Business Intelligence for Public Sector Banks in India: A Case study- Design, Development and Deployment

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Abstract

Banks worldwide use data warehousing solutions for performance measurement, profitability analysis, for risk management, historical analysis, for managing compliance requirements, executive dashboards, regulatory reporting and customer relationship management. Deployment of business intelligence (BI/MIS) capability is the next logical step for banks in India, especially those in the public sector, in their strategic use of information technology (IT). Most of these banks have either already implemented or are in the process of implementing a bank-wide core banking system for transaction processing and have also implemented multi-channel service delivery capability [1]. Because the current systems did not have business intelligence capabilities required to support difficult managerial decisions. For example, executives, managers and employees of the bank did not even have an integrated view of the data, as each of them was using a different set of applications to source the data. And also that long term strategic plans, achievement of objectives and success ultimately depended on how well the bank employees performed their primary mission of delivering high-quality services to their customers through efficient business processes. In this paper we have discussed about the need of MIS/BI solution for PSB in India and Case analysis.

Keywords: India, Business Intelligence, Bank, Management, Employee

Brief History on Public Sector Banks in India

The Indian Banking industry mainly comprises of the Public sector banks (PSBs) (in which Government holds majority stake and developed even prior to its political independence in 1947), Private Banking Sector (PBS), Multinational Banks and cooperative banks. There was a significant presence of both foreign and domestic banks and well developed stock market.

The system expanded rapidly after nationalization of major commercial banks in late 1969 and now ranks in the top quarter among developing countries [2]. Prior to this the Indian banking sector was not seriously drawn toward mechanization of operations, particularly with regard to customer related activities. Instead, the banks focused on employment generation and supported growth in transaction volume by adding more employees instead of technology.

The following steps are taken by the government of India to regulate banking institutions in the country.

1949 : Enactment of Banking Regulation Act.

1955 : Nationalisation of State Bank of India.

1959 : Nationalisation of SBI subsidiaries.

1961 : Insurance cover extended to deposits.

1969 : Nationalisation of 14 major banks.

1971 : Creation of credit guarantee corporation.

1975 : Creation of regional rural banks.

1980 : Nationalisation of seven banks with deposits over 200 crore.

After the nationalization of banks, the branches of the public sector bank India rose to approximately 800% in deposits and advances took a huge jump by 11,000%.

Public Sector Banks gain Market Share

T. T. Ram Mohan et al, were unable to uncover any significant differences in productivity growth and efficiency between the public and private sectors in the period (1999-2000) under study. One of the reason they have noted that there has been a change in orientation in PSBs from social objectives towards an accent on profitability, especially given that some of these have come to be listed on the exchanges and have private investors [4]. It is evident that PSBs have dominated the banking industry in India since Independence. Public sector banks (PSBs) inched closer to acquire 75 per cent market share, as they acquired depositors and borrowers at a faster pace than their rivals during the quarter-ended September 2009. According to the latest data released by the Reserve Bank of India (RBI), PSBs -- comprising 19 nationalized banks, State Bank of India and its six associates -- increased their share of

deposits to 74.3 per cent, while they accounted for 74.2 per cent of the gross bank credit at the end of September 2009 [5].

At the top of the banking system is the Reserve Bank of India; it was established in 1935 in accordance with the Reserve Bank of India Act 1934. Its central office has been in Mumbai since 1937 [4].which is responsible for prudential supervision of banks, non-banks and for performing other central banking functions. There were two successive nationalizations of banks in India, one in 1969 and the other in 1980 and as a result public sector banks occupy a predominant role in Indian financial system. The last decade has seen many positive developments in the Indian banking sector (**Exhibit 1** helps us to understand the expansion of banking sector in India in last 5 years).
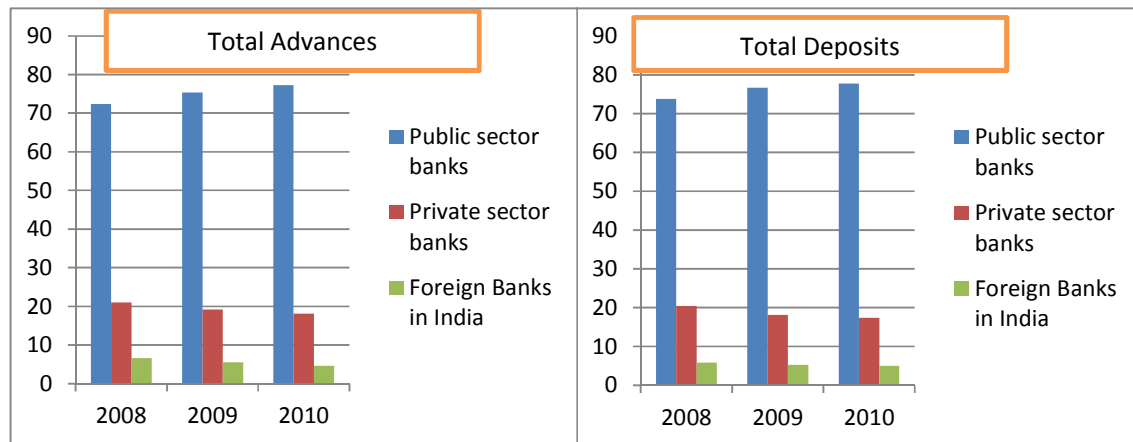

Figure 1: Banks in India

Figure 1 depicts that the Public Sector Banks (PSBs) are dominant in the business profiles of Indian banks, controlling around 77.68% and 77% of the Total Deposits and Total Advances respectively. The Private Sector Banks (a dominant phenomenon post economic reforms) represent around 17% and 18% of the Total Deposits and Advances. On the other hand, Foreign Banks (so far restricted in terms of local aggression for the limited scope offered by law), have mere 5% and 4.6% share in the Total Deposits and Advances respectively.

Information Technology

The private and the multinational banks have started the banking practice with a sound technology base and the Public sector banks, which have a large number of branches, spread

across the entire country have begun inducting technology at a rapid pace with large scale investments [3]. These banks are using the IT solutions not only to implement core banking solutions, but also to streamline the business process. IT not only enhances the competitive efficiency of the banking sector by strengthening back-end administrative processes, it also improves the front-end operations and helps in bringing down the transaction costs for the customers [17].

Public sector banks have been investing for upgrading their operations by way of computerisation. Of the total number of public sector bank branches, 97.8 per cent were fully computerised at end-March 2010. Computerisation of bank branches is the adoption of core banking system (CBS) and most of the public sector banks have completed or near completion of CBS.

Challenges for PSBs

In the present scenario of banking industry, competition for PSBs is very severe ([6], [7]):

1. Implementation of Basel II
2. Implementation of latest technology
3. How to reduce NPA
4. Corporate governance
5. Innovation and customization
6. Talent management
7. Risk management
8. Transparency and disclosures
9. Growth in business
10. Challenges in banking security
11. Enhancing customer service
12. Competition with private sector banks
13. Loan waiver: A new challenge
14. Human Resources Management
15. Information Technology

Systems and procedures in PSBs are being toned up to ensure standardization of products and services, so that the customer has a uniformly good experience throughout the bank. Technology is being strengthened to provide a reliable backbone for delivery of products and services and to get business intelligence data. Customers are being made aware of the enhanced offerings………… With all these steps the success of PSBs should be assured.

Core Banking System verses new Business Intelligence Architecture (NBIA)

CBS is the networking of branches, which enables Customers to operate their accounts, and avail banking services from any branch of the bank on CBS network, regardless of where he/she maintains his account. The customer is no more the customer of a branch. She/he

becomes the Bank's Customer. Thus CBS is a step towards enhancing customer convenience through 'anywhere and anytime banking' [2]. It consisted of an integrated suite of applications such as customer information system, deposits system, loans system and transactions processing system. CBS was essentially a transaction based system, and it was primarily designed for day-to-day operations at the branch level and generation of reports from transaction data. It was not developed to solve the specific decision making problems of the employees, managers and executives of the bank. Core banking systems and modernization of business processes had allowed the banks to centralize computerized processing and operations functions, thereby enabling it to offer new banking products to customers all over India; reversing the trend of customer attrition (**Exhibit 2** helps us to understand the CBS and other existing systems in PSBs). It also led to the consolidation of its affiliate banks. Additionally, the bank could now further expand its product offerings, improve customer service and cut cost. Its solutions focus on efficiency of transaction processing and support core transactions.

Once the business transactional data (deposits and loans etc) from all the branches of the banks had been accumulated in the transactional processing system of CBS (i.e. a common database in a central server located in the data center), giving a consolidated view of the bank's operations, the need of bank managers at various positions to know the financial status (financial statements, cash flows, and summary reports etc.) of the bank in order to acquire new customers and retain existing customers, was perceived. Therefore, bank needed to develop a platform that would integrate data from various sources within the bank (including the CBS) into an easy-to-use, easy-to-locate data delivery service. As a result NBIA came into existence.

Banker's point of View:

K. Cherian Varghese, Chairman & Managing Director, of Union Bank of India said that, all the requirements under the three Pillars of Basel II can be met only if banks have a robust and reliable Business Intelligence Architecture [8]. Technology, therefore, plays a crucial role in implementation of Basel II. Beyond Core Banking which facilitates networking of branches to put through customer transactions with ease and speed, technology should be able to play a supportive role in enabling banks to access and use data in a meaningful manner so that the demands of Basel II can be met in a cost effective manner.

The core functionality of a CBS solution is efficient processing of transactions and not to provide BI. 'If each branch starts firing BI queries it will slow down the system', says A K Upadhyaya, assistant general manager (IT), Bank of Baroda. The system is tuned to run tasks at day-end to produce routine reports [9]. Some banks have tried to use their disaster recovery site to circumvent this problem, but such systems are not designed to run BI application queries efficiently.

Conceptualizing NBIA: Bank wide information distribution:

NBIA would centralize the customer's information of bank, providing valuable insight (e.g. historical analysis, performance analysis, what if analysis, profit analysis, executive dashboards for managing customer relationship) throughout the organization, to improve the efficiency and provide better customer support. This would enable all the employees of the bank, to obtain all the relevant information from a single source, the NBIA systems, in order to carry out their business.

Today's business managers require access to scalable, easy-to-use and fact-based real time decision support environments in order to preempt changes in the environment and make proactive decisions. 'At present, banks compile BI reports mainly from periodic paper reports / statements submitted by the branches and regional / zonal offices, except for a few banks, which have been using technology in a big way' [10]. (An indicative list of BI/MIS reports for different departments of three banks and number of reports are showed in the **Exhibit 3**) Business Intelligence (BI) refers to various software solutions, including technologies such as ETL, Data warehouse, OLAP, Data mining &other reporting applications, share point server and web-enabled interface and methodologies needed to acquire the right information necessary for the business decision-making with the major purpose of enhancing the overall business performance on a marketplace [21] . The new Business Intelligence Architecture (NBIA) of the bank would be designed provide a accurate real time BI environment, by converting raw data into useful information, so that the business mangers and decision-makers can view their priorities / targets, overhead expenses, trends, performance measures, and estimate facts and figures on various dimensions as a support toward making well informed and intelligent decisions. The key purpose of MIS/BI is to get the right information into the right hands at the right time.

A BI system has evident importance as a communication and information diffusion channel, preferably one that is open, trustworthy, transparent and permanent. In supporting

the monitoring and evaluation of business results while maintaining information integrity, BI systems strengthen interaction between groups with a view towards established objectives, and serve as a tool for collaborators to learn, discover and exchange information regarding social and environmental actions taken within the organization and by other organizations [23].According to Ranjan (2008): BI is the conscious, methodical transformation of data from any and all data sources into new forms to provide information that is business-driven and results-oriented. It will often encompass a mixture of tools, databases, and vendors in order to deliver an infrastructure that not only will deliver the initial solution, but also will incorporate the ability to change with the business and current marketplace [22]. Hocevar et al (2010), have found that the main categories of business intelligence benefits can be successfully linked to the defined long-term business strategy. The investment therefore helps the company achieve its strategic objectives which is, one of the crucial criteria for deciding whether the investment in business intelligence is justified or not [20].

IT vision of RBI 2011-2017 in Banking Sector

With a view to further leveraging the role of information technology (IT) in enhancing the efficient functioning of the financial system, the Reserve bank undertook important steps covering IT infrastructure and implementation of new applications. A High Level Committee was constituted under the Chairmanship of the Deputy Governor (Dr. K. C.Chakrabarty) and members from IIT, IIM, IDRBT, Banks, and the Reserve Bank to prepare the IT Vision for the Reserve Bank for the period 2011-2017, inter alia, to review the functions of Department of Information Technology and suggest measures for way forward. In this background, the role of IT in banking sector (especially public sector banks) needs to be revisited with focus on the following [10]:

- Introducing technologies that balance the 3 Cs – Cost, Control and Customer Service
- Implementing data warehousing and business intelligence that meets all internal information requirements as well as the information needs of the regulator
- Adoption of technology-based strategies for financial inclusion
- Usage of analytics for improvement of Customer Relationship Management (CRM), risk management and fraud detection / prevention

Case Analysis of a Public Sector Bank ltd

Project proposal and vendor selection

In april-2007, Chairman and Managing Director (CMD), of Public Sector Bank Ltd., strongly felt that it was necessary to have a decision support information system over and above the existing integrated transaction processing and reporting system often referred to as core banking system (CBS). Facing stiff competition from new generation banks, as part of fulfillment of the bank's long-term strategy, and as a way to meet constantly changing customer expectations and market behavior, the CMD and Board of Directors (BOD) decided to implement a new Business Intelligence Architecture (NBIA). The NBIA once implemented would enable all of their executives, managers and employees to have a unified view of information; whereby, the same information can be used for decision-making and predicting customer behavior.

The Board of Directors and CMD of the Bank realized that the implementation of NBIA would need identification of the specific business requirements of the bank, and heavy support from bank's top management team as it could not be done with IT alone. They also believed that the bank's top management team needed to understand what was happening in the business environment of the bank, and what the users were expecting from this project. As expressed by the CMD, 'it would be of no use if it was not aligned to the needs of its users'. The ordinary user is usually not an expert in business intelligence and will not understand specific terminology .In this way, true users of business intelligence systems can be included in the company enabling the detection of gaps between different user groups [19].

The bank formed an Executive Team of five, headed by the Chief Information Officer to steer the project. The other four members were drawn from different parts of the bank, two of the four these four had experience of working in other IT-projects.

Keeping in view the existing software and hardware infrastructure and previous experience, the Executive Team chose MS SQL 2005 Developers Edition as the database platform, and DELL as the hardware platform. They also decided that in the interest of familiarity and ease of use, all existing format MIS reports would be retained, though contents of some of the reports could undergo changes and some reports could be added/ dropped as per bank's requirements.

The CMD, a few executives from the Central Office and the IT-center, and the Executive Team had a formal meeting at Central Office and decided to call companies for competitive bidding for the software development part of the project. A total of seven responses were received.

After following due process, bank has chosen Software Development Company (SDC) for developing the software for NBIA. The long-term over all functionality of the software to be developed by SDC was judged to be the most appropriate among the seven respondents (the Executive Team felt 'functionality was the important factor, that's what's available to the users to see, that's what available to utilize in their day-to-day activities and that's what available to cause embarrassment or comfort.'). Key business process requirements were also adequately addressed in the presentation made my SDC. SDC developers had previously worked on various core banking applications and data marts, but none of developers or senior staff had worked with SQL BI or the type of applications that Public Sector Bank Ltd. required (i.e. neither in terms of the business functions nor in the technical domain). SDC promised to train their development team on SQL BI tools and other required technical skills, before the start of the project, and provide ongoing training to developers if required. Maintenance during warranty period was to be provided free of charge SDC.

Though SDC was new to this type of project, its approach, motivation and commitment were immediately apparent. They planned to execute the project with the help of Consultancy Company (CC) led by ex-banker with functional and technical knowledge of the financial services.

Teams Structure and Phased Approach

Senior executives from the bank, SDC and Consultancy Company formed a Project Management Team (PMT). The PMT decided to have a clear understanding of the project implementation plan and the information that needed to be made available through NBIA. PMT members from the bank were responsible to gathering the requirements from the bank and performing the user acceptance testing, while Consultancy Company executives were responsible for analyzing the requirements, finding business solution and communicating them to the SDC executives. They were also required to be involved in data management activities, testing and quality assurance, deployment and "going-live". SDC executives were responsible for, finding technical solutions, designing the overall technical architecture,

project management, managing software development teams and ensuring that the business needs of the bank were met by the solution.

Phase 0

During the first two months the bank executives worked on requirement gathering: they have conducted a survey by visiting various Zonal Offices, Regional Offices and the Central Office to gather, categorize and evaluate the business requirements. The Project Management Team (PMT) defined the major objective and scope of the project, while the SDC executives worked on the technical architecture (See **Exhibit 4** to have an idea about the MIS technical architecture) and defined interfaces between the development teams, the project management team and users (**Exhibit 5**).

SDC divided their developers into six teams for the NBIA project, and defined their roles and relationship (**Exhibit 6**). In the first one-month the teams were busy receiving training. After that they started installing software and developing data models. In the subsequent month, the data models were designed and incorporated into the technical documentation of the project. Next, prototypes were developed to show the features and functionality of the software vis-à-vis the requirements.

Internal Knowledge Management system (IKMs) to implementation Teams

'Useful information sharing between the developers promotes the development of high-quality solution' KMs can also be defined as reuse of the knowledge (Between departments/teams, within the departments, etc), the creation of suitable solution and avoid of duplications effort.

SDC-executives have initiated to implement an internal blog to help the development teams, to answer the issues they ran across during the implementation. The goal of this blog was to keep some of the material, which was needed for implementation of MIS. Virtual chat rooms were made available to the developers to discuss the problems with their fellow developers. Developers can share their problems, while other team members and executives give their suggestions. SDC-executives were also encouraged developers to share their innovative ideas. SDC executives were also created a 'common share folder' set up; developers & SDC executives could share the folders/files on the shared drive. SDC-executive team also planned for weekly 2-3 hours meeting to discuss the status of the project, requirements and solve developer's issues, which can't be shared through blog.

Phase 1

In May 2008, the developers had begun the development of the software, and started working on weekly reports under the guidance of SDC executives. The aim of this phase was to design the Data warehouse (DW), develop required extraction routines (ETL packages) for data extraction from the core banking system, cleaning / transforming the data as per the business logic, profiling the data and prepare it to load it into the database, and development of OLAP and other reporting applications. Simultaneously the development teams had to test the individual tools/applications as per the testing procedures prescribed by SDC.

Two months later, the PMT did it first audit the Phase1 project status and realized that they had been able to complete merely 40% of the work that they had planned to complete during Phase-1 (The plan was to complete this phase in three months). This was really unexpected!

SDC and CC executives worked relentlessly for five days to find out the reasons for the poor performance. They pinpointed three main reasons:

- Frequent change requests from the bank: The developers were receiving many change requests after the completion of development and testing. To address this, the bank executives were asked to reduce the number of change requests, and specify the requirements in more detail before the commencement of development.

- Lack of developer experience: Implementation of ETL packages and applications were taking a long time, as they needed lot of customization (The ETL process is the lifeline for any business intelligence solution. ETL design and development work consumes 60 to 80 percent of the resources of an entire BI project (Variar, 2004)), and developers were adopting a trial-and-error method, as this was their first BI project. Without the customizations, the software was not effectively supporting the business needs of the bank.

- A key SDC executive had been replaced: One of the key executives from SDC who had been actively involved in the project, from the bidding for project to the completion of the Phase0 was replaced by a relatively new person.

Bank executives in the PMT demanded that SDC expand the implementation team; by including some additional experienced developers who had worked in at least one similar project. SDC accepted their request saying that though it was a tough situation, they would like to ensure that their resources were correctly prioritized and focused on the project. SDC took approximately 15 days to recruit the developers, introduce them, update them with the

present status of the project and integrate them with the development teams at the appropriate places.

After the completion of development and testing of individual applications/packages of each department, SDC/CC planned to conduct an integration test of all the applications/ packages. The objective of this testing was to ensure that the individual pieces worked together smoothly. For the integration test exercise, one developer was drawn from each of the development teams (while the other developers continued to concentrate on development), to team up with two SDC executives and one CC executive. In this way, the tests were completed successfully with minimal disturbance to the ongoing development.

In the middle of Aug 2008, the bank and CC executives started user acceptance testing. They generated reports manually from data in the existing systems and checked them with reports generated from the NBIA. They also compared the information provided by the NBIA reports with the information needs of the employees of the bank. The objective of this testing was to check the accuracy; functionality and quality of the information available to users through NBIA, and to identify bugs and recommend changes where required. SDC ensured that their developers promptly fixed the bugs, and made the changes required.

By end of September 2008, in a total period of 5 months, Phase-1 of the project, including development, testing, deployment, implementation security policy, authentication, and "going live", was complete.

Phase 2

The aim of this phase was to complete most of the implementation, answer user queries, tune the system, and continue into maintenance of the system. One dedicated developer from each team was assigned to work on identified bugs (SDC knew very well that bugs would be detected frequently during the initial part of implementation.) and change requests from the bank. Since these changes were made after completion of formal testing, they introduced a formal process of careful review and documentation of the changes. Meanwhile, the rest of the development team worked on fine tuning of the ETL programs, the DW itself, and the reporting applications, so that the operational processes of data warehouse (including the data extraction processes, data transfer (and loading) processes, data transformation processes, data cleaning processes and computation processes) could be made as efficient as possible and at the same time faster data access could be provided to the users.

During the initial trial runs, the operations team failed to complete the DW operations process of NBIA on two occasions, during the December month-end data processing. This was because the number of users accessing the source databases was very high, as it was the end of the year (usually during the financial year end, half-year end and calendar year end the bank has to generate some additional reports from the CBS database that are not part of the NBIA), and to do this the NBIA system needed to extract a huge quantity of data and perform some calculations at source systems level. It was realized that the same situation would be repeated on the financial-year-end, half-year end and the next year-end.

The Project Management Team held a meeting to decide on immediate action required, and action to ensure that the problem would not arises in the future. SDC/CC proposed a solution, and requested strong support from bank for its implementation. The bank executives in the PMT agreed to provide a full support to ensure its success.

The solution proposed involved the creation of a replica database almost similar to the sources database (Finacle, LAS etc.) and copying the data required for NBIA, with very few changes. Modifications were also required to be made to the ETL process, so that the ETL programs could support multi-threaded operations and parallel execution of the data copying processes. This would enable very quick copying of data from the source servers to the replica database. The copying of data was expected to take about two hours provided exclusive access to the CBS was available. On request from SDC, the bank agreed to allow exclusive access to CBS during the 'heavy' data processing periods like year-ends.

Extension of Knowledge Management system (KMs) to the users of MIS project

Any IT company will process the data into information and make it available to the users of the bank by using BI Tools, but success rate of MIS project will depends upon the business users who uses this information and apply to solve their business problems (Wikipedia KM ,June 21, 2007).

After the successful execution of the 2nd Phase, Project management team decided to "track" the information related to users' accessibility of MIS and developed packages and started "tracking". Bank executives noticed that the employees from IT-center, Central Office, Regional and zonal office are using extensively, but employees from branches were

not able to use effectively because of various problems (how to use the system and where to apply the results).

SDC-executives shared about their internal blog, how they are sharing the techniques among the teams and how they are able to get the information, they had also shared some of the feedbacks, which they got from the developers. They advised Bank executives to implement a bank wide blog, to where one can go and find more information about the MIS reports.

Executives from SDC had elaborated implementation plan of KMs to the Bank executives

- Technical teams will provide more information about the technical problems and provide brief description about the critical reports. We will visit the site weekly once and answer technical queries.
- We will also display a pop-up message about this KM system on top of the MIS website.
- We will provide Intensive training to the HELP DESK (Bank has a twenty seats help desk to solve the bank employees problems and all the help desk employees are experts in Banking domain and IT-domain) employees to solve the problems of MIS users.
- We will also keep some video clips available to users, if required.
- Encourage users to share their problems, there were chances that other employee might have faced the same problem and found a solution.
- The biggest problem for employees was to find the answer to specific questions, so find the experts from each and every department of the bank, and ask them to share their innovative ideas about the information that is available with this system and to encourage users & promote the system. And one can also share the ideas on which the bank is working at present, the ideas which are outdated and the ideas on which employees are learning etc.

Phase 3

The initial plan for this phase was to solve the bugs from previous phases, complete the implementation of remaining/miscellaneous reports, implementation applications to perform periodic audits, ensuring that the NBIA was functioning as expected and all aspects of the system were secure and protected, and testing the entire NBIA system, training the maintenance team and "going live" for project as a whole. Completion of some development

work like providing an user interface to the branches to update 'GAP information' that was not available in any of the bank's systems, and providing an interface to the maintenance team for updating master information, was also planned.

While the plan activities of Phase-3 were in progress, the bank came up with a new requirement that required some of the report packages to be migrated to run with a different time interval. For example, some reports that were planned to be run monthly now required being run weekly and vice-versa. This new requirement not only needed the involvement of all the developer teams but created a number of technical complications. For example there was a problem with the time frame for which the data related to the reports were kept in the database. Though SDC rose to the occasion and found a solution to all the problems, and it extended the project deployment date by one month.

After deployment, for two months the development teams worked to stabilize the new Business Intelligence Architecture. A few bugs that were discovered were fixed and the support team was provided with full documentation and a checklist.

The entire NBIA project was ultimately complete after 18 months of diligent work, coordinated between the bank, SDC and CC.

Looking forward to the future

The NBIA was now closely coupled with the Core Banking System (**Exhibit 7**). Data will be extracted from bank internal & external sources and stored in CBS. And then data will be extracted using ETL and stored in DW and generated reports can be accessed by branch offices, regional offices, zonal offices, IT office and central office. The Business Intelligence tools were able to analyze the data for decision support in a fast and accurate manner. The bank started using the NBIA for tracking business opportunities and developing customized solutions for its customers. With all the branches under CBS and NBIA made available to employees in all locations, the bank has several other plans firmed up for the future.

Conclusion

In this paper we have provided brief history about the public sector banks in India and the current challenges faced by them. We have also discussed about current IT systems and need of MIS/BI solutions, case analysis on design, development and deployment of MIS/BI solution in a Public Sector Bank. Unexpected problems faced during the development of the

project and the way PMT solved these problems and Data/Information flow within the bank after the implementation of BI.

As per Thomas H.Davenport et al (2007), IT executives believes business managers do not understand what data they need and business managers reflect their belief that IT executives lack the business acumen to make meaningful data available. There is no easy solution to this problem; the beginning of the solution is for business managers and IT managers to pledge to work together on this question [18]. But our study shows that consultants who has the functional knowledge of the bank and understanding on source systems, can bridge the gap between business executives and IT executives. Proper communication within the PMT was became one of the important factor for the success of the project. IKMs helped the development teams to share the information, innovative ideas and minutes of meeting etc. Training and support, intensive training for HELP DESK employees of the bank and, the support provided through EKMs has helped to improve the end-user's performance and satisfaction. EKMs has also helped end-user's to understand the meaning of the data included in MIS/BI and reduced the gap between users and development teams of the solution.

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Exhibit 1–Number of Branches of the commercial Banks in India -2006 to 2010

	As on March 31				
	2006	2007	2008	2009	2010
Bank Groups	1	2	3	4	5
State Bank of India and its group	14310	14673	15846	16878	18114
Nationalized Banks $	35858	37431	39234	40854	43187
Public Sector Banks	**50168**	**52104**	**55080**	**57732**	**61301**
Old Private Sector Banks	4819	4826	4690	4908	5174
New Private Sector Banks	2016	2598	3632	4328	5213
Private Sector Banks	**6835**	**7424**	**8322**	**9236**	**10387**
Foreign Banks	259	272	279	295	310
Regional Rural Banks	14807	14843	15070	15485	15723
Non-Scheduled Commercial Banks	41	46	46	46	47
All Commercial Banks	**72110**	**74689**	**78797**	**82794**	**87768**
Notes :					
1. Data on number of offices include administrative offices.					
2. Data for 2006 to 2009 have been revised and data for 2010 are provisional.					
3. $ includes IDBI Bank Ltd.					
Source : Master Office File (latest updated) on commercial banks, Department of Statistics and Information Management, RBI					

Exhibit 2- Core Banking System (CBS) and other systems of the Public Sector Banks

Bank	CBS	Other systems
Andhra bank (AB)	Finacle from Infosys Technologies	Debit Card Management System, Loan Application Processing System, Oracle-Enterprise General Ledger, Anti-money Laundering, Finacle-e-Banking and Asset Liability Management etc
Oriental bank of commerce (OBC)	Finacle from Infosys Technologies	RTGS / NEFT: IBM, Internet Banking, Govt. Business Module, Cash Management System(CMS) and pension system, etc
Central bank of India (CBI)	B@ncs24, from TCS ltd	e-treasury, Inter-branch Reconciliation System, Accounting system, HRMS solution, CMS, Credit Monitoring & NPA Management
Union Bank Of India (UBI)	Finacle from Infosys Technologies	RTGS / NEFT, Software from RBI, Oracle 9i. Integrated with Finacle with middleware from M/s Logica using QPH.HRM, Lending automation system, SAP and SWIFT
Bank of Baroda (BOB)	Finacle from Infosys Technologies	Enterprise wide General Ledger, Risk Management, Anti-Money Laundering, , SWIFT, RTGS, NEFT, Internet Payment gateway, HRM and Global Treasury

Exhibit 3- Department-wise MIS requirements in three Banks

| No	Department Name	Number of reports		
		CBI	AB	OBC
1	BASEL-II IMPLEMENTATION AND RISK MANAGEMENT	15	34	
2	CENTRAL ACCOUNTS AND BALANCE SHEET DEPARTMENT	51	18	24
3	CENTRAL AUDIT,CONTROL & INSPECTION DEPARTMENT	10		18
4	CENTRAL AUDIT & INSPECTION DEPARTMENT	20		
5	MIS & CREDIT DEPARTMENT	29	9	
6	CREDIT MONITORING	23	79	46
7	HRD DEPARTMENT/ ESTABLISHMENT DEPARTMENT	40		19
8	INTERNATIONAL DEPARTMENT OR IIB (TREASURY & FOREX)	35	45	61
9	PLANNING , OPERATION AND DEVELOPMENT DEPT	26	51	
10	PORTFOLIO REVIEW	20		
11	PRIORITY SECTOR DEPARTMENT	48		108
12	RECOVERY DEPARTMENT	25	25	
13	RECOVERY MONITORING DEPARTMENT	24		
14	VIGILANCE DEPARTMENT	20		11
15	CORPORATE & INDUSTRIAL FINANCE		13	11
16	LEGAL &LAW		51	70
17	MARKETING AND MSME (MICRO-SME)		23	
18	SERVICES DEPARTMENT			15
19	PSPD & RPDD1		37	

CBI: Central Bank of India
AB: Andhra Bank
OBC: Oriental Bank of Commerce

[1] Note: The above data has been collected from RFP for MIS of these banks available in online.

Exhibit 4-Overview of the MIS Project Architecture
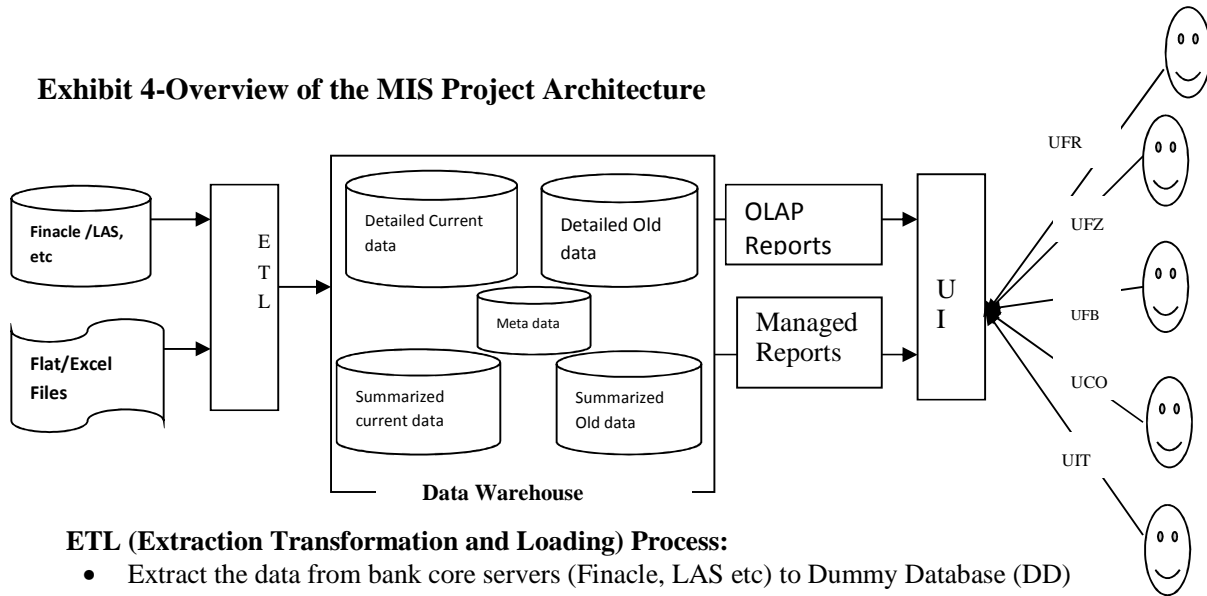
ETL (Extraction Transformation and Loading) Process:

- Extract the data from bank core servers (Finacle, LAS etc) to Dummy Database (DD)

- ETL packages integrate all branches data from core banking system, eliminate data error and redundancies, and provide tailor data for access and analysis.

- Extract the data from DD apply cleaning and transformation techniques and load to DW.

OLAP (online analytical process):

- OLAP represents the relationship among data as a multidimensional structure, which can be visualized as a cubes of data and cubes within the cube, enabling time sophisticated data

- Depending on the banks requirement one or more data cubes will be created. Each OLAP database contains specific number of cubes and dimensions.

DW (Data warehouse):

- Consolidates data from current and historical data from bank core servers (Finacle, LAS etc) in a repository for analysis purpose.

- The data, collected from bank sources, is filtered, aggregated and structured in a manner that allows fast searching

UI (User Interface):

- Easy and comfortable information access is mandatory for any MIS.UI is a standard way to provide "single point of interaction" between users and MIS solution.

Managed/Ad-hoc reports:

- The user selects what data fields to include in the report and chooses criteria to filter information through.

- The Ad Hoc-report feature is similar to a query function in other database systems.

- Managed/Ad-hoc reports process is fully implemented on SQL server Reporting services 2005

UFR: Users from regional offices   UFZ: Users from Zonal offices
UCO: Users from central office   UITC: Users from IT center

Exhibit 5-Connection between the MIS-project solution, IT-executives, Consultancy Company executives, Bank executives and users
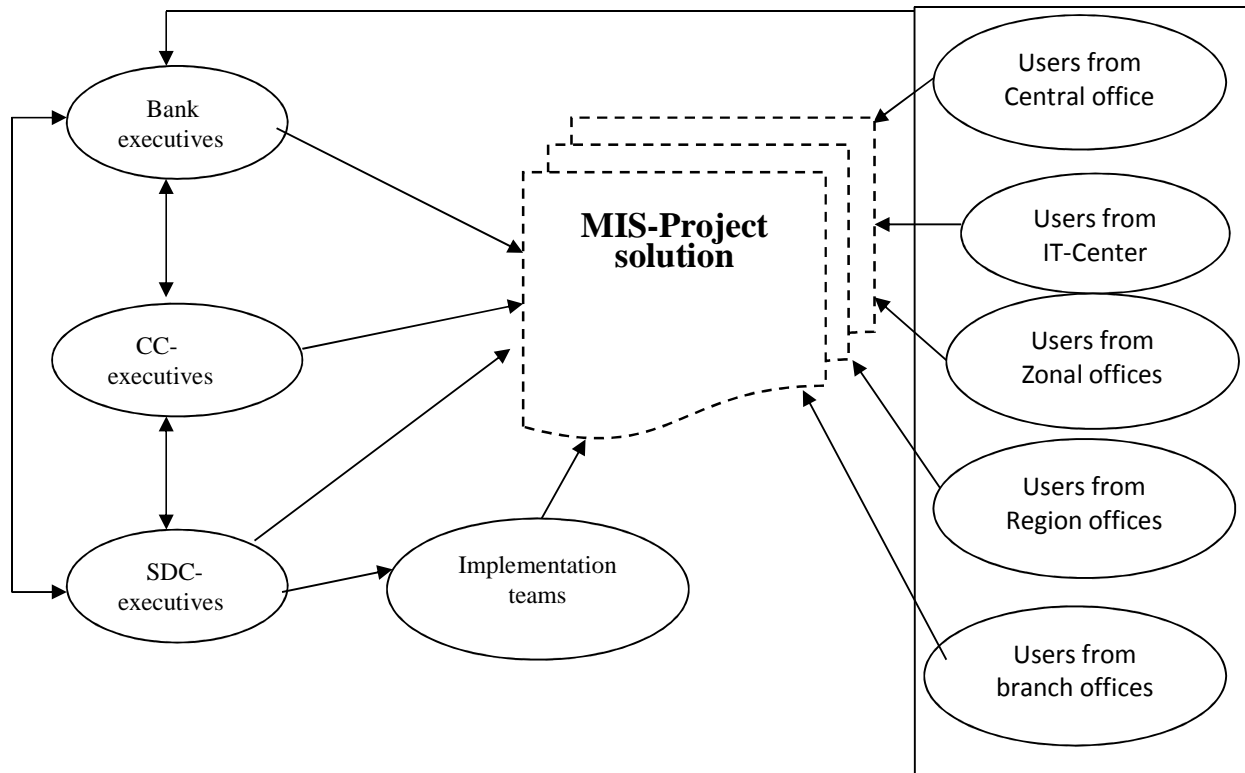
- Bank-Executives will receives the requirement from users, provide solution for users' queries and discuss with Consultancy Company Executives.
- Consultancy-Executives will receives the requirement from Bank-exec, find the business solution and inform to SDC-executives.
- SDC-Executives will receive the business solution for the business needs, find the IT-solution and inform to the Implementation teams. Implementation Teams Implement the MIS-Solution.
- Project management team regularly visits MIS-solution and check out the status and comparability of the solution with business requirements.

Exhibit 6-Relationship between the MIS project Teams
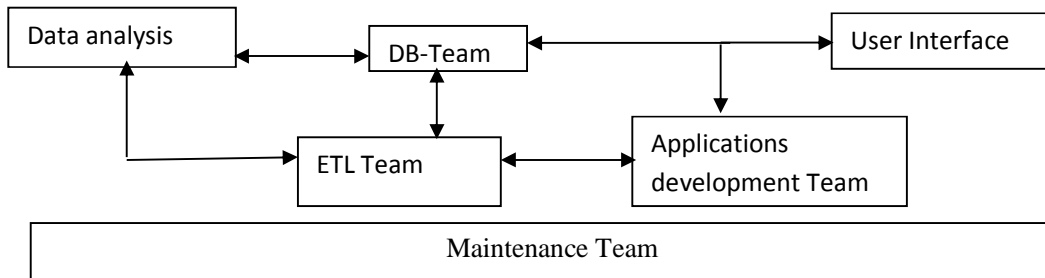
- **Teams 1**(Data analysis): Requirement study (Business needs, IT-needs), define how the data needs to be acquired and define how the data to be maintained. Detailed data analysis of a Bank is performed to identify the fact table granularity, associated dimensions and attributes, and numeric facts.

 Team 2(ETL Team): Use ETL (SSIS) tools to develop packages to extract, profiling, clean and transform (aggregations, split, lookup and merge etc) and load to the data repository (SQL Data Base). Team is responsible for the Incoming data quality and data quality condition needs to be checked frequently..

- **Team 3**(Applications)**:** Template design/Develop reports using reporting tools (SSRS), OlAP reports (SSAS). Develop SSAS cube/SSRS Reports so that users access, analyze and model business problems and share information that is stored in data warehouses.

- **Team 4**(DB-Team)**:** Design the data base to load the data using SSIS packages which contains current summarized data, current detailed data, old summarized data, old detailed data and Metadata.

- **Team 5**(Maintenance Team)**:** Maintenance activities, such as taking the Data Base backup, periodically run the SSIS packages and SSAS Cube database to accumulate data to the repository (DW), index maintenance, and system backup. Continually verify the MIS and make adjustments to make sure the safety and integrity of the system is forever unbroken.

- **Team 6**(User Interface)**:** Develop web interface to view the reports using ASP.NET. Provide proper training   to the users. Application including Dashboards, ad-hoc reports, interface; they are responsible for providing information to users in a comfortable and accessible form through UI.

Exhibit 7-Data/Information flow within the Bank

| Regional Office | IT-Center | Central Office | Zonal Office | Branch office |

| Call center/ Phone banking | Online banking /ATMs | Other sources |

Finacle .... NEFT /RTGS .... LAS

Core banking system

- Data flow between CBS and Bank and External sources

Extraction Transformation and Loading

- Extract Information with the help of OLAP and Reporting applications

- Extract data from CBS

- Load the data into the DW after the transformation

Data warehouse (DW)

- Access reports from UI

User Interface (UI)/ MIS solution

| Regional Office | IT-Center | Central Office | Zonal Office | Branch office |

User interface/MIS solution

| Risk Management | Credit Dept | Social Dept | Retail dept | ...... |

Weekly reports
Monthly Repots
Quarterly reports

| Bank as a whole |
| Zone wise |
| Region wise |
| Branch wise |

| Sector wise |
| Activity wise |
| .... |