Borgman et al. (2013) used Tornatzky et al. Technology organization environment framework to investigate factors that influence the adoption of cloud computing. The findings from this study revealed that organizational and technological contexts affect implementation decisions. The researchers discovered vendor ecosystems, regulatory compliance, and competitive pressures as factors that affect adoption choices. Amini and Bakri (2015) also found regulatory support and competitive pressure to be a significant influence on SMEs cloud computing adoption decisions. In addition, Trigueros-Preciado et al. (2013) security concerns, distrust of transferring data to third parties, data lock-in issues, and difficulties in measuring benefits as potential factors that affect cloud computing adoption among SMEs.

Research Gap

Although previous studies provide insightful information about the factors driving cloud adoption by SMEs, more research needs to be conducted that is explicitly centred on the technology industry in the United Kingdom. Due to the intrinsically technological nature of their business models and the quickly changing digital landscape, small and medium-sized enterprises operating in this sector face different challenges and priorities than those in traditional industries. This makes decision-making about cloud migrations unique. Most of the previous research uses quantitative analytical techniques, which yields valuable empirical data but only offers a limited number of qualitative viewpoints from SME leadership teams and important decision-makers who are deeply involved in the realities of the tech industry. A deeper comprehension of their cloud thought formations, perceived reasons, and prioritized decision criteria may produce more insightful information that is contextualized and useful research. With such regard, this study aims to bridge these gaps through quantitative techniques to conduct a comprehensive investigation into the technological, organizational, and environmental determinants shaping cloud adoption among SMEs anchored in the UKs technology sector.

Methodology

Research Approach

This research utilizes a deductive approach, a scientific method that begins with theory and then utilizes the theory nature to deduce an understanding of an understanding. In this approach, theories are built from already existing philosophical frameworks and a conceptual model derived from a survey of literature. First, hypotheses are developed to guide empirical testing and quantitative analysis of the correlation between the dependent variable (cloud computing) and independent variables (environmental factors, technological and organizational). The hypotheses can be refuted or validated by expanding on the existing conceptual frameworks (Hair et al., 2019). Additionally, the methodology and research design are informed by Trochim and Donnellys(2006) insights.

To address the research objectives, a quantitative research strategy is employed in this study. Specifically, a survey research design is used, which involves the collection of data through a structured questionnaire distributed to a representative sample of SMEs in the UK technology sector.

Sampling Technique

The study employs a probability sampling technique. This ideal ensures the representativeness and relevance of the sample for the quantitative components. Simple random sampling is done by selecting participants randomly from the entire population, giving everyone an equal chance of being chosen (Saunders et al., 2014).

Data collection

Primary Data Collection

1. The collection of the primary quantitative data will be done via carefully structured SMEs from all sectors of technology in the UK online survey questionnaire. A survey was written to collect data about variables, such as the factors of business technology, organization, and environment, and the independent variable, which is cloud computing adoption. The test items are designed by using the existing literature and the theoretical framework, from the Technology-Organization-Environment (TOE) model (Tornatzky and Fleischer, 1990; Baker, 2012), thus giving credence and consistency to the content. For instance.

Technological Context:

"Existing IT infrastructure in our company is compatible with cloud computing technologies"(Awa et al., 2015).

Organizational Context:

"Top management is aware of the benefits of adopting cloud computing" (Low et al., 2011).

"Our company has sufficient financial resources allocated for cloud computing adoption" (Alshamaila et al., 2013).

Environmental Context:

"Competition in our industry pressures us to adopt cloud computing to gain competitive advantage" (Oliveira et al., 2014).

"There are sufficient government support/incentives available for adopting cloud computing in the UK" (Lal and Bharadwaj, 2016).

The survey questionnaire will involve a myriad of questions, such as Likert-scale items to establish attitudes and perceptions (Joshi et al., 2015), categorical or closed-ended questions to gather demographic information that concerns the organizational framework, and probably open-ended questions to collect more insights or feedback (Rowley, 2014).

Data Analysis: Quantitative Data

The study uses quantitative data analysis techniques. This style uses appropriate statistical methods to analyze the quantitative data collected through the survey questionnaire. Such statistical techniques are facilitated by statistical software such as SPSS (IBM Corp, 2017) and Stata (StataCorp, 2019). To have a smooth procedure for analyzing the data, there are various systematic steps involved. These include data preparation and cleaning, descriptive statistics, inferential statistics, and factor, reliability, and validity analysis (Hair et al., 2019).

At the statistical test level, regression analysis is used (Field, 2013). In addition, measures such as Cronbachs alpha and composite reliability are calculated to assess the internal consistency and reliability of the scales used in the survey (Taber, 2018).

Ethical Considerations

The study adheres to strict ethical principles and guidelines to ensure the protection of research participants and the integrity of the research process.

The study has three limitations such as generalization of issues, the possibility of self-reporting bias and cross-sectional limitations.

Research Hypotheses

The research aimed to test the following hypotheses, derived from the conceptual framework and the Technology-Organization-Environment (TOE) model:

H1: Technological factors, including integration readiness, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.

H2: Organizational factors such as the top management priorities and organizational preparedness to adopt Cloud Computingsolutions for SMEs in the UK technology industry.

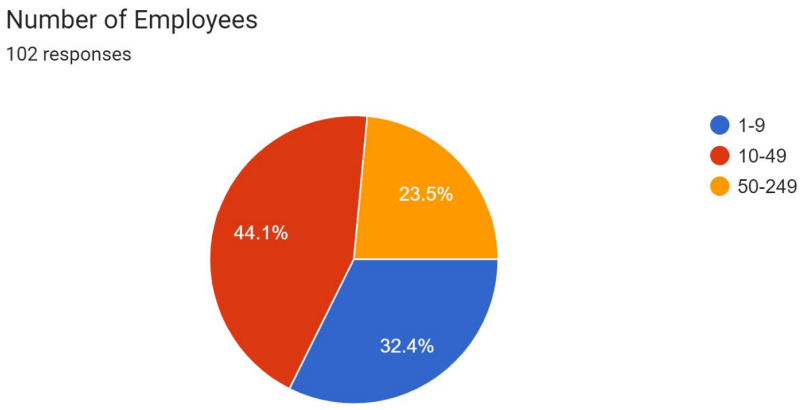
H3: Environmental factors, including competitive pressures and the regulatory environment, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.

Presentation of Results

Frequency Distribution of the Socio-Demographic Factors

The socio-demographic characteristics of the respondents and their companies were analysed using frequency distributions. The key findings are as follows:

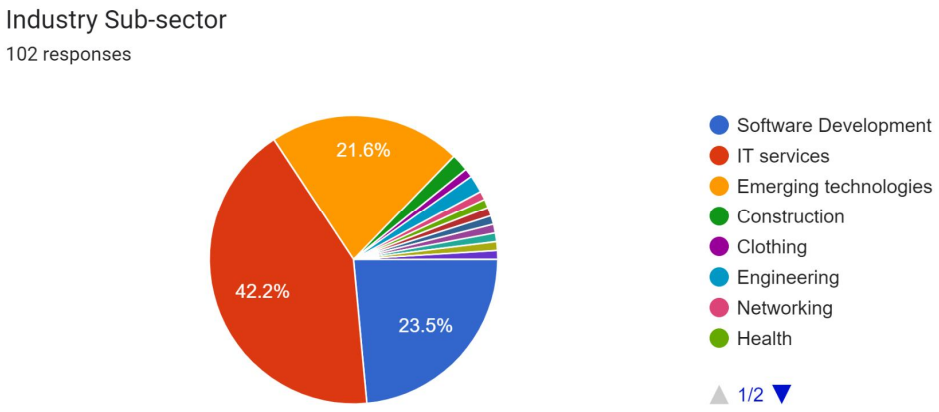
Figure 2: Pie chart showing the distribution of companies by the number of employees



The pie chart shows the distribution of companies by the number of employees. The highest number of companies fall into the 1-10 employee category, indicating a large proportion of small enterprises

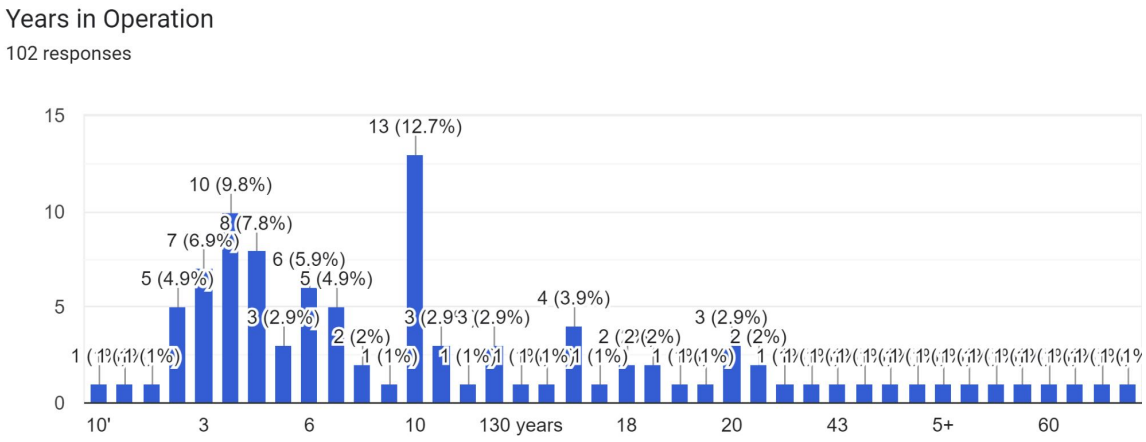
in the sample. There is a decreasing trend as the number of employees increases, suggesting fewer medium-sized enterprises in the sample.

Figure 3: Pie chart displaying the distribution of companies across various industry sub-sectors within the technology sector



The pie chart displays the distribution of companies across various industry sub-sectors within the technology sector. The sub-sector with the highest number of companies is "IT services", followed by "Emerging technologies" and "Software Development". Othersub-sectors like "Construction", "Engineering", "Communications Services", "Content writing", and "Education" have fewer companies represented in the sample.

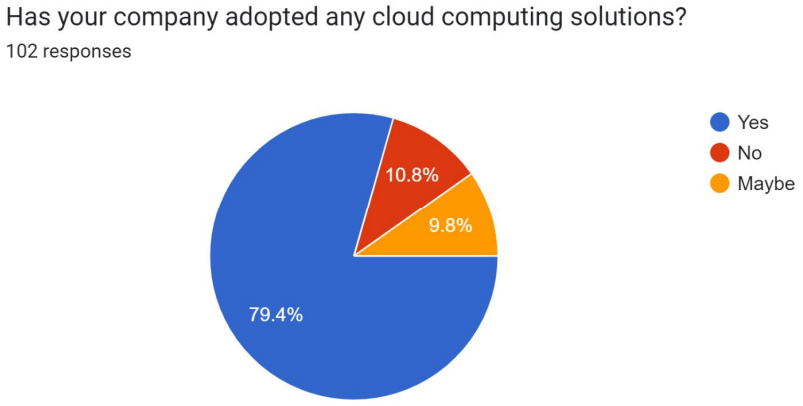
Figure 4: Histogram showing the distribution of companies based on the number of years they have been in operation



The histogram shows the distribution of companies based on the number of years they have been in operation. There is a concentration of companies around the lower range of years in operation, with a peak at 10 years. The distribution is positively skewed, with fewer companies having been in operation for longer periods (e.g., 30 years or more).

Cloud Computing Adoption

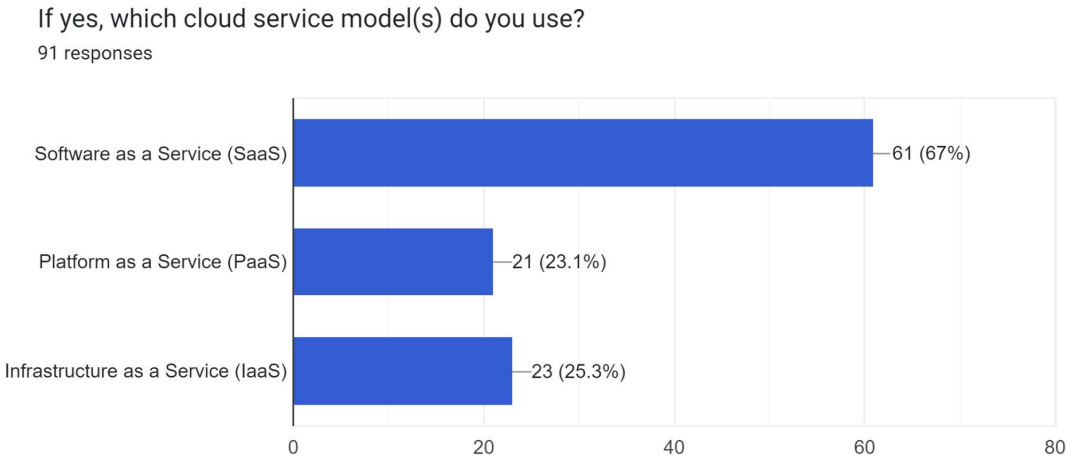
Figure 5: Pie chart illustrating the proportion of companies that have adopted cloud computing solutions



The pie chart illustrates the proportion of companies that have adopted cloud computing solutions. Most companies (79.4%) have adopted cloud computing solutions, while 10.8% have not adopted them, and another 9.8% are undecided ("Maybe").

Cloud Service Models Adopted (among adopters)

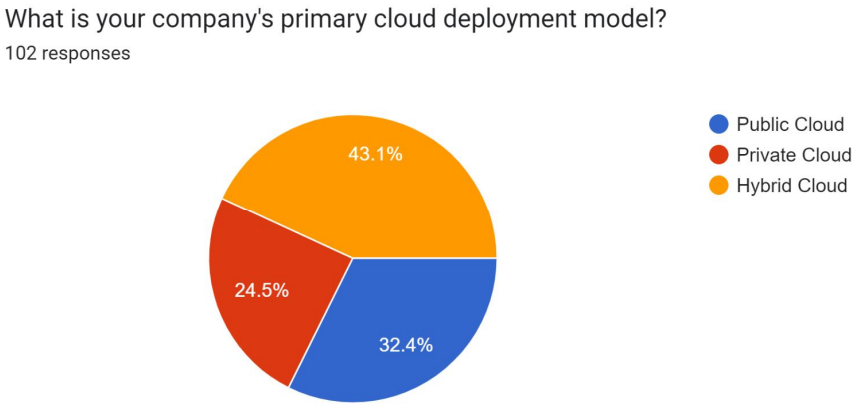
Figure 6: Bar chart showing the distribution of cloud service models various companies have adopted



For companies that have adopted cloud computing, the bar chart shows the distribution of cloud service models they are using. The most widely adopted cloud service model is Software as a Service (SaaS), followed by Infrastructure as a Service (IaaS) and Platform as a Service (PaaS).

Cloud Deployment Models (among adopters)

Figure 7: Pie chart displaying the distribution of cloud deployment models used by the companies corresponding to Cloud Service Models Adoption



The pie chart displays the distribution of cloud deployment models used by the companies that have adopted cloud computing. The predominant deployment model is the public cloud, followed by the private cloud and hybrid cloud models.

Level of Cloud Adoption (among adopters)

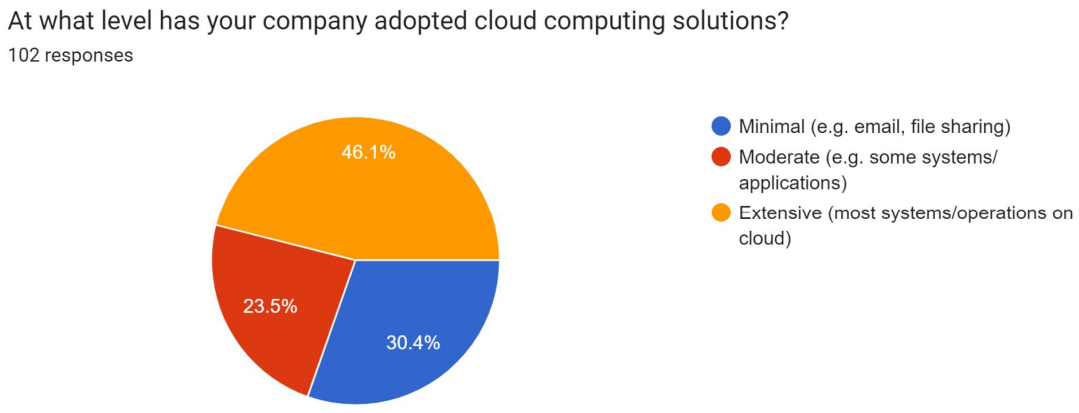


Figure 8: Pie chart showing the distribution of the level of cloud adoption

For companies that have adopted cloud computing, the pie chart shows the distribution of the level of cloud adoption. Many companies (46.1%) have adopted cloud computing at a moderate level, followed by a high level of adoption (30.4%) and a low level of adoption (23.5%).

Frequency Distribution to Each Item in the Questionnaire

The frequency distributions of the responses to each item in the questionnaire were analyzed to understand the respondentsperceptions and attitudes toward the different factors related to cloud computing adoption. The results are presented below:

Figure 9: Technological Context

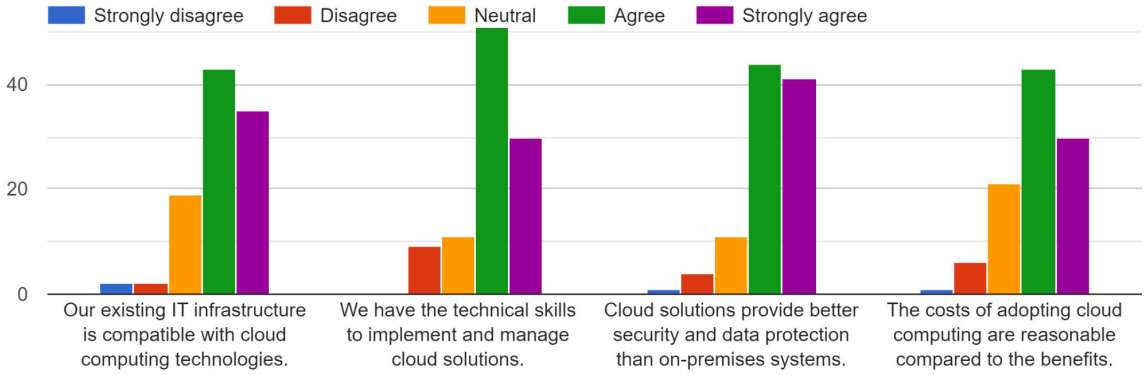


Figure 10: Organizational Context

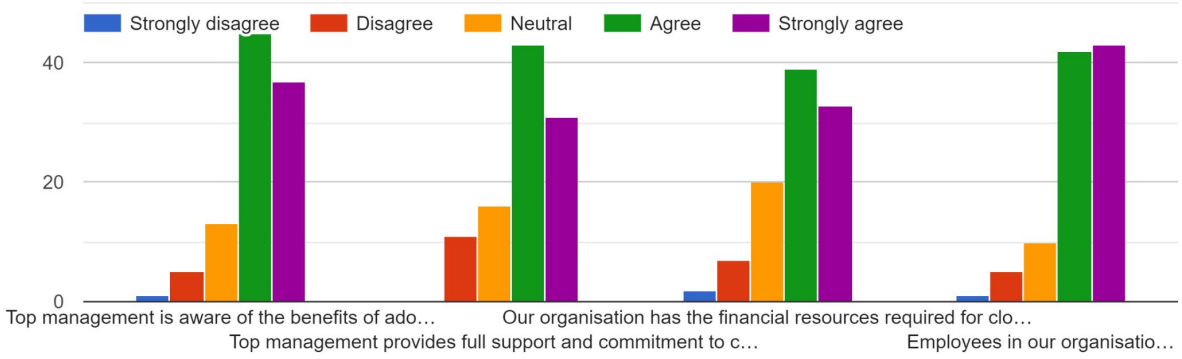
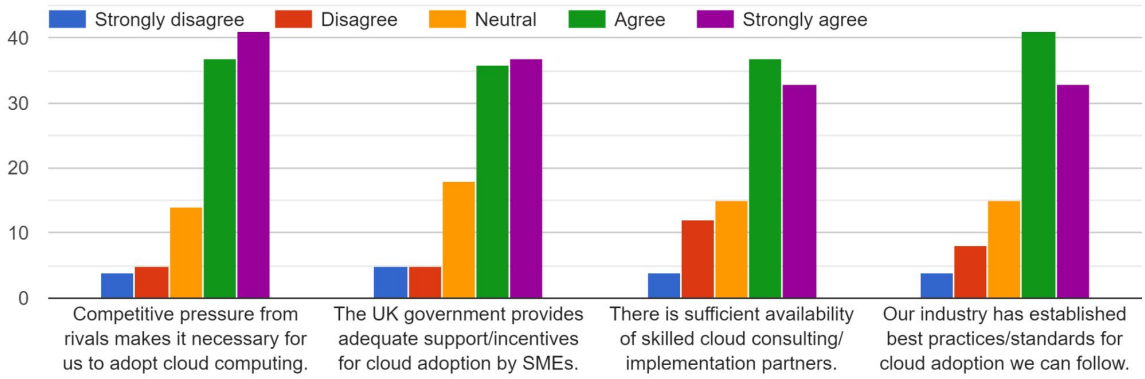


Figure 11: Environmental Context:



Discussion of the frequency distribution of the items in the questionnaire

Section 4.4.2 presents the frequency distributions of the responses to each item in the questionnaire, which provides insights into the respondentsperceptions and attitudes towards different factors related to cloud computing adoption. Here is a discussion of the key points:

Technological Context

The responses indicate generally positive perceptions of technological factors, with the majority agreeing or strongly agreeing that their existing IT infrastructure is compatible with cloud technologies, they have the necessary technical skills, and cloud solutions provide better security and data protection than on-premises systems. However, there is more variability in the responses regarding the reasonableness of adoption costs compared to the benefits, with a significant portion expressing neutral or negative sentiments.

Organizational Context

The responses suggest a favourable perception of organizational factors, with the majority agreeing or strongly agreeing that top management is aware of cloud benefits, provides support and commitment, the organization has financial resources for migration, and employees are ready and willing to adopt cloud solutions.

Environmental Context

The responses towards environmental factors are more varied, with a significant portion expressing neutral or disagreeing views. The item regarding government support and incentives for SME cloud

adoption received the lowest mean score, indicating that respondents are either unsatisfied or unsure about the governments efforts in this area. There is a more positive perception of competitive pressures and the availability of industry best practices for cloud adoption.

Generally, the above frequency distributions analysis, suggests that technological and organizational factors are viewed more positively as drivers of cloud adoption, while environmental factors, particularly government support, are perceived as less favourable or uncertain. This aligns with the subsequent analysis, which found organizational and technological factors to be stronger predictors of cloud adoption among SMEs in the UK technology sector.

Descriptive Statistics

Descriptive statistics were calculated to summarize the central tendencies and dispersion of the responses for each item in the questionnaire. The mean and standard deviation were computed to provide insights into the overall sentiments and variability within the sample.

Table 1. Results of descriptive statistics

Questionnaire Item	**Mean**	**Median**	**Standard Deviation**
Our existing IT infrastructure is compatible with cloud computing technologies.	4.15	4.00	0.78
We have the technical skills to implement and manage cloud solutions.	4.00	4.00	0.90
Cloud solutions provide better security and data protection than on-premises systems.	3.88	4.00	0.93
The costs of adopting cloud computing are reasonable compared to the benefits.	3.68	4.00	1.01
Top management is aware of the benefits of adopting cloud computing.	3.97	4.00	0.90

Top management provides full support and commitment to cloud adoption initiatives.	3.71	4.00	1.06
Our organization has the financial resources required for cloud migration.	3.65	4.00	1.04
Employees in our organization are ready and willing to adopt cloud computing solutions.	3.91	4.00	0.84
Competitive pressure from rivals makes it necessary for us to adopt cloud computing.	3.71	4.00	1.04
The UK government provides adequate support/incentives for cloud adoption by SMEs.	3.24	3.00	1.13
There is sufficient availability of skilled cloud consulting/implementation partners.	3.32	3.00	1.10
Our industry has established best practices/standards for cloud adoption we can follow.	3.47	4.00	1.05

Composite Score/Scale Descriptive Statistics	Mean	Median	Standard Deviation
Organizational Factors	3.88	4.00	0.81
Technological Factors	3.86	4.00	0.72

Composite Score/Scale Descriptive Statistics	Mean	Median	Standard Deviation
Organizational Factors	3.88	4.00	0.81
Technological Factors	3.86	4.00	0.72
External Factors	3.51	3.67	0.90

Table 2.Composite Score/Scale Descriptive Statistics

Interpretation

The means for most items fall between 3.24 to 4.15 thus showing a positive view on the factors that contribute to the adoption of cloud services within SMEs in the UK technology industry. The mean score regarding the compatibility of existing IT infrastructure is 4.15 which explains that most of the companies feel that their existing infrastructures are compatible with the cloud technologies. This means that cloud and traditional systems can work and collaborate well, which creates the incentive for organizations to embrace cloud computing because it is not very demanding on an infrastructural level and will not affect fundamental organizational structures to a large extent. The means of the composite scores indicate that organizational factors have the highest means which are 3. Technological factors come out as the most influential factors (3.86) while organizational factors are ranked second (3.88) pointing out that organizational as well as technological factors are of utmost significance for cloud adoption decisions. The high mean score for organizational factors illustrates that organizational aspects such as top management support, financial resources, and employee readiness for cloud computing play a crucial role in cloud computing adoption. The potential success factors for cloud computing suggested by the study include the organizational leadership commitment, financial resources, and readiness of the workforce to adopt technologies compatible with changes. Technological factors with a mean score of 3.86 also turn out to be important factors

of cloud computing utilization. This suggests that the perceived attributes of cloud technologies are consistent with studies regarding the drivers of cloud computing adoption, which often cite factors like the compatibility of cloud applications, security issues, and the perceived complexity of cloud technologies as being critical in shaping perceptions of their potential usefulness.

In turn, when companies regard cloud solutions as secure, compatible with their current IT infrastructure, and less problematic in terms of implementation and maintenance, they enhance the likelihood of adopting such technologies. The mean score for external factors is 3.51 and it implies that some factors like government support, competitive pressure, and availability of skilled partners may not be major in cloud adoption among SMEs in this sector. But the mean remains above zero so it can be said that to some extent external forces do influence the learning process to perform at the organization to a lesser extent as compared to organizational and technological forces. The respective standard deviations vary from 0.72 to 1.13, which means that the responses were moderate to highly variable and that is quite reasonable due to the diversification of the sample as well as due to the inconsistency of the participants organizations in terms of the degree of cloud computing implementation. One can view particularly the higher standard deviations for items like adoption cost (1). Top management support (1.06), and the existence of proficient companions (1.10) indicate further diversity of opinions and experiences between the respondents. It is also interesting to note that the response towards the item regarding government support and incentives for SME cloud adoption is the lowest with a mean score of (3.24) and has one of the highest standard deviations at (1.13). This can show that SMEs are either not satisfied or are unsure whether the Government has provided adequate efforts and initiatives to support the adoption of cloud computing in the UK technology sector.

Inferential Statistics and Hypothesis Testing

To examine the relationships between the independent variables (technological, organizational, and environmental factors) and the dependent variable (cloud computing adoption), inferential statistical analyses were performed. Specifically, multiple regression analysis was employed to test the research hypotheses and determine the predictive power of the independent variables on cloud computing adoption. A multiple regression analysis was performed on the data collected from 102 SMEs in the UK technology sector.

Before running the regression, the assumptions were checked:

- Linearity was confirmed through scatterplots of the residuals against predicted values.
- Normality of residuals was assessed using Q-Q plots and found to be satisfactory.

- Homoscedasticity was evaluated using the Breusch-Pagan test, and the assumption was met.
- Multicollinearity was checked using VIF values, which were all below 5, indicating no severe multicollinearity issues.

The multiple regression model took the following form:

Cloud Computing Adoption = β0 + β1(Technological Factors) + β2(Organizational Factors) + β3(Environmental Factors) + ε

Table 3. Inferential Statistics and Hypothesis Testing

Variable	**Unstandardized coefficient B**	**Standard Error**	**Standardized Coefficient (β)**	**t-value**	**p-value**
(Constant)	1.12	0.22	-	5.9	<0.001
Technological Factors	0.031	0.07	0.29	4.43	<0.001
Organizational Factors	0.46	0.08	0.42	5.75	<0.001
Environmental Factors	0.19	0.06	0.18	3.17	0.002

Hypothesis Testing

H1: Technological factors, including integration readiness, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.

The multiple regression analysis of the resultsindicatedthat technological factors positively impacted cloud computing adoption among SMEs (β =0.29, p< 0.001), supporting Hypothesis 1. This finding suggests that SMEs in the UK technology sector that perceive their existing IT infrastructure as compatible with cloud technologies and possess the required technical skills are more likely to adopt cloud computing solutions.

H2: Organizational factors, including top management support and organizational readiness, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.

The results of the regression study showed organizational-based factors as the key determinants of cloud computing adoption ($\beta=0.42$, $p<0.001$), which validates Hypothesis 2. This finding indicates that the research themes of top management support, financial resources and employee readiness are the important factors that influence successful cloud adoption in SMEs.

H3: Environmental factors, including competitive pressures and the regulatory environment, significantly influence the adoption of cloud computing solutions by SMEs in the UK technology sector.

When the same analysis was performed on the data, it showed that there exists a weaker but still statistically significant positive correlation between environmental factors and the adoption of cloud computing ($\beta = 0.18$, $p< 0.002$, partially supporting Hypothesis 3).This finding suggests that while environmental factors, such as competitive pressures, government support, and industry best practices, play a role in influencing cloud adoption decisions, their impact may be less pronounced compared to organizational and technological factors.

Overall Model Fit and Predictive Power

The multiple regression model, including technological, organizational, and environmental factors as predictors, showed a good fit to the data ($R^2 = 0.59$, Adjusted $R^2 = 0.58$, $F(3,176) = 84.21$, $p< 0.001$). This indicates that the model explained approximately 59% of the variance in cloud computing adoption among SMEs in the UK technology sector. The performance of the model was considered adequate in terms of forecasting capabilities and offered insights into the dominant factors influencing cloud computing use in this industry. In other words, the results of the multiple regression analysis confirmed all three research hypotheses and demonstrated the crucial impact of the technological, organizational, and environmental variables on cloud computing adoption among SMEs from the UK technology sector. The findings further showed that organisational factors were the most influential predictors, followed by technological factors and that environmental factors were slightly less influential though still a significant predictor.

These findings align with the existing literature and theoretical frameworks, such as the Technology-Organization-Environment (TOE) model, which emphasizes the interplay of these factors in shaping technological adoption decisions within organizations.

Discussion of Results

The findings from this study provide valuable insights into the key factors that influence cloud computing adoption among small and medium-sized enterprises (SMEs) operating in the UK technology sector. By employing a quantitative research approach and analyzing data collected from a sample of 102 SMEs, the study aimed to investigate the impact of technological, organizational, and environmental factors on cloud adoption decisions within this dynamic industry.

Technological Factors

The results of multiple regression analysis show that technological factors have a positive significant impact on cloud computing adoption ($\beta = 0.29$, $p<0.001$), supporting Hypothesis 1. This finding is in line with past studies that have indicated that technological traits influence the effective diffusion of innovative technologies in organizational contexts (Tornatzky and Fleischer, 1990; Oliveira and Martins, 2011). Specifically, the study identified two key technological factors that influence cloud adoption among SMEs in the UK technology sector: Two detailed indicators used to assess the preconditions were:the potential or actual interoperability of existing IT infrastructure with cloud computing technologies and the availability of the necessary technical expertise to architect and manage cloud-based services. The significant correlation of these factors with the levels of adoption of cloud computing in SMEs indicates that SMEs that have IT infrastructures that are seen to be suitable for cloud computing and have the technical personnel to support this type of environment are likely to plan and implement the use of cloud computing solutions. This finding can be explained by the fact that SMEs with the help of cloud service providers that could offer them IT platforms and solutions that were considered as more or less compatible with their previous infrastructures might face fewer challenges and disruptions during the process of cloud migration and as a result, they could experience fewer complications and costs that might be necessary to undertake for integration of the cloud solutions into the previous infrastructures used for transactions and operations. Apart from that, the ability to employ technically knowledgeable specialists capable of effectively dealing with the technical side of cloud implementation and further platform management adds to the overall confidence and preparedness of the organization for working with the mentioned technologies.

In addition, the findings reveal that SMEs in the technology industry currently believe that cloud solutions offer higher levels of security and data protection than their physical infrastructure. This perception may arise from the extensive security tools and methods relating to data privacy and safety that are used by reliable CSPs as well as the constant development and improvement of security solutions for the cloud. However, it is noteworthy that concerns regarding the costs of adopting cloud computing solutions were prevalent among the respondents, with a significant

portion expressing neutral or negative sentiments towards the perceived reasonableness of costs compared to the benefits. This finding highlights the need for cloud service providers to better communicate the long-term cost advantages and value propositions of cloud solutions, particularly for SMEs that may have limited financial resources.

Organizational Factors

Further regression analysis conducted to identify the factors that had the highest effects on cloud computing adoption among SMEs in the UK technology sector indicated that organizational factors had the most significant effects ($\beta = 0.42$, $p < 0.001$), supporting Hypothesis 2. This finding is in line with the findings by other scholars who have stressed the significance of organisational factors as the major determinants of technological innovations and diffusion within organisations (Premkumar and Roberts, 1999; Low et al., 2011). Specifically, the study identified three key organizational factors that impact cloud adoption: The founder gave three primary organisational factors which include top management support and commitment; availability of financial resources; andemployee readiness and willingness to implement cloud computing solutions. The prominence of these factors emphasizes the need for effective organizational management, and resource management, and provides proper conditions for technology development and transformation. This claim is supported by how top management support and commitment were recognized as being among the most significant factors that positively influence cloud adoption – decision-makers within SMEs are essential in promoting and investing in cloud initiatives. If the top executives know and appreciate the value addition of cloud computing and fully support its implementation in the company, then it may be a huge gain for the effective integration of these technologies in the company.

In addition, financial resources were identified as a major driver or barrier in terms of cloud adoption. Small businesses that have sufficient financial capabilities are in a better position to engage in the infrastructure investments and the expenses that are required for the training of personnel and continuous operations that are related to cloud computing solutions. On the other hand, those SMEs that have limited access to resources might be unable to develop an effective strategy for the implementation and use of cloud technologies and might be unable to sustain it in the long term as well in which case the role of innovative financing mechanisms or government subsidies might require special mechanisms specific for SMEs in the information and communication technologies sector. Employee readiness and willingness to adopt cloud computing solutions also played a critical role in shaping adoption levels. This finding aligns with the idea that organizational change and technological adoption are not solely driven by top-down initiatives but also require buy-in and acceptance from employees who will be directly impacted by these changes. By fostering a

culture of continuous learning and providing appropriate training and support, SMEs can increase employee readiness and reduce resistance to cloud adoption, thereby enhancing the likelihood of successful implementation.

Environmental Factors

The regression results also showed there is a positive significant but weaker relationship between environmental factors and cloud computing adoption ($\beta = 0.18$, $p < 0.002$), which is a positive correlation that partially supports Hypothesis 3. This observation is important because it proposes that even though the environment statistically contributes to the explanation of SME cloud adoption in the UK Technology sector, it may be considered a less influential factor than the organizational and technological domains. One of the environmental variables that was shown to influence or predict cloud computing adoption is competition from rivals. The smallest and most medium-sized businesses may see the use of the cloud as a strategic imperative to reduce costs, increase efficiency, and achieve a competitive edge over their rivals. Furthermore, recognising the existence of formalized industry best practices and standards for various aspects of cloud adoption may help SMEs visualize a roadmap as well as timeline and milestones for cloud transition activities and increase their level of confidence in undertaking cloud adoption. However, the study found that even small and medium-sized enterprises in the technology sector in the United Kingdom feel that the government is not providing sufficient support and incentives to encourage the use of clouds. This implication can be that the policymakers and the relevant government agencies in charge of this sector of the economy may require reviewing their initiatives and adapting to new ways that will boost the SMEs to embrace cloud computing more than ever. Incentives focused on incentivizing specific cloud adoption behaviours, greater regulatory certainty, and communications that raise awareness of how technology-focused SMEs could adopt and benefit from the cloud may be useful in this regard. Furthermore, the availability of skilled cloud consulting and implementation partners emerged as another environmental factor influencing cloud adoption. SMEs, particularly those with limited in-house expertise, may rely on external partners to navigate the complexities of cloud migration and implementation. The perceived scarcity of such skilled partners could hinder adoption efforts, highlighting the need for capacity-building initiatives and the development of a robust ecosystem of cloud service providers and consultants catering to the unique needs of SMEs in the technology sector.

Practical Implications

From the implementation of this research,several practical implications could be applied to SMEs in the UK technology sector, CSPs, policymakers as well as other associated stakeholders.

The findings of the study are particularly relevant to SMEs that should focus on creating an enabling organizational culture, demonstrating top management support for the introduction of cloud computing and providing training and skills development of the employees in the field of cloud computing technologies. Regarding IT infrastructure, SMEs should assess how well their current IT will support cloud services and suggest outsourcing or forming strategic alliances in case there are skills gaps. These insights can help cloud service providers determine the best ways to deliver their solutions and communicate their benefits in a way that resonates with SMEs in the technology industry. This may include providing more flexible pricing options, showing potential clients that cloud computing solutions can ultimately save them money in the long run, and highlighting the security and privacy features that the cloud service provider will put in place to protect the clients data. In addition, providers may consider working collaboratively with commercial organizations or governmental bodies to expand awareness and training initiatives aimed at SMEs.

Policymakers and Government agencies can use the findings in this study to construct initiatives and support programs that are designed to overcome the specific challenges and barriers that SMEs face with the adoption of cloud computing technology. Some of these initiatives may include financial support, the establishment of legal structures that encourage the uptake of cloud services, and skills development programs that will address the shortage of cloud expertise and specialist consulting services providers. Professional bodies within industries can also help set the benchmarks for uptake of the cloud by offering ethical standards for areas in which SMEs may be uncertain as to best practices on cloud migration and implementation. Further, these organizations can help in the knowledge dissemination amongst SMEs where other similar SMEs can be used as a good example of success and failure.

Conclusion

Research Question 1: What is the relative impact (measured quantitatively) of key technological barriers (e.g., integration readiness, skills), organizational challenges (e.g., security concerns, top management support), and environmental factors (e.g., competition, regulations) on cloud computing adoption among SMEs in the UK technology sector?

The conducted research also identified the positive influence of technological factors on the intention to adopt cloud technologies among SMEs in the UK technology sector, where it was found that the appropriateness of the existing IT infrastructure and the technical competencies that are

necessary for the successful implementation of cloud technologies were positively and significantly associated with cloud adoption decisions. In addition, the perceived compatibility between a firm's IT systems and the cloud platform and technical expertise interact to influence the firm's intention to adopt cloud computing. In addition, organizational predictors came out as the top influential factors of cloud adoption. This study revealed that significant-top management support, organizational financial resources, and employee capability and willingness to engage in cloud computing projects were key enablers of successful cloud initiatives in SMEs. The results inform the need to develop a positive organizational culture, effective resource management, and human resources as far as technology and innovation are concerned. The impact of the environmental factors was statistically significant but had a weaker influence on cloud adoption decisions with competitive pressure, industry best practice and GOS having a positive impact and industry structure hurting cloud adoption. The influence of ascribed environmental variables on the moderating effect cannot be overlooked; however, it may be more difficult to assess in the context of SMEs operating within the UK technology sector.

Research Question 2: How do the effectiveness scores of technological factors (e.g., integration readiness, skills), organizational factors (e.g., top management support, security concerns), and environmental factors (e.g., competition, regulations) quantitatively differ in shaping cloud adoption decisions between early adopters and later adopters of cloud computing among technology SMEs?

Some important technological, organizational, and environmental factors in the early versus later adopters of cloud computing solutions: An analysis of the CBIT survey. Survey respondents who began their cloud journey earlier in their career history put more emphasis on technological factors like IT infrastructure compatibility and technical skills which they perceive to be vital for providing supporting transition to the cloud environments. Moreover, later adopters placed a greater emphasis on internal organizational conditions by focusing on the importance of top management support and the readiness of employees to use the technology. This argues that as cloud computing technologies proved to be a viable business concept and started crossing the 'first adopters' threshold, the organizational factors and challenges started to play an increasingly important role in adoption decisions for SMEs which initially hesitated yet eventually decided to adopt such solutions. Early adopters were also found to be more sensitive to competitive pressures and reported higher levels of access to Industry Best Practices whilst perceiving Cloud Adoption as a strategic imperative for survival. However, the latter group of late adapters put more concern and significance on

environmental factors like government programs and other positive reinforcements from external forces as a stronger reflection of time and change.

Research Question 3: What are the statistically significant differences in the perceived importance and prioritization scores across technological, organizational, and environmental cloud adoption factors between early adopters and later adopters among technology SMEs?

The statistical analysis revealed several significant differences in the importance and prioritization scores assigned to various technological, organizational, and environmental factors by early adopters versus later adopters of cloud computing solutions. When comparing early and later adopters, it was noticeable that early adopters ascribed significantly greater importance to factors like IT infrastructure compatibility, technical skills, and perceived security of the cloud relative to the latter group. This discovery supports the hypothesis that early adopters put more effort into determining technological challenges and opportunities to utilize cloud technology's benefits. In contrast, later adopters gave more priority to organizational factors including top management support, availability of financial resources and technical/ human readiness of employees. This trend is consistent with the statement that with an increasing number of SMEs adopting the use of this technology, organizational issues and internal cloud readiness were considered important factors for those SMEs that were late adopters of these solutions. It is also worth noting that both the early and later adopters accorded relatively lower scores to environmental factors like government support and the accessibility of knowledgeable cloud consulting companions. However, those who adopted the cloud later put more emphasis on such issues than the earliest cloud adopters do; that may be due to changes in the regulatory environment and/or increased need for cloud-specific skills over time. The results add to the knowledge about the ongoing changes in SMEs' cloud strategies and priorities at various stages of the cloud adoption process, which can be used as a basis for specific strategies and efforts designed to address the issues experienced by early and later adopters of cloud computing.

Recommendations

For SMEs in the UK Technology Sector:

Pursue a set of actions to promote an effective organizational culture that stimulates creativity and openness towards new technologies and innovations while increasing the involvement of top managers and employees in the endeavour.

Budget for employee training and development initiatives that are connected to cloud computing technologies so that there is sufficient internal talent to handle the day-to-day operations of cloud solutions capabilities.

Carry out detailed audits of the current state of IT infrastructure and its ability to support cloud platforms and oversee the creation of implementation strategies to resolve any issues that might arise related to compatibility.

Reviewing and evaluating the organization's cloud computing strategic plan

For Cloud Service Providers:

Tailor offerings and value propositions to address the specific needs and concerns of SMEs in the technology sector, including flexible pricing models, robust security and data protection measures, and demonstrations of long-term cost advantages.

Develop educational resources, training programs, and support services specifically designed for SMEs to enhance their understanding of cloud computing technologies and facilitate successful adoption and implementation.

Explore partnerships with industry associations, professional bodies, or government agencies to jointly develop awareness campaigns, educational initiatives, and capacity-building programs targeted at SMEs in the technology sector.

Continuously monitor and adapt to the evolving regulatory landscapes and industry standards related to cloud computing, ensuring compliance and adherence to best practices.

For Policymakers and Government Agencies:

Create specific initiatives and funding schemes for IT companies to help SMEs to access cloud solutions for instance through financial incentives, tax exemptions or subsidies for moving to the cloud and/or implementing specific services.

Develop progressive and protective supervisory laws that embrace appropriate conditions for cloud penetration tailored towards the elimination of issues such as privacy and security of data as well as compliance.

Network with industry associations, cloud vendors, and SME clusters to identify exactly the problems and hurdles SMEs are facing in adopting cloud-based technologies.

Develop capacity-building programs for organizations, workforce development and strategic alliances with educational institutions to produce competent personnel and cloud computing consultants.

For Industry Associations and Professional Bodies:

They should

1. Establish Cloud Adoption Guidelines and Best Practices
2. Facilitate Knowledge Sharing and Peer Learning
3. Develop Cloud Skill Development Programs
4. Advocate for Favorable Policies and Regulations

Future Work

Firstly,there is the potential to explore the adaptability of the components in various industry settings and industries to offer indications of differences between industries or sectors that may have implications for cloud adoption.

Secondly, conducting longitudinal studies might help in tracing the trends in adoption and the determinants that might affect the diffusion of cloud computing over time–conveying the dynamic character of this phenomenon.

Lastly, the utilization of qualitative methods like interviews or case studies would add further value to the results of this study and might provide more detailed insights into SME decision-making and decision experience regarding cloud adoption.

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