CHAPTER 1

INTRODUCTION
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Technological improvements are responsible for majority of innovations in banking over past few decades. It started with introduction of personal computers and came a long way with computerized banking, Internet banking, ATMs, and CRM as the latest buzz. Customer Relationship Management Systems are adopted by the banks in order to achieve the success in the business and also business strategies can be formulated based on the predictions given by the intelligent data mining tools. This chapter deals with the conceptual aspects of customer relationship management systems, data mining and it’s application in banking sector. The concepts are based on the related literature for the study. The chapter presents the data mining in relation to CRM. The chapter also presents the need of the study in logical way along with the research objectives and tentative chapter plan.

Customer Relationship Management (CRM) is a broad approach to doing business. It is holistic in that it encompasses all aspects and functions of a company, focusing on managing the relationship between customer and company just as much between company and customer. CRM requires a two-way street – and exchange of information just as much as of goods and services. Many organizations have identified the need to become more customer-facing with increased global competitions. CRM is an approach which combines people, process, and technology that allows the organizations to understand their customers and retain the most profitable ones.

The CRM concept has emerged as a new phenomenon to many organizations around the world but it is not off-risk and needs a customer-focused approach. It may also need re-engineering the current business process to support the implementation (Bull, 2003; Bolton, 2004). It has also become an IT project for many companies, rather than being driven by the marketing department.
In the present business scenario, extremely demanding customers and technology have introduced the new dimension of customer relationship management. A Comprehensive CRM system can automate every aspect of a company’s relationship with its customers, from all the activities needed to target customers through those for product development, sales, service, and retention. But smart companies sharply focus their CRM implementations, carefully choosing which segment of cycle and which segment is to be automated. The CRM cycle is given by Rigby (2004) and he suggested that deployment of a comprehensive CRM system could automate every stage of a company’s relationship cycle as shown in Figure 1.1.

![CRM Cycle Diagram](image)

**FIGURE: 1.1**

CRM CYCLE
CRM systems have provided partial solutions to complex heterogeneous banking issues. At times technology – rather than business needs – has been the driver for CRM development but CRM solutions hold great promise for banking when there is a focus on providing support for key business processes.

Today organizations are finding themselves at various stages of evolving into customer-centric enterprises. Many have successfully implemented CRM solutions and created powerful new revenue generating opportunities with technology solutions. As competition increases organization needs to be customer-focused to survive in any market. To create a better environment for managing customer relationship, businesses need to look to a new approach in form of CRM, which is a highly fragmented environment and has come to mean different for different people.

1.1 CRM IN BANKING SECTOR

Technology, commoditization, deregulation, and globalization forever changed the face of banking. The model of the personal neighborhood bank is a quaint memory, replaced by national and multi-national service providers, ATMs, Internet Banking, automated call systems, and a proliferation of product choices, none of them fettered by traditional ties of geography and familiarity.

For banks and other financial institutions, the competition makes it difficult to show competitive differentiation, and harder than ever to show profit. A typical financial institution has thousands of local, regional, national, and global competitors. In this increasingly fragmented industry, most players hold a relatively small and unreliable market share. Customers stick around until enticed by the latest short-term interest rate or direct mail offer.
Banks and financial institutions are recognizing that they can no longer look at a customer from a specific product or snapshot perspective but must encompass the entire customer relationship to fully understand a client’s profitability. From a strategic standpoint, CRM mobilizes resources around customer relationships rather than product groups and fosters activities that maximize the value of lifetime relationships. Many banks like ICICI, HDFC, and Standard Chartered etc. have implemented the CRM to excel in business and to give customized services to their customers.

Many banks have implemented, or are in the process of adopting the CRM systems in the face of competitive pressures. The implementation of integrated delivery channels have focused on the service side of the relationship equation. Bankers are getting better at knowing how to calculate customer profitability, predict propensity to buy, and even recognize attrition behaviors. Customer knowledge databases and analytics engines have made the selling process more predictable than ever before. But the actual use of the information from these systems has been limited to mail campaigns and outbound telemarketing, both of which traditionally have low response rates. Although, these rates have improved somewhat with the improved customer knowledge in hand.

From an operational standpoint, CRM links business processes across the supply chain from back-office functions through all touch points, enabling continuity and consistency across a customer relationship. From an analytical standpoint, CRM is a host of analytical data tools that enables banks to fully understand customer segments, assess and maximize lifetime value of each customer, model “what-if” scenarios, predict customer behaviors, and design and track effective marketing campaigns. The investments made for CRM in banks can pay off banks by:

- Restoring the personal-service connotation that previously removed.
- Fostering greater long-term loyalty through relationship building.
- Maximizing lifetime value of each customer through cross-selling.
- Enabling immediate action to retain the most valuable customers.
- Identifying high-risk customers and adjusting service accordingly.
- Enabling the bank to fulfill customer needs at the right time with right offer.
- Increasing the rate of return on marketing initiatives.

The financial industry has been extremely dynamic, and banks have been among the early adopters of technology to solve business needs. New issues have emerged to join existing business challenges. For example, business intelligence is becoming a key factor in driving intelligent decision making across the enterprise. It is now more important than ever for banks to properly identify the customers and products that can most improve their bottom line profitability. At the same time banks must find new ways to target customers with the products that are most appropriate to their needs and to serve customers with greater cost-efficiency. Given the current economic environment, banks have to justify an investment, and a CRM solution must achieve a quantifiable return on investment.

With a vast talent pool India is fast becoming an important development base of major CRM companies. Indian companies are jumping into the CRM bandwagon to seize a chunk of the global market, both products as well as services. NASSCOM and McKinsey have recently increased their projections for the Indian IT Enabled Services market in 2008 to US$ 21 billion from the US$ 18 billion earlier. About 30% of this business is expected to come from banking, insurance and financial services.

1.2 DATA MINING FOR CRM

The promise of data mining in business environments is enormous. Until recently capitalizing on that promise in a real-world business environment has sometimes been very difficult. The promise is still as bright as ever and the recent past has taught
practitioners of data mining for CRM much about delivering high-return, practical results.

Data mining is not a universal panacea for CRM success but critical criteria include tools selection, business objective matching, data discovery, preparation & delivery. Successful data mining in a CRM environment is far more than the application of algorithms to data. Data mining supports CRM mainly in following two ways.

- **Automated prediction of trends and behaviors.** Data mining automates the process of finding predictive information in large databases. Questions that traditionally required extensive hands-on analysis can now be answered directly from the data quickly. A typical example of a predictive problem is targeted marketing.

- **Automated discovery of previously unknown patterns.** Data mining tools sweep through databases and identify previously hidden patterns in one step. An example of pattern discovery is the analysis of retail sales data to identify seemingly unrelated products that are often purchased together.

Intelligent mining algorithms when applied to data warehouse which is, consistent data store that serves as physical implementation of a decision support model and stores the information on which an enterprise needs to make strategic decisions. The model is generated as a outcome of the data mining tool, the model is then interpreted for the purpose of the business problem solution and strategies are formulated on the basis of which, actions are taken.

Data warehousing provides architectures and tools for business executives to systematically organize, understand and use their data for decision-making. Data warehouse systems play important role in today’s competitive, fast-evolving world. Organizations are moving from a situation where they looked at what happened to a situation where they can influence what will happen. This is possible only by gaining
insights into the business processes by applying data mining to a data warehouse. Data mining algorithms comb the database for the hidden patterns. Data mining process consists of the following sequence of steps (Han and Kamber, 2004):

1. Data Cleaning: To remove noise and inconsistent data.
2. Data Integration: Where multiple data sources may be combined.
3. Data Selection: Data relevant to the analysis task are retrieved from the database.
4. Data Transformation: Data are transformed or consolidated into forms appropriate for mining by performing summary or aggregation operations.
5. Data Mining: Process where intelligent methods are applied in order to extract data patterns.
6. Pattern Evaluation: To identify the truly interesting patterns representing knowledge based on some interestingness measure. Patterns are selected on interestingness basis.
7. Knowledge Presentation: Visualization and knowledge representation technique are used to present the mined knowledge to the user.

The steps are represented in the pictorial form in the Figure 1.2. The first three steps namely data cleaning, data integration, and data selection are the pre-processing steps, before the application of the data mining tool on the data warehouse. This is to prepare the database for the application of the tools for mining the data.
FIGURE: 1.2

DATA MINING PROCESS
1.2.1 CRM ARCHITECTURE

CRM systems include data warehouse as its technology support and when intelligent data mining tools are applied on the data warehouse maintained by the company (to store all the details about the customer behavior), hidden patterns are generated and predictions can be made. CRM is more than just a set of technologies; it is a process. This fact will be of significant importance to information technology professionals who will be asked to support CRM with information and applications. Furthermore, it is intended to be a repeatable process to ensure ongoing, continually improving, and consistent results. Major components of CRM Systems (Lin, 2003) are exhibited in Figure 1.3 below.

<table>
<thead>
<tr>
<th>Communication CRM (Front-End)</th>
<th>Operation CRM (Core-Center)</th>
<th>Analytics CRM (Back-End)</th>
</tr>
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<tbody>
<tr>
<td>• Call Center</td>
<td>• Marketing</td>
<td>• Information Search</td>
</tr>
<tr>
<td>• e-Commerce</td>
<td>• Sales</td>
<td>• Analysis Algorithm</td>
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<tr>
<td>• Web</td>
<td>• Service</td>
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<td>• Wireless</td>
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FIGURE: 1.3

CRM ARCHITECTURE
1.2.2 DATA MINING: AN OVERVIEW

Data mining acts as a backbone for the customer relationship management systems. Data mining is the semi-automatic discovery of patterns, associations, changes, anomalies, rules, and statistically significant structures and events in data. That is, data mining attempts to extract knowledge from data.

Data mining differs from traditional statistics in several ways: formal statistical inference is assumption driven in the sense that a hypothesis is formed and validated against the data. Data mining in contrast is discovery driven in the sense that patterns and hypothesis are automatically extracted from data. Said another way, data mining is data driven, while statistics is human driven. The branch of statistics that data mining resembles most is exploratory data analysis, although this field, like most of the rest of statistics, has been focused on data sets far smaller than most that are the target of data mining researchers.

Data mining techniques are the result of a long process of research and product development. This evolution began when business data was first stored on computers, continued with improvements in data access, and more recently, generated technologies that allow users to navigate through their data in real time. Data mining takes this evolutionary process beyond retrospective data access and navigation to prospective and proactive information delivery. Data mining is now ready for application in the business community because it is supported by three major technologies that are now sufficiently mature:

- Massive data collection
- Powerful multiprocessor computers
- Data mining algorithms
In Business the principle purpose of maintaining the data warehouse is to provide information to business users for strategic decision making. This decision making process is the business analysis of the information stored in the data warehouse, and it is enabled by a number of data mining tools and techniques that can provide various business-focused views to business domain experts. These users interact the data warehouse using front-end tools, or by getting the required information through the information delivery system. Different types of users engage in different types of decision support activities, and therefore require different types of tools.

The accompanying need for improved computational engines can now be met in a cost-effective manner with parallel multiprocessor computer technology. Data mining algorithms embody techniques that have existed for at least 10 years, but have only recently been implemented. Figure 1.4 exhibits the typical data mining architecture.

FIGURE: 1.4

DATA MINING ARCHITECTURE
**Sales and Marketing Data Warehouse:** The ideal starting point is a data warehouse containing a combination of internal data tracking all customer contact coupled with external market data about competitor activity. Background information on potential customers also provides an excellent basis for prospecting. This warehouse can be implemented in a variety of relational database systems: Sybase, Oracle, Redbrick, and so on, and should be optimized for flexible and fast data access.

**OLAP Server:** OLAP is an application architecture that an increasing number of organizations are implementing to support analytical applications. The majority of OLAP applications are deployed using the specialized multi dimensional DBMS technology, a narrow set of data, and a prefabricated application-user interface.

**Data Mining Tools and Techniques:** deploying intelligent tools and algorithms for the search of hidden patterns. The main techniques discussed here are the ones that are used 99.9% of the time on existing business problems. There are certainly many other ones as well as proprietary techniques from particular vendors - but in general the industry is converging to those techniques that work consistently and are understandable and explainable. The Tools and Techniques can be classified as Classic & Next Generation techniques.

- Next Generation Techniques: Decision Trees, Neural Networks, and Rule Induction.

**End-User Solutions:** Given as outcome of a data mining session in form of model, or reports solving a given business problem.
1.2.3 TRENDS THAT EFFECT DATA MINING

Commercial databases are growing at unprecedented rates. A recent META Group survey of data warehouse projects found that 19% of respondents are beyond the 50 gigabyte level. In some industries, such as retail, these numbers can be much larger. There are some external trends which promise to have a fundamental impact on data mining as given below:

Data Trends: Perhaps the most fundamental external trend is the explosion of digital data during the past two decades. During this period, the amount of data probably has grown between six to ten orders of magnitude. Much of this data is accessible via networks. On the other hand, during this same period the number of scientists, engineers, and other analysts available to analyze this data has remained relatively constant. Only one conclusion is possible: either most of the data is destined to be write-only, or techniques, such as data mining, must be developed, which can automate, in part, the analysis of this data, filter irrelevant information, and extract meaningful knowledge.

Hardware Trends: Data mining requires numerically and statistically intensive computations on large data sets. The increasing memory and processing speed of workstations enables the mining of data sets using current algorithms and techniques that were too large to be mined just a few years ago. In addition, the commoditization of high performance computing through SMP workstations and high performance workstation clusters enables attacking data mining problems that were accessible using only the largest supercomputers of a few years ago.

Network Trends: The next generation internet (NGI) will connect sites at OC-3 (155 mbps) speeds and higher. This is over 100 times faster than the connectivity provided by current networks. With this type of connectivity, it becomes possible to correlate distributed data sets using current algorithms and techniques. In addition, new protocols, algorithms, and languages are being developed to facilitate distribution.
1.2.4 DATA QUALITY, DATA MINING AND CRM

Data quality is a major issue in the applications where decisions are taken on the basis of the valuable information stored. Poor quality of data is an issue with the organizational databases as most of the times the data is not collected for the purpose of data mining in the mind, and even the most reliable sources can provide deflecting information. The data mining tools when applied on this effective data will result in poor quality model following the garbage in garbage out for the data. If business decisions are take on these models they may lead to the failure of the whole CRM initiative. So business organizations should make efforts on improving the data quality and preprocessing of data.

The quality of information is usually decided only by the organization, which is going to use this information as quality requirements vary from one organization to another. But there is need to have an agreed framework for the analysis of the quality of data. Some of the guidelines for the data quality are provided by the Department of Defence, which can be applied for most of the applications. Various people have analyzed the impact of the data quality for CRM applications and they have provided the implications.

CRM has a long way to go and already it has moved to e-CRM where electronic resources are used to enhance the quality of customer interaction but still there are various related issues which needs to be taken seriously to succeed with the CRM initiatives.

1.3 NEED AND STATEMENT OF PROBLEM

Many studies reveal that almost 70% of the efforts put-in the CRM initiative goes down the drain and the CRM fails due to inability of the performing companies to resolve certain key issues. A financial institution seeking to adopt a customer relationship model
should consider some key business requirements. Most of the amount spent on the CRM systems goes down the drain because of lack of proper guidance regarding the implementation issues. However, while the importance of the CRM is recognized and interest is high, there is also a great deal of confusion regarding how effective CRM strategies can be developed. CRM software is increasingly offered as the solution to many operational problems.

Data mining is a new technology which helps businesses to predict future trends and behaviors, allowing them to make proactive, knowledge-driven decisions. Data mining tools can answer business questions that traditionally were too time-consuming and complicated to resolve. Many banks have adopted CRM systems along with data mining software in anticipation of improving their business. The cost of implementation of these is very high and banks need to analyze that what they are gaining in return.

Survey of literature reveals that there are lots of unsolved issues in the research done in this area. Evaluation of these systems is complicated because of various reasons. But the need is to find a method which can evaluate the effectiveness of the data mining tools and techniques for the CRM systems. There are problems as there are no standard methods or model, no agreed upon metrics, not much research is done in this field, and who are the right people in organization to evaluate the performance is also difficult to analyze (details of survey of literature have been given in chapter-2). Keeping in view this gap in research and its importance, the following problem has been undertaken for the purpose of this study:

"Effectiveness of Data Mining Tools and Techniques for Customer Relationship Management System in Indian Banking Sector" with the following objectives in mind.
1.4 **OBJECTIVES OF THE STUDY**

Broadly, the present study has been undertaken to study and evaluate the effectiveness of data mining tools and techniques for customer relationship management. The specific objectives of the study were as follows:

1. to design a general model for the effectiveness of data mining tools and techniques used for CRM systems in Indian banking sector.
2. to evaluate the effectiveness of data mining tools in implementing CRM systems in Indian organizations from the managerial perspective.
3. to study the impact of data quality on effectiveness performance of data mining tools and techniques.
4. to study the factors affecting the success and hindrance factors in implementing data mining tools and techniques for CRM systems.

1.5 **SCOPE OF THE STUDY**

For the convenience keeping in view the various constraints, this study was confined to:

1. the application of data mining tools and techniques for customer relationship management in the banking sector. Two banks one from Indian category (ICICI Bank) and one from foreign category (Standard Chartered Bank) were selected, which have already implemented CRM.
2. the executives and the managers working for customer relationship management in the banks and working on the data mining software were selected for the study.
3. the effectiveness of the data mining tools and techniques for CRM in bank is studied from the user's perspective.
4. for the data mining software, executives working in the back-office of the banks were selected.
for CRM implementation relationship managers, customer service executives in
the branches of the banks, who were working with that bank were selected.

The banking sector is selected for the study because as compared to the other
services sectors, financial service sector is one of the early adaptors of the CRM systems
and data mining. CRM systems implementation requires lots of money and time
investment it is very important to know what they are gaining out of whole initiative as
studies show that most of the organizations are failing with their CRM initiative.

The successful implementation of CRM and data mining can be done only when
there are standard methods of evaluating the effectiveness of the data mining software for
the same. Also it is very important to study the other success factors which directly or
indirectly affect the success of CRM systems apart form the technological
implementation.

The terms ‘data mining tools’ and ‘data mining software’ can be used as
synonyms according to the various studies and literature available on data mining.
Therefore in the thesis also the two terms are used interchangeably.

1.6 RESEARCH METHODOLOGY

To meet out the objectives of the study two different sets of questionnaires were
designed, one each for executives working on data mining tools in the banks and other for
the executives involved with the customer relationship management in the branches of
the banks. The efficiency of these questionnaires was tested using cronbach alpha. Data
collection was done through interviews. The analysis of data was done using various
statistical techniques like 'test of significance (t-test)', 'factor analysis', 'mean scores',
'correlations', 'multiple regression' (for details see Chapter-3).

1.7 CHAPTER PLAN
The ensuing chapters will throw light on survey of literature, research methodology, evaluation of effectiveness model for data mining, application of the proposed model, success factors for CRM systems and related issues, and conclusions & suggestions including the limitations of the present study along with the future scope of the study. Chapter plan of the thesis is given as below:

Chapter-1  Introduction

Chapter-2  Survey of Literature

Chapter-3  Research Methodology

Chapter-4  Model for the Effectiveness of Data mining Tools and Techniques for CRM Systems in Indian Banking Sector

Chapter-5  Evaluation of Effectiveness of Data Mining Tools in Implementing CRM Systems

Chapter-6  Impact of Data Quality on Data Mining Tools and CRM

Chapter-7  Success and Hindrances Factors; and Other Implementation Related Issues

Chapter-8  Major Findings and Recommendations

Bibliography

Appendices