A study on the challenges of core banking services

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Abstract

Implementation of Core Banking in the banking sector allows interconnectivity of branches with the centralized data centre. The central banking system has allowed banks to launch and target new products and services to a specific customer segment, after understanding their banking and investment needs and provides many services for customers that are convenient to them in very fast at any-time, anywhere.. The purpose of this paper is to examine the Challenges in Adopting the Core Banking Services. The study also checks, which Core Banking Services dominate the field. The researcher identified mainly six Core Banking Services for the study. They are Automated Teller Machine (ATM), Internet Banking, Mobile Banking, Real Time Gross Settlement (RTGS), National Electronic Fund Transfer (NEFT) and Point of Sale (POS), and Applied Analytical Hierarchical Processing (AHP) technique. Before looking into the challenges, a detailed view of the Demographic characteristics of the sample under study, namely the bank managers which comprise the Gender, Age, Education and Experience are presented. The present empirical based study was conducted with an objective to examine the challenges of core banking services. The study was based on both primary and secondary data. The area of study is confined to selected districts in Kerala .The collected data is analyzed and interpreted by applying various statistical tools and techniques. It is presented in the form of tables, diagrams .The research findings will be useful for all the three segments including banks, customers and other interested people.

Keywords: Core Banking System, Core Banking Services, Banking Sector, Challenges, Managers.

I.Introduction

Core Banking System (CBS) can be defined as a type of banking that allows a person to become a customer of a particular bank, when he/she opens an account in that particular bank's branch i.e.; instead of being a customer of that particular branch, he/she will be the customer of that particular bank. In the stiff competitive environment, the banks are competing with each other, to develop a loyal customer base. This is because, in this sector, getting a new customer is costlier than keeping an existing customer. Hence, considering the need for keeping the existing customer base, the banking companies are searching for ways to develop their own loyal customer base.

II. Literature Review

This study focuses on the challenges and its influence in adopting core banking services. The researcher has made an attempt to review the relevant studies related to the present research work conducted so far in order to identify the research gap.

III. Statement of the problem

The Banking sector is one of the fastest growing sectors and an indicator of overall economic development of the country. In Kerala, the Banking Sector, which is the largest sector, is more techno-savvy and customer-centric by providing 24 hours' services through multiple delivery channels. As the banking sector is providing many services, it is relevant to know whether these services are effectively used or accepted by the customers. Banking sector is developing very fast with the implementation of new technologies. These developments may bring many challenges to the banking sector. So there is a strong need to examine whether the banks face any Challenge in the adoption of these technologies.

Thus, the present research work investigates into the following major issues.

1. What are the challenges in adopting Core Banking Services and do these challenges have any influence on adoption?

IV. Objectives of the study

1. To analyse the priority of the Core Banking Services Adopted by the Customers.
2. To identify the Challenges in adopting the Core Banking Services
3. To Study the Influence of the Challenges on the Adoption of the Core Banking Services

V. Scope of the study

The current study is a Bank-oriented study. The study is restricted to Managers of the Public and the Private sector banks in Kerala. The scope of the present study is limited to the the 'Challenges' faced by the managers while the customers are adopting the Core Banking Services of the Public and the Private Sector banks in Kerala. SBI, Canara Bank, Union Bank of India and Syndicate Bank from the Public sector and Federal Bank, South Indian Bank, HDFC Bank and ICICI Bank from the Private sector have been selected for the detailed study.

VI. Significance of the study

Over the last decades, there has been a tremendous growth in the banking industry in Kerala. The number of branches of both the Public and the Private Sector Banks have increased in Kerala since the last few years. In the current scenario of the banking industry, the CBS plays a significant role in the development of banking sector by offering high quality and fast services to their customers at any time, thus raising the level of customer's satisfaction and loyalty. The Current study examines the 'Challenges' in Adopting the 'Core Banking Services' in the banking sector. This will help the banking sector to overcome those 'Challenges'. Thus, it is expected that the proposed study would be useful to all the sectors of economy, mainly the Banking Sector, the Customers, the researchers and the other interested persons in this field and would also provides valuable directions for the improvement of 'Core Banking Services'.

VII. Research methodology

The study is based on both primary and secondary data as well. The primary data is collected through a well- designed structured questionnaire and discussions with the bank managers. Samples of 400 respondents were identified randomly and through convenience sampling technique the questionnaire was filled by the respondents. Secondary data is collected from various publications, Journals, Magazines, official websites, Bank's annual reports and newspapers. Tables and diagrams have been used at the appropriate places to present and classified the available data.

VII. Sample Design

The sample design of the present work is described in detail as follows:

A. Population

The population of the present study is the bank managers of the Public and the Private sector banks in Kerala. Currently, there are 25 Public sector banks and 20 Private sector banks in Kerala.

B. Sampling Technique

Multi-Stage sampling method was followed for selecting the sample banks and Random sampling was conducted for selecting bank managers.

C. Selection of the Sample Banks

The study was conducted in public and private sector banks. First, the 14 districts of Kerala were classified into three regions as Southern region, Central region and Northern region. One district each from all the three regions were selected on the basis of the districts having the maximum number of bank branches. Then, the banks having maximum number of bank branches were selected.

Table 1

Selection of Districts

Southern Region	No. of bank branches	Northern Region	No. of bank branches	Central Region	No. of bank branches
Thiruvananthapuram	643	Malappuram	448	Ernakulam	1037
Kollam	409	Kozhikode	461	Idukki	183
Pathanamthitta	348	Kannur	323	Trissur	778
Kottayam	470	Kasaragod	175	Palakkad	426
Alappuzha	424	Wayanad	85		

On the basis of the total number of bank branches in these districts, one district from these three regions were selected. Thus, Thiruvananthapuram from south region, Kozhikode from north region and Ernakulum from central region were selected.

D. Sample Banks

The Banks were selected on the basis of the maximum number of bank branches. Four banks each from the public sector and 4 private sector were selected on the basis of banks having the maximum number of bank branches. Thus, SBI, Canara Bank, Union Bank of India and Syndicate Bank were selected from the Public sector and ICICI, South Indian Bank, HDFC and Federal Bank were selected from the private sector.

Table 2

Selection of Sample Banks

Public Sector Banks				
Name of Banks	**Ernakulam**	**Kozhikode**	**Thiruvananthapuram**	**Total number of Branches**
SBI	140	56	179	375
Canara	53	61	49	163
Union Bank of India	76	32	13	119
Syndicate Bank	32	43	18	93
Total Number of Public Sector Banks				**752**
Private Sector Banks				
HDFC	42	18	11	71
ICICI	36	25	16	77
Federal Bank	115	57	36	208
South Indian Bank	84	19	22	125
Total Number of Private Sector Banks				**1242**

E. Sample Size Determination for Bank Managers

The sample claimants are selected based on the US National Education Association Statistical Table and formula by Krejcie and Morgan (1976).

$$S = \frac{x^2 NP(1-P)}{d^2(N-1) + x^2 P(1-P)}$$

S = Required Sample Size

x^2 =The table value of chi-square for 1 degree of freedom at the desired

Confidence level (.10 =2.71 .05 = 3.84 .01 = 6.64 .001 = 10.83)

N = The Population Size

P = The Population Proportion (assumed to be .50 since this would provide the

maximum sample size)

d = The degree of accuracy expressed as a proportion (.05)

The sample size of the present study is calculated as follows:

$$S= \frac{3.84x\ 1242x\ (0.5)\ (1-0.5)}{(0.052^2)\ (1242-1) + 3.84(0.5)\ (1-0.5)}$$

$$= \frac{937.92}{3.4}$$

$$= 350.167$$

When proportionately dividing the sample size 350 into 2, the sample size is low. Therefore, in order to ensure a large representation, a total of **400 managers** were selected **(236 managers from the Public sector banks and 164 managers from the Private sector banks)**.

Table 3
Final Sample Size of Bank Managers

Districts	Banks		Branches	Managers
Thiruvananthapuram	Public	SBI	56	99
		Canara	19	
		Union Bank of India	10	
		Syndicate Bank	14	
	Private	ICICI	9	41
		HDFC	6	
		Federal Bank	19	
		South Indian Bank	7	
Ernakulam	Public	SBI	44	94
		Canara	17	
		Union Bank of India	23	
		Syndicate Bank	10	
	Private	ICICI	12	94
		HDFC	14	
		Federal Bank	40	
		South Indian Bank	28	
Kozhikode	Public	SBI	18	43
		Canara	15	
		Union Bank of India	4	
		Syndicate Bank	6	
	Private	ICICI	5	29
		HDFC	4	
		Federal Bank	13	
		South Indian Bank	7	
Total number of Managers (Public 99+94+43=236 Private 41+94+29=164)				400

IX. Data Analysis and Interpretations

The collected data are analysed and interpreted as follows:

Table 4

Gender of the Bank Managers

		Frequency	Percent
Gender	**Male**	352	88.0
	Female	48	12.0
	Total	**400**	**100.0**

Source: Primary Data

From Table 4, it is observed that 88 per cent of the respondents are male and only 12 per cent are female.

Table 5

Age-wise Distribution of the Bank Managers

Age group	Frequency	Percent
20-30	65	16.3
31-40	186	46.5
41-50	135	33.8
51-60	14	3.5
Total	400	100.0

Source: Primary Data

It is seen from table 5 that, 46.5 per cent of the respondents are between 31and 40 years of age. 33.8 per cent of the respondents are in the age group of 41-50 years. 16.3 per cent of the respondents are in the age group of 20-30 years, and a small percent (3.5) are in the age group of 51 to 60 years. In other words, the majority of the respondents (80.3%) fall under the age group of 30-50 years.

Table 6

Educational Qualification of the Bank Managers

Educational Qualification	Frequency	Percent
Degree	41	10.3
Post-Graduation	260	65
Professional Degree	73	18.3
Others	26	6.5
Total	**400**	**100.0**

Source: Primary Data

It is clear from table 6 that, majority (65 per cent) of respondents are post- graduates and about 18.3 per cent of the respondents are having professional degree qualification. Only 10.3 per cent of the respondents are having degree qualification and Only a small per cent (63.5 %) of the participants are having other qualifications.

Table 7
Experience of the Bank Managers

Years	Frequency	Percent
1-5	141	35.25
6-10	246	61.5
11-15	13	3.25
Total	400	100.0

Source: Primary Data

Table 7 clearly shows the number of years of experience of the bank managers. 61.5 per cent of the managers are having 6-10 years of experience. 35.25 per cent of managers are having 1-5 years of experience and a very small per cent (3.25%) of the respondents are having 11-15 years of experience.

X. Analysis of Objectives

Objective 1: To analyse the priority of the Core Banking Services Adopted by the Customers.

The researcher identified mainly six Core Banking Services for the study. They are Automated Teller Machine (ATM), Internet Banking, Mobile Banking, Real Time Gross Settlement (RTGS), National Electronic Fund Transfer (NEFT) and Point of Sale (POS). In order to check which core banking services dominates, the researcher applied Analytical Hierarchical Processing (AHP) technique.

Analytical Hierarchy Process (AHP)

AHP is a multi-criteria decision making method that was originally developed by Prof. Thomas L. Saaty. It is based on inherent human ability to make a sound judgement about a problem. AHP starts with the construction of hierarchies. Then it moves on to prioritization, to find out the relative importance. Prioritization involves eliciting judgements in response to questions about the dominance of one element over another with respect to a property. The scales used for the same are given in table 8;

Table 8

Analytical Hierarchy Process (AHP) Scales

Scales	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective.
3	Moderate importance	Experience and judgment slightly favour one activity over another.
5	Strong importance	Experience and judgment strongly favour one activity over another.
7	Very strong importance	An activity is favoured very strongly over another; its dominance demonstrated in practice.
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order of affirmation.
2,4,6,8	For compromising between the above values.	Sometimes one needs to interpolate a compromise judgment numerically because there is no good word to describe it.

Table below shows the priority details of the Core Banking Services.

Table 9

Core Banking Services- AHP Analysis

Sl.no	Core Banking Services	Priority Weight	Percentage Priority Weight
1	Automated Teller Machine (ATM)	0.54	54%
2	Internet Banking	0.17	17%
3	Mobile Banking	0.15	15%
4	Real Time Gross Settlement (RTGS)	0.07	7%
5	National Electronic Fund Transfer (NEFT)	0.05	5%
6	Point of Sale (POS)	0.02	2%
	Total	**1**	**100%**

Source: Primary Data

The priority weights of each variable are estimated and are given in Table 9. It can be said that, higher the priority weight, stronger the importance. Hence, Automated Teller Machine (ATM) is the most popular Core Banking Service with a percentage priority weightage of 54%, Internet Banking and Mobile Banking can be regarded as the Core Banking Services of almost equal preference of 17% and 15% respectively. Point of sale (POS) is found to be the least used Core Banking Service.

The Potential Barriers in Adopting the Core Banking Services

The researcher identified four potential Barriers in Adopting the Core Banking Services for the study. They are the Lack of appropriate technology, Huge cost, Non-acceptance by the customers and Resistance to learning new technology. Table below shows the priority details of potential barriers in the Core Banking Services, from the point of view of the managers.

Table 10

Potential Barriers in Adopting the Core Banking Services - AHP

Sl.no	Core Banking Services	Priority Weight	Percentage Priority Weight
1	Lack of appropriate technology	.12	12%
2	Huge cost	.17	17%
3	Non- acceptance by the customers	.32	32%
4	Resistance to learning new technology	.39	39%
	Total	**1**	**100%**

Source: Primary Data

The priority weights of each variable are estimated and are given in Table 10. It can be said that, 'the higher the priority weight, the stronger the importance'. Hence, 'Resistance to learning new technology' and 'Non-acceptance by the customers' can be regarded as the most affected barriers in Adopting the Core Banking Services. While, 'Lack of appropriate technology' and 'Huge cost' are the least affected potential barriers in Adopting the Core Banking Services. It is a point to be noted that both the barriers with high priority weights are related to the attitude of customers; Non-acceptance and Resistance to learning new technology, together contributing 71%. Banks should be aware of that, and take necessary steps to overcome these barriers.

Objective 2: To identify the Challenges in adopting the Core Banking Services

Scale Validation

This section is concerned with the validation of the measurement scale developed by the researcher for the study. Exploratory Factor Analysis using SPSS 21 and Confirmatory Factor Analysis through Structural Equation Modeling using the SPSS Amos 21 were done to validate the instrument.

Scale Development and Validation

After reviewing the literature, the researcher identified the various components of Challenges and Adoption. It became necessary to develop a suitable scale to measure the Challenges and Adoption. Nine challenges were identified in the light of related literature. All were measured on a five-point liker's scale.

Data Collection and Cleaning

The purpose of the research was explained to the managers before distributing the questionnaires. A total of 450 questionnaires were distributed among the managers, out of which 422 questionnaires were collected after completion. After the collection, the data were then checked for the missing responses, outliers, normality and reliability. Using SPSS and Excel, the data outliers were identified, thus ensuring the quality of the data. The multivariate outliers were identified at a minimal level on examining the data. A total of 22 responses were thus identified, reducing the sample size to 400.

The primary data collected were subjected to the Principal Component Factor Analysis with varimax rotation using SPSS 21. An Exploratory Factor Analysis was done separately for each of the scales of variables.

Exploratory Factor Analysis (EFA)

SPSS 21 was used to conduct the Factor Analysis, in order to identify the major components of the study. It is suggested that, the factor extraction can be done by extracting the combinations of variables that explain the greatest amount of variance, if the data set had a large set of variables. The selection of the method of Factor Rotation (between the Common Factor Analysis and Component Analysis) was based on two criteria: (1) the objectives of the Factor Analysis and (2) the amount of prior knowledge about the variance in the variables (Hair et al 2009). The Component Factor Analysis method, also known as the Principal

Component Analysis was adopted in the study since the primary objective was to reduce the data, focusing on the minimum number of factors that needed to account for the maximum portion of the total variance (common, specific and error variances) represented in the original variables set (Eappan, 2014).

Hair, Black, Babin and Anderson (2009) have summarized certain assumptions for Factor Analysis, which included linearity, normality and homoscedasticity (which means dependent variable exhibits equal levels of variance across the range of predictor variables). They further argued that, these statistical assumptions need not be met, if the data matrix had sufficient correlation to produce representative factors and justify the application of factor analysis. The Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin Measure of Sampling Adequacy approaches are used to determine the sufficiency of correlations in the data set for factor analysis (Eappan, 2014). The results of the KMO and Bartlett's test are discussed in Table 11.

Table 11

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.549
Bartlett's Test of Sphericity	Approx. Chi-Square	206.272
	Df	105
	Sig.	.000

Source: Primary Data

Kaiser-Meyer-Olkin (KMO) test was performed to check the sampling adequacy of the data for Factor Analysis. The KMO statistic indicated the proportion of variance in the variables that might be caused by the underlying factors. Kaiser and Rice (1974) stated that, if the KMO values were greater than 0.5, it was considered to be adequate. The Barlett's test of sphericity related to the significance of the study and indicated the suitability of the responses collected to the problem being studied. The Barlett's test of sphericity is a statistical test to identify the presence of correlations among the variables and tests the hypothesis that the correlation matrix is an identity matrix i.e. all diagonal elements are '1' and off-diagonal elements '0' indicating that, all variables are uncorrelated and hence suitable for structure detection and it must be less than 0.05 for the Factor Analysis to be recommended. Since the KMO value is 0.549, it is acceptable. Barlett's test values (206.272, dof 105, Sig. 0.00) indicate that, the values are significant and implies that non-zero correlations existed at the significance level of less than 0.001, and hence proceed to Factor Analysis (D R Swamy, 2015)

The Latent Root Criterion Technique was used to decide on the number of factors to be extracted. The factors having latent roots or Eigen values greater than 1 are considered significant with the component analysis (Eappan, 2014).

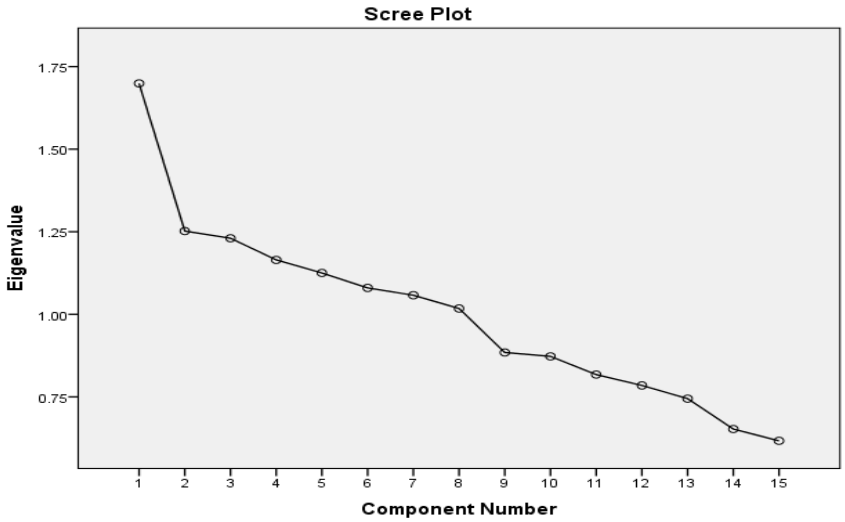

Fig 1: Scree Plot

The Scree plot represented that, by laying a straight edge across the bottom portion of the roots, there were nine factors, before the curve becomes approximately a straight line.

Table 12
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.699	11.328	11.328	1.699	11.328	11.328	1.520	10.133	10.133
2	1.252	8.347	19.674	1.252	8.347	19.674	1.334	8.890	19.023
3	1.230	8.202	27.876	1.230	8.202	27.876	1.235	8.231	27.254
4	1.165	7.765	35.641	1.165	7.765	35.641	1.193	7.953	35.207
5	1.125	7.501	43.142	1.125	7.501	43.142	1.190	7.936	43.142
6	1.080	7.199	50.341						
7	1.058	7.051	57.393						
8	1.018	6.784	64.177						
9	.884	5.896	70.073						
10	.873	5.818	75.890						
11	.818	5.451	81.341						
12	.785	5.231	86.572						
13	.745	4.964	91.536						
14	.653	4.351	95.887						
15	.617	4.113	100.00						

Extraction Method: Principal Component Analysis

Source: Primary Data

The analysis revealed that, five factors identified from the Factor Analysis together explained 43.142 % of the total variance. Based on the Eigen values from the Principal Component Analysis, the five most important components identified were Security, Need, Reliability, Cost and Adoption.

Table 13 presented below shows the structure of factor derived and its corresponding rotated factor loading.

Table 13

Rotated Component Matrix

	Component				
	Security	**Need**	**Reliability**	**Cost**	**Adoption**
I feel that core banking technology is secure.	.854				
I am concerned with the security of the technology used by the Core Banking Services.	.785				
I feel that core banking technology is more secure than traditional banking methods.	.727				
I am willing to use core banking technology to offer my organization's banking services.		.795			
My organization needs to improve its banking services and capabilities.		.721			
My organization needs core banking technology to meet the financial service needs of our customers.		.685			
Core banking technology would/does provide a significant benefit to my organization.		.622			
Core banking technology is reliable.			.799		
Core banking technology is more reliable than the traditional banking service delivery.			.712		
Core banking services are reliable.			.652		
Core banking provides a good value for the costs.				.687	
The cost of maintenance is lower with core banking technology than with the traditional banking methods.				.662	
I consider core banking approaches to have considerable cost savings over the traditional banking service delivery methods.				.592	
I feel comfortable, recommending core banking approaches in my organization.					.621
I feel that core banking uses proven technology.					.548
Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization					
a. Rotation converged in 6 iterations					

Source: Primary Data

The communalities derived from the Factor Analysis were reviewed for assessing the importance of the data through questionnaire for Factor Analysis. If the factor loadings were greater than 0.5, the data set was considered as appropriate {(Stewart 1981); (D R Swamy, 2015)}. The statements having the factor loading greater than 0.5 were finalized for the scale. In general, higher factor loadings are considered as better, and loadings below 0.3 are not interpreted. As a rule of thumb, loadings above 0.71 are excellent, 0.63 very good, 0.55 good, 0.45 fair, and 0.32 poor (Tabachnick and Fidell 2007), (Kumar G, 2011).

Confirmatory Factor Analysis (CFA)

The main objective of conducting the confirmatory factor analysis was to determine the ability of a predefined factor model to fit an observed set of data. It helps to determine the significance of the specific factor loadings and evaluates the convergent and discriminant validity of the data set. The confirmatory factor analysis was done using the SPSS Amos 21.0 in the study.

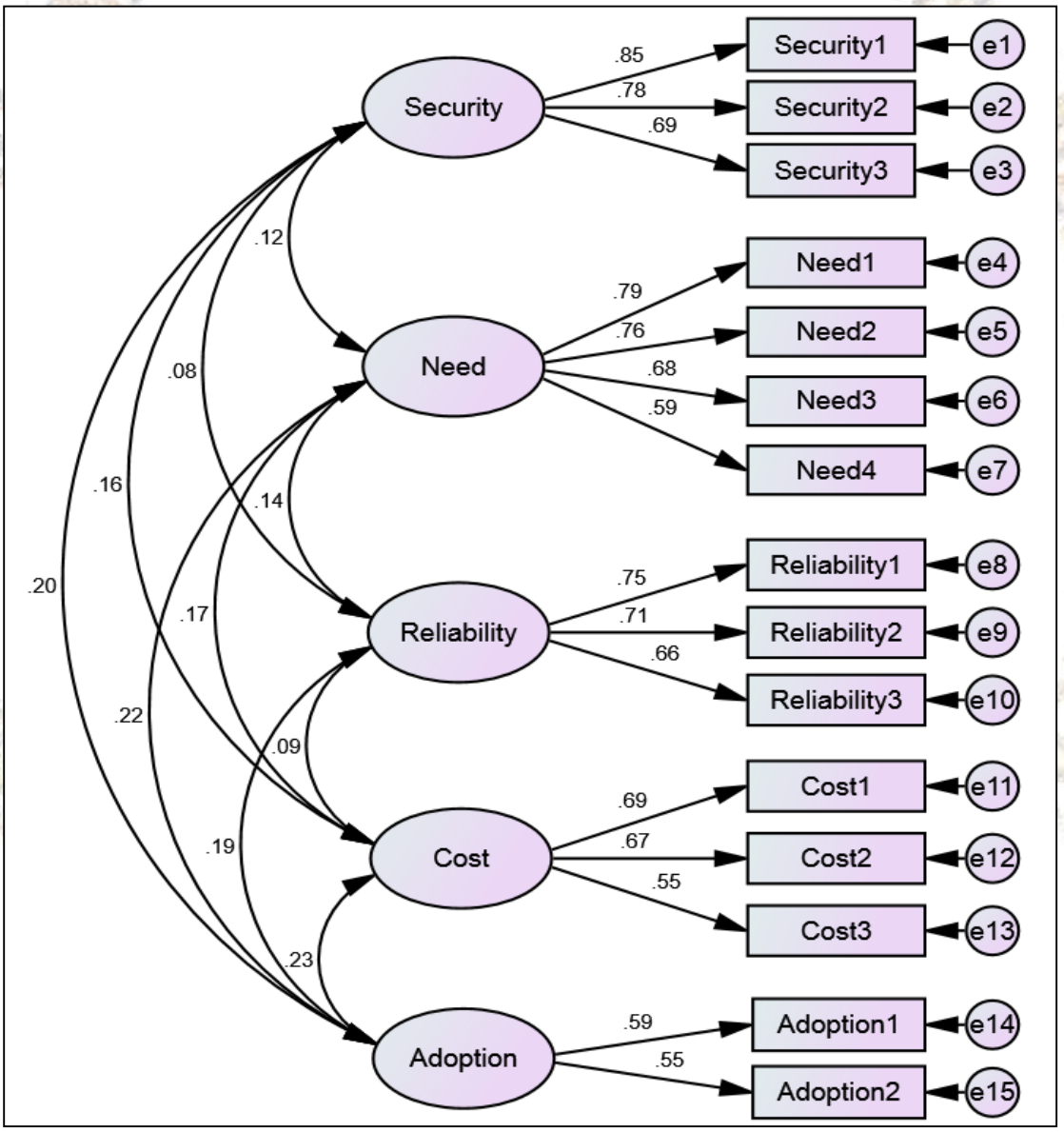

Fig 2: **Measurement model for the study**

The data were found free from missing values and outliers. The model with four constructs and fifteen variables was suggesting good fit in the first estimate as mentioned in the table 10. Compared with the generally accepted model fit standards, the test outcomes seemed to fit the measurement model. The RMSEA is 0.049, suggesting a close fit between the empirical data and the measurement model; it explains 91% of the data variance-covariance (GFI=0.91); it achieved a good balance between theoretical simplicity and explanation power (NFI=0.92, CFI=0.92, TLI=0.91). In all the factors, the beta coefficients were larger than 0.5, which indicates strong loadings among the items in each factor.

Table 14

Model Fit Indices

Variable	**CFI**	**GFI**	**TLI**	**NFI**	**RMSEA**
Measurement Model	.92	.91	.91	.92	0.048
Standard	>0.9	>0.9	>0.9	>0.9	>0.05

The details of the factors after conducting Confirmatory Factor Analysis (CFA) are given in Table 15. The overall reliability of the scale was .854.

Table 15

Factors and Reliability

Factors	**No. of items**	**Cronbach's alpha**	**Overall Cronbach's alpha**
Security	3	.821	.854
Need	4	.838	
Reliability	3	.819	
Cost	3	.811	
Adoption	2	.798	

Source: Primary Data

Measurement model validity highly depends on how well each item in the measurement model fits the data. It explains the extent to which the data collection methods accurately measure what they were intended to measure (Saunders and Thornhill, 2003).Validation of the measurement model in this study consists of exploratory convergent validity and discriminant validity.

Convergent validity

Convergent validity was established when the relationship between the measurement items and the factor was significantly different from zero. Based on this criterion, critical ratios were used to evaluate the statistical significance.

Table 16
Testing of Convergent Validity

Factors	Statements	Beta Coefficient	P value
Security	I feel that core banking technology is secure.	.85	<0.05
	I am concerned with the security of the technology used by the core banking services.	.78	<0.05
	I feel that core banking technology is more secure than traditional banking methods.	.69	<0.05
Need	I am willing to use core banking technology to offer my organization's banking services.	.76	<0.05
	My organization needs to improve its banking services and capabilities.	.76	<0.05
	My organization needs core banking technology to meet the financial service needs of our customers.	.68	<0.05
	Core banking technology would/does provide a significant benefit to my organization.	.59	<0.05
Reliability	Core banking technology is reliable.	.75	<0.05
	Core banking technology is more reliable than traditional banking service delivery.	.71	<0.05
	Core banking services are reliable.	.66	<0.05
Cost	Core banking provides a good value for the costs.	.69	<0.05
	The cost of maintenance is lower with core banking technology than with traditional banking methods.	.67	<0.05
	I consider core banking approaches to have considerable cost savings over traditional banking service delivery methods.	.55	<0.05
Adoption	I feel comfortable, recommending core banking approaches in my organization.	.59	<0.05
	I feel that core banking uses proven technology.	.55	<0.05

Source: Primary Data

In this study the factor loadings ranged from 0.50 to 0.90 and no loading was less than the recommended value of 0.50, hence, evidencing convergent validity.

Discriminant Validity

One construct must be truly distinct from the other constructs, and then only it can be called a discriminantly valid measurement scale. It implies that an unobserved variable should explain better the variance of its own indicators than the variance of other unobserved variables. In other words, the loadings of variables that comes under one latent variable should be higher than that of all other latent variables.

Testing of discriminant validity is done by comparing the Average Variance Extracted (AVE) with the Squared Correlation for each of the constructs. The AVE of an unobserved variable should be greater than the Squared Correlations between the unobserved variable and all other unobserved variables (Cooper &Zmud, 1990, Hair et al., 1998). Discriminant validity is achieved when each measurement item correlates weakly with all other constructs, except with the constructs which are theoretically associated(Cooper &Zmud, 1990, Hair et al., 1998).

Table 17

Testing of Discriminant Validity

Relationship	**Correlation**	**P value**
Security ↔ Need	.12	<0.05
Security ↔ Reliability	.08	<0.05
Security ↔ Cost	.16	<0.05
Security ↔ Adoption	.20	<0.05
Need ↔ Reliability	.14	<0.05
Need ↔ Cost	.17	<0.05
Need ↔ Adoption	.22	<0.05
Reliability ↔ Cost	.09	<0.05
Reliability ↔ Adoption	.19	<0.05
Cost ↔ Adoption	.23	<0.05

Source: Primary Data

For the derived factors, the proof of discriminant validity is shown in Table 17. As a rule of thumb, a 0.85 correlation or higher indicates poor discriminant validity in Structural Equation Modelling (David 1998). None of the correlations among the variables were above 0.85. Thus, discriminant validity of the measurement model is established.

Normality

Kolmogrov- Smirnov test was used to assess the normality of the data used. Table 18 shows the test results.

Table 18

Kolmogrov- Smirnov test of Normality

	N	Mean	SD	Sig.
I feel that core banking technology is secure.	400	4.2400	.46685	<0.05
I am concerned with the security of the technology used by the core banking services.	400	4.3750	.51966	<0.05
I feel that core banking technology is more secure than traditional banking methods.	400	4.2950	.59063	<0.05
I am willing to use core banking technology to offer my organization's banking services.	400	4.7775	.45111	<0.05
My organization needs to improve its banking services and capabilities.	400	3.8700	.56025	<0.05
My organization needs core banking technology to meet the financial service needs of our customers.	400	4.9800	.23396	<0.05
Core banking technology would/does provide a significant benefit to my organization.	400	4.9025	.33657	<0.05
Core banking technology is reliable.	400	3.8875	.44760	<0.05
Core banking technology is more reliable than traditional banking service delivery.	400	4.1625	.43193	<0.05
Core banking services are reliable.	400	4.1400	.41331	<0.05
Core banking provides a good value for the costs.	400	4.0350	.28980	<0.05
The cost of maintenance is lower with core banking technology than with traditional banking methods.	400	1.9525	.60095	<0.05
I consider core banking approaches to have considerable cost savings over traditional banking service delivery methods.	400	3.9150	.51812	<0.05
I feel comfortable, recommending core banking approaches in my organization.	400	4.9625	.30220	<0.05
I feel that core banking uses proven technology.	400	4.9725	.24879	<0.05

Source: Primary Data

Analysis for univariate normality using Kolomogorov- Smirnov test with Lillefors significance correction revealed that, none of the variables are normally distributed.

To assume normality, skewness and kurtosis are commonly used by the statisticians. Skewness refers to the symmetry of a distribution whereas, kurtosis relates to the peakedness of a distribution. A distribution is said to be normal when the values of skewness and kurtosis are equal to zero (Tabachnick and Fidell; 2001). However, there are few clear guidelines about how much non-normality is problematic. It is suggested that, absolute values of univariate skewness indices greater than 3.0 seem to describe extremely skewed data sets (Chou and Bentler 1995). Regarding kurtosis, there appears that kurtosis index greater than 10.0 may suggest a problem.

Table 19

Skewness and Kurtosis

	Skewness		**Kurtosis**	
	Statistic	**Std. Error**	**Statistic**	**Std. Error**
I feel that core banking technology is secure.	.541	.122	.707	.243
I am concerned with the security of the technology used by the core banking services.	-.077	.122	.314	.243
I feel that core banking technology is more secure than traditional banking methods.	-.336	.122	.211	.243
I am willing to use core banking technology to offer my organization's banking services.	-1.986	.122	4.317	.243
My organization needs to improve its banking services and capabilities.	-1.494	.122	3.923	.243
My organization needs core banking technology to meet the financial service needs of our customers.	-1.936	.122	4.964	.243
Core banking technology would/does provide a significant benefit to my organization.	-2.057	.122	2.461	.243
Core banking technology is reliable.	-1.198	.122	7.490	.243
Core banking technology is more reliable than traditional banking service delivery.	.281	.122	4.513	.243
Core banking services are reliable.	.295	.122	5.626	.243
Core banking provides a good value for the costs.	-.780	.122	8.518	.243

The cost of maintenance is lower with core banking technology than with traditional banking methods.	1.620	.122	7.073	.243
I consider core banking approaches to have considerable cost savings over traditional banking service delivery methods.	-2.724	.122	9.906	.243
I feel comfortable recommending core banking approaches in my organization.	-2.660	.122	7.047	.243
I feel that core banking uses proven technology.	-2.316	.122	8.029	.243

Source: Primary Data

In this study, all the variables belong to the derived factors fall under the kurtosis value of 10 and Skewness value of 3, inferring that kurtosis and skewness was not problematic in this research. Hence, parametric test can be used.

From the detailed scale validation provided above, it is observed that, the measurement scale follows normal distribution. Therefore, the researcher applied various normality tests to assess relationships among variables. The researcher used Structural Equation Modeling in order to draw various conclusions.

Descriptive Statistics- Challenges in adopting the Core Banking Services

The researcher identified fifteen challenges faced by the banking sector in adopting the Core Banking Services. Mean scores of the challenges are presented in Table 18.

Table 18

Challenges in Adopting Core Banking Services- One Sample t Test.

	N	Mean	SD	Sig.
I feel that core banking technology is secure.	400	4.2400	.46685	<0.05
I am concerned with the security of the technology used by the Core Banking Services.	400	4.9800	.51966	<0.05
I feel that core banking technology is more secure than traditional banking methods.	400	4.9025	.59063	<0.05
I am willing to use core banking technology to offer my organization's banking services.	400	3.8700	.45111	<0.05
My organization needs to improve its banking services and capabilities.	400	4.7775	.56025	<0.05
My organization needs core banking technology to meet the financial service needs of our customers.	400	4.3750	.23396	<0.05
Core banking technology would/does provide a significant benefit to my organization.	400	4.2950	.33657	<0.05
Core banking technology is reliable.	400	3.8875	.44760	<0.05

Core banking technology is more reliable than traditional banking service delivery.	400	4.1625	.43193	<0.05
Core banking services are reliable.	400	4.1400	.41331	<0.05
Core banking provides a good value for the costs.	400	4.0350	.28980	<0.05
The cost of maintenance is lower with core banking technology than with traditional banking methods.	400	1.9525	.60095	<0.05
I consider core banking approaches to have considerable cost savings over traditional banking service delivery methods.	400	3.9150	.51812	<0.05
I feel comfortable recommending core banking approaches in my organization.	400	4.9625	.30220	<0.05
I feel that core banking uses proven technology.	400	4.9725	.24879	<0.05

Source: Primary Data

Table 18 shows the perception scores of respondents with regard to the Challenges in Adopting the Core Banking Services. It is clear from the table that, the Mean perception scores of all the variables are higher than the test value '3'. The table also reveals that, the difference between the perceived score and the test value of all the components are significant, since the 'p value' of all the components are less than 0.05. Among the Challenges, the variable 'security concerned with core banking technology (4.9800)' is found to be the most important Challenge, followed by 'Core banking technology is secured than traditional methods (4.9025)'. While, the variable 'Low cost of maintenance of core banking compared to the traditional banking methods (1.9525)' is found to be the least important Challenge faced by the banks in adopting Core Banking Services

Objective 3: To Study the Influence of the Challenges on the Adoption of the Core Banking Services

In order to measure the influence of Challenges on the adoption of core banking services, the researcher applied Structural Equation Modeling technique by using SPSS Amos 21.0.

Structural Equation Modeling

Structural Equation Modeling is a Multivariate Statistical Analysis technique that is used to analyze structural relationships. This technique is the combination of Factor Analysis and Multiple Regression Analysis, and it is used to analyze the structural relationship between measured variables and latent constructs. This method is preferred by the researcher because it estimates the multiple and interrelated dependence in a single analysis.

Structural Model Path Diagram

The structural model shown in Figure 3 shows the hypothesis formulated. Before moving on to the Structural Model Analysis it is necessary to understand the structural model path diagram. SEM is actually the graphical equivalent of its mathematical representation whereby a set of equations relates dependent variables to their explanatory variables. In reviewing the model presented in Figure 3, it can be seen that,

there are two unobserved latent factors and six observed variables. These six observed variables function as indicators of their respective underlying latent factors.

Associated with each observed variable is an error term (e1– e6).Errors associated with observed variables represent measurement error, which reflects on their adequacy in measuring the related underlying factors. Residual terms represent error in the prediction of endogenous factors from exogenous factors. For example, the residual e1 in Figure 6.3 represents error in prediction of 'Cost' (the endogenous factor) from the factor 'Challenges'.

Certain symbols are used in path diagrams, to denote hypothesized processes involving the entire system of variables. In particular, one-way arrows represent structural regression coefficients and thus indicate the impact of one variable on another. The one-way arrows pointing from the enclosed error terms (e1 –e6) indicate the impact of measurement error on the observed variables.

Fitting of Hypothesis

The researcher fixed the following hypothesis. In order to test the below mentioned hypothesis, the researcher used Structural Equation Modeling technique. For that, the SPSS Amos 21 is used.

H1: There is significant relationship between the Challenges and the Adoption of the Core Banking Services.

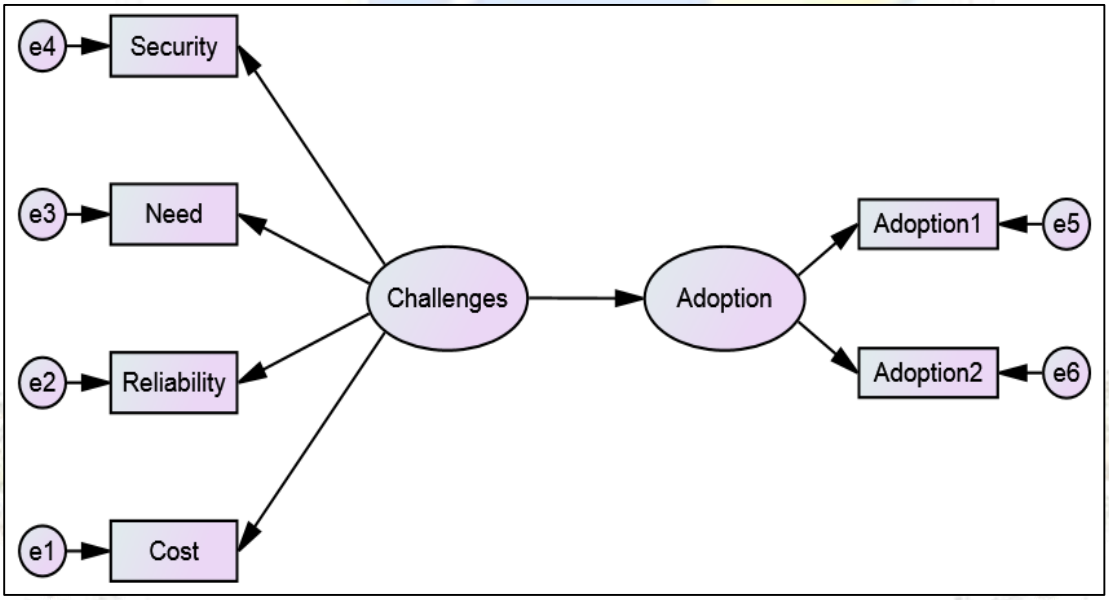

Fig 3: Structural Model for the study

Structural Model- Hypotheses Testing

The SEM analysis was conducted on the Structural Model using Amos 21, to test the hypothesis formulated as shown in Figure 3. Here the Full Structural Equation Model is considered and the hypothesis to be tested relates to the pattern of causal structure linking several variables that bear on the construct of usage intention. In reviewing the SEM path model, it can be seen that, the adoption of the Core Banking Services is influenced by the Challenges. All these paths reflect findings in the literature and the model shown in Figure 6.3 represents only the structural portion of the Structural Equation Modeling (SEM).

Assessing the Structural Model Fitness

The process of establishing the structural model follows the general guidelines adopted for the measurement model. A new SEM estimated covariance matrix is computed and it is different from the measurement model, since the measurement model assumes that all constructs are correlated, but in structural model the relationships between some constructs are assumed to be zero. Therefore, for almost all conventional SEM models, the chi square GOF for the measurement model will be less than the GOF for the structural model. Table 19 presents select fit indices of the structural model.

Table 19

Model Fit Indices

Indices	**GFI**	**AGFI**	**NFI**	**RFI**	**CFI**	**TLI**	**RMSEA**
Obtained	.93	.91	.91	.90	.92	.91	.041
Recommended	>.9	>.9	>.9	>.9	>.9	>.9	<.08

The model fit indices also provide a reasonable model fit for the structural model. Goodness of Fit index (GFI) obtained is 0.93. The Adjusted Goodness of Fit Index (AGFI) is 0.91. The Normed fit Index (NFI), Relative Fit index (RFI), Comparative Fit index (CFI), Tucker Lewis Index (TLI) are 0.91, 0.90, 0.92, 0.91 respectively. RMSEA is 0.041. Hence, it is concluded that, the proposed research model fits the data reasonably.

The hypothesized research model exhibited good fit with observed data as mentioned above. Of greater interest for nomological validity, is the path estimates in the structural model and variance explained (value) in each dependent variable. The hypothesis paths are significant (p value <0.001), and hence supported. The standardized regression weight of the output and result of the hypothesis testing providing support for hypothesis H1 is presented in Figure 4 and Table 20

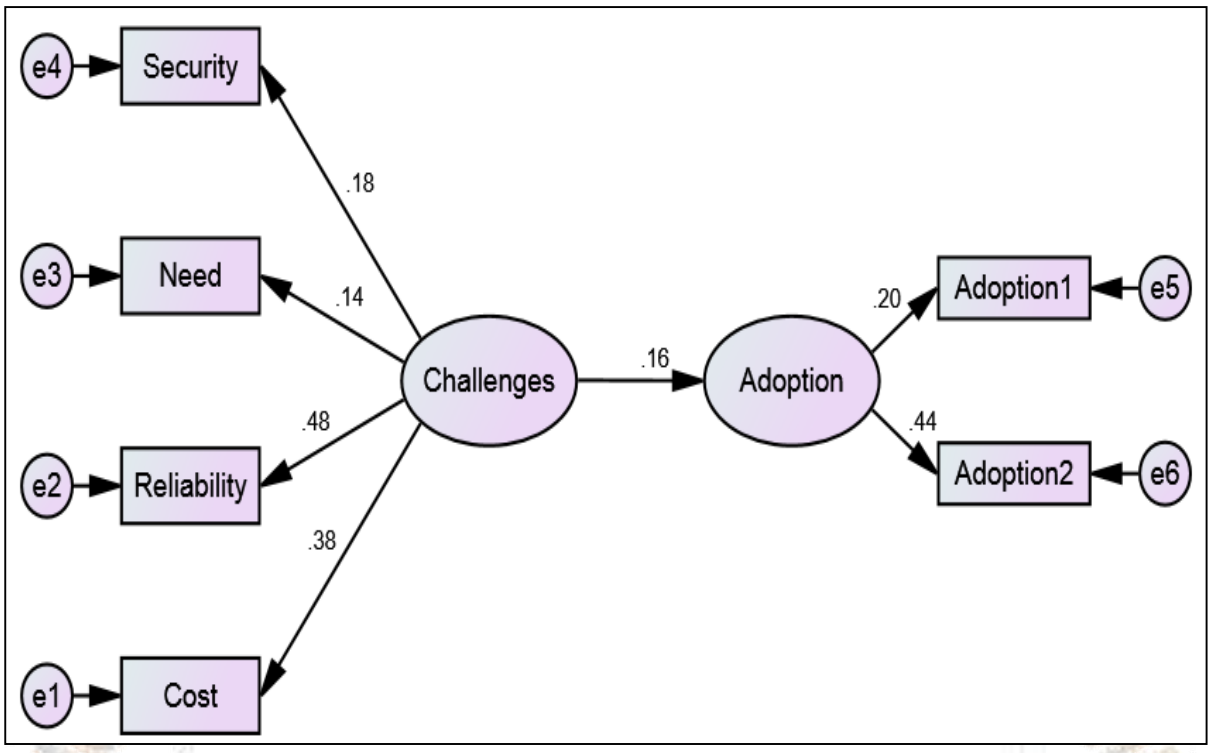

Fig 4: **Structural Equation Modeling- Testing of Hypothesis**

As seen from the **Figure 4**, it is observed that, the variable 'Reliability' contributes the most, towards the factor 'Challenges' (β Value 0.48, $p<0.01$) followed by the variable 'Cost' (β Value 0.38, $p<0.01$) and 'Security' (β Value 0.18, $p<0.01$). The variable 'Need' (β Value 0.14, $p<0.01$) contributes the least. All variables were contributing significantly towards the factor 'Challenges'.

The Hypothesis set is accepted. The beta coefficient value from challenges to Adoption of the Core Banking Services is 0.16 and it is significant at 5 percentage level. It is indicating that there is significant positive relationship between challenges and Adoption of the Core Banking Services. Or in other words, one unit change in Challenges would results 16 percentage increase in Adoption ($\beta= 0.16$, $p<0.05$). Therefore, it is concluded that, the challenges and adoption were being successfully managed by the banks.

Table 20

Result of Hypothesis

Hypothesis No.	**Hypothesis proposed**	**Test Status**
H 1	There is a significant relationship between Challenges and the Adoption of the Core Banking Services.	Supported

XI. Findings of the study

Major findings of the study are explained as follows:

1.Potential Barriers in Adopting Core Banking Services

1. For the study, the researcher identified mainly four potential barriers in adopting Core Banking Services. They are lack of appropriate technology, huge cost, non acceptance by customers and resistance to learning new technology.
2. According to the Analytical Hierarchy Processing method, the higher the priority weight, the stronger the importance. Hence, 'resistance to learning new technology' and 'non-acceptance by customers' can be regarded as the most affected potential barrier in adopting Core Banking Services.
3. The result also shows that, 'lack of appropriate technology' and 'huge cost' are the least affected potential barriers in adopting Core Banking Services.

11. Challenges in adopting the Core Banking Services

1. Five factors are extracted from exploratory factor analysis such as Security, Cost, Need, Reliability and Adoption. Among them, 'Security' is found to be the most important challenge in adopting Core Banking Services. The second prominent challenge in adopting Core Banking Services is 'Need', followed by 'Reliability' and 'Cost'.
2. It is clear from the 'one sample t test' that, the mean perception scores of all the variables are higher than the test value '3'. The table also reveals that, the difference between the 'perceived score' and the 'test value' of all the components are significant, since the 'p value' of all the components are less than 0.05.
3. Among the challenges, the variable 'security concerned with core banking technology (4.9800)' is found to be the most important challenge, followed by 'Core banking technology is secured than traditional methods (4.9025)'. It indicates that 'security; is the main challenge faced by banking sector while adopting core banking services. While, the variable 'Low cost of maintenance of core banking compared to the traditional banking methods (1.9525)' is found to be the least important challenge faced by the banks in Adopting Core Banking Services.

111. Influence of Challenges on Adoption of Core Banking Services

1. From the results of Structural Equation Model, it is observed that the variable 'Reliability' contributes the most towards the factor 'Challenges' (β Value 0.48, $p<0.01$) followed by the variable 'Cost (β Value 0.38, $p<0.01$)' and 'Security (β Value 0.18, $p<0.01$)'.
2. From the results, it is observed that the variable 'Need, (β Value 0.14, $p<0.01$) contributes the least.
3. It is also found that, the beta coefficient value from Challenges to Adoption of Core Banking Services is 0.16 and it is significant at 5 percentage level. It indicates that, there is significant positive relationship between Challenges and Adoption of Core Banking Services. In other words, one unit change in Challenges would result 16 percentage increase in adoption ($\beta= 0.16$, $p<0.05$).

4. Based on the result derived from structural equation modelling, the hypothesis is accepted; it is indicating that there is significant positive relationship between Challenges in Adopting Core Banking Services and Adoption of Core Banking Services.

XII. Suggestions

The banks are facing many Challenges while Adopting Core Banking Services. Thus, Banks have to increase the security of the Core Banking transactions. Banks should not only provide general information about their security policies but also to explain and educate customers about the security policies, risks and benefits of using it. As the challenges are influencing Adoption of Core Banking Services, Banks have to create enhanced and effective security systems which can detect, control, prevent and manage fraud activities in each and every innovation channels. Thus, the Reliability can be ensured.

XIII. Conclusions

The major conclusions drawn from the findings of the study are explained below.

This study covers mostly adopted Core Banking Services by customers and the barriers and challenges in adopting Core Banking Services. AHP Method was used to analyse the popular Core Banking Services and the barriers of the Core Banking Services. One Sample t Test was conducted to examine the Challenges in Adopting the Core Banking Services. The study also point out the research model analysis, which shows the influence of Challenges in adoption of Core Banking Services using SEM. The Structural Model developed using SEM proves that there is a significant relationship between Challenges and Adoption of Core Banking Services.

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