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# Tipping the Scale: Using Unix at One of the Largest Banks on Earth

## A Case Study of State Bank of India

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## Executive Summary

This report is a case study of the State Bank of India (SBI) and its journey to implementing a new core system in its domestic footprint. This domestic footprint is one of the largest in the world, with over 17,385 branches of State Bank of India and its six Associate Banks running on the TCS BαNCS system.

The key takeaways of this migration:

- It was one of the largest migrations on Earth: 17,385 branches; 20,000 ATMs; 262 million accounts; 37 million peak transactions per day; and 205,000 employees.
- State Bank of India chose to run its core system on HP-UX rather than a mainframe to achieve a lower TCO and one-third lower initial cost.
- State Bank of India chose to run the FNS BANCS core system over Alltel Systematics for BANCS' real-time capabilities, more modern architecture, and platform independence.
- SBI was able to reduce the number of employees supporting IT from 15,000 to under 2,000 for dramatically lower TCO.
- TCS was the implementation partner and continues to provide support for running the system. TCS has subsequently purchased FNS and the BANCS system and maintains the code for State Bank of India.

## About State Bank of India

The State Bank of India was founded as the Bank of Bengal in 1806 and today is one of the largest banks on Earth in terms of branches, accounts, and other metrics. The bank is majority-owned by the Indian government and therefore finds itself with two goals: maximizing profit and helping the government execute its policies in financial services. One of the main goals of the national and state governments in India is financial inclusion, serving poor rural India, which has traditionally not had access to any financial services.

State Bank Group consists of the bank itself (State Bank of India) and seven (now six) Associate Banks (AB):

- State Bank of Bikaner and Jaipur
- State Bank of Hyderabad
- State Bank of Indore
- State Bank of Mysore
- State Bank of Patiala
- State Bank of Saurashtra (acquired by State Bank of India in August 2008)
- State Bank of Travancore

The Group has a number of subsidiaries such as SBI Life Insurance Company Ltd., SBI Capital Markets, SBI Funds Management, SBI Securities Ltd., SBI Factors, and SBI General Insurance.

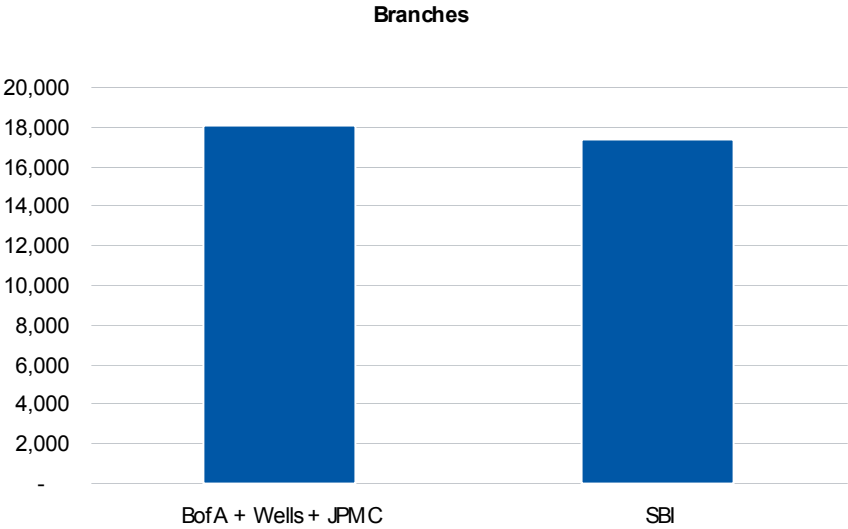
There are 12,470 branches in State Bank of India itself and another 4,915 at the ABs, totaling 17,385 branches in India. The bank opened about 1,000 new branches in 2009. Additionally there are 22 Regional Rural Banks (RRB) sponsored by State Bank of India and its Associate Banks. The bank has overseas branches in 25 countries.

## How Big Is State Bank of India on a Global Scale?

### Branches

The State Bank of India, including its Associate Banks, has 17,385 branches. Let's put this into perspective: Bank of America has 6,153 branches; JP Morgan Chase (+Washington Mutual) has 5,126; Wells Fargo (+ Wachovia) has 6,741. All three of these too-big-to-fail American banks **combined** have a total of 18,521 branches, just slightly more than the State Bank of India at 17,385 branches, as shown in Figure 1.

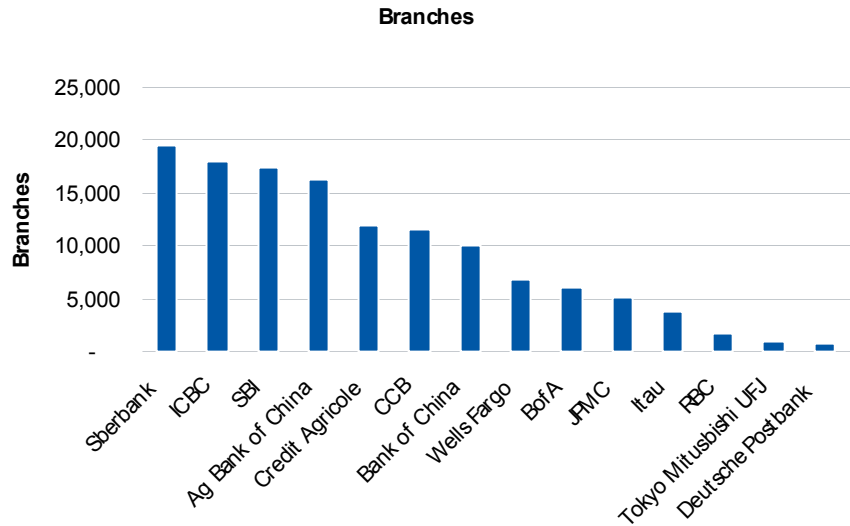
**Figure 1: SBI Is Nearly as Large as Bank of America, Wells Fargo, and JPMorgan Chase Combined**



Source: Annual reports

Bank of America has announced that it will be closing branches, while State Bank of India is adding them. It is likely that next year State Bank of India will have more branches than Bank of America, JPMorgan Chase, and Wells Fargo combined. It has slightly fewer branches than Sberbank, the massive Russian retail bank, and ICBC, the Industrial and Commercial Bank of China, as shown in Figure 2.

**Figure 2: The State Bank of India Has One of the Largest Branch Networks on Earth**



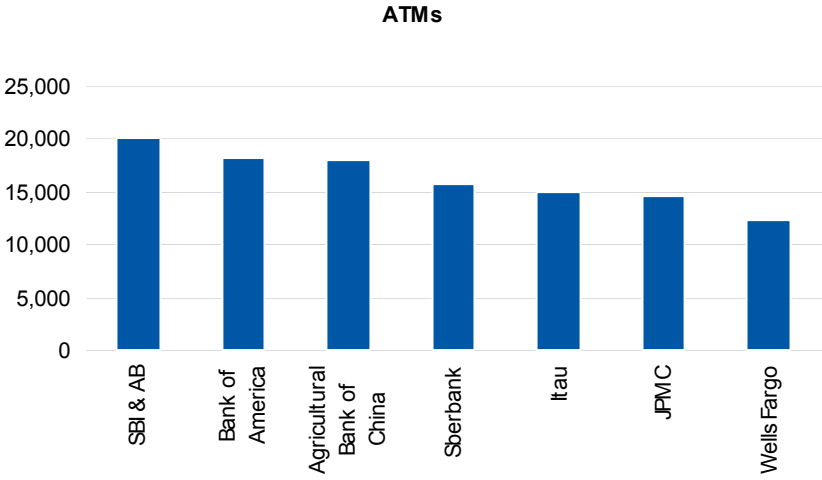
Source: Annual reports, State Bank of India

### ATMs

The bank along with its Associate Banks has 20,000 ATMs (as of January 2010) and expects to have 25,000 ATMs by March 2010. All ATMs run from a single switch. State Bank of India and the ABs have issued 61 million ATM cards and issue 2 million new cards every month. The ATMs dispense Rupees 272 billion (\$5.6 billion) per month. All ATMs are on line, some via CDMA (mobile network). The bank is moving off ACI Base24 on the Tandem platform to another switch running on Unix. State Bank of India also expects to see a huge growth in POS transactions running on this same network. It plans to install 150,000 POS machines. The Indian Railways ([www.irctc.co.in](http://www.irctc.co.in)) generates the highest number of POS transactions for State Bank of India today, about 10,000 on the Internet and 20,000 via online use of debit cards. The bank expects to be processing 7 million ATM transactions and 2 million POS transactions per day by 2011.

State Bank of India and its Associate Banks have the largest ATM network in the world, as shown in Figure 3.

**Figure 3: State Bank of India Has One of the Largest ATM Networks on Earth**

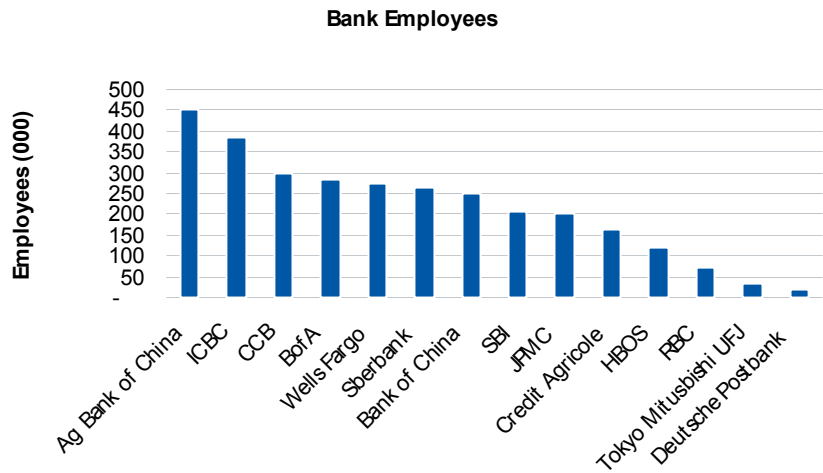


Source: Annual reports, State Bank of India

## Employees

State Bank of India has 205,000 employees, which puts it in the top banks in the world. It has fewer employees than the largest of the Chinese banks as well as the largest of the American banks. It nonetheless cannot be considered anything other than one of the largest of the large, as shown in Figure 4.

**Figure 4: State Bank of India Has One of the Largest Headcounts in the World**

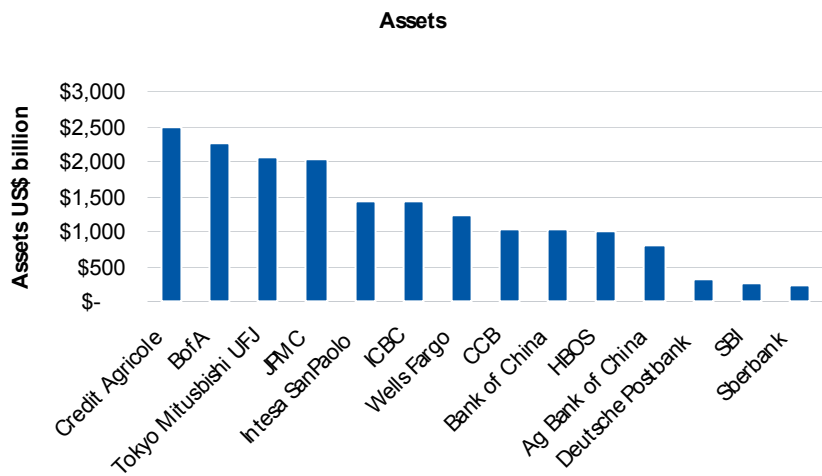


Source: Annual reports

## Assets

State Bank of India has assets of US\$200 billion, and US\$271 billion including its Associate Banks. It is here that State Bank of India does not seem as large because it does business in a developing country where transaction amounts and average balances are smaller. As shown in Figure 5, there are other banks with much larger asset bases, most in the developed world.

**Figure 5: Assets Tend to Underestimate the Relative Size of the State Bank of India**



Source:

While the assets of the bank are not the largest in the world, given that the bank does most of its business in a developing country, from an operational point of view the bank is one of the largest on Earth, with 37 million peak transactions a day.

## The History of State Bank of India IT

In 1991, the bank undertook a computerization initiative it called total branch automation using Kindle (now Misys) Bankmaster to be deployed in the largest branches. State Bank of India computerized all its branches by January 2004, rolling out Bankmaster in 7,526 additional branches in nine months. The bank used a stand-alone IBM mainframe for interbranch reconciliation and used weekly reporting with central reconciliation in a very manual system.

Customers were still expected to queue in different areas for different functions at the bank. There was one teller for issuing drafts, another for accepting deposits, another for foreign exchange. In 2003 the bank rolled out multifunction tellers and Internet banking, allowing multiple functionality from either a single teller or a browser. Customer service has improved due to the bank's ability to provide single-window operations.

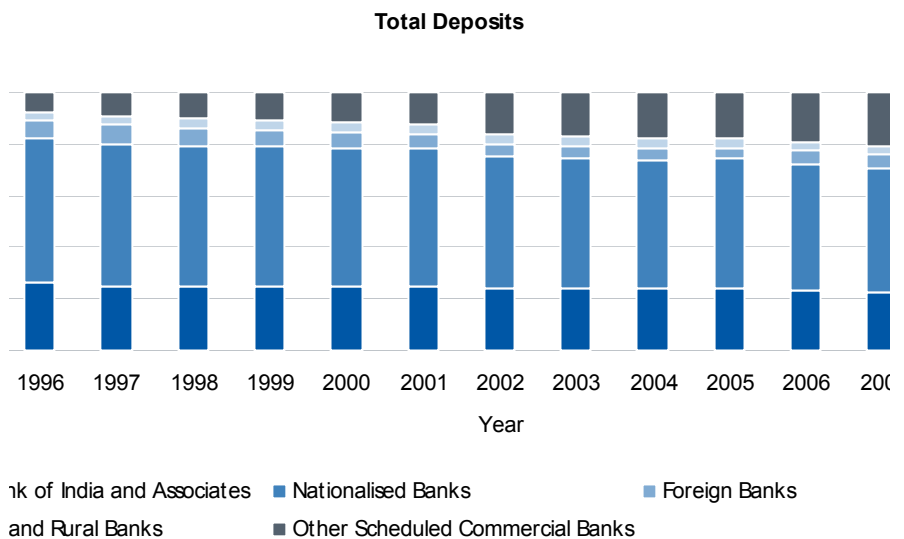
ATMs were connected to the Bankmaster branch system via a gateway PC, and ATM transactions were posted at the end of each day to Bankmaster. The ATM was also connected via ACI's Base24 switch to the broader network.

## The Decision to Migrate Core Systems

State Bank of India was running a branch system, meaning that you did business with the branch, not the bank. All records of account activity resided in the branch. The bank found itself at a competitive disadvantage with respect to both the global banks (Citi, Standard Chartered, HSBC) and the private (as opposed to publicly owned) banks such as ICICI Bank and HDFC Bank, which had a single centralized core banking system in India so that customers could do business with any branch. Corporate customers were moving to other banks that could work with a single bank operating across the country rather than multiple branches that couldn't offer real time consolidation of positions.

Because SBI was at a technology disadvantage with the branch system, the bank was losing deposit share due to entrants in the market. The Indian banking market is dynamic and competitive. The private banks were rolling out new products on modern systems, and State Bank of India had trouble keeping up with this innovation. On the Bankmaster branch system, patches needed to be shipped out to every branch and applied to every branch server. This alone made it much more difficult to compete in the Indian market.

**Figure 6: State Bank of India's Market Share Is Again Increasing**



Source: Reserve Bank of India

The big winners in past years have been the commercial (private) banks such as ICICI Bank, HDFC Bank, Yes Bank, Axis Bank, and others. Their share has grown from 8% of deposits in 1996 to 20% of deposits in 2008. Nationalized banks (excluding State Bank of India) have been losing share steadily, from 56% of deposits down to 48% over the same time period. State Bank of India and its Associates did not have the same fate. Share declined much more modestly, from 26% to 23% over this same time period, and share actually grew from 2007 to 2008 and increased further in 2009. After migrating to TCS BαNCS, the State Bank of India has recently turned the tide and been growing deposit market share in India, as shown in Figure 6 on page 11. Note that while State Bank of India now has 100% of its branches on a centralized core system, the nationalized banks have been lagging, with only 56% of their branches on centralized core banking as of March 2008.

Reconciliation was painful. Each branch would compile reports (on paper) and send them to a central point where they would be keyed into a single system. Clerks would match these reports against branch batches on a weekly basis. When there were discrepancies, clerks would send memos to the branch, and the mismatched batch was mailed back to the central office for reconciliation. There was no network connectivity across branches. There was a requirement that large payments from the government be reconciled at the end of the same day to settle with State Bank of India. Within the current system, this was impossible. Today the bank has better control of reconciliation due to a centralized view of branch books for system suspense accounts, interbranch accounts, etc. The entire clearing process is now totally automated with minimal manual intervention.

A branch was almost a bank in itself, where the branch manager was responsible for many activities such as account opening, customer management, data management, management of funds, daily report generation, etc. Launching of products, services, and policies across all branches was handled at the branch level. Since the whole system was decentralized, the bank had little control over branch activities and their decisions, thereby facing numerous governance issues.

Activities such as end of day (EOD), start of day (SOD), and report generation were repeated across all the branches, resulting in duplication of effort and a drain on resources.

## The Selection of FNS BANCS

As a government-owned entity, the bank had strict procurement procedures that had to be transparent and could not be changed mid-stream. State Bank of India hired KPMG to provide guidance on a future architecture for IT at State Bank of India and help with the RFP process. The bank also engaged the assistance of Dr. D. B. Phatak of the Indian Institute of Technology (IIT) Bombay. The bank had established criteria that said that any system to be considered should be running somewhere else, supporting at least 500 branches. At the time two Indian solutions, FLEXCUBE and Finacle, were unable to provide references running over 500 branches. They were therefore eliminated from the process. At the time Bank of America was running 1,800 branches on Systematics, and ANZ in Melbourne was running 750 branches on BANCS.

The bank was looking at three different possibilities, shown in Table 1.

**Table 1: SBI Was Looking at Three Possibilities**

Integrator	Software Package	Hardware Platform
TCS	FNS BANCS	IBM Mainframe
TCS	FNS BANCS	HP Superdome
IBM	Alltel Systematics	IBM Mainframe

Source: State Bank of India

The bank evaluated the solutions based upon five criteria: architecture, software process engineering, scalability, field proof points, and functionality.

FNS had a small and creative engineering team, but processes were not very strictly implemented. A testing methodology was in place, but not fully executed. Because TCS was taking over the maintenance of the code, this moved the evaluation from one of just FNS to one of FNS and TCS.

Solution architecture was good, but it wasn't clear that either system could scale to 10,000 branches. Neither vendor could prove this at the time. Alltel had 3,000 branches versus 750 branches for FNS, but neither was at 10,000. The greatest concerns were around end-of-day processing.

Both systems met the functionality requirements of the bank. Neither system was especially easy to customize.

The process said that both solutions were able to meet the needs of the bank. The bank negotiated with both sets of vendors, but IBM and Alltel could not come close to the price of solution provided by TCS, HP, and FNS. The process was structured such that the lowest priced solutions among all sufficient solutions was to be awarded the contract.

A few features of FNS BANCS which helped win the deal were:

- 24 x 7 availability providing continuous customer service.
- Online real time Internet banking, ATM, POS, RTGS, SWIFT, for multiple channel operations.
- Message-based interfaces.
- Browser-based front end providing easy manoeuvrability for users and ease of operations.
- Offline branch functionality for key transactions (in case of network failure).
- Parameterized product setup and cloning, allowing faster product launches.

Thus TCS, FNS, and HP won.

## Benchmarks

There were three benchmarks conducted over the course of the implementation and rollout of FNS BANCS. In 2001, the bank ran a benchmark of 72 million accounts and 25 million transactions per day. The bank expected that 1,500 tps would be sufficient and ran this on both the IBM mainframe and the HP Superdome successfully.

### 2001 Benchmark

TCS, FNS, and HP ran the test at HP's lap in Böblingen, Germany and concluded on April 6, 2001. They used a single HP Superdome SD6400 with 64 PA-RISC 8600 at 552 MHz and 64 GB memory running HP-UX 11.11. Storage was on HP SureStore Disk Array XP-512.

With four database regions and 4 x 16 CPUs, TCS, FNS, and HP achieved 1,506 business tps with response time under 120ms. The server CPUs were at 89% capacity utilization. Batch ran at 40 million accounts per hour on 72 million accounts.

What turned the table on the decision process was a benchmark where TCS ran the system, HP contributed hardware, and a team from FNS and TCS executed the project. The project simulated 10,000 branches and swung the decision to TCS/FNS/HP. Dr. Phatak stated, "The results of the benchmark were truly fascinating. With 64 processors, they [TCS with FNS on HP] could show beyond 5,000 to 10,000 and even 15,000 branches."

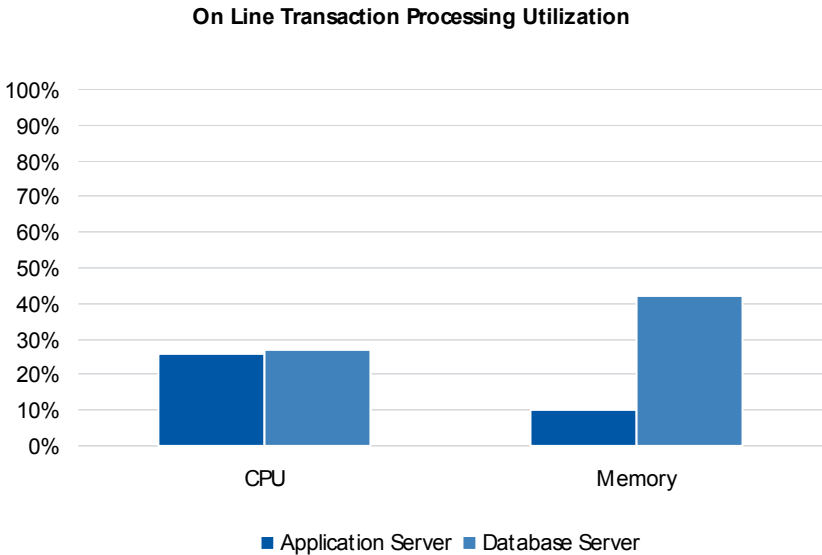
### 2006 Benchmark

In 2006 the bank wanted to see if the customizations it had requested from TCS would scale to this same standard on two 32-core HP Superdomes. The customizations ran 100 million accounts with 25 million transactions per day and 1,500 business tps. A business transaction could be something like transfer funds, which involves multiple granular credit and debit transactions.

The test took place at HP's lap in Cupertino, California and concluded on September 1, 2006. TCS used four application servers and two database servers, all of which had 32 cores. The application servers were HP 9000 Superdomes with 32 PA-RISC 8900 at 1.1 GHz and 128 GB memory. The database servers were HP Integrity Superdomes with IA-64 Montecito processors at 1.6 GHz and 64 GB memory. All were running HP-UX 11.23.

Using these servers, TCS and HP achieved 1,577 business tps with a 0.092 second weighted average response time. In this scenario the application server CPUs were at 26% and used 10% of memory. The database servers were at 27% CPU capacity and used 42% of memory as shown in Figure 7.

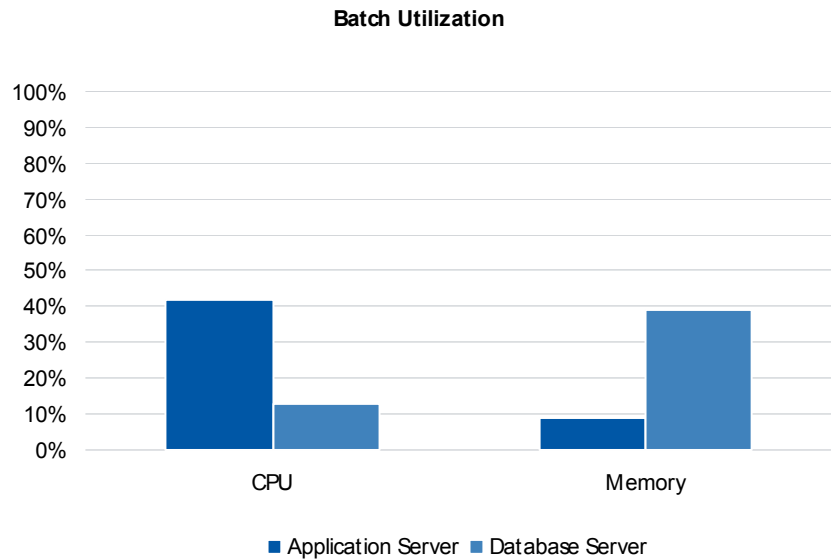
**Figure 7: Capacity Utilization Was Under 50%**



Source: Ernst & Young

Running end of day batch on 72 million deposit accounts out of 90 million in the database in 24 parallel processes took 2 hours and 27 minutes. Application servers were at 42% of CPU capacity and 9% memory utilization. Database servers were at 13% CPU utilization and 39% memory utilization as shown in Figure 8.

**Figure 8: Capacity Utilization Was Under 50%**



Source: Ernst & Young

In all cases there was plenty of headroom in terms of response time, processor utilization, memory, and batch windows. How much headroom could there be?

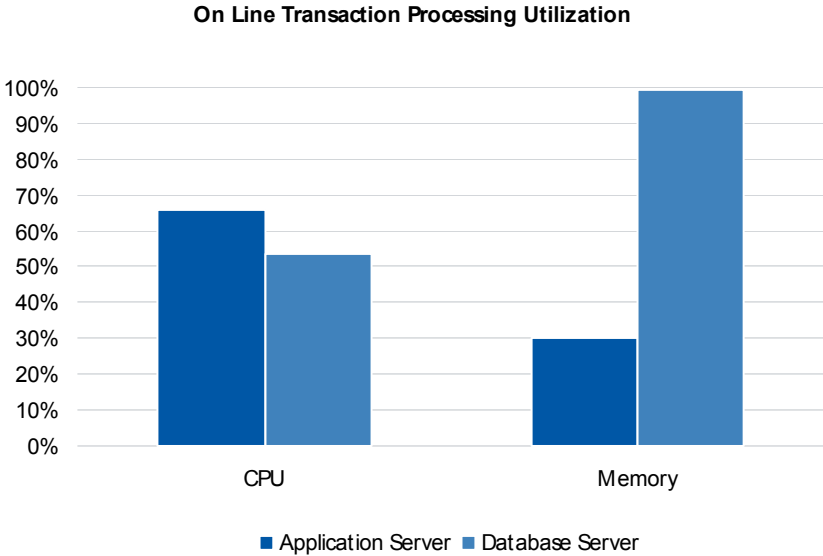
## 2007 Benchmark

At the end of 2007, the bank wanted to assure that the system would be able to grow with the bank to well beyond where the bank was today. They tested 500 million accounts and 125 million transactions in a four hour time period and 10,000 tps successfully on HP Superdome in December 2007 at HP's Cupertino Lab.

This time the test used eight 32-core application servers and four 48-core database servers. The application servers were HP Integrity with dual core Itanium processors 1.6 GHz and 128 GB memory. The database servers were HP Integrity Superdomes with dual-core Itanium processors at 1.6 GHz. and 96 GB memory. All were running HP-UX 11.31.

TCS and HP achieved 10,716 business tps with a 0.143 second weighted average response time. In this scenario the application server CPUs were at 66% and used 30% of memory. The database servers were at 54% CPU capacity and used all the memory available, as shown in Figure 9.

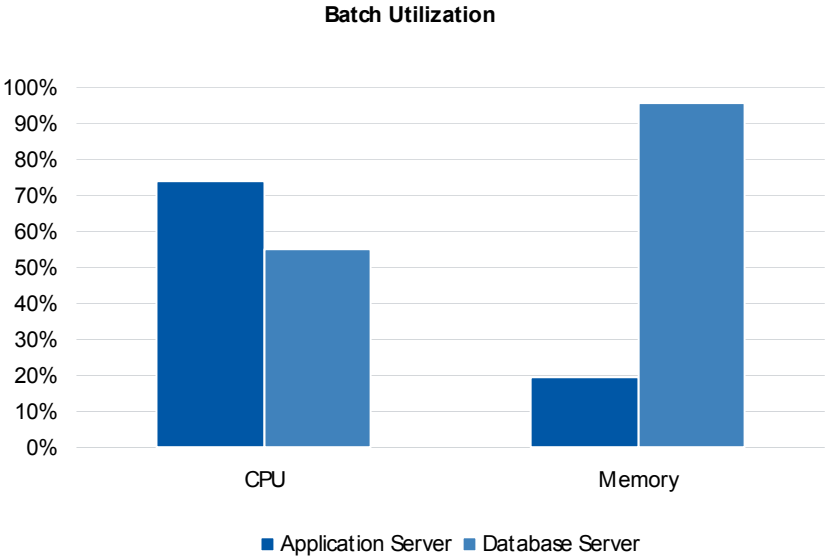
**Figure 9: Capacity Utilization Was at the Limit**



Source: Ernst & Young

Running end of month batch on 500 million accounts in the database in 64 parallel deposit processes took 59 minutes—just under one hour! Loan processing on 32 parallel processes took 49 minutes. Application servers were at 74% of CPU capacity and 19% memory utilization. Database servers were at 55% CPU utilization and 96% memory utilization, as shown in Figure 10.

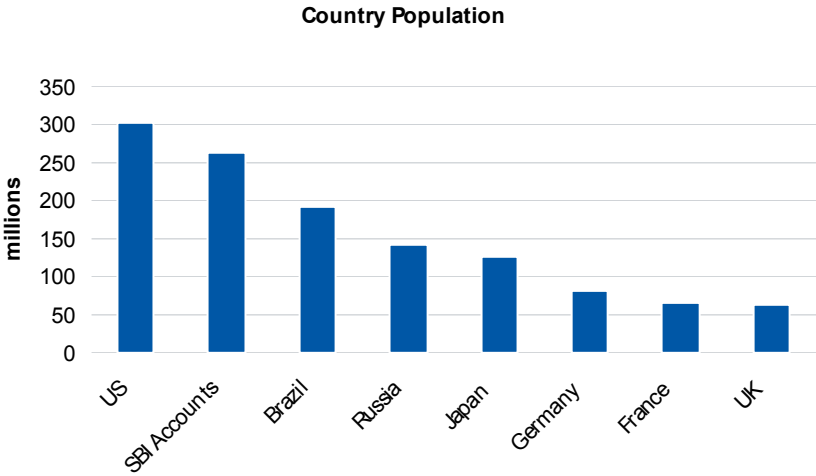
**Figure 10: The Overnight Batch Runs with no Problem**



Source: Ernst & Young

Today the bank has 190 million accounts and is running 30 million transactions per day with 1,500 peak tps. The record for the bank is 37 million transactions in a single day. There are an additional 72 million accounts running at the Associate Banks on the same system to total 262 million accounts running on a single core system. To put this in perspective, only China, India, and the United States have more people than SBI has accounts running on a single instance of TCS BαNCS, as shown in Figure 11.

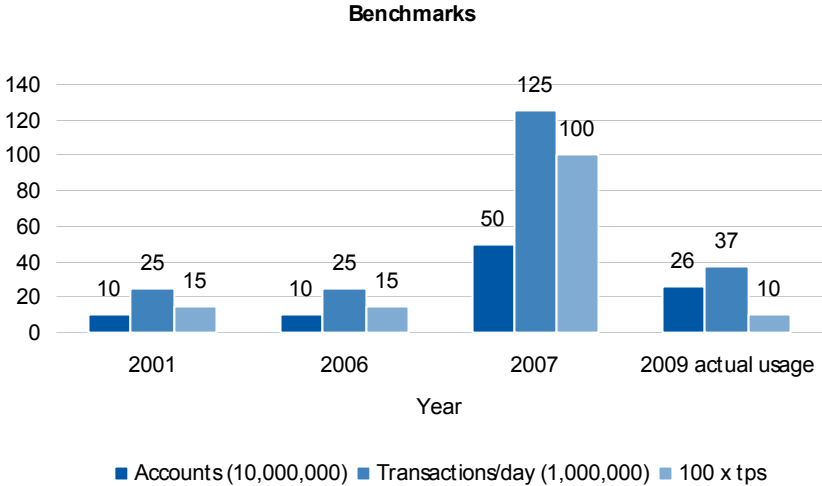
**Figure 11: The Number of Accounts at SBI Is Larger than the Population of Most Countries**



Source: US Census, Instituto Brasileiro de Geographia e Estatistica, Federal State Statistics Service of Russia, Japan Statistics Bureau, Eurostat, State Bank of India

SBI has plenty of headroom to grow, based upon the 2007 benchmark as shown in Figure 12. The bank has the capacity to double the number of accounts and hit a peak tps 10 times greater than it is experiencing today. TCS has a team dedicated to scalability and performance of the system that continues pushing the limits of scalability.

**Figure 12: There Is Plenty of Room for Growth at State Bank of India**



Source: FNS, HP, Ernst & Young, Celent analysis

# Hardware Platforms

## Why Choose Unix?

Most of the largest banks in the world run on IBM mainframes. Why did State Bank of India choose to go with HP Superdome and HP-UX? The bank used KPMG and IIT Bombay to validate the decision. When the bank first looked at the two solutions, FNS BANCS (now TCS BαNCS) and Alltel (now FIS) Systematics, they were both mainframe systems. FNS was ported over to the HP Superdome and was benchmarked at 70 million transactions per day at an HP lab in Germany. The cost of hardware between the mainframe and the Unix was about one-third greater on the mainframe. The bank also felt that DB2 on IBM was a very proprietary solution that would create vendor dependence and drive up cost. Database and operating system software were significantly higher on this proprietary solution.

## Why Choose a Mainframe?

Mainframes have been designed to handle massive workloads for decades and had a mature feature set around such capabilities. Unix had matured by 2001, but didn't have the depth and breadth of capabilities. Logical Partitions (LPARs) had just appeared on Unix; however, in the tests HP was able to demonstrate running four stable LPARs on Superdome. As the load on a mainframe increases, mainframes can put back pressure on jobs and run safely at 99% utilization. This was far more than Unix could offer at the time.

## Why Did State Bank of India Choose Unix?

On a Unix system, one needs to design processes to make sure the machine isn't overloaded. CA Unicenter and IBM Tivoli have had these functions for the mainframe for years. The conclusion at the time was that the mainframe was a superior solution, but that with appropriately defined procedures, processes, and manpower, the Unix solution was sufficient. Unix has since narrowed the gap in capabilities with capabilities in HP UX and HP Openview.

TCS had agreed to support the facilities management and had sufficient experience with Unix to address all operational concerns. As a single point of responsibility for both the application software and the operating environment, Dr. Phatak considered the solution robust.

## Product Technology and Functionality

The State Bank of India decided to move from a branch system based on Kindle (now Misys) Bankmaster to a centralized real time system, as shown in Table 2. Moderniza-

**Table 2: From Old to New**

	Old	New
Software	Kindle Bankmaster	FNS BANCS (now TCS BαNCS)
Programming Language	Assembly, COBOL	COBOL, .NET on front end
OS	Novell Netware	HP UX
Database	Btrieve	Oracle 9i
Processor	One per branch, varies by branch size: Pentium 3	HP Superdome: 2 application servers; 2 database servers, PA RISC
Storage	Local server with 2GB, periodically archived	HP XP24K SAN, 320 TB

Source: State Bank of India

tion and centralization of infrastructure, database, and storage also followed from this migration.

The primary data center setup is located in Mumbai, and a duplicate setup is in Chennai as a disaster recovery (DR) site. The recovery point objective (RPO) is 0, meaning there is no data loss in the event of a failure. The recovery time objective (RTO) is four hours, which means that in the event of a disaster, the bank would be up and running within four hours. In order to assure that the DR site is indeed fully capable of running the bank, the bank switches to the DR site every six months. Both the data centers are ISO IEC 27001 compliant for information security. To date, these capabilities haven't been required. TCS BαNCS has been running at 99.90% uptime with no transaction losses.

After the end of day processing, after the standby database at the DR site is in sync with the production database at the primary site, a copy is made, which is then used for offline reports. The bank now requires 7 x 24 access to the system, due to demands from online banking and operations centers that run from 7 a.m. to 10 p.m. This access is achieved in spite of an end of day batch that takes four hours. There are two regions (copies) of the database that are both in synch, the day region and the night region. At EOD, the batch processes are run on the day region, and the night region handles transaction requests. The EOD process scans through every account, accrues interest, generates service charges, flags non-performing assets (NPA), and creates a journal to update the corporate general ledger (GL). Finally there is a disk to disk snapshot of the day copy of the database. After that, there is a start of day process that runs standing

instructions, rollover of term deposits, and then posts all the transactions from the night region back into the day region. This is how the bank is able to access the core system 7 x 24.

As the number of transactions and number of branches on the system has skyrocketed, the processing window has shrunk to eight or nine hours. The bank requires 7 x 24 availability because there is no time when all State Bank of India branches are closed. Some branches are open on weekends. Each state in India has a different holiday schedule. There is no rest for the weary at State Bank of India.

The State Bank of India has some unique connectivity challenges to link the 17,385 branches. They achieve this with over 20,000 leased lines and a VSAT (very small aperture terminal) satellite network with 6,000 connections. This VSAT system consisted of a small dish of 1.2 meters in diameter that delivers up to 64 kbps connectivity from the branches to the data centers.

## Relationship with Vendors

TCS had the prime relationship with the bank. While originally TCS was the system integrator, it had the source code to FNS BANCS and committed to maintain this code. The company later acquired FNS and with it the entire BANCS code base. The TCS project team resides at State Bank of India.

Millions of lines of code have been added to the base code at State Bank of India. Because the code base is maintained by TCS, which also owns the product, TCS is migrating the vast majority of State Bank of India customizations into the main TCS BANCS code base, thus saving the bank the cost of continuing to support the customizations while improving the functionality of the TCS product.

In any complex environment, there can be challenges to customization, with unintended consequences. TCS undertakes full system testing for every customization while State Bank of India does the regression testing and user acceptance testing (UAT) to guard against this possibility. State Bank of India keeps a test region with a separate database for UAT. Regression testing sits in yet another region.

## Use of Other Systems

Cash management came from Nucleus Software's Finn One product. This product supported limits, sub-limits, sweeping, and common statements for multiple accounts. Corporates could sweep funds in and out of accounts at the end of the day, and allocate credit limits across various offices and accounts.

EximBills was used by the bank for trade finance products such as letters of credit (L/C), buyers credit, and suppliers credit. TCS was the implementer of this system at the bank, running on HP Unix and Windows servers. This system required a tight integration between payments, core, and this trade finance system.

TCS BαNCS was an integral part of the State Bank of India architecture, but other systems were certainly involved. A summary of these systems is listed in Table 3.

**Table 3: TCS BαNCS Was the Center of the Architecture**

<b>Functionality</b>	<b>System</b>
Teller	TCS BαNCS
Sales Platform	TCS BαNCS
Internet	Satyam
Bill Pay	Bill Desk, CC Avenue
ATM	ACI Base 24
Contact Center	Outsourced to Mphasis using TCS BαNCS for inquiries and lost cards
IVR	Mphasis
Mobile	Spanco (India)
International Offices Core Banking	Infosys Finacle
Enterprise Data Warehouse	IBM

Source: State Bank of India

## Implementation Milestones

TCS set up a team of domain experts, architects, performance management specialists, and product experts apart from staffing the team with around 300 IT consultants trained on the TCS BαNCS system. SBI also realized the challenge it faced and set up a dedicated project office from day one for implementation of the core banking solution. It was a structured organisation with clearly defined ownership and responsibilities across the areas of development, quality assurance, business operations, training and implementation, data centre, and infrastructure. The challenge was huge, but the commitment from SBI and TCS management enabled a successful migration.

Training was another critical success factor for this initiative. SBI had more than 200,000 employees, many of them little interaction with web-based technology before FNS BANCS implementation. In such an environment, SBI had to ensure that the SBI employees were well acquainted with the usage of CBS. TCS associates trained SBI employees in three batches on the new system. SBI had 58 training centres at that point of time, which were used by the professionally trained SBI employees to further educate 100,000 employees. The rest of the employees who would be required to use the core system were trained on the job.

Rolling out a new core system to 18,000 branches is no easy task. State Bank of India hired APEX Training Institute in Hyderabad to train the trainers on the new FNS BANCS system. They had more than 50 sites running dummy branches against training servers to simulate the branch experience for the trainees. At least 50% of staff needed to go to a training center. People who had worked in branches that had already migrated were moved to other branches about to convert.

State Bank of India also rolled out an e-learning package to introduce branch staff to the new system. To reduce calls to the service desk, State Bank of India created an indexed help database for staff to make first line inquiries. If this wasn't successful, branch staff could call the service desk that handled 200,000 calls per year. These could be user questions, assistance with a particular transaction, report generation requests, etc. These Level 1 requests were successfully handled at regional offices 75% to 80% of the time. More difficult requests were passed to Central Service Desk at Mumbai and the complex ones to TCS as Level 2. The bank has handled 1.4 million calls since the introduction of the help desk, and 99.9% were fully resolved.

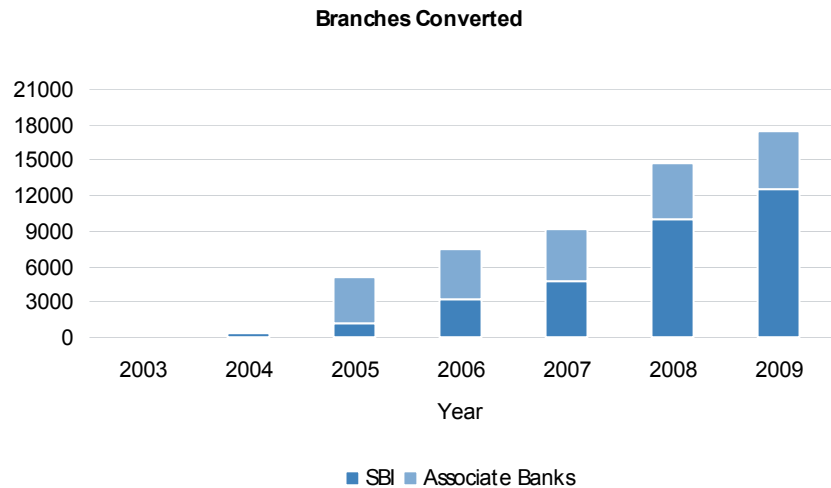
The conversion process was a five-year endeavor, from pilot in August 2003 to full rollout in July of 2008. The process started deliberately and rapidly accelerated:

- July to October 2003: First pilot branch went live on 29 August 2003; 10 pilot branches went live by October 2003.

- 2004: First 350 branches went live.
- 2005: All ABs migrated; 800 more State Bank of India migrated.
- 2006: 3,300 State Bank of India branches migrated.
- 2007: 4,700 State Bank of India branches migrated
- March 2008: 10,000 State Bank of India branches migrated.
- July 2008: All 17,385 branches migrated.

This progress is shown in Figure 13 on page 27.

**Figure 13: State Bank of India Had Nearly 18,000 Branches on the Same System by 2009**



Source: State Bank of India

For any branch to be migrated, there is a series of steps running like an assembly line.

- Training staff
- Network setup
- Hardware setup (so that software can be installed and branch could be brought on the CBS)
- Software installation (operating system and other system software)
- Data cleansing from Bankmaster to TCS BαNCS
- Testing of migration
- Data migration in the production region (making branch live)

This type of industrialization was necessary in order to manage the project of migrating nearly 18,000 branches.

## Business Benefits

While there were many operational efficiencies from the new centralized core system, there were also many business benefits. Price changes were previously implemented in the branch. Now they could be controlled centrally, providing greater speed, accuracy, and consistency of pricing across branches. There was also centralized risk reporting and control, given that all branches were on a single system. A centralized system also enabled the bank to maximize the value of the largest branch network in India. Giving customers over 12,000 State Bank of India branches at which clients could access their accounts gave the bank a huge leg up over its smaller competitors.

Standardizing the KYC process was an additional benefit of installing the BANCS system. Previously, each branch would act on KYC independently, requesting the customer to provide a passport, driving license, voter ID, government ID card, etc. The branch would also request some form of proof of address such as a utility bill or driver's license, lease or deed to a house, etc. Today the core system captures the information for a new customer and scores the customer using a standardized process. The bank issues accounts today in a consistent way across branches.

State Bank of India executed a business process reengineering (BPR) in conjunction with its core migration. Because the bank was using a branch-based system, it took the opportunity to redesign the majority of its business processes to enhance efficiency, consistency, and turnaround time. The bank consolidated middle office activities in four liability centralized processing centers (LCPCs) across the country. Originating an account at the branch requires that only three key fields be entered at the branch. The branch will issue a non-personalized ATM card, 10 checks, and a small brochure. The LCPC handles the remainder of the origination process including setting up Internet banking, issuing printed checks, a customized ATM card, etc. It also can do final KYC and revoke a provisionally issued account if need be. This has enabled higher throughput at the branches that was not possible with the decentralized branch system because the branch staff has been freed from routine data entry, which has migrated to the back office processing centers.

Last year State Bank of India opened 17 million accounts in the LCPC. This year it is on target to open over 20 million accounts. On the asset side, the bank has created an analogous centralized mortgage processing factory.

Many specific lines of business showed business benefits specific to their areas of competition.

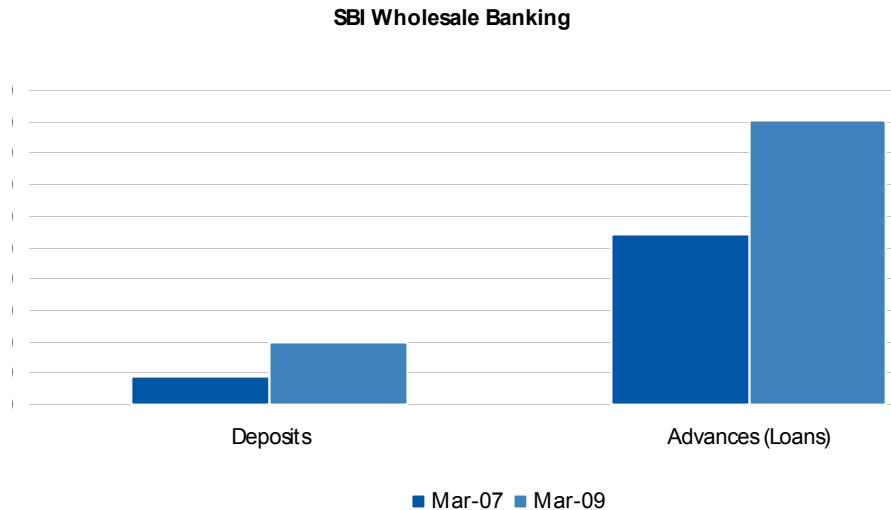
## Wholesale Banking

The Corporate Accounts Group (CAG) handles the wholesale banking at State Bank of India. They issue Rupee credit to business and seek to maximize fee income and share of wallet of their corporate customers. Relationships are owned by CAG branch personnel.

Twenty years ago, the bank had a position of strength, with all the large corporates using State Bank of India for cash management, salary packets, foreign exchange, etc. State Bank of India had been losing share of the cash management business to privately owned (non-government) banks such as ICICI Bank, HDFC Bank, and even some public sector banks such as Corporation Bank. Foreign banks such as Citi, ABN AMRO (now RBS), and Standard Chartered were also taking share. Since obtaining the new core system, State Bank of India has undertaken a massive drive to enhance the product offerings and value addition to this segment of customers, and the results are visible.

State Bank of India has shown improved business results as a result of this initiative, as shown in Figure 14 on page 30. In wholesale banking, deposits grew from 184 to 390 billion Rupees in two years for a CAGR of 46%. Advances grew from 1,081 to 1,803 billion Rupees over the same time period for a CAGR of 29%.

**Figure 14: State Bank of India Wholesale Banking Grew Quickly After the Core Replacement**



Source: State Bank of India

With the new core system, the bank was able to consolidate corporate relationships across the entire branch network. Before a customer had a credit limit at a certain branch. Now the corporation can allocate credit limits across the bank. The bank can

also measure the activity of a corporate customer across the bank, understanding the value that customer is bringing to the bank and measuring achievements with that customer against annual account plan. The bank now had centralized control of interest rates, charges, and fees. Better customer relationship management and risk management have been possible due to a single unified customer view. SBI can now monitor advances and non-performing assets (NPA) via a single view in TCS BαNCS.

One new product enabled by the new core system is the corporate salary packet. If the employees of a corporate client of State Bank of India receive their salary at a State Bank of India savings account, they are given a 25 basis point discount on credit cards, for example. This leverages the unmatched branch network at State Bank of India for national corporate clients to help win back companies that moved their salary payments to other banks. Corporate customers benefit through availability of better payment systems enabled through their cash management interface to TCS BαNCS.

State Bank of India has successfully integrated with SAP at Hindustan Petroleum Corporation (HPC). The SAP ERP system generates billing data to charge various HPC dealers for products shipped and delivered. State Bank of India receives this data and can either debit the account of the dealer or provide financing to that dealer using an HPC arranged credit line.

Another analogous core technology-driven product is the express vendor financing scheme (EVFS) which takes an electronic feed from an ERP system of shipments to a large corporate. The bank pays the smaller, cash-constrained vendor firm now, less a discount. The large corporate pays the bank in 90 days. The large corporate can transmit receipt of shipment information electronically to the bank, reducing the loan processing costs and making the product economically compelling for all parties.

## Small and Medium Enterprise

State Bank of India has been able to grow its small and medium enterprise (SME) business for business customers up to 100 million Rupees (US\$2 million) in bank credit. The Small and Medium Enterprise City Centres (SMECCs) were set up to manage SME account opening, managing such complexities as corporate structure to handle individual accounts, proprietorship accounts, partnership accounts, private limited company, and public limited company accounts.

A new product called Power Jyoti (flame) drew new customers like moths. This product took advantage of the new TCS core system and allows a business to funnel all the cash from a myriad of accounts into a single consolidating account. Businesses used this product to both concentrate money from a number of business branches and act as a universal payment agent. This product also leveraged both State Bank of India's unequalled branch network in India and the new centralized core system. For businesses collecting money across the country, a customer of that business could make a payment at any State Bank of India branch to credit to the business's account. A non-local account payment fee of 25 to 50 Rupees would be deducted from the payment,

due from either the payer or the recipient, depending on how the account was configured. Interbranch transactions have been enabled through TCS BαNCS, resulting in an increase in the variety of transactions and quicker settlement.

## Retail Consumer

The retail consumer is a key part of the success at State Bank of India, and State Bank of India offers product and features to support these customers. State Bank of India currently uses the call center for sales and service rather than transactions. Customers can learn about products, make inquiries about their account, or report a lost ATM card. Transfers are not permitted.

Consumers can access their accounts via Internet banking and make payments between their own accounts. A consumer is likely to have a current account, a public provident fund (PPF) account for tax-deferred savings, a demat (dematerialized) account for use in investing in shares (stocks), and normal savings accounts all supported via the core. Multilingual interface support enables banking in local languages.

Consumers can also make payments to other parties via Internet banking at the State Bank of India site or using biller sites to arrange payments. Transfer of money to third party accounts maintained with other banks is made possible through real time gross settlement (RTGS) and national electronic funds transfer (NEFT) systems operated by the country's central bank, Reserve Bank of India (RBI). Aggregators such as Bill Desk and CC Avenue collect payment requests and integrate to State Bank of India using Internet banking credentials as a way to authenticate and accept payment requests. State Bank of India has also launched a mobile banking service, which enables a customer to make account enquiries, download short account statements, transfer funds, and pay bills.

The bank is now using the electronic clearing service (ECS) to accept mandates for automatic bill payments from utility providers, phone companies, etc. Drafts (checks) are being driven out of the system. The bank is encouraging interoffice credits (IOC) as a way to send money to other parties. If the other party has an account at State Bank of India, you can make a payment to that account. This saves the postage of posting a draft (check) to the recipient. The process is more secure, faster, less expensive, and fully supported by the new core. The goal is to move 40% of all payments to these alternative methods of payment to reduce the transactions that have been taking place at the branch.

Multicurrency deposits are supported with TCS BαNCS. The Reserve Bank of India (RBI), the regulatory authority, permits four foreign currency accounts:

- Dollar
- Euro
- Pound (GB)

## ■ Yen

Additionally there are gold accounts which are popular in India's rural areas. The customers can borrow in gold and pay back gold. Temples (for example) can deposit gold and receive interest payments in gold or Rupees. A gold loan lets a customer deposit gold as collateral and get that same gold back, borrowing Rupees in the interim.

Urban branches are under tremendous pressure at State Bank of India due to the nationwide nature of the bank and its usage for domestic money transfer. Migrant workers from rural India come to get jobs in large cities like Mumbai or Bangalore and open a State Bank of India account in the home village. The migrant worker will deposit cash into the account from his remote urban location and pay a non-local account deposit fee. The family back at home can take the money out at no charge with an ATM card.

## Financial Inclusion

One of the major bank initiatives is financial inclusion. Nearly half the population in India subsists on around 4,000 Rupees (\$86) per YEAR and nearly half the population is without bank accounts; 73% of the area of India does not have access to banking services. These customers can't be profitably served in a traditional branch.

In response to this challenge the State Bank of India has instituted an agent channel called a customer service point (CSP). These CSP agents carry a Java based mobile device that includes a thermal printer, a fingerprint reader, a video screen, and a smart card reader. This system works in online and offline mode and can connect via GPRS mobile technology or via IP to the TCS core. CSPs are often hired and organized by nonprofit (Section 25) companies that operate on a national or regional level.

The consumer is issued a card with biometric (fingerprint, picture) information encoded in the card. They all have State Bank of India accounts on the core system, but these are special customer types with special accounts. The maximum balance on these accounts is 50,000 Rupees (~\$1,000) which allows for limited KYC by the Reserve Bank of India (RBI). There are no checks associated with these accounts, but the account holder can transfer funds from one cardholder account to another cardholder account or even another State Bank of India account. These account holders are not entitled to use the State Bank of India branch channel. These same biometric cards have enabled microfinance in rural India with payments on the loan made via the same agents and cards.

The CSP receives an opening account commission of 10 Rupees and a 0.5% transaction fee. The CSP can also cross-sell insurance products, loans, microfinance, etc. Insurance and loan payments can be paid from this special account. On loans, the CSP earns 0.5% commission on origination and another 0.5% on disbursement for a total of 1.0%, so there is incentive to cross-sell.

There are 11,000 CSPs working with State Bank of India, and there are 3 million customers using this channel. State Bank of India is implementing financial inclusion on its CSP network, which has covered 100,000 unbanked villages in India as of January 2010.

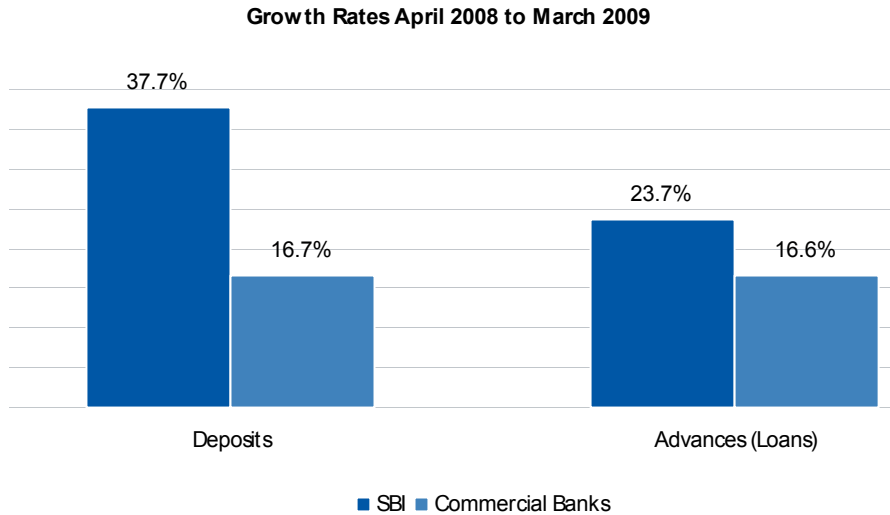
### Government Assistance

How does one create a viable business model on customers living on \$86 per year? One way to do so is by managing the government's National Rural Employment Guarantee Program. In order to alleviate this poverty, the government has created this program which provides people living below the Indian poverty line 100 days of work with wages paid by the government. These have been cash payments in the past, and are very expensive for the government to issue. The government is therefore willing to pay a fee for the distribution of the money. This can subsidize the issuing of no-frills saving accounts, with the payments for this program going into these accounts. These no-frill accounts are accessed exclusively via a biometric card which costs about 35 Rupees (US\$0.70) to produce.

Many state governments are funding the biometric cards to enable financial inclusion. The National Bank for Rural Development has provided grants for the research and development of these systems.

The SBI core system needs to support large corporates, small and medium enterprises, traditional retail customers, and microfinance, all at massive scale. All these factors have driven superior business results with State Bank of India growing faster than its previously more nimble nongovernment commercial banking competitors. They have successfully turned the tide, growing deposits at more than twice the rate of the commercial banks, as shown in Figure 15 on page 35. Loans grew about 40% faster than State Bank of India's commercial bank competitors. New IT capabilities drove new product capabilities, which drove deposit and lending growth.

**Figure 15: State Bank of India Is Growing Considerably Faster Than its Commercial Bank Competitors**



Source: State Bank of India, Reserve Bank of India

## Product Flexibility

Product innovation was one of the key reasons driving the core migration at State Bank of India. One test of the ability to innovate was the “Special Home Loan.” The interest rate in the first two years is fixed. In the third year it can increase up to a certain limit. In the fourth year the rate on the loan resets to a pre-established but not certain variable rate, State Bank Prime plus a spread. The bank took this product to the product committee, which consisted of both bankers and IT. The committee would evaluate the product on both its commercial appeal and how difficult it would be to implement on the platform. Products that required only parameter changes would be implemented in weeks. Products that required custom code required months.

The product was taken to committee in late 2008 and rolled out in February 2009. It took other banks two or three months to duplicate this product. In the meantime State Bank of India acquired a leadership position in new mortgages.

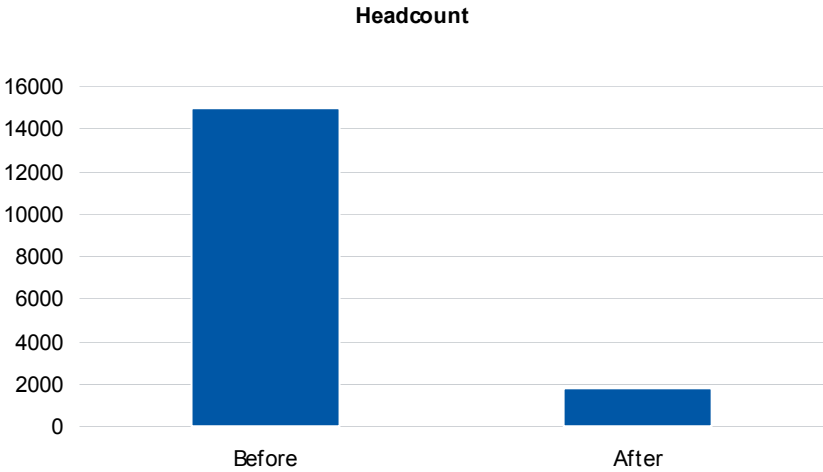
## Cost Savings

Previously each branch had a systems administrator running the local Bankmaster implementation. The bank went from 15,000 Bankmaster branch systems administrators who were maintaining systems and implementing changes down to 30

administrators in headquarters operations plus a large support desk. Overall the number of employees supporting the system went from over 15,000 to under 2,000, a drop of over 13,000 employees, as shown in Figure 16 on page 36.

Lower cost, more flexibility, consistent processes, and centralized control were are benefits of the new system. Corporate accounts group (CAG) was able to implement a nationwide corporate salary packet and connect directly to corporate customers such as Hindustani Petroleum Corporation. The SME group was able to create Power Jyoti. Retail consumers could easily transfer funds to home villages. Microfinance was available via customer service point (CSP) agents. The migration to a new core system has enabled a more competitive State Bank of India.

**Figure 16: A Centralized IT Required Fewer Employees**



Source: State Bank of India

## Conclusion

Moving to a centralized modern core system was a competitive requirement for the State Bank of India. As they saw from their nationalized brethren, those who did not do so would lose share to the privately held and foreign banks. Moving to a Unix solution was not an obvious solution given the size of the bank, but the boldness of State Bank of India created a considerable cost advantage over the mainframe solution that State Bank of India continues to enjoy.

Banks looking to reduce IT costs should consider moving to an open system that can provide the reliability, scalability, and availability that the largest banks in the world require.

## Thank You

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## Indian Institute of Technology (IIT) Bombay

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