BUSINESS INTELLIGENCE IN BANKING: A STUDY OF BI TECHNOLOGY IMPLEMENTATION AND CHALLENGES

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***Abstract*: In today world every manager need more accurate and timely information in order to make effective decisions. With the existed systems they were not able to make fast decisions. Business intelligence (BI) technology is the solution for this problem of managers. Specifically in the banking industry there is a huge amount of data, which should be effectively used for different applications. Business intelligence technology is the solution for this problem as it provides various business data mining tools. This research paper tries to identify the most important areas of improvement of BI processes and strengths of BI processes in banking industry.**

Keywords: Business intelligence, Data mining, Data warehouse, Banks

I. INTRODUCTION

In today electronic environment organizations assemble, understand and bind their data to make effective practical decision in order to improve business operations. Top management needs more accurate information in order to make effective decisions, Kaula (2015). As far as existing systems are concerned, they are not able to make fast decisions and are not able to analyze large amounts of data that may be stored in different locations. According to Xu (2010), managers need the right information at the right time and the right place. Business intelligence technology is the solution for this problem. Business intelligence is giving the competitive advantage to different organizations through various data mining tools. In the online business industry there is a huge amount of data, which should be used for different applications; managers are either not aware or familiar with BI processes, Panda (2012).

In order to improve business operations, organizations need to collect, understand, and process their data. Moreover, faster and more informed and efficient decision making is a competitive crucial because business cycle time is extremely condensed. Business Intelligence is the new approach in which companies collect, organize and apply information. Business Intelligence (BI) system is a technology that provides insignificant business value by improving the usefulness of managerial decision-making.
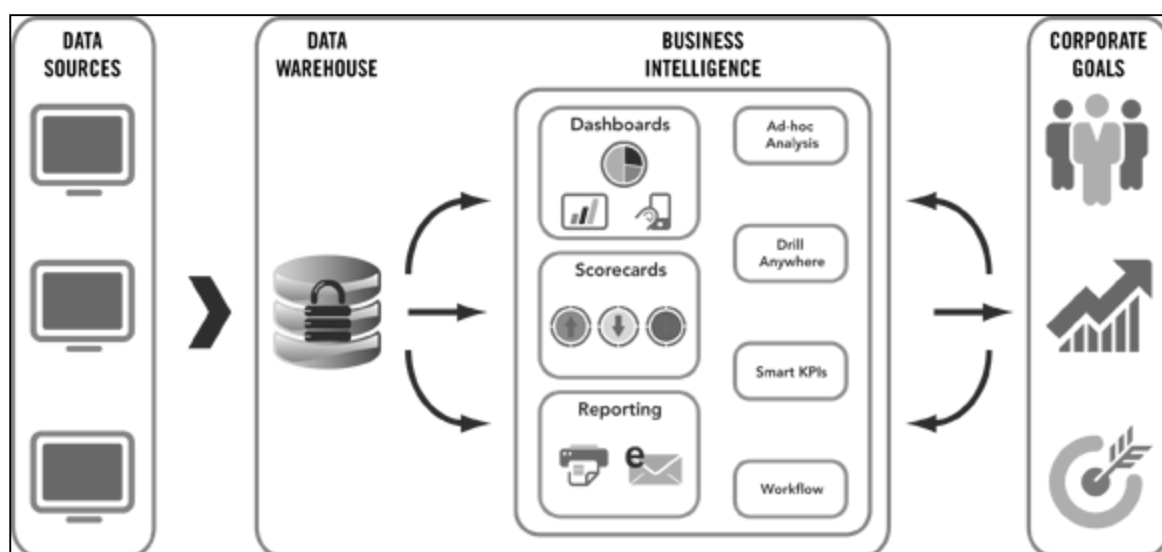

Figure I: The Business Intelligence Ecosystem Source: Motivity Solutions (2016)

Business intelligence analyzers argue that immediate data are also fundamental for organizations that wish to grab new opportunities rapidly or adapt when customer response to a promotion exceeds expectations, GARTNER (2013). Fundamentally, business intelligence solutions provide capabilities to companies to extract, cleanse, and aggregate data from operational tools into a separate data mart. Dobrev et al. (2015) found that business intelligence (BI) is a computer based technique used in finding and analyzing business data, such as sales revenue by products and/or departments, or by associated costs and incomes. As per Salehi and Gemba (2014) BI includes technologies such as data integration, data quality, data warehousing, data mining, master data management, text and content analytics, and many others.

Business Intelligence can be applied to the following business purposes:

- Business Purpose
- Measurement
- Analytics
- Reporting/Enterprise Reporting
- Collaboration/Collaboration platform
- Knowledge Management

Salehi and Gemba (2014) stated that common functions of business intelligence technologies are reporting, online analytical processing, analytics, data mining, business performance management, benchmarking, text mining, and predictive analytics. BI technologies provide historical, current, and futuristic views of business operations. Because Business intelligence supports better business decision-making; thus a BI system can be called a decision support system (DSS), Ivan And Mihaela-Laura (2014). BI helps organizations to understand their opportunities in growth of sales and profit, to identify customer's buying patterns. With implementing business intelligence organizations can improve their overall decision making, Petrini and Pozzebon(2008).

BI evolved through old manual systems to management Information systems (MIS).These manual systems had effectively provided the necessary reports for management and regulatory requirements, Williams and Williams (2007) and Subramaniam (2009). Slowly, majority of the organizations began using information technology for MIS. These earlier initiatives laid the foundations of BI.

Business Intelligence tools can be used for:
- Historical analysis
- Performance budgeting
- Business performance analytics
- Employee performance measurement
- Executive dashboards
- Marketing and sales automation
- Product innovation
- Customer profitability
- Regulatory compliance
- Risk management

Green (2007) believes Business intelligence is decomposed into business information and is not a single entity. Author identifies three major components to business intelligence within a business enterprise; these are relationship Intelligence, competence Intelligence and structure Intelligence. Relationship Intelligence recognizes of how the relations between knowledge workers influence the organizational performance. Competence Intelligence recognizes of how the abilities/proficiency of knowledge workers influences organizational performance. Structure Intelligence recognizes of how the organization's Infrastructure environment influences organizational performance.

Table I: Three components of Business Intelligence

Relationship intelligence
1. Employee-to-Employee Relationships
2. Employee-to-Customer Relationships
3. Employee-to-Competitor Relationships
4. Employee-to-Partners Relationships
5. Customer-to-Customer Relationships
6. Customer-to-Competitor Relationships
7. Customer-to-Partners Relationships
8. Competitor-to-Competitor Relationships
9. Competitor-to-Partner Relationships
10. Partners-to-Partners Relationships

Competence intelligences
1. Employee-to-Information Competencies
2. Employee-to-Process Competencies
3. Employee-to-Product/Service Competencies
4. Employee-to-Technology Competencies
5. Partners-to-Information Competencies
6. Partners-to-Process Competencies
7. Partners-to-Product/Service Competencies
8. Partners-to-Technology Competencies

Structure intelligence
1. Customer-to-Information Structure
2. Customer-to-Process Structure
3. Customer-to-Product/Service Structure
4. Customer-to-Technology Structure
5. Competitor-to-Information Structure
6. Competitor-to-Process Structure
7. Competitor-to-Product/Service Structure
8. Competitor-to-Technology Structure
9. Information-to-Information Structure
10. Information-to-Process Structure
11. Information-to-Product/Service Structure
12. Information-to-Technology Structure
13. Process-to-Process Structure
14. Process-to-Product/Service Structure
15. Process-to-Technology Structure
16. Product/Service-to-Product/Service Structure
17. Product/Service-to-Technology Structure
18. Technology-to-Technology Structure

2. REVIEW OF LITERATURE

This section emphasizes on theoretical bases of business intelligence and it is also important to review all the BI aspects. ICT revolution has fundamentally changed the business by scaling borders and bringing about new opportunities. In India also, it has strongly impacted the strategic business considerations by significantly cutting down costs of delivery and transactions. BI systems are considered an evolution of Decision Support Systems (DSS) – IT-based solutions that can be used to support complex decision making and problem solving Shim et al. (2002). Management Information Systems (MIS) primarily focus on structured decisions; hence IS for semi-structured and unstructured decisions should be termed DSS (Power, 2007; Chi et al. 2007).

There is an array of applications for BI, classified under three broad headings i.e. analysis, monitoring and reporting (Petrini and Pozzebon, 2009). Analysis deals with data Mining and Statistical tools for interactive inquiries which present aggregated data and permits "Slice and Dice" and "Drill Down" into cube measures and dimensions (Chaudhuri and Dayal, 1997), (Few, 2006; Al-Natsheh, 2010). Reporting means pre-defined and structured formats of reports that are distributed to end-users, such as an Excel spreadsheet that offers limited BI capabilities in the form of pivot tables.

Information systems field has witnessed the rapid development of systems and software applications providing support for business decision making since the concept of business intelligence (BI) was introduced in the late 1980s (Chaudhuri et al. 2011, Buchanan and O'Connell, 2006). Organizations started migrating to complete BI environments so that they could have a "single version of the truth" through the use of cross-organizational data, provided by an integrated architecture (Negash, 2004, Chou & Cheng 2006). Organizations need new tools and techniques to improve performance and profits and also to meet the expectations of customers and in order to stay competitive in today's highly aggressive business

world (Williams and Williams, 2007; Clark et al., 2007; Barrento, 2010).

According to Panda (2012) and Des MARAIS (2011) organizations are unable to get right data at right time in right place because data stored in repository are of different Business dimension from various data source which leads to problems such as operational inefficiency. Organizations today collect enormous amounts of data from numerous sources, and using BI to collect, organize, and analyze this data can add great value to a business (Gile et al., 2006). Business intelligence (BI) is the top priority for many organizations and the promises of BI are rapidly attracting many others (Evelson et al., 2007). BI can also provide executives with real time data and allow them to make informed decisions to put them ahead of their competitors (Gile et al., 2006; Chaudhuri et al. 2011; Cheng et al. 2009; Chou & Cheng 2006). Although BI matters so much to so many organizations, there are still inconsistencies in research findings about BI and BI success.

One of the goals of BI is to support management activities. Computer based systems that support management activities and provide functionality to summarize and analyze business information is called management support systems (MSS) (Clark et al., 2007; Elias et al. (2013). Decision support systems (DSS), knowledge management systems (KMS), and executive information systems (EIS) are examples of MSS, Xu (2010). These systems have commonalities that make them all MSS. Using the concepts of BI applications including data mining, organizations will be able to better understand the key success factors in creating new products for customers. A critical success factor of BI implementations is the ability to create a real-time analytics link between the demand management, channel management, production planning and production operations. BI's many applications that interpret data from often dozens of databases to ultimately manage the value chain of an organization to the highest levels of efficiency possible. Various definitions of BI have emerged in the academic and practitioner literature. While some broadly define BI as a holistic and sophisticated approach to cross-organizational decision support, others approach BI from a more technical point of view, Cheng et al. (2009). Following table provides some of the more prevalent definitions of BI.

Table II: BI Definitions

BI Definition	Author(s)	Definition Focus
An umbrella term that encompasses data warehousing (DW), reporting, analytical processing, performance management and predictive analytics	White (2004)	Technological
The use and analysis of information that enable organizations to achieve efficiency and profit through better decisions, management, measurement and optimization	Burton and Hostmann (2005)	Organizational
A managerial philosophy and tool that helps organizations manage and refine information with the objective of making more effective decisions	Lonnqvist and Pirttimaki (2006)	Organizational
Extraction of insights from structured data	Seeley and Davenport (2006)	Technological
A combination of products, technology and methods to organize key information that management needs to improve profit and performance	Williams and Williams (2007)	Organizational
Both a process and a product, that is used to develop useful information to help organizations survive in the global economy and predict the behavior of the general business environment	Jourdan et al. (2008)	Organizational

3. BI IN BANKING INDUSTRY

Organizations can analyze their historical performance over time to be able to plan for the future. Analyzing, interpreting and acting upon on the information are subjective exercises. Hence, the BI vendor shifted their focus to customer relationship management (CRM), Airinei and Berta (2012). CRM continues to be the centre of the attraction and risk management comes to second. CRM is at the centre stage of BI. However, it is becoming difficult to assess whether it is driven by technology or business. It includes all business processes in sales, marketing, and service that touch the customer, Kaula (2015). According to Dobrev et al. (2015),with CRM software tools organizations can build a database about its customers that describes relationships with sufficient detail so that management, salespeople, service people, and even the customers can access information, match customers needs with product plans and offerings, remind customers of service requirements, check payment histories, and so on.

The most crucial and daunting task for companies is to create an enterprise wide repository with 'clean' data of the existing customers, GARTNER (2012). It is well established that the cost of acquiring a new customer is far greater than in retaining an existing one. The transition from a product-oriented business model to a customer-oriented one is not an easy task for online industry. Most of the BI applications cater to the needs of the top management. But, line managers have a different set of BI requirements, which differ from those of the top management, Xu (2010) and GARTNER (2013). The line managers require operational business intelligence.

BI application in banking industry:

There are some factors such as globalization, deregulation, fusions and achievements, competition from non-financial institutions, and technological innovation, have influenced the financial services industry and forced companies to re-think their business. Many large companies have been using Business Intelligence (BI) computer software for some years to help them gain competitive advantage. With the emergence of cheaper and more comprehensive products to the market place, BI is now in the reach of banking and financial sector.

Following are the applications of BI in banking and finance:
1. Customer profitability analysis: Determines the overall profitability of every type of customer and also reduce costs to low-value customers.
2. Credit Management: Evaluate bank's credit portfolio and reduce credit losses.
3. Branch Sales: Improve customer service and strengthen customer loyalty.

3.1 Uses of BI in banking

Business Intelligence tools can be used by banks for historical analysis, performance budgeting, business performance analytics, employee performance measurement, executive dashboards, marketing and sales automation, product innovation, customer profitability, regulatory compliance and risk management.

3.1.1 Historical Analysis

Banks can analyze their historical performance over time to be able to plan for the future. The key performance indicators include deposits, credit, profit, income, expenses; number of accounts, branches, employees etc. Analyzing, interpreting and acting upon on the information is a subjective exercise. Hence, the BI vendor shifted their focus to customer relationship management (CRM). CRM continues to be the centre of the attraction to banks today and risk management comes to second.

3.1.2 Customer Relationship Management (CRM)

CRM is at the centre stage of BI in banking. However, it is becoming difficult to assess whether it is driven by technology or business. Traditional or conservative banking business models of Indian banking industry relied heavily on personal relationships that the bankers of yesteryears had with their customers. If we look into the application of CRM in banking, more closely, CRM is an industry term for the set of methodologies and tools that help an enterprise manage customer relationships in an organized way. It includes all business processes in sales, marketing, and service that touch the customer. With CRM software tools, a bank can build a database about its customers that describes relationships with sufficient detail so that management, salespeople, service people, and even the customers can access information, match customers needs with product plans and offerings, remind customers of service requirements, check payment histories, and so on.

A CRM helps a bank with the following:

- Find customers
- Get to know them
- Communicate with them
- Ensure they get what they want (not what the bank offers)
- Retain them regardless of profitability
- Make them profitable through cross-sell and up-sell
- Covert them into influencers
- Strive continuously to increase their lifetime value for the bank.

Most CRM solutions in Indian banks are, in reality, sales automation solutions. New customer acquisition takes priority over retention. That leads to the hypothesis that it is BI vendors that are driving CRM models in banks rather than banks themselves. Product silos have moved from manual ledgers to digital records. An implementation model of 'relationship' in Indian banking industry is hard to see as of today. Most of the BI applications cater to the needs of the top management in banks. But, line managers have a different set of BI requirements, which differ from those of the top management. The line managers of banks require operational business intelligence.

3.1.3 Operational Business Intelligence

Operational BI embeds analytical processes with the operational business structure to support near real-time decision making and collaboration. This characteristic fundamentally changes the way how data is used, where it exists and how it is accessed. Thus 'Operational BI merges analytical and operational processes into a unified whole'. This change is rapidly exposing the limitations of traditional analytical tools. Operational BI helps businesses make more informed decisions and take effective action in their daily business operations. It can be valuable in many areas of the business, including reducing fraud, decreasing loan processing times, and optimizing pricing.

Although many organizations have implemented BI but it was found that not all the BI initiatives have been successful (Petrini and Pozzebon, 2008; Watson et al., 2006). Researchers have discussed the reasons for success and failure extensively. Various approaches to examining BI capabilities may be one of the reasons behind the gaps in the research about BI success. A lack of fit between the organization and its BI capabilities is one of the reasons for lack of success (Watson et al., 2007; Watson et al., 2006; Cheng et al. 2009).

4. THE PROBLEM

The implementation of BI is a complex undertaking when compared to other information technology initiatives; reason behind this is that it requires large amount of organizational resources and consistent improvement effort, Ivan And Mihaela-Laura (2014). Moreover, role of data is critical in most organizations but there are some industries that need data more quickly and more accurately to analyze very large amounts of data from different sources. In the online business environment security, privacy and risk factors plays a very important role. It is very difficult to analyze trust because of the complexity and risk involved in electronic environment, Cheng et al. (2009). All these aspects will be the decisive factor for success or failure of business intelligence. There are

some issues pertaining to the implementation of BI like:

- Uncertainty on the Path to Follow
- Lack of Understanding in BI Implementation
- Current State of BI
- Shortcomings of Existing BI Models

The problem stated in this research is that banking organizations are dealing with big amount of data on daily basis, but very less number of them have the ability to convert these data to information and other are not enough familiar with the concept of business intelligence. In addition, they do not know how they use business intelligence tools and in which levels of implementing BI they are in because they have no framework to measure the uses of business intelligence, little is known about whether organizations are getting the information and services needed or about the state of the practices of implementation of BI.

Moreover, unprocessed data doesn't have sufficient benefit for making decisions, and that their actual value depends on organization's ability to analyze those data. Therefore the needs for software systems which are equipped to recover, abbreviate, and understand data emerged for end-users. This need stimulated the emergence of many of business intelligence companies that are specialized in providing software systems and services for digging up knowledge from raw data. These software systems would analyze a company's operational data and provide knowledge in the form of tables, graphs, pies, charts, and other statistics. This kind of knowledge is very critical as far as success and failure of organization is concerned.

Internationally, some efforts are being made to develop BI acceptance modal, but in India no systematic measure has been developed for its widespread implementation. So, BI evaluation model is required that is intended to support BI processes. Without a model, it is impossible to determine what variables to measure, what attributes to observe, what data to gather, what questions to ask, what relationship to explore and what scales of measurement to employ.

5. WHAT IS REQUIRED?

In order to adopt and appropriately implement BI process in business organizations following steps need to be taken:
- Measurement of BI
- Performance of BI Process

5.1 Measurement of BI
The most important thing in using and applying Business Intelligence is measurement. The process

should be measured in ordered to understand the improvement level. For managing the process of BI, the BI specialized is considered the main user of the measurement information. Information Builders, who is a supplier of BI products and services, suggests that three distinctiveness of intelligence should be measured: "deploying ability, scalability and usability of the intelligence."

"BI Readiness Assessment" method should be used to verify the position of different subjects that are related to an organization's capability to apply BI. These concepts comprise culture of constant improvement, information or analytics culture and technical readiness. BI is measured for two purposes:

1. Determining the value of BI
2. Managing the BI process

5.2 Performance of a BI Process
Performance of a BI Process should be evaluated by four-phase BI process model which includes:
1. Recognition of information needs**:** In this phase, the organization must realize what kind of business information is necessary to determine different problems and to construct successful decisions. Just relevant information used in decision-making.

2. Information acquirement: The second phase is believed a compound function because there are many different sources of information; internal and external information.

3. Information analysis: In this phase, information is analyzed and then enclosed into different information products and services. The objective of business intelligence process is making the possibility to business users to utilize the right information. Before the processed information can be utilized, information must be conversed to the significant decisions makers and distributed at the right time with appropriate tools.

4. Storage and information utilization: The main goal of the fourth phase is sharing the analyzed information. Finally, the consumption phase cannot be successful if one of the earlier phases in the BI cycle has failed. Therefore, response is critical to optimize each phase of the BI cycle.

6. Conclusion

There is a need to meet the increasingly complex demands posed by clients and the market, the need for automated business operations, more efficient process management and control in the contemporary banking industry is also related to the need for an adequate information system. The basic banking information systems are continuously developed and advanced so as to meet some of these demands. However, in order to make full use of the enormous potential generated in the basic information system on a daily basis, they require upgrades in the form of business intelligence systems. In addition to integrated insight into historic data, BI systems also enable banks to anticipate future behaviour of the system and most of their business indicators. They also enable modelling client behaviour – not only in terms of using new services but also from the perspective of potential risks.

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