

# Analysis of Cloud Computing for Sustainable Banking: Implications and Future Prospects

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## ABSTRACT

Banking is the backbone of Indian economy. The way that information technology requirements are fulfilled has changed as a result of cloud computing. Each central data official is zeroing in on cloud computing since it has brought data innovation into another period. Many financial organizations are turning to cloud computing to help them meet their ever-growing needs. Utilizing cloud computing offers business models that facilitate the delivery of creative customer experiences, effective collaboration, increased IT efficiency, and accelerated time to market. Financial organizations may quickly adapt to changing business needs by leveraging cloud computing. This study examines the paradigm-shifting impact that cloud computing has had on environmentally conscious banking in Hyderabad using surveys and interviews with 180 banking clients. According to the research, there are strong correlations between growing knowledge and important sustainability factors including customer satisfaction, accessibility, and financial literacy. This is ascertained by examining people's perceptions, attitudes, and worries about adopting the cloud.

**Keywords:** *Cloud computing, Banking, Sustainable banking, Analysis, Future, Financial Institutions*

## 1. INTRODUCTION

Indian banking is one of the largest banking systems in the world. It caters the diverse needs of the customers. Since banks handle public funds, they are closely regulated. Banking and financial institutions (FIs) are cautious and under regulatory pressure, yet market uncertainty forces them to decrease operational costs and create new products that can increase market penetration and ROI. IT technology dominates banks' operating costs (Park & Kim, 2020). Cloud computing can give banks a complete and savvy IT technique. Cloud development was low when cloud capacity was presented. Because of information security and limitations, banks and financial institutions were reluctant to acknowledge it. Most banking guidelines and regulations currently permit banks to utilize cloud capacity, clearing the way for cloud administrations (Malik et. al., 2018).

The responsibility in a banking framework vacillates considerably during the day. Beforehand, most financial foundation comprised of CBS and multi-channel channels. The engineering incorporates register escalated moderate investigation, continuous showcasing checking, and client administration examination. This shows that banking CIOs and CTOs require a business reasoning to investigate practical stages like cloud stockpiling. Cloud stages have acquired ubiquity in India's banking and financial business sectors, despite the fact that reception relies upon working expense reserve funds and receptivity to new innovation. Numerous expert appraisals, similar to Gartner's 1, anticipate significant advancement in India's public cloud administrations market (33% in 2015). A few Indian banks have demonstrated that cloud computing has many advantages, however the business should be ready for related issues.

The advantages of cloud computing and deployable structures are very much expressed. Prior to utilizing cloud capacity, grasp its security and authorization challenges. Also, cloud computing can increment security approaches and assurances. This study helps banking associations take on and execute cloud foundation while keeping up with powerful administration and oversight to augment business benefits and limit risk. The banking business stores a ton of customer information and endeavors to offer the best support. Cloud capacity innovation is a cutting edge computerized technique that gives banks uncommon security, movability, and versatility while further developing client information the executives (Ali & Osmanaj, 2020). Cloud administrations will help banking development, portability, and quality. It will assist saves money with redistributing capital and ease IT framework the executives' IT staff, permitting them to zero in on additional creative errands like cutting item hour of kickoff. On-request cloud stages let banks develop foundation to satisfy purchaser need. Inheritance innovation power, overt repetitiveness, and versatility dangers can be tended to with cloud advances (Ali et. al., 2018). Cloud foundation allows banks to embrace new advances and developments as they become accessible, further developing productivity. It lets bank IT experts center around fundamental business exercises and make functional proficiency strategies. Cloud computing can help banks improve on information moves and development with uniform information handling.

### **1.1. Overview of Cloud Computing**

The capacity to get to shared assets and normal framework, convey administrations on request, and do exercises that fulfill changing business needs are undeniably made conceivable by cloud computing. Financial organizations can manage and maximize existing resources by leveraging the processing power offered by the cloud. By today's standards, cloud computing may offer banks essential functions including high-speed, high-security, convenience, data storage, and network computing services (Surbiryala & Rong, 2019). Financial cloud computing is the phrase used to describe the usage of cloud-based applications and services by financial institutions, such as banks, to enhance their present IT standards and provide their clients high-end capabilities. The main obstacle that financial clouds must overcome is banks' perception that data, expenses, and security are at risk. Even if private clouds and the Open Data Centre Alliance are the preferred options for financial institutions, there is still plenty that can be done to take use of cloud computing's advantages.

### **1.2. Benefits of Cloud Computing In Banking and Financial Administrations**

Cloud computing can be favorable for a financial administrations organization that relies essentially upon IT-empowered administrations. The reception of cloud computing by financial administrations firms can be impacted by different factors like apparent expense reserve funds, simplicity of scaling in and out, quicker time-to-showcase for framework organizations, virtualization of big business wide information as a help, endeavor innovation normalization, and versatile admittance to information and applications (Tiwari et. al., 2021). A couple of advantages of cloud computing in the banking and financial administrations industry are recorded beneath?

- **Customer Satisfaction**

The connection among banks and their specialist organizations will be the essential and most troublesome impact of financial cloud computing. These administrations will be simpler to utilize, more available, more convenient, and more custom fitted to the requests and way of life of the singular on account of cloud computing (Li et. al., 2021). This presents a gamble as well as an open door since it is hazy who will drive this shift — banks or the developing number of non-banking contestants. Business banks can give their clients client gadgets because of the plentiful assets of the confidential cloud. Various administrations, for example, complete cupboards, bank cards, self-administration stands, channel the executives, preparation phases, customary support, and update administrations, can be acquired from these gadgets. By examining and handling information utilizing a group community, we can remove significant data by joining cloud and information mining innovations.

- **Pressure worked by Non-Banking Cloud-Based Contenders**

The new influx of cloud-based, socially cognizant cash the board programming is more about client administrations and experience than it is about innovation advancement. Banks are continuously searching for ways of further developing the manner in which they serve their clients. To forestall disintermediation, banks should keep on putting resources into cloud-based plans of action that handle web-based entertainment, examination, and designated item and administration packaging in light of these serious powers. For banks, social as opposed to mechanical impediments might be the essential block to outcome in the social and versatile climate. Online social money organizations have perceived that buyers are presently thinking all alone and have changed likewise. A perfect representation is Bank Straightforward, which gives a stage to its web-based clients to get to web-and versatile based banking administrations.

- **Cost Decrease and Utilization based Charging**

Albeit financial administrations are encountering a decrease in income, this is prompting less spending plans and more strain on cost control because of heritage innovation frameworks and guidelines. The retail banking industry is losing cash, so it requirements to begin controlling costs better. Financial firms can diminish a critical forthright capital consumption into a lower, repeating functional cost by executing financial cloud computing standards. Inordinate consumption on new programming and equipment isn't needed. In light of the exceptional elements of cloud computing, financial institutions can pay for the administrations they use on a case by case basis. For banks, charging is a non-center methodology that can be successfully moved to a minimal expense middle person, opening up cash for other innovation-based center tasks.

- **Investment in Cloud-Based Innovation**

At the point when a bank is attempting to change its business and working strategies, cloud computing can be a key part. To accomplish corporate targets, a cloud computing stage naturally gathers, interfaces, designs, and reconfigures virtualized innovative assets. It eliminates impediments, for example, where actual IT assets are found or which explicit advancements are utilized, empowering the fast and reasonable arrangement of business administrations. Both assorted cultural necessities and quicker financial development are driving advancement in banking in arising economies. The

ongoing shaky business climate and developing financial business sectors propose that banks have gigantic improvement expected soon. By 2015, arising economies will have a \$14 trillion financial market, and 2.7 billion grown-ups in emerging nations won't approach financial administrations. (Willcocks & Lacity, 2018). By 2020, global financial assets are expected to reach USD 37 trillion, a quadruple. Banking executives are searching for flexible cloud-based business models that can streamline operations and boost sustainable shareholder investments, all while creating a more inventive, customer-focused organization. These enterprise IT components in banking might be transformed with the use of cloud computing.

### 1.3. Difficulties of Involving Cloud Advancements in Banking Area

The Cloud computing innovations reception keeps on picking up speed across an extensive variety of banking administrations. Beside all the positive twirl around cloud computing advancements, a dependable, trusted, standard model of cloud computing that will empower quicker rates and more elevated levels of reception is still far off, with somewhat restricted progress being made in such manner in the previous year (Vinoth et. al., 2022). Mission-critical apps and financial and personal data must be kept private and secure at all times. Banks are unable to bear the expense of a security breach. Priority one should be given to protecting the privacy and security of personal and business data as well as mission-critical applications (Sajay et. al., 2019). Apps that are essential to the mission, as well as financial and personal information, must always be kept secret and safe. The costs of a security breach are too great for banks to absorb. The security and privacy of corporate and personal data, as well as mission-critical apps, should be prioritised above all else.

### 1.4. Research objectives

1. To gauge the understanding, attitudes, and concerns of banking customers regarding the adoption of cloud computing in Hyderabad
2. To investigate the barriers faced by banking institutions in Hyderabad when implementing cloud computing solutions for sustainable banking
3. To analyze how cloud computing contributes to environmental, social, and economic sustainability within the specific banking landscape of Hyderabad
4. To anticipate emerging trends and potential innovations in cloud computing within the banking sector

### 1.5. Hypotheses of the study

**Hypothesis 1:** There is a significant variation in the understanding, attitudes, and concerns of banking customers in Hyderabad, regarding the adoption of cloud computing in the banking sector.

**Hypothesis 2:** The barriers faced by banking institutions in Hyderabad when implementing cloud computing solutions for sustainable banking have a measurable impact on the successful integration of cloud technology.

**Hypothesis 3:** Cloud computing significantly contributes to environmental, social, and economic sustainability within the specific banking landscape of Hyderabad.

**Hypothesis 4:** The anticipation of emerging trends and potential innovations in cloud computing within the banking sector correlates with the preferences and expectations of customers in Hyderabad for the continuous development of sustainable banking practices.

## 2. LITERATURE REVIEW

**Smith & Evan (2024)** examined the biological effect of web based banking, this study utilizes a blended techniques system, incorporating quantitative information analysis with subjective assessment. This exploration adds to the current collection of information on sustainable money and gives valuable data to customers, financial institutions, and controllers.

**Ali et. al., (2023)** featured the meaning of Green IT as a vital part in the more extensive conversation encompassing the moral and naturally cognizant usage of IT assets by large companies. The creators recognize four fundamental parts that empower the banking area to participate in socially mindful utilization of data innovation (IT) gear — specifically, green plan, green assembling, green utilization, and green removal — in light of a writing survey and contextual investigations of three unmistakable Australian banks. Guaranteeing socially dependable and sustainable utilization of IT hardware in banks, the creators likewise break down a few interconnected factors, for example, virtualization, flimsy client laptops, energy protection, ICT cost-reengineering, and green server farms.

**Al-Malahmeh (2023)** the objective of concentrating on how business banks in Jordan settle on choices according to cloud computing highlights and properties, for example, on-request self-administration, wide organization access, asset

pooling, quick flexibility, and estimated administration. A sum of 104 supervisors from Jordanian business banks were surveyed involving a poll in this quantitative review. Involving SPSS for information handling and analysis in view of numerous and direct relapse, the review's outcomes upheld the invalid speculation and proposed that cloud computing's advantages help in associations' endeavors to further develop their dynamic cycles. The review's creators recommended seeing cloud computing's effect on bookkeeping and, likewise, how it can assist with financial navigation.

**Mishra et. al., (2023)** studied the components deciding the suitability and power of blockchain innovation in financial institutions. In the wake of assessing the writing and leading semi-organized interviews, seventeen CSFs were found. Following this, the Dynamic Preliminary and Assessment Research center methodology was utilized to make cause-impact connections, and the fluffy Delphi technique was utilized to affirm 15 CSFs. As per the review's discoveries, the two most significant basic achievement factors (CSFs) of blockchain innovation — the simplicity of nearby and global regulation and guideline and the protection of client information — need a lot of consideration from leaders and the board to accomplish versatility and maintainability in the banking area. By enlightening the meaning of CSFs, the review will help experts and lawmakers in fostering an arrangement for the banking business' powerful utilization of blockchain innovation.

**Andira (2023)** conducted factor analysis on customer focus, corporate governance, microfinance, financial inclusion, stakeholder management and risk reduction, financial performance and innovation, and the sustainable digital banking framework. The data came from secondary sources, which include things like previously conducted research, books, websites, journals, and anything else written about the same topics that are still applicable today. This research implies that the latecomer Bank Jago is starting to transition into an online-only bank in order to compete with the technology, strategy, and leadership of the industry trailblazer, the online-only bank WeBank. Additional empirical research can use this study's findings to draw conclusions about the digital-only banking business and its effects.

### 3. RESEARCH METHODOLOGY

This study delves into the revolutionary effects of cloud computing on environmentally responsible banking, looking at the consequences and potential outcomes. The research technique employed in this study is thorough, and it focuses on a sample of 180 banking customers from Hyderabad. We intend to collect data on people's thoughts and experiences with cloud computing in banking through interviews and surveys. Taking a regional focus, this study aims to shed light on the unique circumstances of Hyderabad, India, by analyzing the pros and cons of using cloud computing to promote environmentally responsible banking.

#### 3.1. Research Design

The review picked an exact methodology. Experimental examination is any sort of study that depends completely on discernible and quantifiable information to make its inferences. This observational proof can be accumulated through either quantitative or subjective strategies for statistical surveying. Be that as it may, just a quantitative strategy was utilized in this review.

#### 3.2. Sample Size

The study encompassed participants from the banking sector in Hyderabad, India, with a robust sample size of 180 individuals. The selection process employed a meticulous random sampling strategy, ensuring a comprehensive representation of the diverse banking customer population in this region. Among the participants, 120 were male, and 60 were female, contributing to a balanced gender distribution within the sample. This deliberate approach to participant selection aims to enhance the study's statistical validity and provide insights reflective of the broader demographics of Hyderabad banking clientele.

#### 3.3. Data Collection

I utilized self-organized polls to accumulate information for clear examination studies. Analysts originally inspected the current writing on CPD prior to making the exploration apparatus.

**3.3.1. Primary review:** Essential data was obtained by staff and filled in as the review's whole premise. The survey was broken into three stages, including: Representative socio-economics, including age, orientation, instructive accomplishment, and work history representative contribution and interest, as well as worker discernment and mindfulness.

**3.3.2. Secondary information:** Auxiliary information should be promptly accessible. Its accumulation depends on academic writing audits of articles distributed in diaries, books regarding the matter, studios, meetings, yearly reports of attire associations, contextual analyses, and reference materials.

#### 3.4. Factors

**3.4.1. Independent factors - Cloud computing**

**3.4.2. Dependent factors**

- Raising Awareness
- Financial Literacy

- Accessibility to Banking Products (Loans/Subsidies)
- Safety & Security of Data
- Customer Satisfaction
- Financial Inclusion

4. DATA ANALYSIS

4.1. Cloud Computing Usage in Banking Sector (2013-2023)

Table 1: Cloud Computing Usage in Banking Sector from Year 2013 to 2023

Year	Cloud Adoption in Banking (%)
2013	10.25%
2014	15.30%
2015	20.04%
2016	25.08%
2017	30.29%
2018	35.45%
2019	40.20%
2020	45.79%
2021	50.82%
2022	55.96%
2023	60.99%

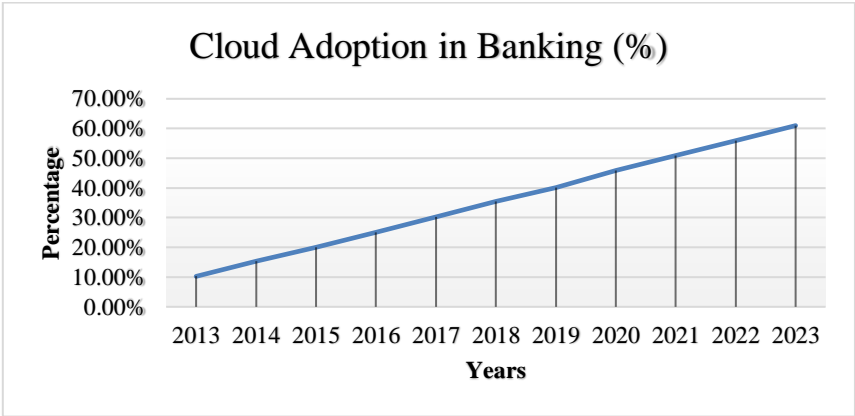


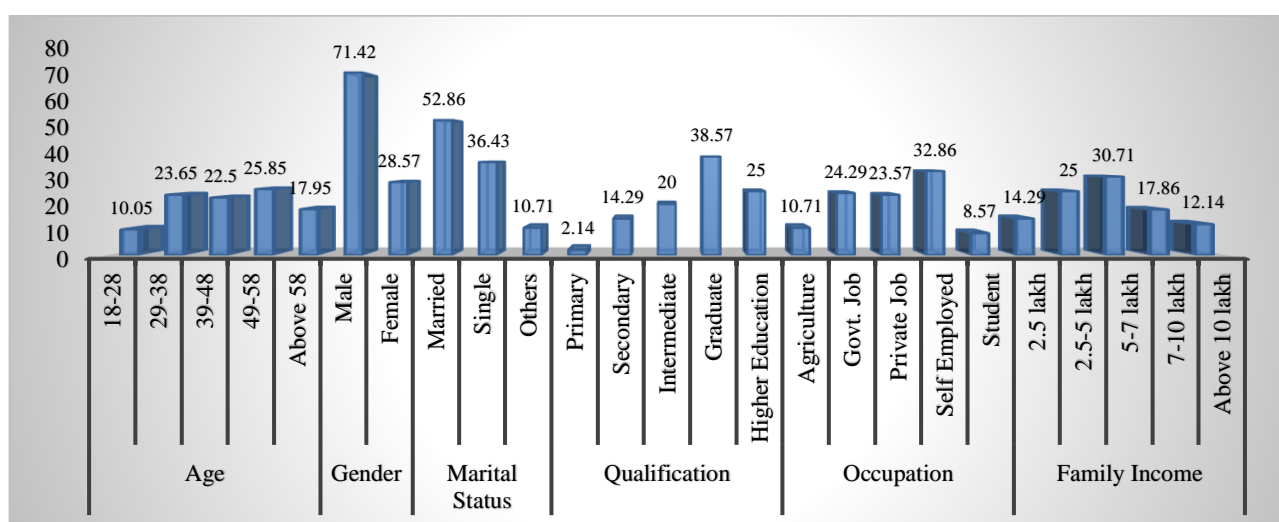
Figure 1: Cloud Computing Usage in Banking Sector from Year 2013 to 2023

4.2. Demographic profile of participants

Table 2: Segment profile

Segment		Frequency	Frequency Rate (%)
Age	18-28	14	10.05
	29-38	34	23.65
	39-48	31	22.50
	49-58	36	25.85
	Above 58	25	17.95
Gender	Male	100	71.42
	Female	80	28.57
Marital Status	Married	74	52.86
	Single	51	36.43
	Others	15	10.71
Qualification	Primary	3	2.14

	<b>Secondary</b>	20	14.29
	<b>Intermediate</b>	28	20.00
	<b>Graduate</b>	54	38.57
	<b>Higher Education</b>	35	25.00
<b>Occupation</b>	<b>Agriculture</b>	15	10.71
	<b>Govt. Job</b>	34	24.29
	<b>Private Job</b>	33	23.57
	<b>Self Employed</b>	46	32.86
	<b>Student</b>	12	8.57
<b>Family Income</b>	<b>2.5 lakh</b>	20	14.29
	<b>2.5-5 lakh</b>	35	25.00
	<b>5-7 lakh</b>	43	30.71
	<b>7-10 lakh</b>	25	17.86
	<b>Above 10 lakh</b>	17	12.14



**Figure 2:** Demographic profile of participants

#### 4.3. Pearson Correlation

**Table 3:** A Correlation Matrix between Dependent Variables

Correlations		Raising Awareness	Financial Literacy	Accessibility to Banking Products (Loans/Subsidies)	Safety & Security of Data	Customer Satisfaction	Financial Inclusion
Raising Awareness	Pearson Correlation	1	.796**	.784**	.792**	.756**	.788**
	Sig. (2-tailed)		0.01	0.02	0	0.01	0.03
	N	180	180	180	180	180	180
Financial Literacy	Pearson Correlation	.796**	1	.778**	.745**	.798**	.782**
	Sig. (2-tailed)	0		0	0.02	0	0.01
	N	180	180	180	180	180	180
Accessibility to Banking Products (Loans/Subsidies)	Pearson Correlation	.786**	.796**	1	.790**	.762**	.765**

es)							
	Sig. (2-tailed)	0.01	0		0.02	0	0
	N	180	180	180	180	180	180
Safety & Security of Data	Pearson Correlation	.758**	.794**	.784**	1	.801**	.805**
	Sig. (2-tailed)	0.01	0.03	0		0	0.02
	N	180	180	180	180	180	180
Customer Satisfaction	Pearson Correlation	.748**	.781**	.794**	.795**	1	.784**
	Sig. (2-tailed)	0	0	0.01	0		0.01
	N	180	180	180	180	180	180
Financial Inclusion	Pearson Correlation	.754**	.782**	.760**	.770**	.784**	1
	Sig. (2-tailed)	0	0	0.01	0	0.02	
	N	180	180	180	180	180	180

\*\*. Connection is critical at the 0.01 level (2-followed).

The correlation matrix reveals strong positive correlations among all pairs of dependent variables, indicating that as one variable increases, the others tend to increase as well. Specifically, there are significant positive correlations ranging from 0.748 to 0.805. Notably, raising awareness exhibits a particularly strong correlation with financial literacy (0.796), accessibility to banking products (0.784), safety & security of data (0.792), customer satisfaction (0.756), and financial inclusion (0.788).

**Table 4:** Model outline of factors

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.763 <sup>a</sup>	.592	.568	.88095
a. Predictors: (Constant) Raising Awareness/Financial Literacy/Accessibility to Banking Products (Loans/Subsidies)/Safety & Security of Data/Customer Satisfaction/Financial Inclusion				

A tolerably solid positive straight relationship is demonstrated by the R-worth of 0.763 in Table 3, and that implies that the indicators can make sense of around 76.3% of the changeability in the reliant variable. With a R Squared worth of 0.592, we can see that the model effectively represents around 59.2% of the variety in the reliant variable. A hearty model is shown by a Changed R Square of 0.568, which considers the quantity of indicators. With a worth of 0.88095, the sexually transmitted disease. Mistake of the Gauge estimates the typical hole among noticed and expected values, offering knowledge into the model's exactness.

**Table 5:** ANOVA summary

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	230.072	1	57.417	69.148	.001 <sup>b</sup>
	Residual	157.236	174	.813		

	Total	389.160	174			
a. Dependent Variable: Raising Awareness, Financial Literacy, Accessibility to Banking Products (Loans/Subsidies), Safety & Security of Data, Customer Satisfaction, Financial Inclusion						
b. Predictors:(Constant) Cloud Computing						

In Table 4, the model makes sense of a lot of change as shown by the high F-proportion (69.148) and the related p-esteem (.001), recommending that the relapse model is genuinely critical. The Number of Squares for Relapse (230.072) addresses the variety made sense of by the model, and the Mean Square (57.417) is gotten by partitioning the Number of Squares by the levels of opportunity (df = 1). The Leftover segment represents the unexplained fluctuation inside the model, with an Number of Squares for Lingering (157.236) and a comparing Mean Square (.813). The Absolute Number of Squares (389.160) is the amount of the Relapse and Leftover Number of Squares.

**Table 6:** Coefficient of Determination of the Variable

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.704	.310	-.638	-6.502	.095
	Raising Awareness	-.060	.010	-.060	-2.778	.409
	Financial Literacy	.377	.160	.271	5.488	.058
	Accessibility to Banking Products (Loans/Subsidies)	.160	.008	.123	3.598	.180
	Safety & Security of Data	.0256	0.150	0.232	0.236	0.326
	Customer Satisfaction	0.306	0.018	0.214	.248	0.172
	Financial Inclusion	0.198	0.38	0.	0.298	0.102
a. Independent Variable: Cloud Computing						

Table 5 shows that the "Standardized Coefficients" (Beta) express the strength of the relationship in standard deviation units. The steady term (- 0.704) shows the assessed worth of the reliant variable when all indicators are zero. The t-esteems and related p-values survey the measurable meaning of every indicator. Financial Education exhibits a critical positive relationship with a t-worth of 5.488 and a p-worth of .058, while different indicators, including Bringing issues to light, Openness to Banking Items, Wellbeing and Security of Information, Consumer loyalty, and Financial Consideration, show non-huge connections.

## 5. RESULTS AND DISCUSSION

The trend in cloud computing adoption within the banking sector shows a consistent upward trajectory from 2013 to 2023, with adoption rates steadily increasing. The percentages suggest a positive inclination towards leveraging cloud technology for banking operations, likely driven by its potential to enhance efficiency, scalability, and overall operational effectiveness.



The demographic analysis of participants reveals important characteristics of the sample population. Most participants fall within the age groups of 29-38 and 49-58, indicating a relatively mature and diverse set of respondents. Additionally, a higher representation of males, married individuals, and those with graduate-level qualifications suggests that the study captures a more experienced and educated segment of the population.

The Pearson correlation matrix unveils strong positive correlations among all pairs of dependent variables, demonstrating that as one variable increases, others tend to increase as well. Particularly noteworthy is the robust correlation of raising awareness with financial literacy, accessibility to banking products, safety & security of data, customer satisfaction, and financial inclusion. These findings suggest that initiatives aimed at increasing awareness could have a widespread positive impact across various aspects of the banking sector.

The relapse analysis model, with cloud computing as the free factor, shows a decently solid positive direct relationship with the reliant factors. The model makes sense of a huge piece of the fluctuation in the reliant factors, as proven by the high R Square worth of 0.592. The ANOVA results further help the model's importance, demonstrating that the indicators aggregately add to making sense of the fluctuation in the reliant factors. Financial proficiency arises as a critical indicator, displaying its significance in impacting the reliant factors with regards to cloud computing reception.

The coefficients of determination provide insights into the impact of individual predictors. Notably, financial literacy demonstrates a significant positive relationship, as reflected by its standardized coefficient (Beta) of 0.271 and a t-value of 5.488. Other predictors, while not statistically significant in this analysis, still contribute to the overall model, highlighting the multifaceted nature of the factors influencing cloud computing adoption in the banking sector.

## 6. CONCLUSION

With the quick progression of innovation, cloud computing will track down a few purposes in the banking industry in the years to come. Cloud computing is ideal for banks, permitting them to begin with their fringe organizations and step by step coordinate it into their primary activities. On the off chance that huge banks are hoping to work on the accessibility and security of their IT framework and proposition on-request IT benefits, a confidential cloud is an incredible spot to begin. Involving this as an establishment, enormous banks can start to try out open and half-breed clouds. Little banks should approach capital, innovation, information, and different assets than it is for huge banks. All in all, the analysis uncovers a positive pattern in cloud computing reception in the banking area. Solid between factor relationships feature the interconnected idea of variables, accentuating the significance of thorough procedures. Financial proficiency arises as a huge indicator, highlighting the requirement for mindfulness and schooling in fruitful cloud innovation reconciliation.

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