Characterization of Adopters and Non Adopters of Credit Cards in Indian Banking Industry

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Abstract

In Indian banking industry, plastic cards can be considered as one of the product as well as process innovation in which Credit Cards have gained prominence as a delivery channel for conducting banking transactions. The present study investigates the recent issue related to the launch of one of the innovation in plastic cards in Indian Banking Sector. The main objective of the study is to identify the characteristics of the banks which could have been affected with the adoption of Credit Cards. For this purpose, all the scheduled commercial banks (79 in number which consists of 27 Public Sector Banks, 23 Private Sector Banks and 29 Foreign Sector Banks) have been taken as sample. The whole sample of banks has been categorized into adopter and non adopter groups. The time period of the study is of 14 years i.e. from 2000 to 2013. Various Bank specific variables Viz. Age, Efficiency, Size, Asset Quality, Profitability, Diversification, Capitalisation, Cost of Operations, Financing Pattern, Liquidity and Industry Advantage have been taken into consideration which may help to demarcate adopters and non adopters. It has been concluded that the initiators and adopters take advantage over the non adopter ones and thus former have found to perform better in terms of various parameters. Overall, the adopter banks are larger in size, older in age, more profitable, having lesser branches, more market share and more liquid as compare to late adopter ones.

Keywords: Innovation in banking, Credit cards, Univariate analysis, Performance differentiation

1. Introduction

The innovations and technological progress are engines of economic growth. Economists and other social scientists have attempted to understand the process of technology diffusion from time to time. When the real need arises, a new idea is generated in the social system which becomes innovation once it is adopted by the community. Thus, Innovation makes the initial idea commercially feasible, and then adoption of the technology by potential users leads to its diffusion (Khan, 2004).

Banks have also tried to redefine themselves with new rules by transforming its operations to universal banking and adding new channels with lucrative deals (Indian Banking; McKinsey & Company, 2010). Hence, the banks introduce innovative products through e-banking and e-payment system. This can be regarded as one of the ways for the banks to survive in this environment by launching the electronic products in the market viz. Internet Banking, Plastic Cards, Electronic fund transfer, Mobile Banking etc. which are known for its unique features like more speed to conduct transactions, universal applicability, lesser financial cost etc. while taking into consideration the customers' needs, preferences, perceptions, convenience and need of an hour.

In modern era banking industry, information technology has revolutionized the way to approach their customers through innovative products and services. As information technology becomes more and more sophisticated, banks in many parts of the world are adopting a multiple-channel strategy. Also, the right mix of banking channels depends not only on the channel characteristics, but also the preferences of the consumers within a particular market (Wan et al., 2005). Thus, the new innovations being adopted by banks hold great promises for them to grab huge business opportunities by competing worldwide. In this way, the innovations itself have also lured the banks to reengineer themselves with tech savvy services which can be reached to their customers by bringing flexibility in their "distribution channels" (Sarkavr, 2001). These new enhancements and their acceptance have shifted the bank interest from product centric to customer centric and Electronic banking can be seen as one of that advantageous change.

Innovation is thus one leading 'driving force' nowadays, in different businesses (Tavares, 2000). It is therefore important to research the investments in technology and their impact in the bank business (Saunders & Walter, 1994; Sethi & King, 1994). The paper has been divided into six sections. Section I briefly explains the emergence of information technology in Indian banking industry, Section II elaborates the Adoption pattern of credit cards in India, Section III deals with the previous literature related to study, Section IV describes the sample and need of the study, however Section V highlights the empirical results and last but not the least Section VI presents the concluding remarks of the results so found.

2. Adoption Pattern of Credit Cards in India

In today's world credit cards came with important technology to facilitate several financial transactions for consumers, as the cards have capacity to support consumers in their everyday life activities without much concerning about cash in hands. Indian banking sector too

actively participated in imparting services to its customers through credit cards issuance. Since its installation in India, Out of all the commercial banks prevailing, 59 banks started issuing credit cards to its customers upto the year 2013. Hence, overall adoption rate of credit cards in Indian banking sector is found to be approximately 75%. It can also be located in Table 1 that the private sector banks have lead with 78.2% of adoption rate. Public sector banks followed them with no much difference having adoption rate of 77.77%. The least adoption can be seen in the case of foreign sector banks i.e. 68.96%.

Table 1. Adoption status of credit cards in Indian banking sector

Bank Type	Number of adopters (% age)	Number of Non-adopters (% age)	Total (% age)	Adoption rate
Private Sector Banks	18 (30.50)	5(25)	23 (29.113)	78.26087
Public Sector Banks	21(35.59)	6(30)	27 (34.17)	77.77778
Foreign Sector Banks	20 (33.89)	9(45)	29 (36.71)	68.96552
Total	59	20	79	74.68354

Source: Websites and Annual Reports of the Banks, Communication with Bank's authorities through telephone and E-mail as on January 2013.

3. Review of Literature

Most of the studies relating to adoption of innovation in banking sector deals with the adoption of services provided through internet banking. No doubt, enough literature is available worldwide evaluating the banks performance by categorizing them into adopters and non adopters of innovations, but most of them are relating to Internet banking only. Hence, there is not much literature available on the part of differentiation or comparison of performance of banks adopting plastic cards than those with the non adopters. In India, also there is no such type of study as far as our knowledge is concerned.

However, Furst et al. (2000, 2002), Sullivan (2000), De Young (2001, 2005), Hasan et al. (2002), Delgado et al. (2004) , Hernando and Nieto (2005), De Young et al. (2006), Malhotra and Singh (2009) etc. are some of the studies who have remarkably researched the performance characteristics of internet and non internet banks by comparing both groups. Various bank specific characteristics like Profitability, Asset Quality, Financing Structure, Size, Cost of Operations etc. have been taken as performance measures by these studies.

Furst et al. (2000, 2002), by taking the sample of US banks, found that internet banks are having better performance than non internet banks and thus outperformed non internet banks. In the line of this, Hasan et al. (2002), Hernando and Nieto (2005), De Young et al. (2006), Malhotra and Singh (2009) also share the same views by analyzing the banks of Italy, Spain, US and India respectively. However, Sullivan (2000) and Delgado et al. (2004) envisaged the contrary results by reporting lower profitability and poorer performance for internet banks.

Hence, performance of banks providing services through plastic cards is the untouched research issue of the banking sector. In the present study, only issues relating to credit card have been analyzed or explored as it is recent observable fact of the Indian banks because very few numbers of banks have yet adopted it.

4. Research Design of the Study

4.1 Objective, Sample Description and Hypothesis of the Study

The main objective of the study is to identify the characteristics of the banks which could have been get affected with the adoption of credit cards. In other words, the attempt has been made to investigate the difference in performance of banks which have adopted Credit cards than that of non adopters.

The sample consists of all the scheduled commercial banks prevailing in India during 2013 i.e. 79 in number out of which 29 are foreign banks, 23 are private banks and 27 are public sector banks. The time period of the study is of 14 years i.e. from 2000 to 2013. The data relating to sampled banks' characteristics has been collected from database of Reserve Bank of India.

The innovation no doubt has the tendency to impact the industry at large as well as the organizational performance. To measure the performance of organization is a complex process which includes internal operations and external activities and interaction between them. There are a multitude of measures used to assess bank performance. The main drivers of banks' performance are its earnings, efficiency, growth, liquidity, risk-taking, leverage etc. For this purpose, various Bank specific variables Viz. AGE, EFFICIENCY, SIZE, ASSET QUALITY, PROFITABILITY, DIVERSIFICATION, CAPITALISATION, COST OF OPERATIONS, FINANCING PATTERN, NETWORK EFFECT, LIQUIDITY and INDUSTRY ADVANTAGE have been taken into consideration which may help to demarcate adopters and non adopters. There can be some variations or differentiations in these two groups in context of their characteristics.

Ho: There is no significant difference between adopters and non adopter banks in terms of their various characteristics.

Table 2. List of the variables

Parameter	Variables	Explanation
Age		Number of Years since incorporation
Diversification	Noninterest Income	Ratio of non interest income to total income
Capitalisation	CRAR	Ratio of total capital to risk weighted assets
Industry Advantage	Market Share	Ratio of banks loan and investment to loan and investment of total banks
Size	Assets	Log of total assets of the bank
	Branches	Total number of branches
Financing Pattern	Deposits	Ratio of total deposits to total funds

	Borrowings	Ratio of total borrowings to total funds
Cost of Operations	Wages	Payment to employees over operating expenses
	Fixed Cost	Ratio of expenses for premises and fixed asset to operating revenue
Profitability	ROA	Ratio of net profits to total assets
	ROE	Ratio of net profits to equity
Asset quality and credit risk	Loans	Ratio of total loans to total assets
	Non Performing Assets	Ratio of net non performing loans to total loans
Efficiency	Business per Employee	Ratio of deposits and advances to total number of employees
	Net Interest Margin	Ratio of net interest margin to net operating revenue
Liquidity	Liquid Assets	Total Liquid assets of the bank
	Cash Deposit Ratio	Ratio of Cash and Cash equivalents to total deposits

Independent sample T test has been applied by differentiating the banks into two groups. The t-test may be used to compare the means of a criterion variable for two independent samples. This test of difference of means indicates whether there is significant difference between the means of two sample groups or not. Here,

Ho: $\mu_1 = \mu_2$

Ha: $\mu_1 \neq \mu_2$

Since the sample size is large enough, the normality of data does not make much relevance at all (Note 1). However the equality of variance has been tested by applying Levene's Test. The t statistic to test whether the population means are different can be calculated as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{s_{\overline{X}_1 - \overline{X}_2}}$$

Where,

$$s_{\overline{X}_1 - \overline{X}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}.$$

Where s2 is the unbiased estimator of the variance of the two samples, n = number of variables, 1 = group one, 2 = group two.

5. Results and Discussion

The empirical results showing the performance of adopters and non adopters of credit cards in Indian banking sector, while taking the various bank specific parameters into consideration are as follows:

5.1 Size

Total assets & number of Branches of the bank has been taken as the proxy of size for the estimation. The results as per Table 3 reveal that Size has a significance and positive relation when empirically tested irrespective of the type of banks taken into consideration. Thus it can be said that the banks issuing credit cards are larger in size than that of non-adopters and thus rejects the null hypothesis and accepts priori assumption.

Table 3. Size of the adopters and non adopters of credit cards

Banks	Total Assets (in Rs crore)			Branches		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	18.32253	16.67299	3.14735*** (0.002364)	0.86798	1.559006	-2.91529*** (0.004652)
Public Sector Banks (N1= 21, N2= 6)	19.82866	19.1795	2.147454* (0.064633)	1.525646	1.793599	-1.42728 (0.165872)
Private Sector Banks (N1= 18, N2= 5)	18.62244	16.77311	5.2379*** (3.99E-05)	0.900519	2.631631	-4.2204*** (0.000384)
Foreign Banks (N1= 20, N2= 9)	16.59828	14.48411	3.86092*** (0.001478)	0.186651	0.318814	-1.30685 (0.205532)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

However, in terms of branches opposite results has been revealed. It has been reported that banks with credit card adoption have lesser number of branches than that of non-adopters though the results are insignificant in case of public as well as foreign sector banks. It can be due to the reason that tech savy banks or banks with the larger number of cards issuance replace the need of physical branches as customers can conduct the general functions of banking not by visiting branch but just through the swipe of cards, which ultimately reduce the need of establishment of more branches in the future.

5.2 Profitability

ROE and ROA has been taken as the measure of profitability. It can be well located that the ROE & ROA is being positively affected with the adoption of credit cards by banks except for the foreign sector banks. It can be well said that adoption of credit cards attract more customers for different type of services or products they are being offered with. It enables the banks to increase its profitability in the long run. Also, due to credit /overdraft facility available with it, banks tend to charge higher rate of interest on the amount withdrawn over the limit which contributes to enhance the overall income of the banks without incurring much of expenses. However, it can also have a negative affect on profitability if the most of the customers turn into defaulter and not able to pay EMI & interest on the due date. Thus, ROA in case of foreign sector banks report lesser profitability for the adopter banks as seen from Table 4.

Table 4. Profitability of the adopter and non adopter banks of credit cards

Banks	ROE			ROA		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	13.26474	9.467723	1.858219** (0.072556)	1.20931	1.063729	0.616921 (0.54157)
Public Sector Banks (N1= 21, N2= 6)	17.87027	16.10728	0.781872 (0.441632)	0.890293	0.721873	1.8791* (0.094569)
Private Sector Banks (N1= 18, N2= 5)	13.51179	10.82457	0.910738 (0.379986)	1.246781	0.785714	1.490093 (0.151267)
Foreign Banks (N1= 20, N2= 9)	8.479545	3.368334	2.081805** (0.047811)	1.501075	1.585928	-0.1551 (0.879934)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

5.3 Cost of Operations

While issuing credit cards, banks have to incur some fixed charges in the form of infrastructure expenses. It have also been reported by the results in Table 5 that adopter banks have comparatively incurred more fixed expenses. However, it is found to be insignificant in all the categories of banks. It can also be said that whether the credit cards have been adopted by banks or not, do not make any impact of its fixed/infrastructure cost. Also in case of credit card, banks need not to have huge investment in order to install new technology. It can be just regarded as a new product & service being offered by bank to its customers.

Table 5. Cost of operations of the adopter and non adopter banks of credit cards

Banks	Fixed cost (Infrastructure cost)			Labour Cost (Wages)		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	0.148535	0.058986	0.595298 (0.55339)	0.507361	0.523468	-0.35207 (0.727598)
Public Sector Banks (N1= 21, N2= 6)	-0.09867	0.255032	-1.33212 (0.197768)	0.65712	0.682592	-0.77189 (0.447414)
Private Sector Banks (N1= 18, N2= 5)	0.213465	-0.07096	1.478537 (0.163003)	0.46768	0.583284	-2.12598 (0.049873)
Foreign Banks (N1= 20, N2= 9)	0.348513	0.048894	1.092732 (0.286412)	0.386461	0.32108	1.56497 (0.149831)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

Labour cost in the form of wages paid to the employees has been found to be reduced if the banks take the decision to adopt credit cards except for the foreign sector banks in which

labour cost of the adopter banks is more than that of non adopter ones. The results are significant for the private sector banks only. Thus, an alternate hypothesis that the adoption of credit cards reduces the role of human tellers hold true and is being accepted.

5.4 Financing Pattern

Banks can raise majority of its finance either through modern or traditional source. It can be termed as the funds which are being arranged by the bank that is whether through modern or traditional source. It can be assumed that the banks having adopted credit cards would be able to attract more customers and thus would have more proportion of deposits in total funds. However, due to overdraft facility being availed in the credit cards, the funds requirement of the banks are more and sometimes it has to borrow some funds from outside sources. As per Table 6 the results also indicate the same as the borrowings of adopter banks are more than the non-adopter ones. However, the difference is significant only in the case of private sector banks.

Table 6. Financing pattern of the adopter and non adopter banks of credit cards

Banks	Deposits			Borrowings		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	0.702583	0.698913	0.056687 (0.955312)	0.146771	0.09530	1.087972 (0.280046)
Public Sector Banks (N1= 21, N2= 6)	0.848207	0.838248	0.633479 (0.547275)	0.022738	0.02944	-0.94386 (0.354273)
Private Sector Banks (N1= 18, N2= 5)	0.782276	0.863989	-2.14117** (0.045671)	0.110464	0.018348	2.445705** (0.026158)
Foreign Banks (N1= 20, N2= 9)	0.499	0.417725	1.11363 (0.275628)	0.297209	0.239986	0.641671 (0.526704)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

5.5 Liquidity Position

Liquidity has been affected negatively, with the adoption of credit cards. The funds being required by the banks issuing credit cards are more than traditional banks as the banks may have more outflows of funds. Liquid assets of the adopters are less than that of non adopters and their differences are statistically significant too. However difference found to be insignificant only in case of public sector banks. It implies that the credit card issuing banks are lesser liquid than non-issuing banks as they disburse more value of funds through retail payment system. However, in case of cash deposit ratio, the difference is found to be insignificant and somewhat opposite to our priori assumption. It depicts liquidity in case of CD ratio, the adopter banks are found to be more liquid as CD ratio is lesser in their case.

Table 8. Liquidity position of the adopter and non adopter banks of credit cards

Banks	Cash Deposit ratio			Liquid Assets to Total Assets		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	8.172849	9.28092	-1.1397 (0.257944)	0.117196	0.172991	-2.10647** (0.038857)
Public Sector Banks (N1= 21, N2= 6)	7.911584	8.232209	-1.03259 (0.314733)	0.091351	0.087361	0.567073 (0.597544)
Private Sector Banks (N1= 18, N2= 5)	7.840167	7.946733	-0.19357 (0.848375)	0.098419	0.135244	-2.16472** (0.044094)
Foreign Banks (N1= 20, N2= 9)	8.676065	11.36419	-1.0537 (0.301361)	0.160959	0.286792	-1.9127* (0.068893)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

5.6 Experience Effect and Industry Advantage

The findings reveal in Table 9 that the experienced banks are more prone to issue credit cards and thus older in age though the results are found to be insignificant. However, private sector banks have the opposite results which indicate that credit cards issuing banks are younger in age and that difference is significant too. The assumption that banks who have already adopted credit cards have more market share as compared to non-adopter banks is found to be true and is statistically significant too as with the issuance of more value added services through credit cards, banks get the industry advantage and thus have comparatively larger market share.

Table 9. Age and market share of the adopter and non adopter banks of credit cards

Banks	Age			Market Share (Competitive Advantage)		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	59.75	58.47368	0.13876 (0.890441)	0.015504	0.004181	2.784454*** (0.006799)
Public Sector Banks (N1= 21, N2= 6)	82.22727	77.4	0.461598 (0.461598)	0.031974	0.013264	1.971327** (0.059944)
Private Sector Banks (N1= 18, N2= 5)	49.25	75.28571	-1.82776* (0.087646)	0.010294	0.00115	2.810553*** (0.013018)
Foreign Banks (N1= 20, N2= 9)	44.90909	28.14286	1.292501 (0.211767)	0.002823	0.000148	2.8486*** (0.009581)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10% respectively.

5.7 Asset Quality and Credit Risk

As per Table 10, it has been found that credit card adopter banks issue more loans though the

difference is insignificant. It happens due to the overdraft facility being given to the credit card users. Also, the asset quality of the banks issuing credit cards is quite good as the adopter banks have lesser NPA and results are significant too. But in case of foreign sector banks, the credit card issuer banks have more NPA which deteriorate its asset quality. It is due to the fact that they may not be able to recover the loans & advances they have distributed.

Table 10. Asset quality and credit risk of the adopter and non adopter banks of credit cards

Banks	Loans			Non Performing Assets		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	0.442281	0.436608	0.170351 (0.865193)	3.901223	3.960877	-0.05154 (0.959027)
Public Sector Banks (N1= 21, N2= 6)	0.479537	0.460075	1.0499 (0.303808)	3.202057	4.201983	-1.8555* (0.075353)
Private Sector Banks (N1= 18, N2= 5)	0.49323	0.466592	0.913582 (0.371819)	3.553386	5.000571	-2.02658** (0.055593)
Foreign Banks (N1= 20, N2= 9)	0.367972	0.387068	-0.23992 (0.812271)	4.853362	2.748964	1.06402 (0.296892)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

5.8 Efficiency

Business per employee of the adopter banks is comparatively more. In other words, adoption of credit cards enhances the business per employee of the banks which indicate its efficiency as well. Thus, credit cards adopter banks are more efficient to carry business. The results reported in Table 11 are significant too in case of public as well as private sector banks. Efficiency has also been measured with Net interest margin of the banks which is not found to be significantly affected by adoption of credit cards in any case.

Table 11. Efficiency of the adopter and non adopter banks of credit cards

Banks	Business per employee			Net Interest Margin		
	Mean		t-statistics	Mean		t-statistics
	Adopters	Non-adopters	(p value)	Adopters	Non-adopters	(p value)
All sampled banks (N1= 59, N2= 20)	6.059076	5.804158	1.418909 (0.159961)	2.987674	3.2663	-1.23025 (0.22235)
Public Sector Banks (N1= 21, N2= 6)	5.630567	5.41506	1.825392* (0.079912)	2.971441	2.978345	-0.03939 (0.970169)
Private Sector Banks (N1= 18, N2= 5)	5.916163	5.440012	2.83525*** (0.009913)	2.711591	2.937692	-0.80516 (0.42975)
Foreign Banks (N1= 20, N2= 9)	6.591522	6.446232	0.429779 (0.670767)	3.204695	3.800589	-1.10506 (0.278883)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

5.9 Capitalisation and Diversification

Capitalisation has been measured with reference to the capital adequacy ratio of the banks. The results as per Table 12 reported lesser capital for the adopter banks as proportion to its risk bearing assets. However, it has been found to be insignificant in all the categories of banks. It depicts that the adoption of credit card does not embark any impact on the capitalization of banks. In other case, Non-interest income of the adopter banks are more as compare to non-adopter ones which depicts that the adopter banks are more diversified and have tendency to earn more incomes from the non-traditional activities. However, it is found to be significant only in case of private sector banks.

Table 12. Capitalisation and diversification of the adopter and non adopter banks of credit cards

Banks	CRAR (Capitalisation)			Non Interest Income (Diversification)		
	Mean		t-statistics (p value)	Mean		t-statistics (p value)
	Adopters	Non-adopters		Adopters	Non-adopters	
All sampled banks (N1= 59, N2= 20)	20.07053	29.82869	-1.47948 (0.143093)	2.223257	1.806394	1.218944 (0.228367)
Public Sector Banks (N1= 21, N2= 6)	12.64607	12.26172	0.689121 (0.497094)	1.444446	1.540468	-0.96455 (0.344007)
Private Sector Banks (N1= 18, N2= 5)	12.68329	14.57243	-1.57979 (0.129101)	1.60618	1.356563	1.783338 (0.097734)
Foreign Banks (N1= 20, N2= 9)	32.86752	57.6328	-1.61089 (0.118835)	3.45085	2.446172	1.221828 (0.23877)

Note. Here ***, ** and * means statistically significant at 1%, 5% and 10 % respectively.

6. Summary and Discussions

The present study investigates the recent issue related to launch of one of the innovation in plastic cards in Indian Banking Sector. For this purpose all the scheduled commercial banks (79 in number which consists of 27 Public Sector Banks, 23 Private Sector Banks and 29 Foreign Sector Banks) have been taken as sample to examine the various aspects of adopter banks in comparison to non adopter banks of Credit cards in India. After exploring the websites and Annual reports of banks during January, 2010, out of all the commercial banks prevailing, 59 banks started issuing credit cards to its customers up to year 2011. Hence, overall adoption rate of credit cards in Indian banking sector is found to be approx 75%. In the sample, the private sector banks have lead with 78.2% of adoption rate. Public sector banks followed them with no much difference having adoption rate of 77.77%. The least adoption can be seen in the case of foreign sector banks i.e. 68.96%. The whole sample of banks has been categorized into adopter and non adopter groups.

Table 13. Summary of empirical results of credit cards

Parameters	Variables	All Sampled Banks	Public Sector Banks	Private Sector Banks	Foreign Sector Banks
Size	Total Assets	Yes (+ve)	Yes (+ve)	Yes (+ve)	Yes (+ve)
	Branches	Yes (-ve)	No (-ve)	Yes (-ve)	No (-ve)
Profitability	ROE	Yes (+ve)	No (+ve)	No (+ve)	Yes (+ve)
	ROA	No (-ve)	Yes (+ve)	No (+ve)	No (-ve)
Cost of Operations	Fixed cost	No (+ve)	No (-ve)	No (+ve)	No (+ve)
	Labour Cost	No (-ve)	No (-ve)	Yes (-ve)	No (+ve)
Financing Pattern	Deposits	No (+ve)	No (+ve)	No (-ve)	Yes (+ve)
	Borrowings	No (+ve)	No (-ve)	Yes (+ve)	No (+ve)
Capitalisation	CRAR	No (-ve)	No (+ve)	No (-ve)	No (-ve)
Diversification	Non interest Income	No (+ve)	No (-ve)	Yes (+ve)	Yes (+ve)
Asser Quality and Credit Risk	Loans	No (+ve)	No (+ve)	No (+ve)	No (+ve)
	Non Performing Assets	No (-ve)	Yes (-ve)	Yes (-ve)	Yes (+ve)
Efficiency	Business per Employee	No (+ve)	Yes (+ve)	Yes (+ve)	No (+ve)
	Net Interest Margin	No (-ve)	No (-ve)	No (-ve)	No (-ve)
Experience	Age	Yes (+ve)	No (+ve)	No (-ve)	Yes (+ve)
Industry Advantage	Market Share	Yes (+ve)	Yes (+ve)	Yes (+ve)	Yes (+ve)
Liquidity	Cash Deposit Ratio	No (-ve)	No (-ve)	No (-ve)	No (-ve)
	Liquid Assets	Yes (-ve)	No (+ve)	Yes (-ve)	Yes (-ve)

Here, Yes means statistically significant at 1%, 5% or 10%; No means not statistically significant at 1%, 5% or 10%; (+ve) means variable having positive relation with adoption and (-ve) means variable having negative relation with adoption.

The significant demarcation can thus be drawn among the adopter and non adopter banks of credit cards in India in terms of Size, Branches, Asset quality, Liquidity, market Share. However, variables like labour cost and borrowings are found to be significant affecting the performance of the private sector banks only. Other factors viz fixed cost, loans, NIM, CD ratio have not been influenced by credit card adoption by banks.

The private sector adopter banks are found to be larger in size, having more share in the market, lower cost of operations, more business per employee and net interest margin, rely more on modern source of finance for raising funds and thus found to be more efficient.

However, they would have lesser liquidity and confined branch network. Asset quality of the private sector adopter banks is found to be satisfactory too. In case of public sector banks, the adopter banks are larger in size, having more market share, more profitable, having more business per employee and better asset quality. While foreign sector banks are larger in size, older in age, having traditional source of financing, more profitable, having lesser capitalization and more market share.

Thus the significant demarcation can thus be drawn among the adopter and non adopter banks of credit cards in India in terms of Size, Branches, Asset quality, Liquidity, Market Share. However, variables like labour cost and borrowings are found to be significant affecting the performance of the private sector banks only. Other factors viz. fixed cost, loans, NIM, CD ratio have not been influenced with credit card adoption by banks. Thus, it can be said that the adopter banks outperform the non adopter banks. To conclude the advantages availed by the adopter banks are more than that of those who have not adopted. It thus evidently reveals that the performance of the banks have been affected with the introduction of new technology in various ways.

Hence, the results have tendency to enhance the scope for regulators, bankers and other related parties to study the deep rooted affect of new technology on industry. It can provide them broader view to frame polices   regarding the introduction of new technology in the industry while keeping in mind its micro as well as macro level effects in the long run so that further diffusion and adoption criterion can be set thereof. The adoption rate of credit cards by different types of banks has been elaborated in the study which can help the regulators & bankers to understand different issues and concerns pertaining to it. The comparison of adopter and non adopter banks in terms of their different performance measures can make them clear about the fact that which characteristics of the banks have been affected significantly with the adoption of new technology at large. It will further help to evaluate the performance & participation of every sector of banks in the adoption of innovation and technology within the economy. The banks and technology providers may also get many important directions for technology application.

References

Carlson, J., Furst, K., Lang, W. W., & Nolle, D. E. (2001). *Internet Banking: Market Developments and Regulatory Issues*. Manuscript, The Society of Government Economists, Washington D.C.

De Sarkar, P., Yadav, S. S., & Banwet, D. K. (2001). Emergence of Flexible Distribution Channels for Financial Products: Electronic Banking as Competitive Strategy for Banks in India. *Global Journal of Flexible Systems Management, 3*. Retrieved March 20, 2008 from http://findarticles.com/p/articles/mi_qa4012/is_200107/ai_n8957497

Delgado, J., Hernando, I., & Nieto, M. J. (2004). *Do European Primarily Internet Banks Show Scale and Experience Efficiencies?* Working Paper No. 0412, Banco de España, Madrid.

Delgado, J., Hernando, I., & Nieto, M. J. (2006). Do European Primarily Internet Banks

Show Scale and Experience Efficiencies? *European Financial Management* (forthcoming).

DeYoung, R. (2001). The Financial Performance of Pure Play Internet Banks. *Economic Perspectives, 25*(1), 60-75.

DeYoung, R. (2005). The Performance of Internet-based Business Models: Evidence from the Banking Industry. *Journal of Business, 78*(3), 893-947. https://doi.org/10.1086/429648

DeYoung, R., & Rice, T. (2003). Noninterest Income and Financial Performance at U.S. Commercial Banks. *Emerging Issues Series*, Supervision and Regulation Department, Federal Reserve Bank of Chicago.

DeYoung, R., Lang, W. W., & Nolle, D. E. (2006). How the Internet Affects Output and Performance at Community Banks. *Journal of Banking and Finance* (forthcoming).

Dos Santos, B. L., Peffers, K. G., & Mauer, D. C. (1993). The Impact of Information Technology Investment Announcements on the Market Value of the Firm. *Information Systems Research, 4*, 1-23. https://doi.org/10.1287/isre.4.1.1

Egland, K. L., Furst, K., Nolle, D., E., & Robertson, D. (1998). Banking over the Internet. *Quarterly Journal of Office of Comptroller of the Currency, 17*(4).

Furst, K., Lang, W. W., & Nolle, D. E. (2000). Who offers Internet Banking? *Quarterly Journal, 19*(2), 27-46.

Furst, K., Lang, W. W., & Nolle, D. E. (2002a). *Internet Banking: Developments and Prospects*. Working Paper, Center for Information Policy Research, Harvard University, April.

Furst, K., Lang, W. W., & Nolle, D. E. (2002b). Internet Banking. *Journal of Financial Services Research, 22*(1&2), 93-117.

Hasan, I., Maccario, A., & Zazzara, C. (2002). *Do Internet Activities Add Value? The Italian Bank Experience*. Working Paper, Berkley Research Center, New York University.

Hernando, I., & Nieto, M. J. (2005). *Is the Internet Delivery Channel Changing Banks' Performance? The Case of Spanish Bank*s. Banco de Espana, Unpublished Manuscript.

Indian Banking. (2010). *Executive summary*. Mckinsey and Company.

Khan, B. S. (2004). *Essays on Diffusion of New Technology*. University of California, Berkeley.

King, W. R., & Sethi, V. (1994). Development of Measures to Assess the Extent to Which an Information Technology Application Provides Competitive Advantage. *Management Science, 40*(12), 1601-1627. https://doi.org/10.1287/mnsc.40.12.1601

Malhotra, P., & Singh, B. (2009). The Impact of Internet Banking on Bank Performance and Risk: The Indian Experience. *Eurasian Journal of Business and Economics, 2*(4), 43-62.

Ombati, T. O., Magutu, P. O., Nyamwange, S. O., & Nyaoga, R. B. (2010). Technology and

service quality in the banking industry. *African Journal of Business & Management (AJBUMA), 1*, 1-16.

Porter, M. E. (1985). *Competitive Advantage* (Ch. 1, pp. 11-15). New York: The Free Press.

RBI. (1989). *Report of the committee on Computerization in Banks.* (The Rangarajan committee) Mumbai. Reserve Bank of India.

RBI. (1999). *Report of the Saraf Committee*. Reserve Bank of India, Mumbai.

Saunders, A., &Walter, I. (1994). *Universal Banking in the United States.* New York: Oxford University Press.

Shaharudin, M. R., Rizaimy, M., Omar, M. W., Elias, S. J., Ismail, M., Ali, S. M., & Fadzil, M. I. (2012). Determinants of electronic commerce adoption in Malaysian SMEs' furniture industry. *African Journal of Business Management, 6*(10), 3648-3661

Sullivan, R. J. (2000). How Has the Adoption of Internet Banking Affected Performance and Risk at Banks? A Look at Internet Banking in the Tenth Federal Reserve District. *Financial Industry Perspectives,* 1-16

Varma, J. R., Raghunathan, V., Korwar, A., & Bhatt, M. C. (1992). *Narasimham Committee Report - Some Further Ramifications and Suggestions*. Working Paper No. 100, February, Indian Institute of Management, Ahmedabad.

Wan, W. W. N., Luk, C. L., & Chow, C. W. C. (2005). Customers' adoption of banking channels in Hong Kong. *International Journal of Bank Marketing, 23*(3), 255-272. https://doi.org/10.1108/02652320510591711

Note

Note 1. The t based methods are only weakly dependent on normality of Yi, particularly when n is large. They are extremely dependent on the independence assumption (www-stat.stanford.edu/~owen/courses/262/ttest.pdf)

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