CHAPTER IV
BI MODEL FORMULATION

4.1 BI MODEL WITH SOFT COMPUTING: BANKING INDUSTRY

Banks worldwide use data warehousing/BI solutions are tried vastly in the following areas, such as profitability analysis, risk management, historical analysis, managing compliance requirements, executive dashboards, regulatory reporting and customer relationship management. Once the business transactional data (deposits and loans etc) from all the branches of the banks had been accumulated in the transactional processing system (i.e. a common database in a central server located in the data center), giving a consolidated view of the bank’s operations, the prime duty of any bank manager
is to assess the financial status of the bank in order to acquire new customer and at the same time old customers under its influence without any deviation. Therefore, bank needed to develop a platform that would integrate data from various sources within the bank into an easy-to-use, easy-to-locate data delivery service. As a result BI came into existence. BI system brought the perception of knowledge discovery which bankers have quickly adopted for active support to decision making processes at all managerial levels. BI tools founded on information technologies such as on-line analytical processing and data mining make possible intelligent business decision making in complex banking environment. In this paper we have discussed about BI, KM, BI & KM applications for banks, literature review on BI and KM integration, need to integrate BI & KM and a framework for banks to integrate BI and KM.

**ETL PROCESS**

ETL packages extract data from internal and external sources, eliminate data error and redundancies, and provide tailor data for access and analysis and load to DW. An important part of this process is data cleansing where variations in data schemas and data values from disparate transactional systems are resolved.

**OLAP (ONLINE ANALYTICAL PROCESS)**

Depending on the organizations requirement one or more data cubes will be created. Each OLAP database contains specific number of cubes and dimensions. OLAP is a multidimensional model can then be created which supports flexible drill down and roll-up analyses (roll-up analyses create progressively higher-level subtotals, moving from right to left through the list of grouping columns. Finally, it creates a grand total).
4.1.1 BUSINESS INTELLIGENCE APPLICATIONS IN BANKING INDUSTRY

BI 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) into 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 BI systems, in order to carry out their business.

Applications of BI in banks can be summarized as follows Katarina et al.[19].

BANKS PERFORMANCE (BP)

Banks analyze their historical performance in a phased manner and it can come across a system which may help bank to draw a picture to face any eventuality in the future.

FINANCIAL DERIVATIVES

Derivatives are financial instruments whose value is based upon other, simple, instruments or market variables. These instruments or variables usually include prices of commodities, stocks, or bonds, or any other type of asset which is normally traded. Derivatives, however, can also be dependent on other variables, including weather or market indices – anything quantifiable (Hull 1). In fixed-income trading, derivatives such as options and forward contracts are often used to hedge risk in bond position (Hull 6).

RISK OF FINANCIAL DERIVATIVES

Risk in financial derivatives is measured in dimensions denoted by Greek letters the most common being delta (Δ), gamma (Γ), and Vega (ν). Vega is not technically a Greek letter, but it is commonly used with the symbol for ν. There exist other Greek
risk characteristics, however these are outside of the scope of this project and will not be
discussed here.

Delta (Δ) risk describes the way an option’s price will change as the underlying asset or instrument’s price changes, providing a characteristic of the relationship between price of the asset and its derivative. Mathematically, delta for a stock’s call option can be defined as:

\[ \Delta = \frac{8c}{8S} \]

Equation 1.2.1

Where \( c \) is the price of a call option on the asset and \( S \) is the stock price (Hull 360). Since delta is defined as a first-order mathematical derivative, it is considered a “first order” measurement of risk. Vega is a measure of portfolio volatility – that is, the rate at which portfolio value will change given the rate of change in volatility of the underlying assets. This rate is defined mathematically as:

\[ \gamma = \frac{8V}{8\sigma} \]

Equation 1.2.2

Where \( V \) is the value of the portfolio and is the volatility of the asset.

MARKETING:

One of the most widely used areas of data mining for the banking industry is in marketing. The bank’s marketing department can use data mining to analyze customer databases and develop statistically sound profiles of individual customer preferences for products and services. By offering only those products and services the customer really wants, the bank saves money on promotions and offerings that would otherwise be unprofitable.

RISK MANAGEMENT (RM)
In the context of changes and uncertainties, banking institutions need to rely more on fact-based actionable information, guided from ever-increasing data assets, to reduce risk wherever possible. BI is widely used for risk management in the banking industry. Bank executives need to estimate the reliability of their customers. Lack of knowledge regarding future customers may prove to be a great risk while offering new customers credit cards, extending existing customers lines of credit, and approving loans. Construct Credit scoring models to assess the credit risk of the loan applicants and construct fraud detection models to give signals of possible fraud transactions. Card theft analysis showed that number of transactions increases rapidly after the theft. By comparing expected average number or value of daily transactions, the authorization system can issue an early warning.

**FRAUD DETECTION**

Now a days, keep a watch on fraud that is going in every business, is a biggest challenge. According to Decker, two different approaches have been developed by financial institutions to detect fraud patterns. In the first approach, a bank taps the data warehouse of a third party (potentially containing transaction information from many companies) and uses data mining programs to identify fraud patterns. The bank can then cross-check those patterns with its own database for signs of internal trouble. In the second approach, fraud pattern identification is based strictly on the bank’s own internal information (Decker, 1998). But data mining come to the rescue of business house in detecting this fraud, is really boom to every sector.

**CUSTOMER ACQUISITION AND RETENTION**

BI helps in acquiring and retaining customers in the banking industry. BI techniques can be used to study customers’ past purchasing histories and know what kind of promotions and incentives should be adopted to target new customers. Also, if a
branch has seen a number of people leave and go to competitors, BI can be used to study their past purchasing histories, and use this information to keep other customers from doing likewise. The findings can be used to prepare e-mail catalogues, target advertisements and promotion campaigns.

**BUDGET PLANNING**

Defining performance indicators from a specific area, calculated from the existing information from the system. We can follow the entire performance of the company or the performance of some groups as against others from the same area.

**CLIENT LIFETIME VALUE**

Customer lifetime value management estimates expected revenue from each customer in the future period. It is expected that a person with high education has higher income and is willing to meet the expense of additional products. The BI can build models for expected client lifetime value, so that bankers can treat clients accordingly, considering client’s profitability based on his complete history.

Business intelligence needs to provide us with feedback information that can be used to evaluate a decision. According to our study, we can conclude that proper integration of BI & KM can help bank to get wide benefits. It includes historical context, not just a shallow examination of what is apparent and easily accessible.

Banks will be able to manage explicit information and thereby transform the information to knowledge which in turn can help bank in making better decisions and lead them to be in a better position in contemporary business competitive environment. This integration will not only facilitate the capturing and coding of knowledge but also
enhances the retrieval and sharing of knowledge across the bank to gain strategic advantage and sustain its development in the competitive atmosphere.

4.2 BI MODEL WITH DATAMINING: FINANCIAL RISK

The data mining process is based on inductive learning methods, whose main purpose is to derive general rules starting from a set of available examples, consisting of past observations recorded in one or more databases. In other words, the purpose of a data mining analysis is to draw some conclusions taken from a sample of past observations and to generalize these conclusions with reference to the entire population, in such a way that they are as accurate as possible. Data mining activities can be subdivided into two major investigation streams, according to the main purpose of the analysis: interpretation and prediction.

4.2.1 BASIC DATA MINING TASKS

- Characterization and discrimination
- Classification
- Association rules
- Description and visualization

4.2.2 CLASSIFICATION MODEL

- Training phase
- Test phase
- Prediction phase

4.2.3 ROC CURVE CHART
Receiver Operating Characteristic (ROC) curve charts is used to evaluate the discriminative performance of binary classifiers. This is obtained by plotting the curve of the true positive rate (Sensitivity) versus the false positive rate (1 – Specificity) for a binary classifier by varying the discrimination threshold. Prior to plotting the ROC curve the sensitivity and specificity need to be calculated as follows:

- **True Positive (TP)** = The number of predicted positive cases that are actually positive.
- **True Negative (TN)** = The number of predicted negative cases that are actually negative.
- **False Positive (FP)** = The number of predicted positive cases that are actually negative.
- **False Negative (FN)** = The number of predicted negative cases that are actually positive

\[
\text{Sensitivity} = \frac{TP}{TP+FN}
\]

\[
\text{Sensitivity} = \frac{TN}{FP+TN}
\]

An ROC chart is a two-dimensional plot with the proportion of false positives fp on the horizontal axis and the proportion of true positives tp on the vertical axis. The point (0, 1) represents the ideal classifier, which makes no prediction error since its proportion of false positives is null (fp = 0) and its proportion of true positives is maximum (tp = 1). The point (0, 0) corresponds to a classifier that predicts the class \{-1\} for all the observations, while the point (1, 1) corresponds to a classifier predicting the class \{1\} for all the observations. For every possible cut-off point or criterion value you select to discriminate between the two populations, there will be some cases with the disease correctly classified as positive (TP = True Positive fraction), but in some cases
the disease will be classified as negative (FN = False Negative fraction). On the other hand, in some cases without the disease TN will be correctly classified as negative (TN = True Negative fraction), but in some cases, without the disease FP will be classified as positive (FP = False Positive fraction).

Tackle and solve the most complex problems and create unique predictive capabilities for intelligent decisions. The advanced innovative research in data analysis and optimization helps us to establish a proactive versus reactive strategy to enhance performance and improve operational efficiency. Optimization capabilities including crime analytics, complex supply chain, risk management and marketing investment, can mitigate risk, transform business processes and predict outcomes with greater certainty.

Data mining involves discovering various patterns, generalizations, regularities and rules in data resources [44, 58, 98]. Knowledge resulting from data mining may be utilized in two dimensions, i.e.

- To predict (prediction), and
- To describe (description) reality.

Prediction involves using already known variables to predict future. For instance, prognostic models help on the basis of historical data – to assess incomes within particular assortment groups of products and customer groups. On the other hand, reality description by means of data mining techniques, enables to create clear and understandable for a human being interpretation of knowledge, mined from data in the form of graphs, formulas, rules and tables.

4.2.4 CREDIT SCORING

Credit scoring models enable to determine financial risk that is related to particular customers. It is based on the data that come from application forms provided by a customer.
• Application scoring – used in case of new customers; information on them is available only on the basis of the completed application forms;

• Behavioural scoring – paying attention to additional information on customers’ track records; it predicts customers’ future behavior; and

• Profit scoring – expanding of the basic scoring model; it pays attention not only to probability of paying credits back by customers, but also helps to assess what sort of profit may be expected as a result of co-operation with a particular customer; it is a more sophisticated model because it considers several additional economic factors.

By bringing discipline to strategic financial modeling, facilitating the world wide operational planning and forecasting, and linking strategies with operations. By letting management, finance, and operating staff focus on analyzing information rather than gathering and processing it, such solutions provide organizations with the agility they need to capitalize on business opportunities, optimize resources, and link strategic goals to operational plans. It is understand that all change involves some risk even change that ends up conferring a great benefit on the organization. We are aware of the risks and know it whether the risks are technological, people and business oriented one. If we identify the risk to which category it belong, we can formulate some strategy to face the problem in the future.

4.3 SUMMARY

In this chapter BI model has been formatted to solve the Banking and financial risk decision making process. The several difficulties involved to implement the BI model in Banking sector is deeply analyzed in this chapter and also solutions to formulate the model using computer aided techniques has been proposed in this chapter.