Indian Nationalized Banks Performance Post Implementation of Information Technology: An Empirical Analysis.

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ABSTRACT

Purpose

Technological advancement has created a competitive environment in view of diversified e-banking platform. The study unleashes the performance of nationalized banks against the backdrop of technology adoption in the Banking industry.

Design

The study is based on panel data for 14 years obtained from an average value of 5 Banks with head offices in South India. The period is split into two panels of seven years i.e. 2002 to 2008 representing the pre IT developments, and 2009 to 2015 as post technology adoption period. Performance of nationalized banks was examined through various indicators of Margin, Profitability, Cost Efficiency, Business Growth, Management Efficiency and Stability. Statistical tools applied were Cohen's 'd', Multiple Regression, Paired sample t-test, Arithmetic Mean (M), Average Annual Growth Rate, Standard Deviation & Coefficient of Variation.

Findings

IT has taken of the advantages that the large banks enjoyed and monopolized the industry. Margins have come down significantly owing to competition and technology. Declining spread also shows convergence among peers and focused on non-interest income. Undiversified banking practices signal a risky banking system due to higher dependence on interests, Trade-off between profitability and asset quality. Banks have to expand their technology driven product line and greater emphasis should be on the customer relationship management. A balanced approach would be to bring down net interest margin, which would improve the efficiency of financial intermediation, along with an increase in income from other sources and reduction in operating expenses to enhance profitability.

Research Implications

Scope for further research is to merge demonetization along with forced technology adoption in banking sector. Due the demonetization the banking performance indicators showed abnormal deviations, so the year 2016 & 2017 was not considered for this study.

1. Introduction

Technological advancement has created a competitive environment in view of diversified banking products. Many literature reviews have considerable evidence that productivity improvements in the banking sector could be driven by technology transfer, leading to pressure, compelling banks to raise productivity levels and by technological adaptation, expand the range of production possibilities in the Indian scenario.

Before Information technology adoption, scheduled banks in India were region-centric primarily dependent on their primary function of borrowing and lending. Location was their area of concern for their business excellence. New private bank have brought in a new operating environment of competition and facilitated state-of-the-art technology for survival. Computerization can be regarded as a precursor to subsequent technology initiatives in the Indian banking sector. Technology adoption has led to the introduction of new service channels bridging the physical gap to create a platform. It has also led to competition in the industry, raising efficiency levels. Cost advantage from IT has vanished due to competition when all banks in the industry equipped themselves with the same technology.

Banks started focusing on macro level parameters with the help if technology enabled banking. Phone banking to Mobile banking was one of the latest advancement which most of the bank's customer rely on. IT has modified to the over the counter customer relationships leading greater transparency and reduced credit risks. It has led to more demanding and informed customers, higher performance standards increased security concerns, heavy investment in technology, constant updating and maintenance of IT infrastructure. Reliance on technology can exacerbate operational risk since it requires changes in procedures, reputational risk when bank fails to deliver secure and timely service and legal risk at times of uncertainty on legislation applying to e-banking transactions. Every new technological innovation accounts for proportionally smaller reductions in price differentials.

Later, banks embraced technology initiatives as a cost saver and differentiator from its counterparts. The network effect works from the demand side and the cost reduction effect from the supply side. Cost advantage acts through reduction in banks' operational costs and the network effect facilitates more efficient transactions among customers within the same network (Ho and Mallick. 2010). Also it can be observed that there is a lateral shift in the customers from traditional to technology enabled banking platform.

2. Literature Review

Yadav, (2014) concludes that before the global recession foreign bank group was performing much

better than other banking sectors. Private, Nationalized and SBI bank groups kept on performing almost same, but certainly better than RRBs for all the period of study. Safari and Yu (2014),using SFA, reported that in Iranian banking industry the average technical efficiencies of publicly-owned bank are lower than the privately-owned banks. Empirical results indicated that components of IC ownership and bank size have a significant influence on technical efficiency levels.

Goel & Bajpai, (2013) used financial indicators like Liquidity, Capital Adequacy, and Profitability ratios to explain that there is no such great impact on Indian banks due to global recession for the time period 2006-2009. The study by Mohanraj & Gomathi, (2013) found that the banking sector faces profitability pressures due to higher funding costs, mark-to-market requirements on investment portfolios, and asset quality pressures due to a slowing economy. But Indian banks' global exposure is relatively small, with international assets at about 6 per cent of the total assets. The strong economic growth in the past, low defaulter ratio, absence of complex financial products, regular intervention by central bank, proactive adjustment of monetary policy and so called close banking culture has favored the banking industry in India in recent global financial turmoil. A similar study conducted on Tanzanian banks by Raphael (2013) interpreted that efficiency gains improved as a result of technical efficiency rather than scale efficiency.

Kumar & Malhotra, (2013) found that Bank of Baroda was at the first position with overall composite ranking average of 6.05 due to its better performance in the areas of liquidity and asset quality, closely followed by Andhra Bank with overall composite ranking average of 6.15 because of its strength in the spheres of management efficiency, capital adequacy and asset quality. United Bank of India held the bottom most rank with overall composite ranking average of 14.60 due to management inefficiency, poor assets and earning quality. The study recommends that United Bank of India has to improve its management efficiency, assets and earning quality. Similarly Bank of Maharashtra should take necessary steps to improve its liquidity position and management efficiency. Surulivel et al. (2013) on Indian Banking sector in two related papers. While one paper empirically evaluates the impact of IT on the cost efficiency to detect significant difference among Indian banks, though not across years, the other paper distinguishes private sector banks on cost efficiency. Information Technology was found to contribute more in old private sector banks than new ones

Empirical study conducted by Omar et al. (2012) used primary data to find that investment in IT has contributed towards increased market share, reduced operating cost and improved customer services. Kaur, (2012) is to examine the financial performance of public and private sector banks. The study found that the overall performance of Public Sector Banks is better than private Sector Banks over the period of study. Dandago and Usman (2012) found that MIS surrogates like software, hardware investment and number of ATMs had a significant impact on the financial performance of Nigerian bank as measured by return on assets.

Dwivedi and Charyulu (2011) concluded that national banks, new private banks and foreign banks in India showed higher efficiency than remaining banks in post-reform era. Most sample units showed more than 90 per cent efficiency in estimated mean technical efficiencies under DEA-CRS model. Chaudhary & Sharma (2011) concluded that an efficient management information system should be developed. The bank staff involved in sanctioning the advances should be trained about the proper documentation and charge of securities and motivated to take measures in preventing advances turning into NPA. Public banks must pay attention on their functioning to compete with private banks. Banks should be well versed in proper selection of borrower/project and in analyzing the financial statement.

Hamdan and Karim (2010) examined the effect of IT on the effect of financial performance comprising MVA, ROI and EPS and the matrix of operational performance consisting of NPM, ROA and PE. The results indicated an impact of MVA, EPS, ROA and NPM on investment in IT for Jordanian banks. Indian counterparts of the study examined include papers cited below. Most influential among them are authored by Kumar et al. (2010) and Kumar and Gulati (2010). Kumar et al (2010) probed the influence of technology change in the Indian banking sector by employing DEA. Technology and innovation was found to impact total factor productivity than efficiency change over the entire period (1995-2006). The fixed effect estimates show that size, ownership and time period exert significant effect on technical change. They employed DEA analysis to analyze the trends of cost efficiency and its components across Indian public sector banks during the post-deregulation period. The empirical results proved that deregulation had a positive impact on cost efficiency levels and that cost inefficiency is driven by technical inefficiency rather than allocate inefficiency.

Valverde et al. (2004) deduced that the average Spanish bank had saved 37% in unit operating cost between 1992 and 2000 from changes in service delivery methods and the level and mix of payment volumes.

3. Justification of the topic

This study attempts to bring out the salient facets of banking performance against the backdrop of technology. Even though transfer pricing from traditional to modern methods was high, long run benefit of the change was expected to generate higher economies of scale. After the decision by central bank to implement CBS system from 2005, banks have struggled hard to adapt to their operational change. Study by Natarajan et.al. (2015) took 2006 as the shifting period from traditional to IT enabled banking. But the Trends and Progress of Banking Report (RBI, 2009-10) reveals that 50% of the bank came under CBS in 2006-07. Against this background the study was conducted to compare the pre and post technology adoption performance of the Indian Nationalized banks considering technology shifting period between 2008 and 2009.

4. Objectives of the study

a. To compare the Banks performance between pre- and post-IT adoption period.

b. To analyze the efficiency of IT Adoption in Banks.

c. To determine factors which affect the earning capacity of bank

5. Hypotheses

Following alternative hypotheses were formulated

a. $H1_{(1a,1b,1c)}$: There is significant difference in Margin between pre- and post-IT Adoption

b. $H1_{(2a,2b,2c)}$: There is significant difference in Profitability between pre- and post-IT Adoption

c. $H1_{(3a,3b,3c)}$: There is significant difference in cost efficiency between pre- and post-IT Adoption.

d. $H1_{(4a,4b,4c)}$: There is significant difference in Business growth between pre- and post-IT Adoption

e. $H1_{(5a,\ 5b)}$: There is significant difference in Management efficiency between pre- and post-IT Adoption.

f. $H1_{(6a,6b)}$: There is significant difference in Stability between pre- and post-IT Adoption.

g. $H1_{7}$: There exists a positive relation of Spread Ratio, Intermediation Cost Ratio, Market share of loans, Business per Employee and Net NPA Margin on financial performance.

6. Research Methodology

Data Source: Nationalized banks had been computerizing their operations from 2005-06 onwards in a phased manner bringing all branches under CBS by 2009-10 (RBI report, 2004). Hence the period from 2002 to 2015 is selected for the study. The study is based on panel data for 14 years obtained from an average value of 5 Banks with head offices in South India. Data was collected from Annual reports of Banks, data releases of RBI and statistical tables relating to banks in India by Central Statistical Organisation (CSO). The Banks considered for the study was Canara Bank, Indian Bank, Indian Overseas Bank, Vijaya Bank and Andhra Bank. The period is split into two panels of seven years i.e. 2002 to 2008 representing the pre IT developments, and 2009 to 2015 as post technology adoption period. The required data has been drawn from various statistical reports of Reserve Bank of India, Central Statistical Organisation and annual reports of banks.

Financial Indicators: Performance of nationalized banks is examined through various parameters of Margin (3), Profitability (3), Cost Efficiency (3), Business Growth (3), Management Efficiency (2) and Stability (2). Financial ratio was primarily used for measuring efficiency. Some of the ratio was directly given and other was derived by compiling different financial indicators and basic mathematical operators.

Statistical tools: Cohen's 'd', Multiple Regression, Paired sample t-test, Arithmetic Mean (M), Average Annual Growth Rate (AAR), Growth Rate (GR), Standard Deviation (S.D) and Coefficient of Variation (C.V).

Cohen's 'd' effect size is employed to interpret the results. Results are derived using SPSS. Cohen's'd' is a descriptive measure of effect size calculated as the standardized mean difference between the two groups. Cohen's d is used instead of Pearson's r in a paired t-test. Cohen classified the effect sizes into small (1.5 to 2), medium (2 to 4) and large (>4). Cohen's'd' for a paired t-test can be calculated as a ratio of the mean of differences (M) and standard deviation (SD) of the differences. No effect size is calculated for a no significant finding as it would have indicated that mean difference occurred due to random chance.

6.1 Multiple Linear Regression Models

Multiple linear regression analysis is a technique for modelling the linear relationship between two or more variables. It is one of the most widely used of all statistical methods. In banking and finance literature (Kutner, Nachtsheim & Peter, 2004), regression analysis is a very common method used to find the determinants of bank performance.

$$ROI_i = \beta_0 + \beta_1.SR_i + \beta_2.ICR_i + \beta_3.MSL_i + \beta_4.BPE_i + \beta_5.NNPAM_i + \epsilon_i$$

Where,

Dependent Variable

ROIi=Return on Investment

ROAi=Return on Assets

NPMi=Net Profit Margin

Independent Variable

SRi=Spread Ratio,

ICRi=Intermediation Cost Ratio

MSLi=Market Share of Loans

BPEi=Business Per Employee

NNPAMi=Net NPA MArgin

€i=Error Term

1. Limitation of the Study

a. Accurate break up between pre and post IT adoption is not possible.

b. Study is dependent solely on secondary data, so Impact of IT enabled banking services effectiveness is not evaluated.

2. ANALYSIS, INTERPRETATION AND FINDINGS

i. Margin

Financial ratio approach specifies margin ratios for both components of income i.e. interest income and non-interest income. Burden efficiency ratio measures the level by which the non-interest income is able to cover the non-interest expenditure.

Table No. 1: Margin

Ratios	Mean (M)			GR (%)	AAR (%)		S.D			C.V (%)	t-value	d-value	Decision t (5%,12) =2.179
	Pre (M1)	Post (M2)	M1-M2		Pre	Post	M1	M2	Combined				
NIM	2.85	2.48	0.37	7.26	-4.42	1.40	0.40	0.15	0.30	11.38	2.28	1.10	Reject $H1_{1a}$
SR	2.96	3.29	-0.34	48.8	-2.28	7.35	0.47	0.49	0.48	15.34	-1.31	-0.97	Reject $H1_{1b}$
BOA	0.68	0.61	0.06	52.5	3.20	11.1	0.26	0.12	0.21	31.79	0.59	0.18	Reject $H1_{1c}$

Source: Annual reports of Banks, RBI reports and releases, Statistical tables relating to banks by CSO

Interpretation: Table No.1 shows that mean values of ratios showed a declining trend except SR. Considering growth rate between 2008 to 2015, SR and BOA showed a high positive growth rate of 50% (approx). The average annual growth of the ratios during the pre period showed an overall decreasing trend. While post IT adoption period showed a positive growth trend all the margin variables. Standard deviation measure shows that Pre adoption period showed higher degree of variability, where post period showed greater level of uniformity. Relative variation shown by coefficient of variation indicates better positive variability in the post adoption period.

Hypothesis $H1_{1a}$, $H1_{1b}$ and $H1_{1c}$ proved to be insignificant under all the ratios considered for testing the significance of margin between pre and post adoption period. Cohen's'd' overall values shows that effect size were very small as it were near to 1.

Findings: As a cost saver, IT has reduced operating expenses to reduce burdens, while increasing focus on non-interest income remain as a significant factor. Even though the NIM showed positive trend, rate of increase in net interest income was considerably less lieu to rate of cost reduction. The technology had a

positive impact on the performance of nationalized banks in terms of burden and spread. Technology has induced competition thinning spreads and increasing efficiency. Increasing spread shows divergence among its peers and signals increased focus on its primary source-interest income. A decline in burden ratios indicates burden bearing capacity. But in 2015 the growth rate of burden ratio signals hindrances to this capacity. Overall it was observed that there was no significant difference in the margins between pre and post IT adoption period.

ii. Profitability

Profitability was analyzed with the help of ROI, ROA and Net Profit Margin (NPM). ROI is a financial performance measure, while ROA is a crucial indicator of profit efficiency representing ability to utilize resources and mix funds optimally. NPM denotes a bank's ability to earn from operating and non-conventional sources, reflecting its operational ability.

Table No. 2: Profitability

Ratios	Mean (M)			GR (%)	AAR (%)		S.D			C.V (%)	t-value	d-value	Decision t (5%,12) =2.179
	Pre (M1)	Post (M2)	M1-M2		Pre	Post	M1	M2	Combined				
ROI	8.19	7.29	0.90	6.94	-5.53	1.02	1.13	0.32	0.83	10.73	2.03	2.42	Reject $H1_{2a}$
ROA	1.01	0.82	0.19	-20.00	-2.16	-2.79	0.12	0.11	0.11	12.58	3.10	0.49	Accept $H1_{2b}$
NPM	10.87	9.05	1.82	-24.49	2.77	-3.38	0.91	1.69	1.36	13.64	2.51	4.50	Accept $H1_{2c}$

Source: Annual reports of Banks, RBI reports and releases, Statistical tables relating to banks by CSO

Interpretation: Table No.2.Shows that profitability indicators have decreased in terms of absolute means between the two periods. NPM showed the highest decline followed by ROA and ROI in terms of seven yearly growth rates. Post IT adoption period showed significant positive ARR, whereas ROA and NPM showed negative ARR. NPM showed an alarming situation were pre ARR was +2.77% which changed its direction to -3.38%. Individual variability shown by standard deviation indicated a shift in direction from pre to post period. Overall variation was highest for the NPM and least for ROA. The relative variation shown by coefficient of variation showed the highest value of 13.64% in NPM and lowest of 10.73% in ROI.

Student t-test result showed insignificant difference in the value of ROI during pre and post adoption period by rejecting the hypothesis H12a, whereas ROA and NPM witnessed significant difference between the pre and post adoption period by accepting the hypotheses H12b and H12c. The effect size of related to profitability showed small for ROA, Medium for ROI and large for NPM.

Findings: Even though cost efficiency has improved in general, banks have become less efficient operationally as endorsed by declining net profit margins. Profitability showed a declining trend due to the lower concentration of non interest income and rate of increase in NPA (as per table 6). Asset utilization i.e. the performance of advances and investment should be dealt with extreme care. A significant difference in the net profit margin is an indication that supreme care must be given to non-interest expenses and non performing assets of the banks. The insignificant effect of technology on profitability needs to be understood in the context of increasing competition and declining margins. IT fails to have an effect on the bottom line of nationalized banks as the earnings showed a decline during the post period.

iii. Cost Efficiency

It is a measure of the operating efficiency of the banks Cost efficiency was measured with the help of the help of Intermediation Cost Ratio (ICR), Cost-Income Ratio (CIR), and Output-Cost to Unit Output (OC/ Unit OP).

Table No. 3: Cost Efficiency

Ratios	Mean (M)			GR (%)	AAR (%)		S.D			C.V (%)	t-value	d-value	Decision t (5%,12) =2.179
	Pre (M1)	Post (M2)	M1-M2		Pre	Post	M1	M2	Combined				
ICR	2.02	1.43	0.59	-16.67	-7.00	-2.41	0.36	0.09	0.26	15.16	4.21	1.39	Accept $H1_{3a}$
CIR	48.24	43.87	4.37	-3.65	-1.57	-0.50	2.93	0.73	2.13	4.63	3.83	9.79	Accept $H1_{3b}$
OC / Unit OP	1.37	0.93	0.44	-9.28	-8.76	-1.22	0.31	0.04	0.22	19.48	3.70	0.94	Accept $H1_{3c}$

Source: Annual reports of Banks, RBI reports and releases, Statistical tables relating to banks by CSO

Interpretation: Table No.3. Indicates that means ratios have declined significantly from pre to post adoption period. The s growth rate to 2015 showed an appreciable declining trend with vales of -16.67%, -3.65% and -9.28% respectively. The ARR for the pre and post study period also showed similar declining trend, with lower rate of decline in the post adoption period. The cost income ratio also showed

a declining trend during the second phase. Banks paid approximately 43% of their net income towards operating expense in 2013 as against neatly 45% in 2005. The absolute deviation measured in term of standard deviation showed higher level of uniformity in the post adoption period. The relative variation measured by the coefficient of variation had highest value of 19.48% for per unit output cost and the least of 4.63% in the case of Income to Cost Ratio.

The t-value was significant in stating that the values varied significantly between the two stages of comparison. Hence all the hypotheses pertaining to the cost efficiency H13a, H13b and H13c were accepted. Cohen's'd' effect showed that CIR had the largest change effect and the remaining showed only a small effect size.

Findings: Intermediation cost ratios have declined indicating more productivity due to a higher level of technical efficiency related to growth in automated disbursal (ATMs), deposits (CDMs) and other electronic channels. Banks have improved its efficiency as evident from the declining trend in per unit cost of output. The cost efficiency rate was declining in post period since it was the phase of technology optimization. The cost component will have major role due the transfer technology cost. Operating expense ratios have shown statistically significant reduction in their means with medium effect size. Above analysis shows that banks were successful in reducing the operating cost during the post IT Adoption period. Cost efficiency was found to have significant difference between the pre and post adoption period.

iv. Business Growth

Business growth has been examined in terms of Market Share of Loans (MSL), Market Share of Deposits (MSD) and Non-Interest Income proportion (NII). The NII ratio measures the relative share of net interest earnings in gross incomes.

Table No. 4: Business Growth

Ratios	Mean (M)			GR (%)	AAR (%)		S.D			C.V (%)	t-value	d-value	Decision $t_{(5\%,12)}$ =2.179
	Pre (M1)	Post (M2)	M1-M2		Pre	Post	M1	M2	Combined				
MSL	48.86	53.48	-4.61	6.59	1.17	0.93	0.96	0.58	0.79	1.55	-10.85	-9.19	Accept $H1_{4a}$
MSD	50.66	55.75	-5.09	9.78	1.02	1.36	0.59	0.73	0.66	1.25	-14.33	-9.34	Accept $H1_{4b}$
NII / Total Revenue	14.52	9.56	4.95	-26.8	-2.6	-3.92	3.14	1.51	2.47	20.48	3.76	8.24	Accept $H1_{4c}$

Source: Annual reports of Banks, RBI reports and releases, Statistical tables relating to banks by CSO

Interpretation: Table.No.4 indicates the nationalized bank's share in terms of deposits and credit to the customers. Both loans and deposits showed an increased average value of 55.48% and 55.75% respectively, whereas the Non-interest Income to the revenue showed a reduced mean value in the post adoption stage. Noninterest income still accounts for only 9.56% (post-mean) of total revenue. As far as total growth rate is considered MSL and MSD showed a 7 yearly growth rate of 6.59% and 9.78% respectively. NII to total revenue decreased drastically to -26.8% which is caution sign for the banks. MSL and MSD had a positive average annual growth rate of 0.93% and 1.36%. AAR again showed a declining trend throughout the study period. All three indicators of business growth showed lower level of variability in post period with respect to standard deviation. NII to Total revenue showed higher relative variability between two periods with coefficient of variation of 20.48%.

t-statistic calculated was more than the table value in all the three cases, which indicates that all the hypotheses H14a, H14b and H14c was accepted. All d-value showed larger impact size of which share of deposits had the highest value followed by loans and NII to total revenue.

Findings: Nationalized banks have responded to the new challenges of competition, as reflected in the increase in share of these banks in the overall deposits and credit of the banking sector. An increased market share signifies a bank's brand equity, branch network and deposit mobilization strength. But non-interest income as a proportion of revenues has shown significant reduction over the year which is reflect in the decreasing profitability. It was observed that there is significant improvement in market share of loans and deposits during second phase, but IT developments do not seem to induce growth in Non-Interest Income. Banks must focus on the non interest component to improve upon its earning capacity.

v Management Efficiency

Management efficiency is a measure of the productivity rate of employees in the banks. It was examined with the help of Profit per Employee (PPE) and Business per employee (BPE).

Table No. 5: Management Efficiency

Ratios	Mean (M)			GR (%)	AAR (%)		S.D			C.V (%)	t-value	d-value	Decision t (5%,12) =2.179
	Pre (M1)	Post (M2)	M1-M2		Pre	Post	M1	M2	Combined				
PPE	0.28	0.70	-0.42	69.39	20.2	8.20	0.11	0.08	0.10	19.97	-7.93	-0.63	Accept $H1_{5a}$
BPE	54.14	188.0	-133.9	199.3	23.7	17.25	25.0	62.1	47.33	39.09	-5.29	-174.9	Accept $H1_{5b}$

Source: Annual reports of Banks, RBI reports and releases, Statistical tables relating to banks by CSO

Interpretation: Profit and business per employee show significant rise with mean values of 0.70 per employee and 188 per employee. Business per employee of Indian banks increased over threefold times. Considerable growth rate was observed for PPE and BPE with values of 69.39% and 199.3%. AAR also showed an approximate value of 20% in pre adoption phase. Average annual growth rate was 8.20% and 17.25% for PPE and BPE during the post adoption phase. Standard deviation of BPE showed higher variability of 62.1 which in line with the growth indicators. Relative variation was highest for BPE with Coefficient of Variation of 39.% and least for PPE with 20%.

t-statistic value showed that both the hypotheses H15a and H15b were accepted. d-value suggested that PPE had very low effect size as it is the profitability parameter, whereas BPE showed a higher change effect.

Findings: Technology adoption has brought significant changes in productivity rates of the employees. One reason for this is the decline in human capital requirement due to IT adoption, which has significantly reduced the direct expenses of the banks. So management efficiency of the banks showed a significant positive trend. Overall, a significant distinguishing productivity improvement in the banking sector was observed over the IT adoption period.

vi. Stability

Stability is a measure of soundness which was measured through Secured Advances (SA) to Total advances (TA) and Net NPA to Net Advances ratio.

Table No. 6: Stability

Ratios	Mean (M)			GR (%)	AAR (%)		S.D			C.V (%)	t-value	d-value	Decision $t_{(5\%,12)}$ =2.179
	Pre (M1)	Post (M2)	M1-M2		Pre	Post	M1	M2	Combined				
SA / TA	83.43	86.06	-2.64	14.4	-1.29	1.96	28.61	5.28	20.57	24.27	-0.24	-143.2	Reject $H1_{6a}$
Net NPA / NA	1.92	1.95	-0.03	335.3	-18.14	24. 8	1.52	0.88	1.24	64.16	-0.05	0.01	Reject $H1_{6b}$

Source: Annual reports of Banks, RBI reports and releases, Statistical tables relating to banks by CSO

Interpretation: Table. No. 6. shows the stability of the banks considering the attributes and performance of the assets. Secured Assets (SA) to Total Assets (TA) showed a marginal increase in its mean with vale of 2.63%, whereas net NPA to Net Advances showed a very small increase of 0.03%. Seven yearly growth rate showed that SA/TA and NPA to NA had values of 14.4% and 335.3 %. It is an indication that Net NPA was rising at a very high rate which is a threat to the banks in terms of profitability. Pre IT adoption showed negative AAR with vales of -1.2owed 9% and -18.14% which indicated that net NPA had a declining trend with decrease in SA. The post adoption period SA to total assets showed an AAR of 1.96% and Net NPA to NA showed a high AAR of 24.8%, which is an indication that net NPA are growing at a faster rate than the increase in the secured assets of the banks. The variability among the ratios was high in terms of standard deviation. The relative variability also showed a value of 24% and 64% respectively.

Testing of hypotheses proved that there was no significant difference in the values between the pre and post adoption period i.e. both the hypotheses H16a and H16b was rejected. D- Value showed that SA to TA had a high change effect whereas the changes in NPA to NA were found to have a negligible change effect.

Findings: Both ratios have shown marginal improvements in second phase though insignificantly, since both the hypotheses pertinent to measuring financial soundness were rejected. It reflects that soundness is not primarily affected by improved monitoring using MIS but through other significant factors like credit quality or provisioning norms. Even though banks were able to increase its business base, the non-performing asset absorbed a significant portion of their profitability. It is argued that higher level of credit quality would achieve greater productivity gains over the period. Banks must ensure that loans and other credit instruments offered are monitored appropriately so that it won't turn into NPAs.

7.1 Regression result and discussion

Table No. 7: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.993[a]	.986	.976	.142	1.868

a. Predictors: (Constant), NNPAM, MSL, SR, BPE, ICR

b. Dependent Variable: ROI

Table No. 8: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10.956	5	2.191	109.028	.000[b]
	Residual	.161	8	.020		
	Total	11.116	13			

a. Dependent Variable: ROI

b. Predictors: (Constant), NNPAM, MSL, SR, BPE, ICR

Table No. 9: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.948	1.972		5.046	.001
	SR	-.144	.180	-.077	-.800	.447
	ICR	.148	.467	.063	.317	.760
	MSL	-.056	.033	-.151	-1.692	.129
	BPE	-.004	.002	-.359	-1.800	.110
	NNPAM	.682	.078	.879	8.703	.000

a. Dependent Variable: ROI

From Table 7 the Durbin-Watson statistic was 1.868 it means that there was no serial correlation between independent variables and ROI.

Looking at regression from table 8 and Table 9, we find that the explanatory power of the whole second regression model is about 97.6%, where at the same time, the F-stat is 109.028 and is less than 5%, which is significant . As a result, we accept the alternative hypothesis claiming that "there exists an impact of Spread Ratio, Intermediation Cost Ratio, Market share of loans, Business per Employee and Net NPA Margin on financial performance of commercial banks measured by ROI".

Thus, we can predict the average ROI (profitability indicator) with about 97% explanatory power by the following model:

ROIi= 9.948-0.144 SRi+0.148 CRi-0.056 MSLi-0.004 BPEi+0.682 NNPAMi+€i

We referred to table 9 to assess the significance of each independent variable on the dependent variable Return on Investment (ROI). Net NPA Margin is the only variable that found to be significant the other variables , Spread Ratio, Intermediation Cost Ratio, Market share of loans, Business Per Employee are found to be insignificant and doesn't individually affect ROI as their t-sig are more than 5%.

9. Conclusion

With technology acting as a moderator in nationalized banks have regained shares they had lost to private banks. Banks much adjust to the technological advances at a greater pace. More focus must be done on improvement in the non- interest income, which can be gained only by providing addition banking services to its loyal customers. Declining spreads and margins are characteristic of rising competition induced by technology. The net interest margin, operating expenses and other income' are crucial in

determining profitability of the banking sector. Banks with an appropriately managed loan portfolio will be able to minimize inputs for any given level of loan output. A balanced approach would be to bring down net interest margin, which would improve the efficiency of financial intermediation, along with an increase in income from other sources and reduction in operating expenses to maintain profitability. Also the banks must equip themselves to adapt to the frequent changes in the technological advancements.

10. Scope for further research

This study is aimed at the performance evaluation of banks post IT adoption. This study can be extended by considering the foreign banks. An elaborated version of the study can be designed by considering micro level performance indicators using CAMELS model. A comparison between foreign banks and Indians banks can be considered only for post adoption period. Considering demonetization the study can also be split into three segments in i.e. pre IT adoption, IT adoption till demonetization period in 2016 and post demonetization. This time horizon is of great importance because agenda behind demonetization was to increase the adaptability to technology driven banking. So measuring the effectiveness of the post demonetization period bank performance will indicate the real success. Further elaborated studies can be conducted using quarterly reports.

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Annual Reports of Banks from 2002 to 2015,
RBI reports, 2005, 2010, 2013 and 2016
CSO Data release

Ratios from 2002 to 2015 (Annexure)

Indicators & Ratios			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
			3.16	3.29	3.13	2.92	2.8	2.28	2.34	2.26	2.75	2.55	2.39	2.47	2.41	2.51
		SR	3.68	3.28	3.22	3.01	2.49	2.49	2.54	3.01	2.8	2.65	3.82	3.26	3.74	3.78
		BOA	0.69	0.36	0.83	1.07	0.88	0.52	0.4	0.37	0.75	0.63	0.6	0.69	0.65	0.61
	Profitability	ROI	10.18	9.22	8.23	7.83	7.49	7.32	7.06	6.81	6.85	7.43	7.42	7.51	7.46	7.55
		ROA	1.26	0.92	0.89	0.94	1.01	1.03	1	1.03	0.88	0.74	0.73	0.76	0.78	0.8
		NPM	9.78	12.75	10.79	10.48	10.87	10.75	10.7	11.25	11.59	9.15	7.66	7.89	7.74	8.08
	Cost efficiency	ICR	2.47	2.36	2.24	2.07	1.84	1.62	1.56	1.48	1.6	1.44	1.41	1.39	1.41	1.3
		CIR	49.97	44.61	49.29	52.69	49.02	47.45	44.62	43.95	44.52	42.88	44.1	44.86	43.77	42.99
		OC / Unit O/P	1.76	1.68	1.54	1.41	1.18	1.03	0.97	0.92	0.99	0.91	0.9	0.96	0.92	0.88
	Business Growth	MSL	48.72	47.73	49.55	48.43	48.35	48.6	50.67	52.71	53.76	53.72	52.61	53.98	53.56	54.01
		MSD	50.78	50.39	50.69	49.9	50.45	50.6	51.82	54.43	55.67	55.74	55.55	56.11	55.87	56.89
		NII/ Total Revenue	16.68	20.03	16	12.26	11.41	12.82	12.41	12.79	10.08	8.72	8.65	8.88	8.73	9.08
	Management Efficiency	PPE	0.17	0.24	0.21	0.22	0.28	0.38	0.49	0.57	0.7	0.69	0.65	0.71	0.76	0.83
		BPE	26.02	31.89	38.31	49.01	61.83	78.32	93.59	115.3	127.8	142.2	192.7	217.87	240.11	280.12
	Stability	SA / TA	87.15	86.66	84.88	82.15	82.66	79.96	8.52	79.49	80.18	82.54	87.58	89.11	91.47	92.08
		Net NPA / Net Advances	4.74	3.13	2	1.16	0.94	0.77	0.68	0.91	0.92	1.44	2	2.53	2.89	2.96