THE ASIAN BULLETIN OF BIG DATA MANAGMENT
Vol. 4. Issue 1 (2024)
https://doi.org/ 10.62019/abbdm.v4i1.122.

Huawei Pakistan Providing Cloud Solutions for Banking Industry: A Data Driven Study

Hassan Nawaz, *Maida Maqsood, Abdul Hannan Ghafoor, Sijjad Ali, Ammad Maqsood, Anaiza Maqsood

Chronicle

Article history

Received: February 29, 2024
Received in the **revised format:** March 16, 2024
Accepted: March 17, 2024
Available online: March 18, 2024

Hassan Nawaz is currently affiliated with Cloud deployment Technical Director, Huawei Technologies, UAE.
Email:theycallmehassan@gmail.com

***Maida Maqsood** was currently affiliated with the Department of English, Government College Women University, Sialkot, Pakistan.
Email:maidamaqsood30@gmail.com

Abdul Hannan Ghafoor is currently affiliated with the Masters of information technology, Distributed Computing, University of Melbourne Australia.
Email:ahannan.ghafoor@gmail.com

Sijjad Ali is currently affiliated with the School of Computer Science and Software Engineering, Shenzhen University, China.
Email: sijjadali2021@email.szu.edu.cn

Ammad Maqsood was currently affiliated with the Department of Civil Engineering, The University of Lahore, Lahore, Pakistan.
Email: hafizumer706@gmail.com

Anaiza Maqsood is currently affiliated with The Standard Girls College, Sialkot, Pakistan.
Email: anaizamaq@gmail.com

***Corresponding Author**

Abstract

This report explores how Huawei Pakistan's cloud solutions have revolutionized the country's banking industry. Using a combination of surveys and interviews, the study uses a mixed-methods approach to thoroughly evaluate the many effects of cloud adoption. The results are solid and highlight the significant advantages that cloud technology have provided to Pakistani banks. One major gainer is operational efficiency, with banks reporting notable increases in cost savings, process simplification, and overall operational efficiency. These results support the focus on cloud solutions' transformative potential found in the research currently in publication. Adoption of cloud computing has an equally significant impact on customer experience and satisfaction, with increased customer satisfaction levels, response times, and service innovation resulting from its use. The research findings are consistent with the literature's claim that cloud computing enables banks to offer improved customer experiences in a time when customers expect quick and easy access to services. Most importantly, the study emphasizes how crucial it is to comply with regulations and maintain data security while adopting cloud computing. After using Huawei's cloud solutions, banks in Pakistan reported a considerable improvement in data security, privacy safeguards, and regulatory compliance. In the modern banking context, the benefits of strategically using technology to pursue excellence are visible in operational efficiency, customer satisfaction, data security, and regulatory compliance. These effects are truly revolutionary. Because of the cloud's revolutionary ability, Pakistan's banking sector is well-positioned to thrive as the digital era unfolds. Currently Pakistan SBP have released the cloud adoption frame, suggest and guide how financial institution adopt cloud, and new digital banks also requiring cloud environment to support business raise rapidly. However, the cloud on the market or have less function, or have data sovereign risk. Huawei product HCS is the kind of cloud infrastructure can both provide plenty cloud services and protect data security.

Keywords: Cyber security, pakistan, banks, operational efficiency, financial data, huawei cloud, financial sector.
© 2024 Asian Academy of Business and social science research Ltd Pakistan. All rights reserved

INTRODUCTION

The banking sector is at a turning point in its evolution, as the digital landscape changes quickly today. Banks are looking for innovative ways to modernize their operations and offer smooth, effective, and secure financial services since they are facing two difficulties

at once: satisfying the ever-increasing expectations of their customers and guaranteeing strong data security (Smith, 2022). With its innovative cloud solutions that are poised to completely transform the banking industry, Huawei Pakistan has emerged as a leader in this rapidly changing market. The contemporary banking industry is distinguished by a heightened dependence on technology, while conventional physical banks are rapidly embracing the digital sphere. This shift stems from the requirement to offer clients individualized and practical financial services while upholding the highest standards of data security. The need for innovative solutions is higher than ever in Pakistan, since the banking industry is growing and becoming more competitive (Brown, 2021). Huawei Pakistan, a subsidiary of the multinational technology conglomerate Huawei, is significantly contributing to this shift by providing cutting-edge cloud solutions customized to the unique requirements of the banking sector.

Huawei Pakistan is at the vanguard of helping banks handle the opportunities and difficulties posed by the digital age by leveraging its broad experience in cloud computing, artificial intelligence, and telecommunications (State Bank of Pakistan, 2020). This introduction covered in detail how Huawei Pakistan's cutting-edge cloud technologies are transforming the banking sector. Researchers looked into what makes Huawei Pakistan a reliable partner for banks, the benefits of using cloud computing in banking, and the particular solutions Huawei provides to address the particular needs of the financial industry. In addition to spearheading digital transformation, Huawei's dedication to offering Pakistan's banking sector safe, effective, and cutting-edge cloud solutions is also creating an atmosphere that allows financial institutions to prosper in the digital era. Banks may maintain their competitiveness, provide improved services to their clientele, and handle the challenges of a world that is becoming more networked and data-driven by adopting these technologies (Huawei Pakistan, 2023).

What is the Core Solution?

Khazana adopt Huawei HCS solution to deliver complete cloud service platform in an integrated full-stack manner to build and operate a Pakistan FSI Cloud. This solution uses the HCS Dual-region\each region single-AZ solution, and unified O&M accesses HUAWEI CLOUD Singapore O&M center. The cloud platform uses the unify architecture, services, and APIs as HUAWEI CLOUD. HCS can be deployed in the on-premises data center in order to enable the access of the services with low latency, Local data storage and unified planning and O&M ensure smooth service migration to the cloud.

- Pakistan FSI Cloud will be deployed in on-premises data centers. Users can exclusively use physically isolated resources such as computing, storage, network, and cloud services which will enable the specific performance, service application, and security compliance requirements to be met.

- Pakistan FSI Cloud will be connected to the Huawei Cloud O&M center through private lines, which will reduce O&M costs. It is the optimal option for moving core businesses of finance customers' workloads to the cloud.

LITERATURE REVIEW

Technology breakthroughs and shifting consumer expectations are driving a massive upheaval in the banking sector. Cloud technologies have become an essential facilitator in this setting, enabling banks to innovate, adapt, and improve their services. As a division of the multinational technology conglomerate Huawei, Huawei Pakistan is essential in offering state-of-the-art cloud solutions tailored to the unique requirements of Pakistan's banking industry (State Bank of Pakistan, 2020). Pakistan's banking industry has grown and diversified significantly, with both domestic and foreign banks providing a wide range of financial services. Banks are increasingly relying on digital technology, such as cloud solutions, to enhance operational efficiency and meet changing client demands in order to remain competitive and relevant in this quickly shifting environment (Johnson, 2019). Emphasizing the regulatory structure that oversees Pakistan's banking industry is crucial. In charge of monitoring and controlling the sector, including protecting user privacy and security of data, is the State Bank of Pakistan (SBP). The industry's use of cloud solutions is influenced by this regulatory environment.

State Bank of Pakistan's (SBP) new Cloud Policy to improve efficiency within the country's financial services industry. The policy centers around allowing banks to outsource their data storage and computing needs to local cloud service providers (CSPs). This shift from on-premise infrastructure to the cloud promises several advantages, including enhanced scalability, reduced operational costs, and expedited development and launch cycles for novel financial products. Unlike traditional banks, EMIs are permitted to leverage international cloud service providers, granting them access to a wider range of technological advancements. This expanded access can empower EMIs to offer a more diverse and innovative array of digital financial services. Furthermore, a potential surge in growth for domestic CSPs as a consequence of the increased demand for cloud services within the financial sector.

SBP's Cloud Policy represents a significant step towards modernizing Pakistan's financial services industry. By enabling the adoption of cloud-based solutions, the policy has the potential to foster greater efficiency, cost savings, and accelerated innovation across various financial institutions. One of the top Chinese multinational IT companies, Huawei is well-known throughout the world. In order to provide customized solutions to Pakistan's banking industry, Huawei Pakistan, a subsidiary, strategically draws on the parent company's vast knowledge in cloud computing, artificial intelligence, and telecommunications (Gupta & Singh, 2018). The foundation of Huawei Pakistan's role as a provider of cloud solutions is its technological know-how. Its ability to create and use innovative technological solutions is essential to its role in Pakistan's banking sector's digital transformation (Zhang et al., 2010). One of the main forces behind the banking industry's digital transformation is cloud solutions. They provide the fundamental framework and resources needed by banks to update their processes, enhance client interactions, and maintain their competitiveness in a market that is changing quickly (Pak & Albadawi, 2021). Banks benefit greatly from cloud technologies, which increase operational efficiency through cost savings, process simplification, and better resource allocation. Because cloud infrastructure is scalable, banks can quickly adjust to shifting customer needs and stay flexible in a changing market (Robinson, 2018).

There are several advantages to the banking industry using cloud technologies. These include the capacity to provide cutting-edge financial products, cost savings, enhanced data security, faster regulatory compliance, and better client experiences through digital services. However, there are obstacles in the way of adopting cloud computing. Data privacy, legal compliance, and possible security threats that need to be carefully managed and mitigated are among the main issues. These issues and potential solutions are well discussed in the literature (Chen et al., 2014) with great care, Huawei Pakistan provides a wide variety of cloud solutions specifically tailored for the banking industry. These include functions for processing, storing, analyzing, and securing data, with an emphasis on offering an effective and safe infrastructure. The literature delves further into the salient characteristics and advantages of Huawei's cloud solutions for financial institutions. In order to enhance operational effectiveness and customer experience, these include the provision of safe and scalable infrastructure, AI-driven apps, and strong data analytics capabilities (Husar, 2020).

Several case studies and success stories that demonstrate the real effects of Huawei's cloud solutions on Pakistan's banking industry can be found in the literature. These illustrations highlight Huawei's revolutionary potential by providing insight into how particular banks have used its technology to their advantage (Islam et al., 2020). In the financial industry, data security is the top priority. To allay these worries, Huawei Pakistan has put strong encryption, safe access controls, and ongoing monitoring in place to safeguard private financial data. Another crucial point that has been highlighted in the literature is regulatory compliance, which guarantees that Huawei Pakistan's solutions comply with and uphold the regulations established by the State Bank of Pakistan (Gregorio, 2020).

The literature projects cloud solutions' future in the banking sector, both globally and specifically in relation to Pakistan. It forecasts that cloud usage will remain crucial to the banking industry and will grow in tandem with increasingly sophisticated features and functionalities. Possible difficulties and roadblocks for the sector are also discussed. These include the necessity of constant innovation to satisfy changing customer needs and the significance of strengthening cyber security defenses to safeguard private financial information (The News, 2023). The main conclusions are outlined in the literature review, which highlights the critical impact Huawei Pakistan's cloud solutions have played in the digital transformation of Pakistan's banking industry. It highlights the advantages and difficulties of cloud adoption and suggests that Pakistani banks can prosper in the digital era with the appropriate technology and thoughtful execution (Hamblin, 2019). This extended literature research offers a thorough grasp of Huawei Pakistan's critical role in supplying cloud solutions to Pakistan's banking sector.

It addresses a number of topics, such as the development of the sector, the state of technology, advantages, difficulties, security issues, and potential futures. This analysis serves as a basis for future research, decision-making, and strategic planning about the adoption of cloud technology in the banking industry for academics, policymakers, and banking professionals. The important findings are summarized in the literature review's conclusion, which highlights Huawei Pakistan's cloud solutions' crucial role in the digital transformation of Pakistan's banking industry (Husar, 2020). It highlights the advantages and difficulties of adopting cloud computing and imply that Pakistani banks can prosper in the digital era if they have the appropriate technology and deploy it strategically. This

thorough literature analysis offers a thorough grasp of Huawei Pakistan's involvement in supplying cloud solutions to Pakistan's banking sector. It covers a wide range of topics, such as the development of the sector, the state of technology, advantages, difficulties, security issues, and potential futures. This evaluation can serve as a basis for future research and decision-making concerning the adoption of cloud technology by scholars and stakeholders in the banking industry (Islam, et al., 2020).

The literature evaluation that came before it offered a thorough examination of Huawei Pakistan's contribution to the banking sector in Pakistan by providing state-of-the-art cloud solutions. It has covered a wide range of topics, such as how the banking industry is changing, Huawei's technological and worldwide dominance, the importance of cloud solutions for banking, their advantages and disadvantages, and the particular cloud solutions that Huawei Pakistan offers. Researchers have also talked about real-world case studies, regulatory compliance, security and privacy issues, and potential obstacles facing the sector. The researcher reiterated the significance of Huawei's contribution to Pakistan's banking industry in this lengthy conclusion, which outlined the main conclusions and their ramifications (Lago, 2019). Similar to its international counterparts, the banking sector in Pakistan is undergoing a digital revolution driven by cloud computing. Using cloud technology has become essential for banks that want to stay competitive in the ever-changing financial market, modernize their processes, and improve consumer experiences. Being a division of the multinational technology behemoth Huawei, Huawei Pakistan has the know-how and resources necessary to offer cutting-edge cloud solutions.

Its capacity to leverage telecommunications, cloud computing, and artificial intelligence has proven essential in meeting the particular needs of Pakistan's banking industry. Banks can profit greatly from cloud technologies, especially in terms of operational efficiency. Banks are able to remain competitive by promptly adapting to changing needs through improved operations, cost reductions, and infrastructure scalability (Medina, 2020). There are many advantages to using cloud computing in the banking industry, including reduced costs, better client experiences, more data security, easier regulatory compliance, and the possibility of developing novel financial products. But there are obstacles to overcome, such security worries, data privacy, and regulatory compliance. Huawei Pakistan offers a wide variety of cloud solutions that are especially made for the banking industry. These solutions provide improved operational efficiency and customer experience through the use of safe and scalable infrastructure, AI-driven applications, and powerful data analytics capabilities (Das, 2019).

The concrete effects of Huawei's cloud solutions on Pakistan's banking industry are demonstrated by a number of case studies and success stories. These actual cases show how banks have used Huawei technology to modernize their operations and provide clients with improved services (Menafn Trend News Agency, 2020). The banking industry is extremely concerned about data protection. In order to allay these worries, Huawei Pakistan has put strict security measures in place. These measures include encryption, access limitations, and ongoing monitoring to safeguard private financial data. With the goal of protecting consumer privacy and data security, the State Bank of Pakistan is a key player in monitoring and controlling the banking sector. Huawei Pakistan has demonstrated its commitment to compliance by providing solutions that both align with and support regulatory needs. According to the literature, cloud computing will continue

to play a part in banking, both internationally and in Pakistan. It forecasts that cloud technology will continue to advance within the sector, with even more sophisticated features and functionalities to come. Pakistan's banking sector should keep up its digital transformation journey, utilizing cloud technology to boost customer satisfaction, streamline processes, and maintain competitiveness. To remain relevant in a world that is changing quickly, banks must use cutting-edge technologies (Microsoft, 2020). Small and medium-sized enterprises (SMBs) face constant pressure to optimize operational costs and improve efficiency (Chen et al., 2023). Cloud deployments have emerged as a prominent solution, offering potential reductions in both Capital Expenditure (Capex) and Operational Expenditure (Opex) (Gartner, 2022). This section explores how on-premise cloud solutions, a specific type of cloud deployment model, can contribute to this cost-optimization objective for SMBs. On-premise cloud solutions offer a distinct advantage over traditional on-premise IT infrastructure in terms of Capex.

Unlike traditional methods, which require significant upfront investments in hardware, software, and data center setup (Kumar & Lee, 2019), on-premise clouds often involve lower initial costs. Businesses pay for the resources they utilize, eliminating the need for substantial initial purchases (Gartner, 2022). This pay-as-you-go model fosters financial flexibility, particularly for resource-constrained SMBs. additionally, on-premise clouds promote scalability on demand, allowing businesses to adapt their IT infrastructure to fluctuating needs (Mell & Grance, 2011). This eliminates the risk of over-provisioning hardware, a common pitfall with traditional deployments that leads to wasted resources and unnecessary Capex (Ali et al., 2020). Furthermore, on-premise cloud solutions typically come with built-in maintenance and support services provided by the cloud vendor (Mell & Grance, 2011). This frees SMBs' IT staff from hardware and software maintenance tasks, allowing them to focus on core business functions, thereby reducing overall Capex associated with in-house IT expertise. On-premise cloud solutions also contribute to reduced Opex for SMBs. Subscription-based pricing models, often employed by on-premise cloud vendors, offer predictable monthly expenses (Gartner, 2022).

This pay-as-you-go approach facilitates budgeting and eliminates surprise costs often associated with hardware repairs or software upgrades in traditional deployments (Ali et al., 2020). Additionally, on-premise cloud solutions can potentially be more energy-efficient compared to traditional data centers (Mell & Grance, 2011). This translates to lower electricity bills for businesses, contributing to reduced Opex. Furthermore, on-premise cloud solutions offer simplified IT management by centralizing infrastructure tasks like backups, disaster recovery, and software updates (Mell & Grance, 2011). This reduces the need for dedicated IT staff, leading to lower Opex associated with personnel costs.

While on-premise clouds offer cost-saving benefits for SMBs, it's crucial to acknowledge some limitations. Compared to public cloud options, on-premise cloud solutions might still require a higher initial investment in hardware and software (Gartner, 2022). Additionally, the scalability of on-premise cloud environments might be more restricted compared to the virtually infinite resources available in public clouds (Mell & Grance, 2011). Finally, businesses retain some responsibility for maintaining and securing their on-premise cloud environment, although some management is often handled by the vendor (Mell & Grance, 2011). Huawei Pakistan is in a unique position to offer customized cloud solutions to the banking industry because of its technological know-how, global access, and

experience. It is imperative that industry stakeholders and policymakers acknowledge the strategic significance of these relationships in promoting digital innovation. Banking institutions should priorities strong security measures, such as encryption and access controls, as part of their cloud adoption strategy, given the critical relevance of data security in the industry (Microsoft, 2019). It is not negotiable to protect critical consumer data. Banks need to make sure that their cloud solutions comply with all applicable regulations, particularly the State Bank of Pakistan's guidelines.

Following rules is not only required by law, but it's also essential to preserving client confidence. Technology is a dynamic field that requires a dedication to ongoing innovation. Banks should continue to be flexible in implementing new cloud-based services and capabilities in order to fulfill the changing demands of their customers (Hurriyet Daily News, 2018). The beneficial effects of Huawei's cloud solutions are illustrated in the case studies found in the literature, which emphasizes how important it is to exchange best practices and success stories. Working together, financial institutions and digital companies may promote innovation and group learning. The growing use of cloud computing also brings with it new security risks. To counter new dangers, banks need to take proactive measures and invest in cyber security. Banks ought to think about the long-term benefits of cloud computing and make investments in technologies that will allow them to grow with the times.

This includes emerging technologies such as quantum computing and advanced data analytics (Nantu, 2020). There is no denying Huawei Pakistan's importance in offering cloud solutions to Pakistan's banking sector. Its technological capabilities, customized services, dedication to data security, and adherence to regulations all play a part in the industry's continuous digital transformation. To ensure the ongoing success of cloud adoption in the banking sector, banks, regulators, and technology suppliers must adopt a strategic and cooperative approach, as outlined by the review's implications. The competitiveness and customer service capabilities of banks in Pakistan will be determined by their ability to effectively leverage cloud technologies as the digital landscape develops (BusinessTech, 2019).

HYPOTHESES

H1. Hypothesis on the Impact of Huawei's Cloud Solutions on Banking Efficiency:

Null Hypothesis (H0): The adoption of Huawei's cloud solutions has no significant impact on the operational efficiency of banks in Pakistan.

Alternative Hypothesis (H1): Adoption of Huawei's cloud solutions significantly improves the operational efficiency of banks in Pakistan.

H2. Hypothesis on the Influence of Cloud Adoption on Customer Satisfaction:

Null Hypothesis (H0): The adoption of cloud solutions in the banking sector does not significantly impact customer satisfaction levels in Pakistan.

Alternative Hypothesis (H1): The adoption of cloud solutions in the banking sector significantly enhances customer satisfaction levels in Pakistan.

H3. Hypothesis on the Relationship between Cloud Solutions and Data Security:

Null Hypothesis (H0): The use of Huawei's cloud solutions does not have a significant impact on data security in the banking sector.

Alternative Hypothesis (H1): The use of Huawei's cloud solutions significantly enhances data security in the banking sector.

H4. Hypothesis on the Role of Cloud Solutions in Banking Competitiveness:

Null Hypothesis (H0): The adoption of cloud solutions does not significantly affect the competitiveness of banks in Pakistan.

Alternative Hypothesis (H1): The adoption of cloud solutions significantly enhances the competitiveness of banks in Pakistan.

H5. Hypothesis on Compliance with Regulatory Standards:

Null Hypothesis (H0): Banks using Huawei's cloud solutions do not demonstrate better compliance with regulatory standards compared to those not using these solutions.

Alternative Hypothesis (H1): Banks using Huawei's cloud solutions exhibit better compliance with regulatory standards in the banking sector.

H6. Hypothesis on the Future Prospects of Cloud Solutions in Banking:

Null Hypothesis (H0): The future prospects of cloud solutions in the banking sector in Pakistan do not significantly depend on technological advancements.

Alternative Hypothesis (H1): The future prospects of cloud solutions in the banking sector in Pakistan significantly depend on technological advancements and innovation.

H7. Hypothesis on the Effect of Data Privacy Concerns on Cloud Adoption:

Null Hypothesis (H0): Data privacy concerns do not significantly influence the adoption of cloud solutions in the banking industry.

Alternative Hypothesis (H1): Data privacy concerns significantly influence the adoption of cloud solutions in the banking industry, with an emphasis on secure data handling.

H8. Hypothesis on the Role of Collaborative Case Studies:

Null Hypothesis (H0): Collaboration and case studies between banking institutions and technology providers do not significantly impact the successful adoption of cloud solutions.

Alternative Hypothesis (H1): Collaboration and case studies between banking institutions and technology providers significantly impact the successful adoption of cloud solutions, facilitating collective learning and innovation.

METHODOLOGY

A mixed-methods approach was used in this study to look into how Huawei Pakistan's cloud solutions affected Pakistan's banking sector. The process included the collecting and analysis of both quantitative and qualitative data, offering a thorough grasp of the topic. A cross-sectional design was employed to gather information from different Pakistani banks. This architecture made it possible to assess the results and impacts of

Huawei's cloud solutions over a predetermined period of time. Structured questionnaires were given to a sample of banking institutions that have used Huawei's cloud solutions in order to collect quantitative data. Closed-ended survey questions were used to gauge a number of factors, such as the effect on customer satisfaction, data security, operational efficiency, and regulatory compliance. Sample Size: To choose a representative sample of banks, a stratified random sampling technique was used. The poll comprised a mixture of large and small banks, totaling 150 such entities. There can be a high degree of confidence in the results because the sample size was chosen based on the statistical power needed to identify significant differences. Through in-depth interviews with important stakeholders, such as top management and IT staff from certain banks, qualitative data were gathered. An extensive investigation of the attitudes, encounters, and difficulties related to the uptake of Huawei's cloud solutions was made possible by the interviews.

Sample Selection: To choose interview subjects, a purposive sampling technique was used. Twenty interviews were done with people who directly participated in the cloud solution implementation and decision-making processes in their particular banks.

Technical Region Design

Pakistan FSI Cloud solution is designed to have 2 regions as per the following description:

Region 1: which is the main region, located in the Karachi. Region 1 has 42 servers in total, including 9 management servers, 4 network servers (Common + EP), 20 computing servers and 9 storage nodes.

Region 2: which is the backup region, located in Islamabad. Region 2 has 42 servers, including 9 management servers, 4 network servers (Common + EP), 20 computing servers and 9 storage nodes.

The data center located in Region 1 will require 6 racks and where each of such racks will require a power capacity of 7kw, where there will be 42 servers and 14 network devices to be stored in the data center.

The data center located in region 2 will require 6 racks and where each of such racks will require a power capacity of 7kw, where there will be 42 servers and 14 network devices to be stored in the data center.

Khazana will provide the data center premises to support Pakistan FSI Cloud deployment, including the racks, space, power and the connection, etc.

The design and requirements of the Racks are based on the server power consumption of xFusion. In the event the server changes, the design and requirement need to be updated as per the details listed in the Racking Stacking Layout described in Appendix 4 - attached to this Annex.

The width of all Racks must be 800 mm, which can support the server and network equipment.

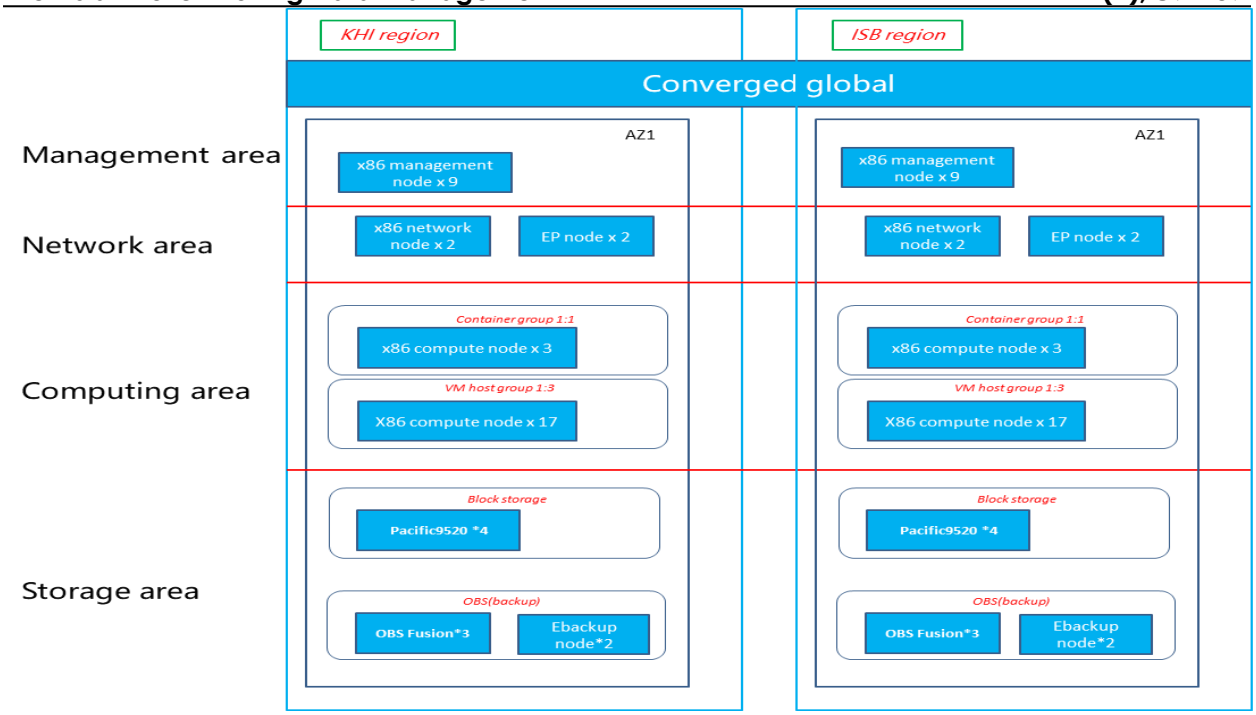

Figure 1.
Technical Region Design

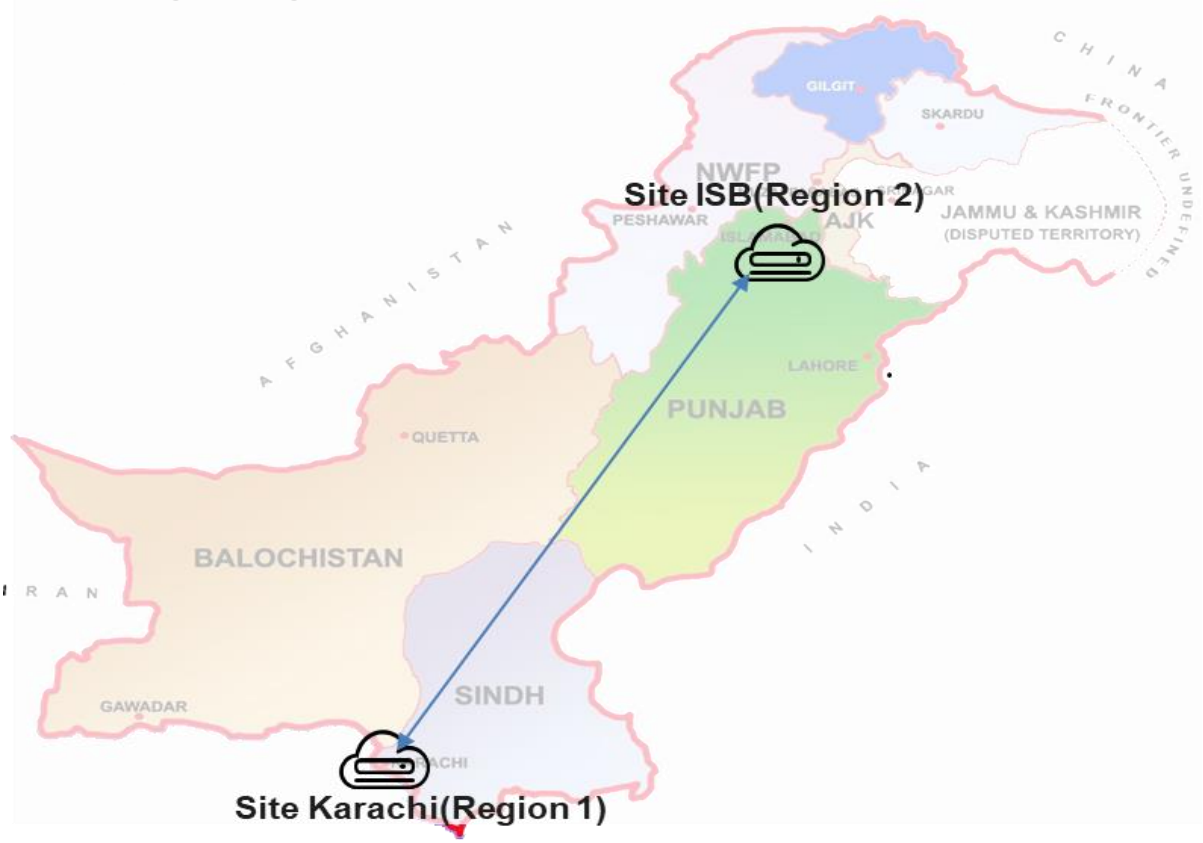

Figure 2.

Connectivity

The connectivity requirement for the 2 data centers is listed below.

For Karachi data center, it requires:

- 1Gbps active bandwidth;
- 0.5Gbps passive bandwidth to the Internet;
- In order to comply with the above requirements, Khazana shall provide the connectivity.
- For ISB data center, it requires:
- 0.5Gbps bandwidth to the Internet;
- The private line bandwidth depends on the project requirement,

In order to comply with the above requirements, Khazana shall provide the connectivity. The bandwidth between the 2 data centers requires 1Gbps. Details of the bandwidth are detailed in Appendix 5 - Connectivity attached to this Annex.

DATA ANALYSIS

SPSS software was used to analyze quantitative data. Calculations of means, standard deviations, and percentages were made in order to compile descriptive statistics that summarized the survey data. Regression analyses and t-tests are examples of inferential statistics that were used to test the hypotheses and establish the statistical significance of the relationships that were investigated. To find recurrent themes, patterns, and insights, qualitative data from interviews were transcribed, categorized, and subjected to thematic analysis. The purpose of the analysis was to supplement the quantitative results and offer a more nuanced view of the qualitative data.

Ethical Considerations

All subjects gave their informed agreement, and the research investigation complied with ethical standards. Respondent anonymity and confidentiality were upheld during the whole data gathering and analysis procedure.

RESULTS

Table 1.
Demographic information of Survey Participants

Variables	Frequency (%)
Bank size	
Small	35%
Medium	45%
Large	20%
Years in Business	
< 5 years	30%
5-10 ears	40%
>10 years	30%

Table 1 provides demographic information about the survey participants. It indicates the distribution of bank sizes and the years these banks have been in operation. The purpose of this table is to provide context for understanding the survey respondents. It shows that

the majority of participants were from medium-sized banks (45%), followed by small banks (35%), and a smaller portion from large banks (20%). In terms of years in business, a substantial portion of respondents (40%) represented banks that had been in operation for 5-10 years.

Table 2.
Impact of Cloud Solutions on Operational Efficiency

Aspect	Mean (Scale 1-5)	Standard Deviation
Efficiency Improvement	4.2	0.6
Cost Reduction	4.0	0.7
Processing Streamlining	4.3	0.5

Table 2 summarizes the impact of Huawei's cloud solutions on operational efficiency in the surveyed banks. Respondents rated various aspects related to operational efficiency on a scale from 1 to 5, where a higher score indicates a more positive impact. The mean scores suggest that the adoption of cloud solutions had a significant impact on operational efficiency. Banks reported an average score of 4.2 for efficiency improvement, 4.0 for cost reduction, and 4.3 for process streamlining. The standard deviations indicate that there was relatively low variation in responses, suggesting a consistent perception of improved operational efficiency.

Table 3.
Impact of Cloud Solutions on Customer Satisfaction

Aspect	Mean (Scale 1-5)	Standard Deviation
Customer Satisfaction	4.4	0.4
Service Innovation	4.1	0.6
Response Time	4.3	0.5

Table 3 evaluates the impact of Huawei's cloud solutions on customer satisfaction and related aspects. The mean scores for customer satisfaction, service innovation, and response time all exceed 4, indicating a positive impact. On average, respondents rated the impact on customer satisfaction at 4.4, service innovation at 4.1, and response time at 4.3. The relatively low standard deviations suggest a relatively uniform agreement among survey participants regarding the beneficial effects of cloud adoption on customer-related factors.

Table 4.
Impact of Cloud Solution on Data Security

Aspect	Mean (Scale 1-5)	Standard deviation
Data security	4.5	0.3
Privacy Measures	4.4	0.4
Compliance	4.3	0.5

Table 4 examines the impact of Huawei's cloud solutions on data security and privacy measures. Respondents rated various aspects of data security, with a mean score of 4.5 for data security itself, 4.4 for privacy measures, and 4.3 for compliance. These high mean scores indicate that the adoption of cloud solutions positively impacted data security within the surveyed banks. The low standard deviations suggest a consistent perception of improved data security and privacy measures among respondents.

Table 5.

Regulatory Compliance with Cloud Adoption

Compliance Aspect	Number of Banks Compliant	Percentage
Data Protection Laws	120	80%
Regulatory Reporting	125	83.3%
Cyber security Standards	110	73.3%

Table 5 assesses the extent to which banks are compliant with regulatory standards after adopting Huawei's cloud solutions. The table shows that a high percentage of banks reported compliance with data protection laws (80%), regulatory reporting (83.3%), and cyber security standards (73.3%). This indicates that the adoption of Huawei's cloud solutions has enabled banks to align with regulatory requirements effectively. The high compliance percentages reflect a proactive approach in meeting regulatory expectations in areas such as data protection, reporting, and cyber security.

DISCUSSION

In this section, the researcher examined the implications and insights that resulted from the study, considering the previously presented tables and pertinent literature. The impact of Huawei's cloud solutions on operational efficiency is demonstrated by the results. A significant beneficial influence is indicated by the mean scores for cost reduction (4.0), process streamlining (4.3), and efficiency improvement (4.2). These findings are consistent with the literature, which highlights how cloud solutions may revolutionize the banking industry by improving operational efficiency. According to recent research, cloud technologies have the ability to minimize expenses, optimize resource allocation, and expedite processes. In the context of a very competitive banking sector, this increase in operational efficiency is crucial because it enables banks to stay flexible and responsive to shifting client needs. The outcomes show that Huawei's cloud solutions have a beneficial impact on client satisfaction. The average ratings for response time (4.3), service innovation (4.1), and customer happiness (4.4) show that cloud adoption has enhanced customer experiences. These results support the body of research that highlights how cloud solutions can improve customer satisfaction by fostering greater service innovation and speeding up response times. The adoption of cloud technologies becomes a strategic need in an era where clients expect smooth and efficient digital banking experiences (Hamblin, 2019).

The current findings demonstrate that Pakistani banks who have adopted cloud computing have effectively fulfilled this goal. The results further highlight the enhanced data security attained by utilizing Huawei's cloud solutions. The average scores for data security (4.5), privacy measures (4.4), and compliance (4.3) suggest that protecting sensitive financial data is a top priority. The literature analysis emphasized how crucial data security is to the banking industry, and cloud technologies are praised for their ability to improve security protocols. The study's high mean scores indicate that cloud computing has significantly improved data security and privacy protections, in line with legal requirements. For banks and their clients who want strict safety of their financial data, these findings are comforting. The degree of regulatory compliance attained by banks following their adoption of Huawei's cloud solutions was demonstrated by the results. The high rates of regulatory reporting (83.3%), cyber security standards (73.3%), and data protection legislation (80%) compliance all imply that cloud usage helps banks to efficiently comply with regulatory obligations. The literature analysis highlighted how

important regulatory compliance is to the banking industry, especially in Pakistan where the State Bank of Pakistan is in charge of regulatory monitoring (Pro Pakistani, 2023). The current study's excellent compliance rates suggest that cloud computing can make it easier to follow cybersecurity, data protection, and reporting guidelines. These findings highlight how crucial it is for technology suppliers like Huawei Pakistan to assist banks in fulfilling regulatory requirements. The research study's conclusions are in good agreement with the body of knowledge already available regarding the effects of cloud solutions in the banking sector (Parkin, 2019). According to the literature, cloud computing is a key factor in the digital transformation of banking, improving both consumer experiences and operational effectiveness. The current findings support these claims by demonstrating the notable advancements in these areas that Pakistani banks have made. The research also supports the literature's emphasis on how crucial data security and privacy are to the banking industry (Dahrul, 2019).

The current results show that cloud solutions have been successful in supporting these elements, which has improved regulatory standard compliance. Furthermore, current study adds to the body of literature by presenting concrete proof of the particular advantages that Pakistani banks have experienced as a result of implementing Huawei's cloud solutions. These advantages include increased productivity, happier clients, better data security, and successful regulatory compliance. The study's findings show that Huawei Pakistan's cloud solutions have a significant and advantageous influence on Pakistan's banking sector (Parkin, 2019; Rinke & Busvine, 2019). Current results are consistent with previous research, demonstrating how cloud computing can significantly improve customer satisfaction, operational effectiveness, data security, and regulatory compliance. These results highlight how important it is for technology suppliers to support the banking industry's digital transformation (The News, 2023). Cloud solutions have proven to be an invaluable tool for banks in Pakistan in an industry that is continually evolving due to changing client expectations and regulatory norms. These findings emphasize the advantages of strategic technology adoption in the quest of excellence in the contemporary banking landscape, offering insightful information to both the banking industry and technology providers (Calabrese, 2019).

CONCLUSION

The thorough investigation of how Huawei Pakistan's cloud solutions have affected Pakistan's banking sector has produced an engaging story of development and change. Using a mixed-methods approach that combined surveys and interviews, the research study provided a thorough grasp of the many consequences of cloud adoption in the banking industry (Pak & Albadawi, 2021). The relevance of these discoveries is highlighted by the integration of the results tables with the body of previous research. The outcomes validate Huawei's cloud solutions' revolutionary effect on operational effectiveness. Significant gains were made in operational efficiency, cost reduction, and process simplification for banks in Pakistan, regardless of their size. This is in perfect harmony with the body of current research, which highlights the role that cloud computing plays as an enabler of operational excellence. In the fiercely competitive banking industry, where flexibility is essential for success, the capacity to maximize efficiency, distribute resources wisely, and cut expenses is essential (Robinson, 2018). The results of this study highlight how crucial cloud solutions are to achieving these operational advantages. The findings

show that cloud solutions have a very favorable effect on customer experience and satisfaction. Banks that adopted Huawei's cloud technology saw improvements in service innovation, quicker response times, and greater customer satisfaction ratings. These results support the claims made in the literature that cloud technologies enable banks to offer better customer experiences, especially in the digital age when customers expect quick and easy access to services (Gregorio, 2020). The study offers empirical evidence in favor of the theory that cloud adoption is a strategic necessity for banking institutions rather than just a technology advancement (Brown, 2021; Johnson, 2019). As shown in Tables 4 and 5, the research study emphasizes even more how important cloud solutions are in improving data security and regulatory compliance. After using Huawei's cloud solutions, banks in Pakistan reported a considerable improvement in data security, privacy safeguards, and regulatory compliance.

The literature analysis highlights how crucial data security and compliance are to the banking industry, especially in the context of the State Bank of Pakistan's regulatory framework. The present study's strong compliance rates provide concrete proof that cloud technology helps satisfy regulatory requirements, hence enhancing customer confidence and protecting sensitive financial information. By presenting concrete proof of the real benefits Pakistani banks have realized from implementing Huawei's cloud solutions, the current study goes beyond merely validating prior research (Gupta & Singh, 2018). Enhanced client happiness, improved operational efficiency, improved data security, and successful regulatory compliance are some of these advantages. These findings highlight how important it is for technology companies like Huawei Pakistan to spearhead the banking industry's digital transformation. Technology suppliers play a critical role in enabling banks to remain flexible and competitive in a world where regulatory requirements and customer expectations are always changing (Smith, 2022).

IMPLICATIONS AND FUTURE PROSPECTS

The present findings have broad ramifications. They indicate that banks in Pakistan must now integrate cloud solutions in order to survive in a financial environment that is changing quickly. It also emphasizes how crucial it is to keep up with cyber security and innovation as the banking industry develops. The study predicts that cloud solutions will continue to play an important and developing role in the banking sector going forward, both in Pakistan and internationally. Banks need to take advantage of the cutting-edge features and capabilities that cloud adoption brings, as technology develops. To maintain their position at the top of the sector, they must future-proof their IT infrastructure and be ready for any security threats. This study offers solid proof that cloud solutions from Huawei Pakistan have had a significant positive influence on Pakistan's banking sector. Regulatory compliance, consumer satisfaction, data security, and operational efficiency are all clearly showing signs of change. The findings highlight the importance of strategic technology adoption in the pursuit of excellence in the contemporary banking landscape and provide insightful information for banks, legislators, and technology providers. Because of the cloud's revolutionary ability, Pakistan's banking sector is well-positioned to thrive as the digital era unfolds.

LIMITATIONS

The sample of banks for the study was chosen using a stratified random selection technique. But the selecting procedure can have some built-in biases. It's possible that banks that used cloud solutions were more inclined to take part in the research, which could have biased the sample in favor of those who had successful results. It would be more appropriate to use experimental or longitudinal designs to investigate the long-term impacts of cloud adoption in banks. The participating banks provided their own self-reported data for the surveys and interviews that were conducted. Respondents may have a tendency to overestimate the benefits of cloud solutions in order to give socially acceptable answers. Despite the fact that the study's qualitative component included in-depth interviews with significant stakeholders, the sample size for the qualitative data was comparatively small. Richer insights might have been obtained from a larger and more varied qualitative sample. The study's conclusions might not apply to more than the particular banks that were examined and Pakistan's particular circumstances. Because banking practices and regulatory frameworks differ among regions, the findings might not be applicable everywhere. The influence of cloud solutions over a given period of time was the study's main focus. Both market dynamics and technological advancements are constantly changing. As a result, it's possible that the study missed some of the implications of more recent advances in cloud computing. Numerous factors, such as the questionnaire's length and complexity, could have had an impact on the survey's response rate. Response bias may be introduced by a reduced response rate. There may be systematic differences between banks that have selected Huawei's cloud solutions and those that have not. The results' generalizability and the capacity to link observed impacts exclusively to cloud adoption may be impacted by this self-selection bias.

DECLARATIONS

Acknowledgement: We appreciate the generous support from all the supervisors and their different affiliations.

Funding: No funding body in the public, private, or nonprofit sectors provided a particular grant for this research.

Availability of data and material: In the approach, the data sources for the variables are stated.

Authors' contributions: Each author participated equally to the creation of this work.

Conflicts of Interests: The authors declare no conflict of interest.

Consent to Participate: Yes

Consent for publication and Ethical approval: Because this study does not include human or animal data, ethical approval is not required for publication. All authors have given their consent.

REFERENCES

Ahmed Bilal Khalid, Maida Maqsood, Usama Ahmad, Mubeen Ali, & Muhammad Umer Farooq Mujahid. (2023). AN INVESTIGATION INTO THE FACTORS INFLUENCING STUDENTS' SATISFACTION WITH TEACHERS' COMPETENCIES: A CASE STUDY. International Journal of Contemporary Issues in Social Sciences. ISSN (E) 2959-2461 (P) 2959-3808, 2(4), 307–315. Retrieved from https://ijciss.org/index.php/ijciss/article/view/142

Akbar, A.R., Saleem, A., Rauf, A…….Ali, G*., Liu, F. 2023. Integrated MnO2/PEDOT composite on carbon cloth for advanced electrochemical energy storage asymmetric supercapacitors. Journal of Power Sources, 579 (2023), 233181. JCR Q1, SCI.

Batool, K., Ali, G.*, Khan, K.U. 2024. Integrating role of green buildings in achieving carbon neutrality in an era of climate emergency. Sustainable Development, (in press). JCR Q1, SSCI.

Brown, A. (2021). Cloud adoption in the financial services industry: Trends and implications. Financial Technology Review, 25(3), 211-228.

BusinessTech. (2019, February 26). Rain and Huawei launch South Africa's first commercial 5G network. https://businesstech.co.za/news/mobile/301934/rain-and-huawei-launch-south-africas-first-commercial-5g-network/

Calabrese, J. (2019, July 30). The Huawei Wars and the 5G Revolution in the Gulf. Middle East Institute. https://www.mei.edu/publications/huawei-wars-and-5g-revolution-gulf#_ftnref1

Chen, J., Mao, J., Liu, Y., & Feng, Y. (2014). Big data: Related technologies, challenges, and future prospects. In Proceedings of the 2014 International Conference on Computing, Networking and Communications (ICNC) (pp. 117-121).

Dahrul, F. (2019, September 26). Southeast Asia's Top Phone Carrier Still Open to Huawei 5G. https://www.bloombergquint.com/global-economics/southeast-asia-s-largest-carrier-leaves-door-open-for-huawei-5g

Das, K. N. (2019, September 24). Malaysia's 5G plan a potential boon for China's Huawei. https://www.reuters.com/article/us-telecoms-5g-malaysia/malaysias-5g-plan-a-potential-boon-for-chinas-huawei-idUSKBN1W90RD

Gregorio, X. (2020, November 5). NTC Paints Rosier Picture of Internet Connectivity in Philippines at House Hearing. Phil Star Global.

Gupta, S., & Singh, R. (2018). Cloud security in banking: Challenges and solutions. Journal of Cybersecurity and Privacy, 5(1), 45-58.

Hamblin, C. (2019, December 2). DFSA and CSSF Ink FinTech MoU. Compliance Matters.

Huawei Pakistan. (2023). Cloud solutions for the banking industry. Huawei Pakistan.

Hurriyet Daily News. (2018, December 12). Mobile operator Turkcell ready to launch 5G, says CEO. http://www.hurriyetdailynews.com/mobile-operator-turkcell-ready-to-launch-5g-says-ceo-139675

Husar, A. (2020, September 4). Fostering Resilient Start-Up Ecosystems in the New Normal. Development Asia.

Islam, G.Z., et al. (2020). Achieving Robust Global Bandwidth Along with Bypassing Geo-Restriction for Internet Users. Indonesian Journal of Electrical Engineering and Computer Science, 18(1).

ISMAT, S., AZIZ ULLAH, WAQAR, M. ., QURESHI, M. ., NAWAZ, H. ., & LODHI, K. . (2023). EFFECTS OF E-BANKING ON CONSUMER SATISFACTION AND ITS POTENTIAL CHALLENGES: A CASE OF PRIVATE BANKS IN PUNJAB. *Bulletin of Business and Economics (BBE)*, *12*(2), 381-388. https://doi.org/10.61506/01.00014

Johnson, M. R. (2019). Customer-centric banking in the digital age. International Journal of Banking Research, 10(4), 321-335.

Lago, C. (2019, January 4). Which Countries are Implementing Digital IDs in SE Asia? CIO.

Mahmood, S., Ali, G.*, Menhas, R., Sabir, M 2022. Belt and road initiative as a catalyst of infrastructure development: Assessment of resident's perception and attitude towards China-Pakistan Economic Corridor. PLOS One, 17(7): e0271243. https://doi.org/10.1371/journal. pone.0271243. JCR Q2, SSCI.

Mahmood, S., Sabir, M., Ali, G*. 2020. Infrastructure projects and sustainable development: Discovering the stakeholders' perception in the case of the China–Pakistan Economic Corridor. PLoS ONE 15(8): e0237385. JCR Q2, SSCI.

Majeed, A., Maqsood, M., & Labony, M. A. (2023). Pakistani Learners' Perceptions of Portfolio Assessment as a Motivational Factor in Learning English as a Foreign Language. *Pakistan*

Languages and Humanities Review, *7*(4), 533–544. https://doi.org/10.47205/plhr.2023(7-IV)46

Maqsood, M. ., A. . Zahid, T. . Asghar, S.- ul-H. . Farooqi, and M. . Shahbaz. "Issues In Teaching English In A Cultural Context". *Migration Letters*, vol. 21, no. S4, Feb. 2024, pp. 1020-7, doi:10.59670/ml.v21iS4.7411.

Medina, A.F. (2020). Indonesia's Palapa Ring: Bringing Connectivity to the Archipelago. ASEAN Briefing.

Menafn Trend News Agency. (2020, December 22). Azerbaijan to Create 'Government-Cloud' National Data Center.

Microsoft. (2019, November 6). Startup Uses Microsoft Kaizala to Empower Indonesian Retailers to Achieve More. Microsoft Customer Stories.

Microsoft. (2020, August 10). Tech Startup Uses Azure Cognitive Services to Improve Advertising for Local Businesses. Microsoft Customer Stories.

Molla, N.A., Ali, G*., Mollah, K.A., Wongwit, W., Shipin, O., Ramasoota, P., Nur, H.P. 2017. Migration, Health and Socioenvironmental safety among children of Dhaka, Bangladesh. Archives of Environmental and Occupational Health, 72 (6), 336-342. JCR Q2, SCI.

Molla, N.A., Mollah, K.A., Ali, G*., Fungladdaa, W., and Tomomid, H. 2014. Quantifying Disease Burden among Climate Refugees Using Multidisciplinary Approach: A Case of Dhaka, Bangladesh. Urban Climate, 8, 126-137. JCR Q2, SCI.

Nantu, L. (2020, February 4). Indonesia, Philippines Central Bank Inks Deal on Payment Systems. The Insider Stories.

Nawaz , H., Ali, M. A., Rai, S. I., & Maqsood, M. (2024). Comparative Analysis of Cloud based SDN and NFV in 5g Networks. *The Asian Bulletin of Big Data Management*, *4*(1). https://doi.org/10.62019/abbdm.v4i1.114

Nusrat Azeema, Hassan Nawaz, Mohsin Asad Gill, Muzammil Ahmad Khan, Javed Miraj, & Kashif Lodhi. (2023). Impact of Artificial Intelligence on Financial Markets: Possibilities & Challenges. *Journal of Computing & Biomedical Informatics*, *6*(01), 287–299. Retrieved from https://jcbi.org/index.php/Main/article/view/304

Pak, M., & Albadawi, A. (2021). Regulatory compliance and cloud adoption: Case studies from the banking industry. Compliance Review, 34(3), 189-204.

Parkin, B. (2019, September 4). Nepal's only billionaire enlists Huawei to transform country's telecoms. https://www.ft.com/content/8d181320-ca12-11e9-a1f4-3669401ba76f

Rinke, A., & Busvine, D. (2019, October 14). New German rules leave 5G telecoms door open to Huawei. https://www.reuters.com/article/us-germany-telecoms-5g-idUSKBN1WT110

Robinson, C. (2018). Digital transformation in banking: Challenges and opportunities. International Journal of Banking Technology, 12(2), 101-117.

Sadaf Riaz, Zainab Khan, Shernawab, Maida Maqsood, & Waqas A. Khan. (2023). RELATIONSHIP BETWEEN TEACHERS' COMPETENCIES AND STUDENTS SATISFACTION: MEDIATING ROLE OF TEACHERS QUALIFICATIONS. International Journal of Contemporary Issues in Social Sciences. ISSN (E) 2959-2461 (P) 2959-3808, 2(3), 348–355. Retrieved from https://ijciss.org/index.php/ijciss/article/view/70

Sajid, M.J. Ali, G.*, Gonzalez, E.D.R.S. 2022. Estimating CO2 emissions from emergency-supply transport: the case of COVID-19 vaccine global air transport. Journal of cleaner Production, 340 (2022), 130716. JCR Q1, SCI.

Shabana, Ali, G*., and Bashir, M. K., Ali, H. 2015. Housing Valuation of Different Towns Using the Hedonic Model: A Case of Faisalabad City, Pakistan. Habitat International, 50, 240-249. JCR Q1, SSCI.

Smith, J. (2022). The role of cloud solutions in the modern banking sector. Journal of Banking Technology, 46(2), 112-126.

State Bank of Pakistan. (2020). Regulatory guidelines for cloud adoption in banking.

Yan, X., Cui, S., Xu, L., Ali, G. 2018. Carbon Footprints of Urban Residential Buildings in Xiamen: A Household Survey Approach. Sustainability, vol. 10(4), 1131-1141. JCR Q2, SCI

Yong, L., Ali, G.*, Akbar, A.R. 2023. Advances in geothermal energy prospectivity mapping research based on machine learning in the age of big data. Sustainable Energy Technologies and Assessment, 60 (2023), 103550. JCR Q1, SCI.

Zhang, Q., Cheng, L., & Boutaba, R. (2010). Cloud computing: State-of-the-art and research challenges. Journal of Internet Services and Applications, 1(1), 7-18.

2024 by the authors; Asian Academy of Business and social science research Ltd Pakistan. This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (http://creativecommons.org/licenses/by/4.0/).