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Jayanthi Ranjan, Vishal Bhatnagar

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Role of knowledge management and analytical CRM in business: data mining based framework

KM and analytical CRM in business

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Jayanthi Ranjan

Institute of Management Technology, Ghaziabad, India

Vishal Bhatnagar

Ambedkar Institute of Technology, Delhi, India

Abstract

Purpose – The purpose of the paper is to provide a thorough analysis of the concepts of business intelligence (BI), knowledge management (KM) and analytical CRM (aCRM) and to establish a framework for integrating all the three to each other. The paper also seeks to establish a KM and aCRM based framework using data mining (DM) techniques, which helps in the enterprise decision-making. The objective is to share how KM and aCRM can be integrated into this seamless analytics framework to sustain excellence in decision making using effective data mining techniques and to explore how working on such aCRM system can be effective for enabling organizations delivering complete solutions.

Design/methodology/approach – This paper is based on focused and dedicated study of the literature present on the aCRM, KM and data mining techniques. The paper considered how to develop a strategy and operational framework that would build aCRM on the foundation of existing DM techniques and KM approach to meet the business challenges. Based on this research, a customized, integrated framework, to match the needs of business was designed.

Findings – KM focuses on managing knowledge within the organization and aCRM focuses on gaining analytical information from the customer data. Both KM and aCRM help in the decision making process and understanding. This knowledge is difficult to uncover. Hence, this paper explains the importance of data mining tools and techniques to uncover knowledge by the integration between KM and aCRM. This paper presents an integrated KM and aCRM based framework using DM techniques.

Research limitations/implications – All the firms may not be in favor of adopting KM while implementing aCRM. The KM requires a convalesce of organizational culture, technology innovations, effective work force in culminating knowledge dissemination in all business domains.

Practical implications – The organizations implementing this knowledge enabled aCRM framework would be easily able to convert their business knowledge via the analytical CRM to solve many business issues, such as increase response rates from direct mail, telephone, e-mail, and internet delivered marketing campaigns, increased sales and increased services. With aCRM, firms can identify their most profitable customers and use this knowledge for promotional schemes for those customers as well as identify future customers with prediction on ROI.

Originality/value – The need for the integration of KM and aCRM is clear. It is written for practitioners who are looking for approaches to improve business performance and maintain high profits for their business by incorporating knowledge-enabled aCRM in their setup.

Keywords Customer relations, Knowledge management, Data mining, Business analysis

Paper type Research paper

1. Introduction

The business executives have started to realize the importance of the analytical Customer Relationship Management (aCRM) in their approach to deal with customers.

The application of the analytical approach helps the business organizations to understand the benefits that are achieved through continuing analysis of the customer data. The traditional operational framework of the customer information has reached its maximum benefits and now the analytical touch to the operational data provides additional information pertaining to the customers. This information varies from providing the hidden and unknown information related to customers to help in market basket analysis.

ACRM helps to find the hidden and unknown information from the customer data. The analytical engine provides the knowledge required about the customers to the business executive. Doyle (2005) showed a sample road map for aCRM. Shogini (2003) found how CRM analytics started to pay off to the users of it. This helps them to understand the customers in a better way and helps executives to interact closely with the customers.

Macsweney (2001) found and realized the importance of the CRM analytic by considering it to be the next step in business world. The analysis of the customer data leads to effective management within the organization. This has helped the executives to plan their strategy above the contact center point, which used to provide only the existing information pertaining to the customer. The market basket analysis, cross-selling and up-selling increases with the adoption of aCRM in the organization. Thomas (2003) found the growing importance of the CRM analytics in the business intelligence. Xu and Walton (2005) showed the importance of aCRM to gain the customer knowledge. Qiaohong *et al.* (2007) designed an aCRM framework for distributed data wares. Kadayam (2002) showed the importance of knowledge management (KM) to gain ROI from business intelligence (BI). As aCRM is currently catching up and KM methodologies are progressing, the essence of aCRM and its value can be felt in an organization only with KM and data mining (DM) principles. Nemati *et al.* (2002) termed knowledge warehouse as integration of KM, decision support, artificial intelligence and data warehousing. Nemati argued for an organizational success a covalence of KM decision-making, DM is essential. This derived a fact that for a successful analytic based CRM KM coupled with DM is essential. Cody *et al.* (2002) showed the effectiveness of implementing the KM and BI. This derived the fact that DM and KM are essential methods for any Business analytics. Hameed (2004) tried to bring the difference between the KM and BI.

KM related to customer needs to be gathered from all the possible ways and means that is through customer demographic details, customer-buying patterns or other external sources. This information can be effectively gathered and utilized through the methods, which allow ease and quick interaction with the customers. The aCRM with DM tools and techniques helps to gather, store and effectively retrieve information from the customer data. The adoption of aCRM in the organization is dependent on the technology used for analysis. The DM tools and techniques help to uncover the hidden and unknown information from the customer data.

The paper is organized as follows: in section 2 we had presented the motivation and related research in KM and aCRM area. Section 3 showed the design and approach adopted by authors. Section 4 explored the growing importance of the aCRM and DM. Section 5 showed the importance of KM in current business scenario. Section 6 showed the framework for aCRM from KM perspective using DM tools and techniques. Section

7 concluded by urging the business organization to applying the KM based aCRM in the organizations using DM techniques.

2. Related research and motivation

The application of the DM is increasingly growing in the business world. This can be realized through analyzing the set-up of many of the organizations in current business environment. The application of DM in CRM has produced immense profit for the service sector industries. The growth of the aCRM through the application of the DM has produced some serious concern related to the security.

The literature review is organized as follows:

- Study of the existing frameworks for aCRM.
- Related research in the field of aCRM and DM.
- KM based BI and aCRM.

The work by Ahn *et al.* (2003) designed framework on aCRM based on distributed data warehouse. Their paper added value to our framework as key aspect required for the framework on aCRM was studied from this paper only. Tzokas and Saren (2002) showed the way knowledge helps to achieve competitive advantage in relationship marketing. Rowley (2002) found questions for customer KM in e-business environment. Kim and Hawamdeh (2008) argued extensive use of customer knowledge in e-commerce web site and showed its importance in e-commerce business. Sap (2003) realized and showed the growing importance of aCRM in the business of an enterprise. This paper helped to gain the insight of how the aCRM is really beneficial for business organizations. Xu and Walton (2005) explained how to gain customer knowledge through aCRM. This paper has helped to gain insight into CRM analytics. Qiaohong *et al.* (2007) showed aCRM design frame based on distributed data warehouse. Campbell (2003) showed the importance of customer knowledge and its creation for providing customer relationship in the organization for strategic discussion making process.

Saarenvirta (1998) explored the application of DM in customer relationship management to help the executives take strategic decision. This paper helped us to know how well DM can provide added advantage to CRM. Siragusa (2001) argued for implementing DM for better CRM and improved service for the customers to provide them satisfaction. Mukhopadhyay and Nath (2001) measured efficiency of CRM systems and proposed a model, which provided to measure the efficiency of the CRM system. Wong *et al.* (2004) found DM application to be intelligent for CRM by showing the effect of DM in analyzing customer data. Berson *et al.* (1999) explained how to build DM application for CRM, which helped us to gain knowledge about the CRM and DM in detail. Wang and Wang (2007) explored mining purchasing sequence data for online customer segmentation. Chen *et al.* (2005) found out the DM application in CRM of credit card business. Chen *et al.* (1996) discussed on overview of DM from the database perspective. Kleissner (1998) discussed DM for the enterprise. Srivastava (2004) emphasized on DM for the customer relationship management. Ranjan and Bhatnagar (2008) reviewed tools of DM for effective CRM implementation. DM helps in finding hidden and previously unknown information from the operational customer database. This information will be used by firms, for future growth, and to achieve competitive advantage. Ranjan and Bhatnagar (2008) discussed the critical success factor for implementing CRM using DM.

Rowley (2002) showed us the reflection of customer KM in e-business. This paper helped us to understand the growing importance of KM in e-business. Rowley (2004) explored the integration between relationship marketing and KM. This paper showed how partnering of KM with relationship marketing increases the profit for the organizations. Nissen (1999) explored knowledge based KM in the reengineering domain. Lei and Tang (2005) discussed the KM based CRM system. Lyons *et al.* (2008) explored how knowledge enabled excellence in performance can be achieved by integrating KM and quality management. Kaplan (2006) developed a knowledge convergence framework to build a performance learning culture. Kaplan and Reed (2007) showed the growth of KM from theory to practice over years. This paper helped us to gain the complete know ledge about the KM.

The study of the papers had helped us to gain insight into what aCRM is all about. The papers also helped us to know about KM and DM application and importance in business world. The study of the papers related to KM, DM and aCRM and faster adoption of aCRM in the business organization has motivated and prompted us to propose knowledge enabled aCRM framework using DM techniques. This is the motivation for our research.

3. Design and approach

The research goal was the development of new knowledge enabled data mining based analytical CRM framework for integrating knowledge management and analytical CRM. We followed the design science approach as described by March and Smith (1995) and Hevner *et al.* (2004). "Design Science [...] creates and evaluates IT artifacts intended to solve identified organizational problems":

In the design-science paradigm, knowledge and understanding of a problem domain and its solution are achieved in the building and application of the designed artifact [...] Such artifacts are not exempt from natural laws or behavioral theories. To the contrary, their creation relies on existing kernel theories that are applied, tested, modified, and extended through the experience, creativity, intuition, and problem solving capabilities of the researcher (Hevner *et al.*, 2004).

3.1 Research approach and strategy

The purpose of this study is to gain in-depth about the analytical CRM, Knowledge management and their integration from data mining perspective, the selection of qualitative approach was found to be appropriate to fulfill the stated objective and empirical case scenarios of adoption of the framework is discussed to authenticate the saying. The purpose of the paper is to provide a thorough analysis of the concepts of BI, KM and aCRM and to establish a framework for integrating all the three to each other. The theoretical scope of the paper is to distinguish between BI, KM and aCRM to clarify the role and importance of each in business development environment. The mail aim is to share how KM can be integrated into aCRM that uses DM techniques to sustain excellence in business performance. The paper also outlines three principles, which basically may be used as guidelines/templates, to create a successful KM based aCRM framework. Where data were discrepant and inadequate, logical justification is provided. Furthermore, multiple-empirical case scenarios will provide more in-depth information about the research problem concerning definitions, profits and different

characteristics of aCRM in knowledge management using data mining tools and techniques.

3.2 Data gathering techniques

The data for this study that is collected is expected to be mainly of a qualitative nature. The data gathering techniques is informal discussions and meetings. This paper is based on focused and dedicated study of the literature present on the aCRM, KM and DM techniques. The author has contacted the organizations executives for informal discussions to gain an insight into the previously said technologies. Based on the reflection of the previous discussions, meeting with pellet developers, management educators, management consultants and management students we had come to a decision to provide the effective framework for aCRM considering DM techniques and KM. The authors had informal talks with the various key notes speakers of various international and national conferences on KM, aCRM, BI and DM and had collected various feedbacks from them for coming to some conclusion.

The methodology adopted can be classified as:

- (1) The importance of aCRM was felt and realized through study of various literature and discussions.
- (2) The importance of DM in providing the added advantage in terms of hidden and unknown information is realized through the study of literature and with the discussions that we had.
- (3) We considered how to develop a strategy and operational framework that would build aCRM on the foundation of existing DM techniques and KM approach to meet the business challenges.
- (4) We had looked for ways to effectively integrate the KM approach with aCRM principles.
- (5) We needed a approach that would work for a customer value with maximum benefits to an organization.
- (6) We focused in our paper on KM enabled aCRM approach.
- (7) We discussed the integration of success of incorporating KM in aCRM.
- (8) We researched the aCRM principles and framework for effectiveness in business organizations. Ranjan and Bhatnagar (2009) showed principles for successful aCRM in the business organizations.
- (9) Based on our research, we designed a customized, integrated framework to match our needs of business.
- (10) We identified three basic principles for aCRM to be implemented. They are:
 - management of knowledge asset in aCRM, which adds value to customers;
 - knowledge structure, and processes in aCRM to gather distribute, and convert the information into bottom-line value; and
 - knowledge disseminations, which arbiters the aCRM's actions.

3.3 Verification of framework

The final emerged framework is empirically examined to find the solutions to various business problems and requirements in different business organizations. The validity

of the framework needs to be further tested by examining its impact on real case scenario, which is the matter of future research work, as they would require the real implementation of said framework in the organization. We believe that framework for integration of KM with aCRM using DM techniques should be considered as necessary and important parameter. We believe that future work on this framework would be on analyzing its merits and demerits on its application in the organizations that implement KM in aCRM. We believe that successful implementation of framework will enchain the business value for the organizations.

4. ACRM and DM: an introduction

Customer loyalty can be increased through the effective management of customer information and this will expand the business for the organizations. Lin and Su (2003) showed how CRM strategies if implemented effectively can increase customer value and provide satisfaction for the customers. The key aspect is the gathering of the valuable customer information and extracting hidden and unknown information's which can be shared with all who are concerned.

The integration of operational customer information with the analytical tools of DM drives analytic applications, to identify predictable trends in customer behaviors. The resulting information analysis can then be incorporated into organizations BI process for effective planning of marketing strategy. Analytical data pertaining to customers includes customer-buying behavior region wise and other demographics information's depending on the sector or the organization like age, etc. Doyle (2007) showed the importance of CRM analytics by using a business case. Kim and Lee (2007) analyzed customer selection and strategies where network externalities exist. Iriana and Buttle (2006) showed the attributes for strategic, operational and aCRM.

The use of the aCRM in BI has helped the enterprises to plan their strategy for marketing, service and any other departments of the organization. ACRM is the process of evaluating customer data and their behavior pattern in buying any product to better understand the trends. The business enterprise needs to know the answer to certain question from the aCRM. They are:

- What are the products, which can be sold together?
- Who are the most profitable customers?
- Which customers are likely to churn?
- What offers can be given to increase the profits?
- Which are the upcoming trends in the market?
- How to increase cross selling?
- How to increase up selling?

Knowing the answers to this questions helps in framing the policies for the companies by the executives. This is possible, if the analysis, of the customer data are done by the analytical tools, and techniques of DM. Hall (2004) found aCRM to be the missing link in CRM strategy to implement BI in the organization.

ACRM consist of the following components and process:

- Various databases from where the customer data can be collected like the production database, internal database, external database, like information center and archive data.
- Operational customer data warehouse consisting of customer information for contact center, etc.
- Analytical tools and techniques of DM can provide the modeling algorithm for analysis of the customer data for finding the hidden information.
- Campaign management.
- Reporting of the information retrieved.
- Communication of the retrieved information via the networked environment to various users.

ACRM is able to provide high benefits to the business organization. The implementation of aCRM in the organizational setup leads to following benefits:

- It helps in cross selling, up selling.
- Targeted marketing is possible through aCRM.
- It helps in market basket analysis.
- It helps in fraud detection activities.
- It helps in segmenting the customers on the basis of criteria fixed.

DM helps to uncover the hidden and unknown information from the data warehouse. The DM is now being used predominately in business sector to find hidden and interesting patterns. The aCRM is benefited through the DM as customer data, which is collected over time, can be analyzed through the DM tools and techniques for finding hidden and unknown information. The various DM techniques are available like clustering, classification, neural network, etc. This technique helps to segment the customers according to their choices, etc. This technique helps in market basket analysis. The future decision making process for the business executives becomes easy with the information related to future trend is available which is easily made by DM techniques and tools.

5. Knowledge management: an introduction

Knowledge is and critical component of the BI. Hameed (2004) defined intelligence as finding of unknown, hidden, inherent information from the various organizational data, which is helpful for decision making. This helps organization to acquire BI. DND Intranet (2004) defined KM as:

An integrated systematic approach which when applied to an organization enables the optimal use of timely, accurate and relevant information; it also facilitates knowledge discovery and innovation, fosters the development of a learning organization and enhances understanding by integrating all sources of information, as well as individual and collective knowledge and experience.

Haimila (2001) defined KM in terms of BI. He showed that KM is the helping hand of BI. This requires the involvement of BI in the business setup. The DM tools and techniques are considered to be playing the crucial role in providing a true BI environment in the

organization. The DM tools and techniques being able to find hidden and unknown information help to gain knowledge, which in term provides BI. The Cook and Cook (2000) explored that the technological development helps in providing quick and powerful tools to store, retrieve, model and analyze large amount of information from customer data. This is possible by having large data warehouses were data of customers can be stored and powerful tools and techniques of DM to analyze the customer data to uncover the relevant and important information. Kadayam (2002) suggested that BI and KM are evolved over few decades only. BI has adopted earlier more traditional tools for achieving objectives while the KM is more focused on use of technological infrastructure. The development in the field of internet and technologies like DM to analyze customer data has bridged the gap between the BI and KM. Campbell (2006) defined 11 principles for KM success. We had adopted them with respect to aCRM. They are:

- (1) *KM is a discipline*: The KM needs to be thought as a complete discipline rather than just a technology. The completeness in term of discipline helps in providing a good system to capture data related to customers, analysis it and use the knowledge derived from it. The complete system will have improved and latest technology to enable the extraction of the knowledge from the system.
- (2) *One champion is not enough*: The continuous effort to retrieve and use the knowledge from KM requires the champion, which should not leave the organization as this can create disaster for the organization. The understanding of the aspect of organization makes a lot of difference and analysis of customer data require an experience in term of past knowledge or information derived through the aCRM system.
- (3) *Cultural change is not automatic*: The change in the atmosphere of organization by involving the KM enabled technologies is not automatic. The acceptance of latest and new technological changes needs to be welcomed in the organizational setup as this involves usage of latest DM tools and techniques.
- (4) *Create a change management plan*: The way plan of changes will be executed in the organization need to be developed so that new changes do not affect the system in such a way that it creates a negative effect. This is required as using KM enabled aCRM is a complex task, which needs through planning and understanding.
- (5) *Stay strategic*: The decision for KM needs to be long term and continuous. This means the strategic decision to implement KM enabled technology in the setup is not one time-work, it needs to be continuously monitored and maintain it. The implementation of aCRM based KM requires investment in huge amount and output need to be investigated over a period of time rather of sudden basis as decision affected through the aCRM may be long term plans.
- (6) *Pick a topic, go in-depth, and keep it current*: The understanding in depth of the subject concerned is important. This helps to collect the huge volume of concerned data, which can then be applied to extract the knowledge out of it.
- (7) *Do not get hung up on the limitations*: The limitations need to be taken care in long term to enable quick and easy knowledge delivery. The knowledge can be improved over time by going on specific requirement and data collections.

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- (8) *Set expectations or risk extinction:* The expectation measurement is also important. We should be able to measure the return ROI for KM. The risk assessment involves with every business prospect. The risk needs to be calculated well in advance.
 - (9) *Integrate KM into existing systems:* The already existing system needs to be integrated with KM enabled technology to help gain the benefit from the both system. This needs proper planning on how to integrate the existing system with new KM system.
 - (10) *Organizations should educate their self-service users:* The educating the user on the new technology is a must to welcome it in a proper manner. The KM needs to be made popular among users, staff and every one who are concerned. This requires training and making them aware about e-mails, online services, etc.
 - (11) *Become knowledge-enabled organizations:* The whole setup of the organization need to be adopting knowledge enabled technological changes in years to come. This will help the organization to gain profit from new coming technological and improved methods for KM.

Eppler *et al.* (1999) defined CRM process to be considered knowledge-intensive processes. This means that CRM process needs to be knowledge enabled. Lei and Tang (2005) defined the knowledge from CRM into three categories. They are:

- (1) *Knowledge about customers:* The information pertaining to the customers need to be understood through the various detail collected from them. This information can be collected from their demographic details, which help to understand about customers in details. This enables operational CRM in the organizations. The knowledge retrieved from customer data can be helpful for organizations in sales; service and marketing (see Figure 1). The analytic information related to customer help in increasing sales, improving marketing strategies and provides customer satisfaction in term of service provided.
- (2) *Knowledge for customers:* The information retrieved through the knowledge about customers can be used for providing them the benefits they are in need. This is possible through the analysis of the customer data through the DM tools and techniques to enable extract important information, which will be useful for customers. This give rise to aCRM. The information derived will be the knowledge for customers.
- (3) *Knowledge from customers:* The information can be collected more easily and frequently if the customers can be easily communicated and reached. This is possible only when convenient and ease methods are available with organizations and customer to contact with each other. This is possible through e-CRM and mCRM. This two enables the extensive use of ease communication methodology to help gain maximum information from the customers, which can later be analyzed through DM techniques for their benefits.

The knowledge derived from the three resources mentioned previously, provide the complete CRM management in the organization (see Figure 2). The knowledge about customers, from customers and for customers help it gain maximum information pertaining to customers. This is a cycle as information derived out of operational CRM

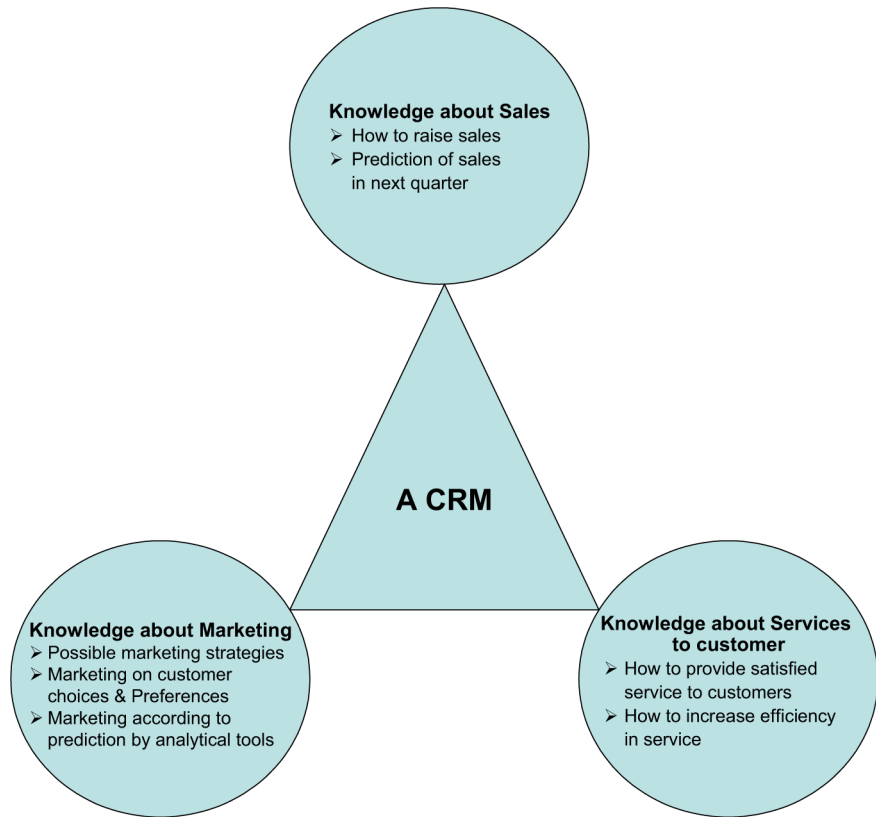


Figure 1.
Knowledge from sales,
marketing and services
using aCRM

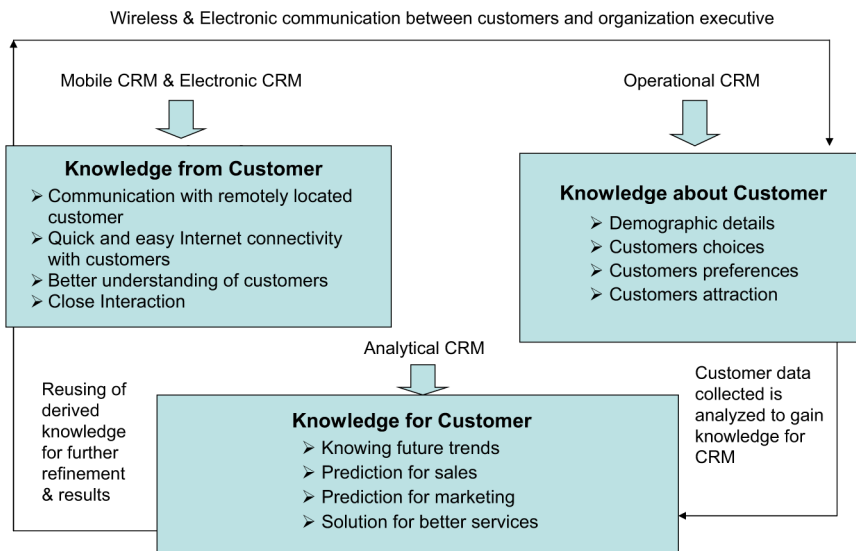
data are again reused for further facts findings and prediction. The whole procedure is repeated again and again, which gives refined and exact information as per demands of the executives of the organization.

The extensive use of KM for CRM is providing the benefit for the organizations. We propose the framework for the aCRM considering DM tools and technique from KM perspective to enable organization to gain maximum benefit from the existing CRM system with latest DM tools and techniques, which will provide knowledge for the long term benefit of the organization.

6. Framework for aCRM considering DM tolls and technique from KM perspective

The framework for the aCRM from KM perspective using DM tools and techniques has following process:

- *Various centers for collection of customer data related data:* The data of customers need to be collected through various collection centers and touch points. The internal data are collected through the database of the customer data kept for internal purpose. The data, which can be helpful from outside the



Source: Adapted from Lei and Tang (2005)

Figure 2. Technology enabled KM for CRM

organizational set-up are collected from external sources. The archive data are collected from the existing database, which consists of the past data of the customers. The production or process data, which relates to the current or latest statistics of the production or growth of the organization. These customer data are collected for in-depth analysis by the aCRM system.

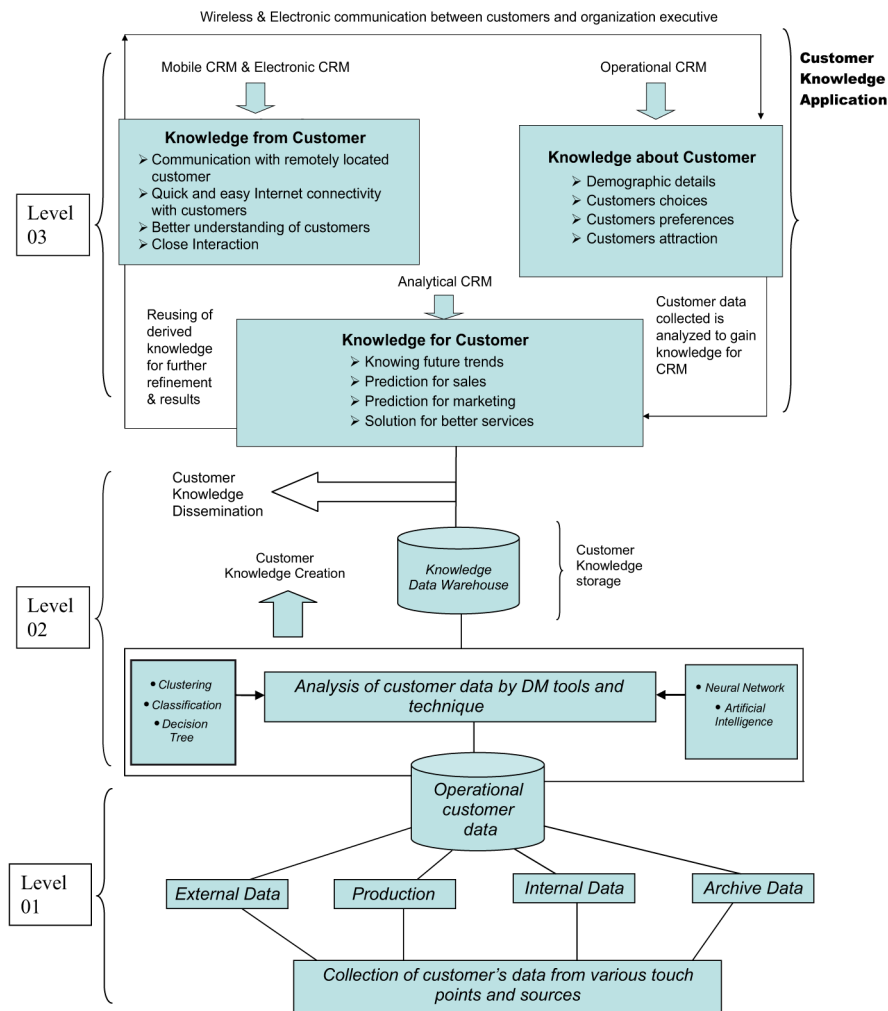
- *Operational customer data warehouse:* Operational customer data ware consisted of the all the mixed data collected from above, said sources. This data warehouse act as contact center to provide the relevant information pertaining to the customer, which does not requires the analysis. This is helpful for the sales, marketing and service departments of the organization to get any information immediately if required about the customers. This customer data are made available to the business users through the GUI interface, which helps them to take strategic business decision for executives. The data warehouse management system helps to maintain the data about the data (meta data). It also helps in managing the mixed of the data stored in the data warehouse.
- *DM tool with complex modeling algorithms for analyzing the customer data:* The DM provides various tools and techniques for analysis of the customer data. The tools already in the markets are equipped with latest modeling algorithms for complex data analysis and helps in finding the hidden and unknown information from the databases. This information helps business executive to take strategic decision for growth of organization. The various techniques of DM like clustering, decision tree, neural network, etc. are applied to extract useful and unknown information from the customer data through the analysis.

- *Knowledge data warehouse of customer information:* The knowledge customer data warehouse is having the analyzed data, which is built, after the analysis is done, by the DM tools. The hidden and unknown information is stored and used by the executives for strategic decision-making. This process is long term and also this derived or extracted information may be used in long-term basis. So this is kept in the warehouse for future references.

The framework is basically divided into three Levels namely data store of operational data warehouse, data analysis by DM tools and knowledge data warehouse and Knowledge management applications (see Figure 3). The customer data are collected from various sources that are like production data, archive data, internal data and external data. This data are collected in the operational data warehouse. The operational data warehouse act as contact center for getting information pertaining to the customers like demographic information, etc. from customer data warehouse. The customer data are passed through the Extraction, transformation and loading (ETL) process for making it eligible for the analysis by the analytical tools of data mining. The data mining techniques like clustering for customer data segmentation, decision tree for customer preferences are applied on the customer data. This results in forming knowledge based customer data warehouse. The knowledge extracted by the DM tools from customer data are applied for KM of customer data. The knowledge is used for knowing information about customers, information for customers and information from customers. The whole process of the KM namely customer knowledge storage, customer knowledge creation, customer knowledge dissemination and customer knowledge application are managed through the framework.

The firms have recognized the importance of aCRM and KM for the masses. Some of them are listed in the following.

- (1) With DM superior tools, now employees can also easily convert their business knowledge via the aCRM to solve many business issues related to customers like increase response rates from direct mail, telephone, e-mail, and internet delivered marketing campaigns.
- (2) With KM based aCRM firms can identify their most profitable customers and the underlying reasons for those customers' loyalty, as well as identify future promotional schemes for customers.
- (3) This framework will help to analyze and utilize click-stream data to improve e-commerce strategies and better management through the electronic mode.
- (4) This framework will help to improve sales in the organizations as more focused products towards demand will be made by the organizations.
- (5) Analyze potential growth customer profitability and reduce risk exposure through more accurate financial credit scoring of their customers.
- (6) Determine what combinations of products and service lines customers are likely to purchase and when.
- (7) Allows organizations to set more competitive and profitable rates.
- (8) Helps to solve problem related to churn management and helps to analysis why and how customers had left or are likely to left.



Source: Adapted from Lei and Tang (2005)

Figure 3. Framework for knowledge enabled aCRM using DM techniques

- (9) We identified three basic principles for aCRM to be implemented. They are:
- management of knowledge asset in aCRM, which adds value to customers;
 - knowledge structure and processes in aCRM to gather distribute and convert the information into bottom-line value; and
 - knowledge disseminations which arbiters the aCRM's actions.

We had discussed some specific case of business organizations like retail, financial, and insurance to find the business requirements and the application of the proposed framework in their setup and their needs (see Table I).

Table I.
Business cases scenario, requirements and solutions by DM enabled knowledge-based aCRM framework

| Case/ problem scenario | Nature of business | Business requirements | Purpose | Deliverables | Results and business value achieved |
|------------------------------|---|---|---|--|--|
| 1 | Automobile industries in manufacturing, business lead project | Requires increased customer satisfaction and better utilization of knowledge about the customer Requires better idea about the demand and requirement of the customers | Increased profit and better CRM in the organization | Adoption of Customer centric approach in the organization Adoption of analytical CRM in the organization Adoption of data mining tools and techniques to carry analysis of collected customer data Organizational changes to support | Analytical CRM achieved in the organization, which is knowledge enabled Improving customer satisfaction Better idea of the customer choices and preference Better prediction of the customer demand due to customer data analysis by the DM tools |
| 2 | Insurance company | Increased sale of various policies to the customers Risk management related to various policies Facilitation for the underwriter to help in formulating better and desired policy for the customers | Better understanding the demand of the customers and maximizing the profit for the organization | Analysis of the customer data to understand their present needs by the DM tools The information collected through various sources related to customer, existing policies, etc. to be used to gain knowledge about further course of action | Improved understanding of customer demands and needs Better formulations of the new policies for the customers Flexible IT landscape shareable which helps in overall management of all information's Increased customer satisfaction |
| 3 | Financial services | Awareness of the current financial stand of the company Fraud detection and analysis Elimination and removable of fraud in the company Required management tools to monitor and measure the performance of third party service providers participating in the process | Decreased business cost and improved financial services in the organization | Automated fraud detection and suggestive measures to curb and eliminate fraud in the company Customer life time value analysis Automated data collection, quality control, exception handling, and reporting across the whole set-up no matter how distance apart they are | Reduced fraud, increased profit margin, reduces cost for the company |

(continued)

| Case/problem scenario | Nature of business | Business requirements | Purpose | Deliverables | Results and business value achieved |
|-----------------------|-------------------------|---|---|---|--|
| 4 | Retail industry | <p>Become the largest chain in the market</p> <p>Easy communication with worldwide staff and customers across various part of the globe</p> <p>Ensure the customer satisfaction in terms of product quality and service delivery</p> <p>Increased sale with more profit and improved working environment</p> <p>Centrally managed data warehouse of customer and product details for easy and timely access</p> | <p>Business cost reduction and increased profit margin</p> | <p>Knowledge management will provide the overall centrally managed warehouse of data for easy and quick relevant information</p> <p>Data mining tools will segment the data according to the requirement and will provide the hidden and unknown information in the form of knowledge to the users</p> <p>Enterprise portal will provide unified access to reports, product as per demand and requirement of the customers and promotional, marketing, campaigning information to the business executives</p> | <p>Improved management of retail outlet with more knowledge enabled setup which will provide improved service to customer at lower and affordable cost for the retailers who are going to provide it</p> |
| 5 | Pharmaceutical industry | <p>Improving the working environment in the organization by strengthening the employees of the organization</p> <p>Help in the analysis process carried by the researchers and scientist in pharmaceutical industry</p> <p>Improve business efficiency by automating and consolidating processes, applications, and systems into one shared platform</p> | <p>Making business process more efficient and profitable for the organization</p> | <p>Better development in term of increased research and analysis by the data mining tool's and techniques</p> <p>Knowledge enabled environment developed in the organization</p> | <p>Cost savings and reduced headcount, driving to increased profit margin for the company</p> |

Table I.

7. Conclusion

An ACRM system contributes to the company's competitive advantage by enhancing an organization's ability to improve customer services, sales performance and marketing analytics. However not all aCRM systems are successful. KM technologies coupled with DM principles are capable of managing the firm's explicit and implicit knowledge. The blend of KM and DM in ACRM would definitely add value to the business. Hence in this paper we had identified a framework that is suitable for the enterprises using KM and DM principles in aCRM framework.

We believe that framework for integration of KM with aCRM using DM techniques should be considered as necessary and important parameter. We believe that future work on this framework would be on analyzing its merits and demerits on its application in the organizations that implement KM in aCRM. We believe that successful implementation of framework will enhance the business value for the organizations.

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About the authors

Jayanthi Ranjan received her PhD from Jamia Millia Islamia Central University, India, in the field of data mining and has 15 years of teaching experience. She has published various papers on data clustering, data mining, database security, business intelligence, educational technologies that appeared in: *International Journal of Business Information Systems*, *International Journal of Indian Culture and Business Management*, *International Journal of Business Innovation and Research*, *International Journal of Business Excellence*, *Information Management and Computer Security* and many more. She has 50 publications in various international journals, national and international conference proceedings to date.

Vishal Bhatnagar received his BTech in Computer Science and Engineering from Nagpur University in Nagpur, India in 1999 and the MTech in Information Technology from Punjabi University, Patiala, India in 2005. He is an Assistant Professor in Computer Science and Engineering Department at Ambedkar Institute of Technology (Govt. of Delhi), Inderprastha University, Delhi, India. His research interests include database, advance database, data warehouse and data mining. He has been in teaching for more than eight years. He has guided undergraduate and post-graduate students in various research projects of databases and data mining. He has published various papers on data mining applications in CRM in *International Journal of ECRM*, *Direct Marketing: An International Journal*, *Journal of Knowledge Management* and many more.