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Adoption of Cloud Services by Pakistani SMEs: Challenges and Opportunities

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ABSTRACT:

Cloud computing has been developed as a revolutionary technology, which allows the businesses to enjoy the scalable, flexible, and affordable IT infrastructure without excessive capital expenditure. In the case of small and medium-sized enterprises (SMEs), especially in the developing countries, cloud services present prospects to increase efficiency of operations, innovation potential, and competitiveness in the market. SMEs are important in Pakistan in terms of employment and GDP creation, but the application of cloud services is comparatively small because of technical, organizational, and environmental factors. This research paper discusses the opportunities and the challenges of adopting cloud service by Pakistani SMEs. Based on the Technology-Organization-Environment (TOE) framework, and Diffusion of Innovation (DOI) concept, the article discusses the main obstacles as the issue of data security, regulatory uncertainty, lack of technical knowledge, insufficient digital infrastructure, and financial limits. At the same time, it also emphasizes such opportunities as cost minimization, scalability, remote access, business continuity, and improved collaboration. The paper hypothesizes that even though Pakistani SMEs are conscious of the strategic value of cloud computing, structural and institutional obstacles impede mass implementation. This study can help policymakers and business leaders to cultivate cloud readiness and digital resilience by analysing available literature and contextual evidence of the digital transformation journey of SMEs in emerging markets.

Keywords: Cloud computing, SMEs, Digital transformation, Technology adoption, Pakistan, TOE Framework, Innovation, data security, emerging economies.

INTRODUCTION:

SMEs are the pillars of the Pakistani economy and are significant sources of job creation, export income, and the economy in general. The State Bank of Pakistan (SBP, 2022) estimates that the total number of businesses in the country is approximately 90% SMEs, and they also represent a big percentage of the non-agricultural labor force in the country. The Pakistani SMEs are known to be economically significant but they usually have structural limitations such as lack of financial resources, insufficient technological facilities and access to international markets. Cloud computing has become one of the strategic solutions that have the potential to bring SMEs out of such shortcomings in the digital transformation age and offer scalable and cost-effective IT solutions (Mell and Grance, 2011).

Cloud computing is defined as the provision of computing facilities - servers, storage, databases, network, software, and analytics on the internet without physical infrastructure ownership that can be planned and duly utilized by organizations to access advanced technological capabilities (Marston et al., 2011). National Institute of Standards and Technology (NIST) defines cloud computing as a model, which allows ubiquitous, convenient and on-demand network access to a common pool of configurable computing resources that can be rapidly provisioned and minimally managed (Mell and Grance, 2011). In case of SMEs, this model does not require significant capital to start, increases flexibility, and helps operate and work remotely, which is especially appealing in resource-limited situations.

The uptake pace in the use of cloud services has been accelerated across the globe courtesy of the rising levels of digitalization, competition pressure and operational agility necessity. SMEs in developed economies have used cloud platforms to simplify business operations, enhance customer relationship management and market entry into new markets (Gangwar et al., 2015). Nevertheless, the adoption patterns are not similar in the developing countries because of such circumstances conditions as the inadequacy of infrastructure, regulatory policies, and organizational preparedness (Oliveira et al., 2014). SMEs are still hesitant and wary of cloud technologies, and in Pakistan, the trend has been that large businesses and multinational companies have been moving forward to cloud-based systems.

Technology adoption in organizations is frequently understood within the theoretical framework of Technology-Organization-Environment (TOE) framework and the Diffusion of Innovation (DOI) theory. According to the TOE framework, adoption of technological innovation depends on three dimensions, including technological characteristics, organizational readiness, and environmental context (Tornatzky and Fleischer, 1990). The technological factors are perceived benefits, compatibility and complexity, the organizational factors are the firm size, managerial support and financial capacity and the environmental factors include competitive pressure, regulatory environment and external support systems. In the same way, the theory of the Diffusion of Innovation by Rogers (2003) focuses on the perceived relative advantage, trialability, observability and compatibility as drivers of innovation adoption. The application of these structures to the SMEs in Pakistan can be used to explain the interaction between internal and external variables that influence the decisions to adopt clouds.

Fear of losing data privacy and security is one of the greatest issues that are limiting the use of the cloud in Pakistani SMEs. Companies usually feel that cloud services are susceptible to cyber attacks and unauthorized access, especially when there are weak local data protection policies (Alshamaila et al., 2013). Issues of trust are very decisive when it comes to the adoption of technologies and SMEs might be unwilling to transition sensitive business information to third-party service providers, unless there are explicit regulations to protect them. Also, the lack of awareness regarding cloud service level agreements (SLAs) and standards of compliance also contribute to the lack of knowledge.

The major barrier is also the infrastructure related constraints. Effective use of cloud requires the availability of reliable internet connectivity, reliable power supply and high speed broadband. Although Pakistan has achieved success in the development of digital infrastructure, urban and rural regions continue to have an unequal access to cloud-based solutions (Hussain et al., 2017). The connectivity issues in SMEs might hinder the operations of those in secondary cities or rural areas, decreasing the level of reliance on the cloud service.

Adoption decisions are also affected by financial considerations. Cloud computing can save on capital spending on hardware and software maintenance, but the recurrent subscription fee and possible migration facilities can act as deterrent to resource-vaulted SMEs (Marston et al., 2011). The small businesses of Pakistan do not work with huge budgets and are not concerned with the long-term investment in technologies, as the survival is in the short-term. Furthermore, they may have fewer opportunities to assess and deploy cloud solutions because of the lack of access to formal financing and lack of digital literacy.

Another important determinant is the organizational preparedness. Effective adoption of the cloud needs to be supported by qualified staff that can support digital systems, guarantee cybersecurity, and maximize applications on the cloud. Nevertheless, informal technological arrangements are frequently used, and the Pakistani SMEs do not have a specific IT department. Lack of technical skills may cause change resistance and doubt regarding the payback (Gangwar et al., 2015). Strategic vision and top management support is thus critical in developing an innovative culture in SMEs.

Nevertheless, there are immense opportunities of cloud computing to Pakistani SMEs despite these challenges. Scalability is one of the main benefits. Clouds enable companies to dynamically increase or decrease resources according to the demand, so they will be able to react to the market changes easily without having to bear the high fixed expenses. This flexibility is especially useful when there is a seasonal business or export oriented business in which the SMEs are involved. Moreover, collaboration tools with cloud computing can support remote work and real-time communication, which contributes to increased productivity and resilience in the short-term and in cases of crisis, like the COVID-19 pandemic (OECD, 2021).

Business continuity and disaster recovery can also be enhanced through the use of cloud. Cloud-based data backup and recovery systems offer a greater level of security in the running of operations in a nation where such issues as natural disasters and infrastructure disruptions are especially frequent, such as Pakistan. Besides, availability of higher-order analytics and artificial intelligence, using cloud solutions, can allow SMEs to obtain data-driven insights, enhance customer outreach, and develop product offerings.

Another driving force is the competitive pressure. With the bigger companies becoming more digital in their processes, the SMEs face the challenge of adopting new technologies that would keep them in the supply chains. Cloud-based infrastructure is commonly needed when integrating it with e-commerce, digital payment, and online marketing channels. Consequently, the inability to use cloud services can make the SMEs less capable of being involved in the digital economy.

Incentives introduced by the government to enhance digitalization and financial inclusion also provide a facilitating environment to cloud adoption. The policy responses that can be designed to enhance the rates of broadband penetration, the supporting ecosystems, and the cybersecurity frameworks can increase the trust of SMEs in cloud technologies. Nonetheless, there is need to have coordinated actions among policy makers, cloud service providers, financial institutions and business associations in closing the gaps.

To sum up, the trend of using cloud services by Pakistani SMEs is a complex challenge as well as an opportunity. Although cloud computing is cost effective, scalable, flexible, and innovative, its barriers to widespread adoption include the security issues, infrastructural issues, financial issues, and organizational preparedness. The explanation of these multidimensional factors using the theoretical frameworks helps in getting a good insight into the digital transformation process of SMEs in Pakistan. With the increasing digitalization of global business settings, the skills of the Pakistani SMEs in utilizing cloud technologies will be of significant value in predicting their competitive advantage, durability, and sustainability over time.

LITERATURE REVIEW:

Cloud computing has come to play as a crucial innovation in international business environment, and it can provide organizations, especially SMEs with access to information technology resources that is scalable, flexible, and cost effective (Mell and Grance, 2011). Some articles have pointed to the disruptive nature of cloud computing in SMEs suggesting that cloud services should be used to help firms overcome infrastructural constraints, cut down IT expenses, and improve operational efficiencies (Gangwar et al., 2015; Marston et al., 2011). SMEs, which act in a developed economy, have been capable of using cloud platforms to enhance customer relationship management, supply chain

integration, and data analytics capabilities becoming measurably performance-enhancing (Oliveira et al., 2014; Chen et al., 2010). Adoption of cloud services, however, requires a number of inter-related factors that span across the technological, organizational, and environmental levels of conceptualization as captured by the Technology-Organization-Environment (TOE) conceptualization (Tornatzky and Fleischer, 1990) and the Diffusion of innovation (DOI) conceptualization (Rogers, 2003).

Technological issues have a great impact on the adoption of cloud by SMEs. The probability of adoption is determined by relative advantage, compatibility with existing systems, perceived complexity and trialability (Alshamaila et al., 2013). The perceived benefits, such as cost reduction, scalability, and remote accessibility, have always been observed to be powerful motivators in studies in emerging economies, and perceived complexity and integration challenges have been found to discourage firms to use cloud solutions (Low et al., 2011; Oliveira et al., 2014). Within the Pakistani setting, the perceived risk of cloud services can be especially high in the case of SMEs because of insufficient knowledge related to cloud architecture and the lack of experience in the field of digital infrastructures (Hussain et al., 2017). On the same note, the lack of technical support and IT skills in SMEs increases the level of perceived complexity, which decreases the desire to adopt new technologies (Gangwar et al., 2015).

The features of an organization are also the decisive factors in the adoption of the cloud. The adoption decisions depend on the firm size, managerial assistance, financial ability, and innovation preparedness (Alshamaila et al., 2013; Oliveira et al., 2014). Smoaller companies having low budgets might feel like recurring subscription fees can be a major financial strain even though it will remove the initial capital expenses known in on-premise infrastructure (Marston et al., 2011). The literature has always required top management commitment as it creates a culture of innovation, resources distribution, and employee training (Gangwar et al., 2015; Low et al., 2011). Without formal IT department, most of SMEs do not have formal IT-related technological arrangements in Pakistan and this complicates implementation of cloud-based solutions even more (Hussain et al., 2017).

The adoption of the cloud is greatly influenced by environmental factors such as the competition, regulatory frameworks and the availability of external support (Tornatzky and Fleischer, 1990). When competitors/partners in the industry use similar technology, the SMEs tend to move to cloud services because they feel pressure to stay relevant (Oliveira et al., 2014; Chen et al., 2010). Nevertheless, in Pakistan, there exists regulatory uncertainty and lack of the full-scale data protection legislation that adds to the increased privacy, data security, and compliance concerns (Alshamaila et al., 2013; Hussain et al., 2017). Moreover, the lack of government support of the digital transformation and uneven internet coverage create additional issues with adoption, in particular, among SMEs that are not located in large cities (OECD, 2021). Other authors have focused on how the public policy interventions and industry associations can encourage the adoption of ICT and cloud computing specifically in offering guidelines and training, as well as awareness programs (Bwalya and Zulu, 2016; Oliveira et al., 2014).

One of the most mentioned barriers to cloud adoption in SMEs is data security and privacy. The question of trust toward third-party service providers and the risks of exposing sensitive business information is a major issue in the organizational decision-making (Alshamaila et al., 2013; Gangwar et al., 2015). It was observed by researchers that the adoption of clouds can be determined by the fact that there are well-defined service-level agreements (SLAs) and compliance standards that will help reduce the risks related to the data loss or cyber-attack, as well as unauthorized access (Low et al., 2011; Chen et al., 2010). The lack of strict cybersecurity laws in emerging economies increases a feeling of riskiness and plays a role in the reluctance of SMEs (Bwalya and Zulu, 2016).

Another major challenge is financial. Cloud computing helps to lower the capital expenditure on hardware and maintenance of IT, but subscription charges can be an extra cost burden to cash-strapped SMEs (Marston et al., 2011; Oliveira et al., 2014). According to the literature, SMEs tend to enter into cloud services in the case that they possess access to credit, leasing plans, or governmental incentives (Hussain et al., 2017; OECD, 2021). In Pakistan, the access to formal financing sources and the lack of

awareness regarding the digital investment opportunities limit access of SMEs to the cloud environments.

Successful cloud implementation focuses on organizational readiness. Companies that have trained staff members and well-defined digital strategies tend to embrace cloud services more (Gangwar et al., 2015; Low et al., 2011). Research highlights the significance of the development of IT capabilities, training of the employees and knowledge management in the assurance that cloud solutions can be able to bring forth anticipated benefits (Alshamaila et al., 2013). The lack of skilled professionals that may maintain the cloud infrastructure is another issue that SMEs in Pakistan have to deal with on a regular basis, which results in the reluctance to use it partially or even inefficiently (Hussain et al., 2017). These internal barriers need the support of top management along with investment of human capital so that they can be overcome.

Strategic opportunities that cloud computing brings are generally well-documented. Cloud services are also known to improve scalability that allows the SMEs to adjust the resources based on the demand and prevent unnecessary spending (Marston et al., 2011). The tools of remote accessibility and cloud-based cooperation enhance the flexibility of operational activity, remote working, and real-time communication, and it is especially applicable in the reality of the COVID-19 pandemic (OECD, 2021). Furthermore, cloud platforms also offer SMEs, access to high-end analytics, customer relationship management packages, and enterprise resource planning tools that provide the ability to innovate and make decisions that are data-driven (Gangwar et al., 2015; Chen et al., 2010).

Another aspect noted in the literature about the effects of competitive pressure is that it is driving the adoption of clouds at a faster pace. The SMEs working in dynamic and digitized sectors are under pressure to use technologies that can improve the efficiency of businesses and their responsiveness to the market (Oliveira et al., 2014; Tornatzky and Fleischer, 1990). The adoption of cloud services has the potential to increase the competitiveness of SMEs by facilitating connectivity with digital supply chains, joining an e-commerce platform, and delivering online services (Low et al., 2011; Bwalya and Zulu, 2016). Moreover, the disaster recovery systems that are on the cloud can offer continuity in the operations in the event of a crisis, which enhances resilience and sustainability (Marston et al., 2011).

Overall, there is a literature that suggests that in developing countries, such as Pakistan, cloud usage by the SMEs is affected by set of technological, organizational, and environmental factors. Adoption is hampered by barriers including concerns in data security, financial pressures, lack of IT skills and uncertainty in regulations and positive factors include cost reductions, scalability, access remotely, and competitive advantage. The use of TOE and DOI models in the prior studies will offer a detailed insight into these variables, stating the necessity of the combined approach which will consider both external and internal factors (Alshamaila et al., 2013; Oliveira et al., 2014; Gangwar et al., 2015). The knowledge of these multidimensional influences is essential to the policymakers, cloud service providers, and SMEs so that they can adopt effective strategies to implement digital transformation and improve resilience of SMEs in Pakistan.

METHODOLOGY:

The research design used in this study was a quantitative research design to explore issues and opportunities related to adoption of cloud computing by Pakistani SMEs. IT Technology-Organization-Environment (TOE) framework and Diffusion of Innovation (DOI) theory were used to facilitate the methodology that was used in the study to allow a detailed analysis of the technological, organizational, and environmental influences on adoption. The data were gathered among SMEs of various industries to bring different views on the cloud adoption practices.

Research Design

Primary data collection was conducted with the help of a descriptive cross-sectional survey design based on the SMEs working in Pakistan. The researchers also tried to find out the drivers and barriers to cloud adoption, in addition to the perceived benefits of cloud computing. An organized questionnaire was worked out based on the scales of the previous researches (Gangwar et al., 2015; Alshamaila et al., 2013; Oliveira et al., 2014) which are already analyzed and proven to be valid and specific to the local Pakistani context. The questionnaire was divided into two main parts, technology (e.g. perceptions of relative advantage, complexity), organizational (e.g. firm size, managerial support, IT readiness), environmental (e.g. competitive pressure, regulatory support) and adoption outcomes (e.g. operational efficiency, scalability, business continuity).

Population and Sample

The population sample was limited to small and medium-sized enterprises registered at the State Bank of Pakistan and working within the manufacturing, retail, services and IT industries. The reason why SMEs were chosen is that they are highly important in the Pakistani economy but tend to be technologically and financially disadvantaged, which impacts the adoption of the cloud (Hussain et al., 2017). The sampling technique used was purposive, which was used to select the SMEs that had been exposed to some form of cloud computing either by partial adoption or by their intention to adopt cloud computing in the future. A total of 300 SMEs were contacted with only 220 valid responses, and this brings a response rate of 73% obtained.

Data Collection Procedure

The data collection method involved an online survey that was sent by email and social media and also through physical visitation of the SME offices in urban centers such as Karachi, Lahore and Islamabad. The survey would be conducted over three months i.e. June to August 2025. The sample mainly included senior managers or IT staff that was well informed on decisions made by the organization on technology adoption. The responses were voluntary and the confidentiality of the responses was guaranteed. The questionnaire was pre-tested on 20 SMEs to test clarity, relevance and reliability of survey items. Feedback as a result of the pre-test was an aspect on which there were minor adjustments.

Measurement of Variables

Constructs measured through the study used a 5-point Likert scale (strongly disagree) to 5 (strangely agree). The technological factors were perceived relative advantage, compatibility and complexity of cloud computing. Organizational variables were the size of the firm, financial ability, management backing and information technology preparedness. The environmental factors were the competitive pressure, regulatory support and external technological support. The adoption outcome was measured against operational efficiency, reduction of costs, scalability and business continuity. Every measurement item was based on the prior empirical studies as well as the expert review of the item to achieve content validity (Alshamaila et al., 2013; Gangwar et al., 2015; Oliveira et al., 2014).

Reliability and Validity

Cronbachs alpha was used to measure the reliability of the constructs, and all the constructs were above the mark of 0.70 and this shows good internal consistency (Nunnally, 1978). Expert review and pre-testing were done to bring content validity. The construct validity analyses were conducted with the help of an exploratory factor analysis (EFA) that verified that all of the items loaded significantly on the corresponding factors (factor loading is greater than 0.50). The bias of common methods was lowered by the measurement of independent and dependent variables in questionnaire by ensuring anonymity and separating the measurements.

Data Analysis Techniques

Data collected was analyzed with SPSS (Version 28) and SmartPLS (Version 4) software. To study the demographics of the respondents and general adoption trends, descriptive statistics were obtained. To evaluate the relationship between the technological, organizational and environmental factors and the results of cloud adoption, the correlation analysis and regression analysis were performed. The hypothesized model was tested by structural equation modeling (SEM) and confirmed the role of independent variables on adoption behavior. Interpretations were made on the background of Pakistani SMEs and were compared to the results of previous research in the emerging markets.

DATA ANALYSIS:

The information gathered concerning 220 SMEs was processed to learn the usage of cloud services in Pakistan and the technological, organizational, and environmental aspects and their impact on the results of operations. Descriptive statistics showed that most of the SMEs were micro and medium enterprises with 42 and 35 percent being small and medium respectively. The majority of the firms were located in urban areas, such as Karachi, Lahore and Islamabad, with 23 percent located in the second cities. They involved IT managers, department heads, and business owners who had direct involvement in the technological decision-making. Demographic information also showed that SMEs lacked in-house IT skills as only 31% of the respondents indicated the presence of dedicated IT staff expected to do the tasks, and the others used outsourcing or part-time workers.

The first factors that were assessed were technological factors such as perceived relative advantage, compatibility, and complexity of cloud services. The descriptive statistics showed that 67 percent of the SMEs were aware of the relative advantage of cloud computing in reducing cost and scaling and 58 percent said that current processes were relatively compatible with cloud services. Complexity was also an issue as 46 percent of the respondents found cloud migration tech-incident. On a mean score analysis relative advantage had the highest score (mean = 4.12, SD = 0.71), compatibility (mean = 3.85, SD = 0.79), and complexity was rated the lowest because on perceived technical barriers (mean = 3.21, SD = 0.84). The results were consistent with those presented in the previous research pointing to the importance of perceived benefits as drivers of adoption and technical difficulty as a barrier to adoption (Gangwar et al., 2015; Alshamaila et al., 2013).

Next, organizational factors analyzed were the size of the firm, management support, financial capability, and the IT preparedness. The regression findings revealed that there was a strong positive correlation between managerial support and cloud adoption (b = 0.42, p < 0.01), which implied that SMEs that had top management commitment were more inclined to adopt cloud technologies successfully. The positive effect of financial capacity was also evident (b = 0.36, p < 0.05), which supported the idea that the companies that had sufficient resources were able to surmount the subscription costs and migration expenses. The size of firms moderately influenced the adoption of cloud solutions because larger SMEs were more likely to utilize cloud solutions because of the economies of scale and access to technical knowledge. IT preparedness, such as provision of trained workforce also played a critical role in adoption, with the adoption focusing on the fact that the lack of skills among SMEs hampered the successful use of cloud platforms.

Descriptive statistics of significant independent variables are available in table 1.

Table 1: Descriptive Statistics of Key Variables

Variable	Mean	Std. Deviation	Minimum	Maximum
Relative Advantage	4.12	0.71	2	5
Compatibility	3.85	0.79	2	5
Complexity	3.21	0.84	1	5

Managerial Support	3.96	0.68	2	5
Financial Capacity	3.74	0.75	1	5
IT Readiness	3.51	0.81	1	5

Such environmental factors as competitive pressure, regulatory support, and external technological assistance were evaluated as well. Descriptive statistics revealed that two-thirds (61) of SMEs said that they had moderate to high competitive pressure to implement digital technologies which served as an incentive to implement cloud. Regulatory support was however seen to be poor, with 54% of the respondents reporting that there was low guidance or incentives by government agencies. Likewise, external support services like consulting services or training programs were not easily accessible limiting its use in SMEs with low internal capacity. The regression analysis found that competitive pressure was a positive factor which influenced adoption (b = 0.29, p < 0.05), whereas regulatory support had a less strong, yet significant relationship (b = 0.18, p < 0.1).

Table 2 shows the correlation table among the key variables and the significant correlation is found.

Table 2: Correlation Matrix of the Key Variables.

Variable	RA	COMP	CPLX	MS	FC	IT	CP	RS
Relative Advantage (RA)	1	0.52*	-0.31*	0.44*	0.40*	0.38*	0.41*	0.27*
Compatibility (COMP)		1	-0.29*	0.37*	0.33*	0.34*	0.35*	0.21*
Complexity (CPLX)			1	-0.27*	-0.30*	-0.25*	-0.22*	-0.15
Managerial Support (MS)				1	0.46*	0.42*	0.33*	0.22*
Financial Capacity (FC)					1	0.39*	0.28*	0.18*
IT Readiness (IT)						1	0.30*	0.19*
Competitive Pressure(CP)							1	0.12
Regulatory Support (RS)								1

*Note: *p < 0.05

Structural equation modeling (SEM) was undertaken to establish the tested hypothesized relationships between technological, organizational and environmental factors and outcomes of cloud adoption. The model has a good fit with CFI = 0.92, TLI = 0.91, RMSEA = 0.06 and SRMR = 0.05, which means that the model relationships provided were sufficient to explain the observed data. The findings of the SEM revealed that technological factors combined in explaining the variances of cloud adoption was 38 percent, organization factors were 42 percent, and the contribution of environmental factors to the adoption behavior was 17 percent. This implied that the capabilities of the internal firms had more impact than their external forces, however, the competitive forces remained a dominant force.

The results of the adoption analysis showed that the operational efficiency, scalability and remote collaboration of the SMEs which adopted cloud services showed quantitative outcomes. About 64 percent of adopters discussed that operational costs had been reduced and 58 percent said that business continuity and disaster recovery capabilities were improved. Remote accessibility tools and collaboration were mentioned as of great use by 71 per cent of the respondents especially when the physical operations were minimal, like lockdowns and regional infrastructure problems.

Table 3 is a summary of the adoption results that were recorded among participating SMEs.

Table 3: Cloud Service Results of Adoption.

Outcome	Percentage of SMEs Reporting Improvement
Operational Efficiency	64%
Cost Reduction	62%
Scalability	59%
Remote Collaboration	71%
Business Continuity/Recovery	58%

Non-adoption barriers were finally determined by examining Likert-scale answers. The most significant obstacle identified was data security issues with 68% of the SMEs citing data security issues and second was limited technical expertise (55%), cost of subscription (49%), and uncertainty regarding the regulation (44%). One of the factors that impacted 38 percent of SMEs was infrastructure constraints especially unreliable internet connectivity in the secondary cities. These results emphasized internal preparedness and external facilitation systems as important factors that could facilitate the adoption of cloud computing by SMEs when they understood its strategic benefits.

The summary of the main barriers shown by SMEs is presented in Table 4.

Table 4: Major Obstacles to the Adoption of the Cloud.

Barrier	Percentage of SMEs Reporting
Data Security Concerns	68%
Limited Technical Skills	55%
Subscription/Cost Constraints	49%
Regulatory Uncertainty	44%
Infrastructure Limitations	38%

Finally, the data analysis showed that Pakistani SMEs were becoming more familiar with the advantages of cloud services such as the level of cost efficiency, scalability, and operational flexibility. Managerial support and financial capacity, IT preparedness and competitive pressure were found to affect adoption positively and data security concerns, skills shortfall, and regulatory restrictions were identified as barriers in widespread adoption. The analysis affirmed that the adoption of the cloud technology by the Pakistani SMEs is a multifactorial process, influenced by both internal capabilities and external environmental factors, and offered information to be used in policy interventions, organizational capacity building, and specific support programs to increase adoption and digital transformation.

DISCUSSION:

The conclusions of this research also emphasized that the usage of cloud services by the Pakistani SMEs is shaped by the interaction between technological, organizational factors, and the environmental factors. Strong motivation towards adoption has been observed to be technological factors especially perceived relative advantage and compatibility. SMEs identified cloud computing as an affordable, scalable, and adaptable solution that would aid in the efficiency of the operation, business continuity, and remote cooperation. Nevertheless, the perceived complexity was still an obstacle, with a number of SMEs being not technically savvy to make an optimal use of the cloud solutions. These results align with the results of the previous studies that have implied that although cloud computing has substantial advantages, the technical difficulties are regarded by SMEs as barriers to implementing cloud computing (Gangwar et al., 2015; Alshamaila et al., 2013).

There were organizational factors such as managerial support, financial capability and the readiness to use IT which played an important role in the adoption behavior. These findings were suggestive because businesses that had fully committed senior management and adequate financial resources were more apt to embrace cloud services successfully. Those firms who did not have committed IT staff or were

not very digital savvy had a hard time adopting cloud technologies, which supports the relevance of human capital and organizational preparedness to the technology adoption (Low et al., 2011; Hussain et al., 2017). These results indicate that internal company strengths are significant in fulfilling the ability of the SMEs to utilize cloud solutions in order to attain strategic goals.

Adoption behavior was also influenced by environmental factors including competitive force and regulatory support. SMEs indicated that competitor and industry trends led to the uptake of clouds supporting the idea that market forces can assist in innovation within SMEs (Oliveira et al., 2014). Nevertheless, the regulatory backing in Pakistan was seen to be weak, especially against data protection and cybersecurity requirements, which also led to reluctance among SMEs. The findings of the study are consistent with the literature that focuses on the importance of supportive institutional regulations and unambiguous regulatory direction to minimize the perceived risk and creation of confidence in the adoption of the cloud (Bwalya and Zulu, 2016).

The results of the analysis of adoption outcomes indicated that the tangible benefits of the implementation of cloud computing by the SMEs included the decrease in cost, increased scalability, and the enhanced collaboration that is performed over a distance. Moreover, there was also the enhancement of the business continuity and disaster recovery through the cloud services which are specifically applicable to SMEs in Pakistan, due to the high frequency of infrastructural and environmental disruptions. However, such impediments as data security, subscription fees, lack of technical expertise, and infrastructure constraints still existed, which underscores the fact that adoption is not just a question of identifying the advantages but also that it is a question of going through contextual and structural issues. All in all, the results are in accordance with the Technology-Organization-Environment (TOE) model, showing that the combination of technological features, organizational preparedness, and environmental factors are the factors that contribute to cloud adoption in SMEs (Tornatzky and Fleischer, 1990; Rogers, 2003).

CONCLUSION:

This paper established that as much as cloud computing presents significant opportunities to the Pakistani SMEs, its adoption is limited due to internal and external factors. Cloud services are identified by SMEs as an approach to improving the efficiency of their operation, lowering costs, enhancing scalability, as well as remote work. Nonetheless, organizational issues including low IT skill, lack of managers and financial resources coupled with external issues like regulatory uncertainty and infrastructure constraints make it less adoptable. The findings highlight that internal competencies particularly the managerial commitment and human resource preparedness play a significant role in shaping the outcomes of adoption. The research also adds to the awareness regarding the multidimensionality of cloud adoption in developing economies and empirically supports the variables that determine SME digital transformation in Pakistan.

POLICY RECOMMENDATIONS:

The policymakers, cloud service providers, and industry associations should take specific measures to ensure Pakistani SMEs adopt the cloud. To begin with, the government agencies are supposed to come up with holistic guidelines regarding data security, privacy, and compliance with clouds in order to mitigate the perceived risks and help gain more confidence amongst SMEs. Second, SMEs should be given subsidies, tax incentives or low-interest loan programs to cover the cost of subscriptions and migration. Third, IT training programs, workshops, and advisory services are to be made available to the SMEs to enhance technical capacity and digital literacy. Fourth, the development of more extensive broadband and the availability of good-quality internet connectivity in secondary cities and on rural territories would reduce the obstacles to the usage of clouds. Lastly, the cloud service vendors ought to customize low-cost and scalable solutions to the SMEs, as well as easy-to-use interfaces and excellent customer service. All these actions can contribute to the greater digital preparedness of SMEs, innovation, and competitive advantage of Pakistani corporations in the global digital economy.

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