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Decision making design for banks: a combination of knowledge management systems and business intelligence.

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Contents

1 Abstract

Business' strategic environment has been heavily transformed by globalization. In such a complex and connected world, the majority of industries have been facing increasing problems. The production, storage and retrieval of information have become way different: organizations don't have total control over creation and acquisition of information anymore. The sudden cost reduction of communication and processing power has pushed companies to use information technologies and complex technological solutions, in order to effectively deliver services and products to customers. This technology-oriented innovation can be especially seen in the banking industry, where process improvement and employee empowerment have become key points for success.

2 Introduction

2.1 Background

Nowadays customers have busy lives, are fully socially connected and better informed about their rights, so banks' job is to provide them adequate services and products by accurately studying their backgrounds.

2.2 Problem

The problem addressed in this is the following one: customers' acquisition as well as retention are only possible thanks to effective collaboration between banks and decision makers, so how can an accurate representation of banks' operations and activities be given to the latter? In fact, Business Intelligence alone doesn't effectively align extracted data with business processes and strategic goals/objectives too. Let's see how this problem can be solved.

2.3 Goal

Here Business Intelligence comes into play: bankers resort to knowledge discovery to support their decision making process related to business. Knowledge Management allows companies to turn their own experience into information and insights through processes specifically designed to gain, store and use knowledge for dynamic learning, problem solving, strategic planning and decision making integrity [1]. The goal is then to adopt systems and frameworks based on the creation of fresh knowledge in order to keep a strategic edge over competitors.

2.4 Research method

In the next sections, Business Intelligence and Knowledge Management (BI and KM) applications in the banking industry are analyzed through a specific framework for new product development based on their integration. As we will see in detail and with literature references later, researchers have elaborated a specific BI framework that focuses on clients' experience and desires in the New Product Development (NPD) process. Customers are real partners in this process and a critical knowledge source, so they have to take part in the knowledge creation process. The real life examples of ICICI bank and Public Sector Banks in India will finally show how this BI and KM integration can be successfully achieved.

3 Theoretical base and concepts

3.1 Business Intelligence Applications in Banking

BI systems make advanced communication and information spreading possible in organizations, thanks to safe and transparent channels. Besides, they support monitoring and evaluation processes while keeping information integrity at the same time [2]. Using Zeng et al's definition [3], BI is a "business management term used to describe applications and technologies which are used to gather and provide access to analyze data and information about an enterprise, in order to help them make better informed business decisions". BI

infrastructure is more and more a key point for organizations, because of the following changes brought by globalization:

1. Agitated global environments;
2. Heavy solicitations from external stakeholders to provide accurate performance and risk indicators;
3. Difficulty in coordinating all these challenging processes.

Banks need full customers' profiles from the integrated database in order to be able to separate the "good" ones from the "bad" ones. This can be achieved in an easier way thanks to data warehousing technologies, that integrate several sub-systems into a BI framework. 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". An infrastructure needs a balanced mix of tools and solutions, databases and vendors to be able to provide a solution capable to adapt to the ever changing business and market's needs [4]. The most crucial categories of BI benefits depend on a successfully defined long-term business strategy [5]: this means that the initial companies' investments in their strategies are critical and have to be wisely justified. The most common scenario for a bank contemplates the centralization of customers-related data in order to intelligently support decision makers on efficiency and customer support improvements. These are some of the main applications of BI in the banking industry [6; 7; 8; 9]:

1. **Marketing:** The marketing division uses data mining and analysis to study customer databases and create statistically accurate profiles regarding clients' preferences. This allows to save money on promotions and publicity for services and products;
2. **Risk Management:** Bank directors must know whether their clients possess a good profile or not and the lending risk associated with them, in order to provide credit cards to new customers, to extend lines of credit of existing ones or to approve loans. Specific models can also be used to track down transactions on stolen credit cards (the authorization system gives an early warning by comparing expected average number or value of daily transactions);
3. **Customer Segmentation:** Clients' behaviours are properly analyzed, and the bank can make its services better using this data at its own advantage. Sentiment analysis regarding customers for services and products is performed. A proper customer segmentation gives insights on the potentially perfect (most profitable) customer profile;
4. **Fraud Detection:** Criminal actions have to be detected before it's too late, and BI makes this possible;
5. **Customer Acquisition Retention:** Clients' previous purchasing histories can be studied to understand which promotion or incentive the bank could use to effectively reach targeted customers;
6. **Cross-Selling:** Banks need to provide the right product or service to the right customer at the right time. Predictive models can show the probability of selling specific products and thus making cross-selling easier. Marketing campaign costs can be significantly cut and a high response rate can be reached, improving customer relations quality at the same time;
7. **Customer Lifetime Value:** It is very important for the bank to calculate the expected revenue from each customer in the future. For example, a highly educated person usually has higher income and is able to pay more for additional products. Business Intelligence models for expected customer's lifetime value that take into consideration complete purchases history, allow bankers to act with each client in the most appropriate way.

Anyway, one weak point of BI is that it doesn't effectively align extracted data with business processes and strategic goals/objectives too. This is due to the data-centric point of view, rather than a process-centric one, of most BI developers about business processes [10]. This is why Knowledge Management is so important and needs to be integrated with Business Intelligence. KM systems, with their open and flexible architecture, expand the BI systems giving them the power to treat data and information in a more business-focused way, improving decision-making and action-taking. It is also interesting to note that employees can use the KM system to send their evaluations and feedback, feeding the BI solution with more valuable information. Adopting new BI solutions and/or improving existing ones requires time and willingness to understand the changes occurring in the market. Interactions with end-users are guaranteed by a KM system during development stage, increasing their overall satisfaction level.

3.2 Knowledge Management in Banking

End-users make decisions based on their own experience and eventually interacting with other people, after getting information from BI system. KM improves these kind of interactions with a dedicated collaboration environment and allowing social and organizational information exchange. The famous knowledge spiral model proposed by Nonaka's and Takeuchi in 1995 explains how both explicit and implicit knowledge are combined to generate a platform dedicated to organizational learning. A specific framework for this matter represents four different conversion patterns [11]:

1. Socialization (implicit to implicit);
2. Externalization (implicit to explicit);
3. Combination (explicit to explicit);
4. Internalization (explicit to implicit).

Knowledge Management is the practice of adding value to information by collecting implicit knowledge and transforming it into new explicit knowledge, which will then be tested. Implicit knowledge is linked to strong cultural and mental models or beliefs taken for granted by people [11]. KM is characterized by six dimensions:

1. Knowledge creation;
2. Knowledge acquisition;
3. Knowledge organization;
4. Knowledge saving;
5. Knowledge dissemination;
6. Knowledge application.

According to Lee (2000), "inclusion of human's collaboration and help is the factor that distinguishes knowledge from corresponding data and information with it and this adds more value to the individual to whom knowledge is transferred" [12]. Besides, KM improves the performances respectively of knowledge workers, processes, employees, markets and organizations [13]. Here is a list of the main advantages of KM applied to banks [14; 15; 16]:

1. Thanks to KM systems, banks can develop an accurate placement policy that ensures that the right person will be assigned to the right job. This continuous job rotation guarantees internal knowledge creation as well;
2. Experience that is shared by senior employees to the younger and high qualified generation and effective mentoring have a big impact on the bank/company's future;
3. As explained before, banks need to take advantage of customers' preferences and behaviour (information that comes from both internal and external sources) in order to always provide value and up-to-date services and products to them;

4. Lifelong learning and the ability to create the perfect team for any given project are very important benefits.

To sum it up, KM offers a platform for encouraging collaborations, a discussion forum where knowledge workers can talk about pretty much any topic, and the possibility of performing knowledge recycling and strategic processes such as customer relation management.

3.3 BI and KM Integration

Unlike BI and traditional information systems, KM systems extract knowledge from information, and they don't convert data into information. By emphasizing knowledge itself, KM systems improve the utilization process of BI [17]. The KM cycle can be continually improved thanks to feedback, which gives management the opportunity to understand end-users' expectations and behaviour. The final nature of the BI/information system depends on how the intelligence requirements are defined [18]. In modern global economy, KM can be thought of as intercultural management which operates across different environments such as human, technical and social [1] and has the goal of supporting business cases' interpretation. Before we saw the benefits of KM; now let's have a look at the advantages of KM and BI integration:

1. Deployment of successful businesses is made possible through multicultural teams management and delivery of global high quality services and products;

2. Preferences and direct experience of end-users can be added during BI system's development;

3. A more detailed understanding of the business contexts is achieved, especially thanks to end-user training.

BI and KM have different technologies and objectives, but they can be combined to empower companies' performance. They support managers in their decision making process and predict the future trends through data and insights gathered from internal and external sources. Implementing BI along with social practices can improve employees' capability of producing valuable corporate results using information in the right way [19]. In fact, while the focus of BI is mainly directed towards explicit knowledge, the one of KM touches both explicit and implicit knowledge. Learning, decision making and understanding are always the most important aspects. Knowledge Management can affect the nature of BI to its core [1]; in fact, KW (knowledge warehouse) has been proposed by researchers as a BI model's extension. The knowledge warehouse architecture makes tracking, coding and sharing of knowledge inside the organization easier and more effective, through a new direction and purpose for BI itself [1; 20] specifically in knowledge improvement. BI is really successful when it allows the decision makers' understanding level and decision making skills, that directly lead to company's growth [21]. Another interesting point of view is that no existing KM framework can really assist the delivery of brand new analytical knowledge created by BI [17]: for this reason, there is still a lot to learn about BI-generated knowledge integration within KM systems. A4T (Analytics for Target) data transformation models have been sugested for future intelligent KM [17]. The possible integration levels between KM and BI are three [18]:

1. **Presentation level integration** - it offers a horizontal integration alongside a user interface;

2. **Data level integration** - it offers KM content for BI processes. Metadata are stored in the data warehouse;

3. **System level integration** - it offers sharing and re-use of BI models for analysis by a KM system.

BI and explicit KM solutions work with part of the KM model. If a bank (or any other organization) doesn't have a well established KM architecture running, while adopting a BI system, KM can be at first implemented for BI and only later expanded with other components. This situation is analyzed in the following chapters of this essay using two different BI and KM integration scenarios, respectively:

1. a company which is actively using knowledge management;

2. a company which is not using knowledge management.

Domain knowledge (in this specific case banking domain experts provide the information) has a critical influence in each stage of BI implementation [22], from early adoption to final interpretation of the results. As far as this latter aspect is concerned, it is not always easy to model interpretations since they depend on domain experts' intuition and gut feeling [22]. Business intelligence infrastructure must be effectively integrated in order to improve banks' profits through the large quantity of customer-related data in their possess. KM facilitates sharing and diffusion of end-users' experience, which can be considered as tacit, transforming it into explicit knowledge. Bigger and more developed banks don't just intercept knowledge thanks to BI technologies, but also from external sources (through the action of KM systems). Employees can observe growth and profitability of customers, and cut risk exposure using advanced financial credit scoring of their clients. Banks absolutely need to be able to offer customer-centric services and products in order to gain competitive advantage in the market. Researchers have elaborated a specific BI framework that focuses on clients' experience and desires in the New Product Development (NPD) process [23; 24]. Customers are real partners in this process and a critical knowledge source, so they have to take part in the knowledge creation process [25]. Advanced NPD processes might be a function of better developed management, that obviously leads to optimal performance and results for banks, and surely benefit the retail bank segment as well as other industry areas [26]. Adopting a KM infrastructure in NPD processes leads to overall increased performance [21]. Several KM technologies can effectively support knowledge creation in NPD stages such as socialization, externalization, combination and internalization, and there are proven ways of how such solutions can be implemented [27]. The main benefits derived from integration of KM and BI in NPD projects for top management include continuous monitoring of market modifications, technological upgrades and possibility of adding personal experience. The KM system eventually provides the final product to the employees of the bank. Besides, customers can be interviewed using a survey: the resulting data can be filtered and analyzed through text mining processes. The most insidious challenge is discovering the most profitable customers who actually have the lowest level of risk.

4 Practical applications

4.1 Organization in practical application I: ICICI bank

ICICI bank is the second biggest bank in India and the most huge private sector bank as far as market capitalization is concerned. It offers a large range of financial services both to normal customers and organizations, such as personal and car loans, mortgages, or debit/credit cards. The bank owns a dedicated business intelligence infrastructure with the goal of taking advantage of data analytics to support management's decision making. Profit is thus maximized, while risk is minimized. ICICI Bank's customer relationship processes are managed by a Sybase IQ data warehouse, which has been allowing the organization to provide effective promotion plans and reduce costs since 2000. Later in 2003 the bank adopted PowerCenter, an upgrade to the warehouse architecture which gathers information and data from five new external sources. Originally there were only three sources, respectively for credit cards, retail banking and security. The main advantages of PowerCenter are without any doubt its extremely intuitive drag-and-drop graphical interface and native support for a lot of different data sources. ICICI Bank then decided to switch to SAS solutions to implement a single framework for the whole organization, as opposed to various reporting systems it used to rely on. This framework is composed by:

1. **SAS ETL Server**;

2. **SAS Enterprise BI Server**;

3. **SAS Enterprise Miner**.

4.1.1 Result of practical application I

The IT division of ICICI bank has been been able to grow very fast and drastically improve their technical skills thanks to PowerCenter [28]. As Vohra stated, the "adoption of SAS in ICICI Bank is in line with our strategy to consolidate our BI framework and establish an enterprise wide BI platform. With the SAS Data Integration Server it will now be possible for us to integrate our data sources across the enterprise" [29]. ICICI Bank assembled a team made of IT, HR and KM experts to build "WiseGuy", an experimental portal which has since then continued to grow and expand the organization's activities (the first demo of WiseGuy was accessible merely after three months). The young age of employees allowed to get a good understanding of the working culture, and as a consequence, an improvement of the KM system. "WiseGuy" has revealed itself to be the perfect compromise for both professional and technical employees, who have been able to improve their skills thanks to the shared interface and platform.

4.1.2 Practical application I discussed

Initially adoption of KM was not mandatory at ICICI Bank, but eventually it had to be officially recognized to stay alive [30]. Besides, ICICI Bank had to keep its BI infrastructure updated and guarantee ongoing employees' knowledge learning for decision making in order to stay relevant in the market. To do so, BI and KM had to be continuously integrated, so that top management could be able to track the ever changing desires of the end-users and apply fast modifications to the BI system where needed. After the first phase of the project's development lead by young employees, even the middle aged workforce started familiarizing with the KM system, finding its meta-data repository particularly useful for their analyses.

4.2 Organization in practical application II: Indian Public Sector banks

In the retail banking business, solutions and services must be extremely customer-centric and the employees need to be skilled and competent. The banking industry in India, especially in public sector, is no exception. Clients have to be provided individualised, competent and transparent products, and they need to feel that the bank and its employees are trustworthy [31]. Indian Public Sector banks (PSB) still have to effectively master Knowledge Management, but they have implemented new technologies, such as Core Banking Solution (CBS), to offer services to their customers and allow "anywhere banking" for quite some time.

4.2.1 Result of practical application II

CBS offered an integrated interface with customer information, deposit, loans and transactions processing system applications; this was very useful for operational activities and transaction data reporting, but not ideal for decision making (at any level). Thanks to centralized computer processing and its modern business processes, CBS made it possible for PSB to provide novel banking services and products in India and to reduce customer attrition. Public Sector banks needed something more though: a single database for customer data and information, achieved through the integration of the various systems used for data analysis tasks and, of course, investments in business intelligence. This is something several Indian banks have already done [32]: employees and top management of PSB have been able to access the BI systems in a hierarchical way for quite some time. Users located in different regions and countries have access to their data even if it is stored in the central database.

4.2.2 Practical application II discussed

Anyway, while the IT division located in the central Indian office possess the required knowledge to understand BI technical issues, users working in other external branches don't. For this reason, sometimes users might not obtain the right data they need and a long change process performed by the central bank may be required to solve the problem. Banks can achieve effective results and mitigate the aforementioned complexities in the following ways:

1. Continuous support by IT experts;

2. Internal information sharing.

Let's analyze a practical example: employees of the technical team can solve problems of technical nature and comment crucial KM reports, by visiting the KM portal weekly and answering queries. Once the hardest task of finding appropriate answers to specific queries is completed, the BI system can be updated according to end-users' feedback. Expert workers of the bank can speed up the complex job by:

1. Sharing their most brilliant and fresh ideas regarding the internally available data;

2. Encouraging end-users to promote the system.

KM gets tacit and explicit information from internal and external sources and employees, by making information and knowledge sharing the backbone of the bank. All this shared knowledge is then used by BI users for improved decision making, and by top management to apply required changes to the BI solutions according to the current market trends. With users becoming more and more conscious about the benefits of BI and KM integration, wide applications of these practices will be gradually much more easier for Public Sector banks in India.

5 How to make the essay to a research contribution

One possible way to further this essay and research could be to analyze the integration framework for KM and BI in another existing bank but by using data that comes from internal sources; primary information provides insights that secondary data or indirect observations cannot give. Anyway it is already clear that integrating BI and KM banks allows to achieve incredible results.

6 Conclusion

Business intelligence and Knowledge Management integration leads to decision making improvements. As analyzed in the previous sections, bank's profits and growth can be increased by developing better financial credit scoring models and by lowering exposure to risk. These actions are perfect instruments against issues related to churn management, because they give useful insights about customers' decision or will to leave. It is possible to discover the most valuable customers and what makes or keeps them loyal, designing effective promotional plans for the future.

6.1 Research question (or Goal) revisited

Advanced New Product Development processes might be a function of better developed management, that obviously leads to optimal performance and results for banks, and surely benefit the retail bank segment as well as other industry areas [26]. Adopting a KM infrastructure in NPD processes leads to overall increased performance [21]. The main benefits derived from integration of KM and BI in NPD projects for top management include continuous monitoring of market modifications, technological upgrades and possibility of adding personal experience. This becomes knowledge that can be successfully used for dynamic learning, problem solving, decision making integrity and strategic planning [1], keeping a strategic advantage in the market.

6.2 Future research

Since processes are saved in the process model base, they can be used more times making the bank more effective and flexible [12]. Creating an intelligent decision making infrastructure means being able to build new services or products and modifying existing ones at the same time; this applies to existing or even new policies in the company/bank. Obviously, since every bank is structured differently and has a specific target of customers, they must accurately study their own KM and BI architectures and practices in order to integrate them in the best way possible. Future research could focus on these further investigations.

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