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Business Administration

The Role of Data Mining Technology in Building Marketing and Customer Relationship Management (CRM) for Telecommunication Industry

(**Case Study:** JAWWAL Mobile Operator – Gaza Strip)

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A Thesis Submitted in Partial Fulfillment of the Requirement for the Master Degree of Business Administration

2013 -1434H

أعوذ بالله من الشيطان الرجيم

وَلْتَكُنْ مِنْكُمْ أُمَّةٌ يَدْعُونَ إِلَى الْخَيْرِ وَيَأْمُرُونَ بِالْمَعْرُوفِ وَيَنْهَوْنَ عَنِ الْمُنْكَرِ وَأُولَئِكَ هُمُ الْمُفْلِحُونَ

صدق الله العظيم

سورة آل عمران - ١٠٤

بسم الله الرحمن الرحيم

الجامعة الإسلامية – غزة
The Islamic University - Gaza

عمادة الدراسات العليا
هاتف داخلي: 1150

الرقم Ref ..... ج س ع/35/
التاريخ Date 2013/02/17

نتيجة الحكم على أطروحة ماجستير

بناءً على موافقة عمادة الدراسات العليا بالجامعة الإسلامية بغزة على تشكيل لجنة الحكم على أطروحة الباحث/ **محمود عايش سليمان أبو اللبن** لنيل درجة الماجستير في **كلية التجارة/ قسم إدارة الأعمال** وموضوعها:

The Role of Data Mining Technology in Building Marketing and Customer Relationship Management (CRM) for Telecommunication Industry Case Study: JAWWAL Mobile Operator – Gaza Strip

وبعد المناقشة العلنية التي تمت اليوم الأحد 06 ربيع آخر 1434 هـ، الموافق 2013/02/17م الساعة الواحدة ظهراً بمبنى القدس، اجتمعت لجنة الحكم على الأطروحة والمكونة من:

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وبعد المداولة أوصت اللجنة بمنح الباحث درجة الماجستير في **كلية التجارة/ قسم إدارة الأعمال**.

واللجنة إذ تمنحه هذه الدرجة فإنها توصيه بتقوى الله ولزوم طاعته وأن يسخر علمه في خدمة دينه ووطنه.

والله ولي التوفيق ،،،

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DEDICATION

I dedicate This study to…

..Palestine, the homeland and the identity..

Martyrs, Life and Freedom

..My Father, memories give me the energy to continue..

..My Mother, the words are not enough to express my gratitude's.

..My wife, my son Ebrahim, and my daughter Sara, the continuous support..

..My sisters and my brothers..

..Private sector, the core of development..

..Who encourages me to accomplish my study

ACKNOWLEDGEMENT

Allah help and support me to complete this study and grant me the ability to study, to write, to read, to see and to thank . really, I extremely grateful for my God.

I would like to express my deepest appreciation to Dr. Rushdy A. Wady for providing me with critical suggestions through his supervision in this study.

My sincere appreciation to Prof. Majed Alfarra and Dr. Sami Abu Naser who accepted to examine the research study.

I would like to thank Jawwal Co., and to appreciate all the interviewees who participated for granting their time to participate in this study and offering the necessary information.

I would like to express my deepest gratitude to my mother, my wife, my sisters my brothers, specially Hosam.

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LIST OF ABBREVIATIONS

CRM	Customer Relationship Management
DM	Data Mining
DW	Data Warehouse
BI	Business Intelligence
RM	Relational Marketing
IT	Information Technology
IVR	Interactive Voice Response

Definition of Terms

Customer Relationship Management (CRM): Business philosophy that based on the strategic use and managing of technology, people, process and culture to increase the customer satisfaction and profitability, this investigated by managing and analysis of the customer data (demographic, behavior, financial and etc.) in order to acquire, develop and retain customer, with extra interest in profitable customers (Conceptualized by the researcher).

Operational CRM: Includes daily communication with clients. It provides support for "front office" business processes, such as sales, marketing and service departments within the company (Habul & Velic , 2010).

Collaborative CRM: Involves all company's interactions with external entities, such as its customers, suppliers and partners. When customers communicate with the company they are able to see only the collaborative CRM, which includes all channels of interaction with them. Those are: offices, telephone contacts, e-mail, web pages, contacts, etc. (Habul & Velic , 2010).

Analytical CRM: Data stored in the contact centric database is analyzed through a range of analytical tools in order to generate customer profiles, identify behavior patterns, determine satisfaction level, and support customer segmentation (Chaudhury and Kuiboer ,2002).

Data Warehouse: A central depository where data from operational databases and other sources are integrated, cleaned, and archived to support decision making (Hong & Choi (2007).

Data Mining: Data mining involves the use of sophisticated data analysis tools to discover previously unknown, valid patterns and relationships in large data sets. These tools can include statistical models, mathematical algorithms, and machine learning methods. Thus, data mining is not only collecting and managing data; it also includes analysis and prediction (Kaptan et al., 2002).

Customer Attraction: After identifying the segments of potential customers, organizations can direct effort and resources into attracting the target customer segments via implementing different marketing campaign (Ngai, Xiu, & Chau (2008).

Customer Retention : The strategy of keeping existing customers and often the goal of marketing campaigns (Sharp, 2002).

Customer Development: This involves consistent expansion of transaction intensity, transaction value and individual customer profitability (Ngai, Xiu, & Chau (2008).

Clustering: A data mining approach that attempts to identify distinguishing characteristics between sets of records, and then place them into groups or segments. (Sharp, 2002).

Direct Marketing : Is concerned with identifying likely buyers of certain products or services and promoting them to the potential buyers through various channels (Shin & Cho, 2006).

Churn: A term used by telecommunications companies to describe the loss of customers to competitors (Alberts, 2006).

Cross Selling: Promoting and selling additional products or services to existing customers (Tsiptsis and Chorianopoulos, 2009).

Up selling: Offering and switching customers to premium products, other products more profitable than the ones that they already have (Tsiptsis and Chorianopoulos, 2009).

Deep Selling: Increasing usage of the products or services that customers already have (Tsiptsis and Chorianopoulos, 2009).

Market Basket Analysis: aims at maximizing the customer transaction intensity and value by revealing regularities in the purchase behavior of customers (Aggarval & Yu, 2002).

Customer Life Time Value: aims at predicting the net present value of the cash flows a customer generates with a company or a brand over the entire length of time that he is a customer of that company or brand (Potums, 2011).

Postpaid: Customers with mobile phone contracts. They have a contract and a long-term billing arrangement with the network operator for the services received. They are billed on a monthly basis and according to the Traffic of the past month (Tsiptsis and Chorianopoulos, 2009).

Prepaid: These customers do not have a contract-based relationship with the operator and buy credit in advance. They do not have ongoing billing and they pay for the services before actually using them (Tsiptsis and Chorianopoulos, 2009)..

ABSTRACT

Today, most of the companies search about new technologies and tools to support the managers to take critical decisions, Data mining (DM) is one of the best and modern technologies that provide the companies with valuable and critical information to develop their marketing activities and applications. Data mining has an efficient ability to benefit from the large databases and turn the data stored into meaningful and hidden information. This research focused on the role of DM technology in building the marketing and the customer relationship management (CRM) for mobile telecomm. industry, the major technological requirements of CRM system that support building DM applications, the marketing and CRM applications of DM in terms of customer identification, customer attraction, customer retention and customer development were investigated and examined in this study. Jawwal mobile operator – Gaza strip, was chosen as case study.

Interviews with well informed persons, the website of the company, and the previous studies & literature were used as the source of data. Reviewing and studying the previous studies and literature facilitated the researcher to build comprehensive perspective about the research area, to build deep analysis, to formulate good interview questions and to deliver valuable conclusions and recommendations. The analysis process was used to test if there is agreement between the previous studies & literature, and the analysis results. The researcher used the company website (Jawwal.ps) to pick sample from their marketing campaigns and services, and analyzing their content.

This research concluded that, data collection, data warehouse and data quality of any CRM system are necessary dimensions for building any DM application. Most of the company services, offers and marketing campaigns highly depended on DM . This technology considered as effective and strategic tool to support building effective marketing and CRM strategy in all examined dimensions, in customer identification, customer attraction, customer retention and customer development. DM has valuable contribution to analysis customers data and to understand their characteristics and behavior, to create and discover divers segments, to choose the appropriate segment, channel, time, offer, message and place for direct marketing, to create and design different value added services to develop and increase the customer value and usage, to analyze the customer churn and predict the customers that are mostly like to be churn, to discover the profitable customers and targeted them with tailored privileges and services. In addition to the company analyze the customer data (demographic, behavioral and financial) to specify the customer's needs and designing the suitable different marketing activities. a diagram was concluded and extracted to illustrate the contribution of DM in CRM and marketing.

The study recommended the company to be more interested in customer segmentation based on the demographic data (sex, qualification , region,…), and behavioral data such as type of mobile. To make more interest in direct marketing specially in response modeling of the customer responses, and to enhance using the internet to reach, interact and transact with customers.

ملخص الدراسة باللغة العربية

" دور تقنية تنقيب البيانات في التسويق وإدارة العلاقة مع الزبائن بالنسبة لأعمال الاتصالات"
"حالة دراسية : شركة جوال"

نلاحظ اليوم أن العديد من الشركات تبحث عن تقنيات حديثة لدعم المدراء في اتخاذ قرارات هامة ، تقنية تنقيب البيانات تعتبر أفضل واحدث التقنيات التي تزود الشركات بمعلومات مفيدة وقيمة والتي تساعد الشركات في تطوير أنشطتها وتطبيقاتها التسويقية ، تمتلك تقنية تنقيب البيانات قدرة عالية في الاستفادة من البيانات الهائلة الموجودة في قواعد بيانات الشركة وتحويلها إلى معلومات لها معنى ويصعب الحصول عليها بالطرق التقليدية. هذه الدراسة تركز على دور تقنية تنقيب البيانات في دعم إستراتجية التسويق وإدارة العلاقة مع الزبائن بالنسبة إلى قطاع أعمال الاتصالات ، وهناك عدد من المحاور تركز عليها الدراسة وهي الاحتياجات التكنولوجية اللازمة في نظام إدارة العلاقة مع الزبائن لبناء تطبيقات تنقيب البيانات ، التطبيقات والأنشطة التسويقية المرتبطة بتقنية تنقيب البيانات من ناحية تحليل خصائص الزبائن وتحديد الجهة المستهدفة ، استقطاب زبائن جدد والتسويق المباشر، الحفاظ على الزبائن من التحول إلى منافس آخر، وأخيرا تنمية ربحية وقيمة الزبائن. وتم اختيار شركة جوال كحالة دراسية لإجراء هذا البحث.

اعتمدت هذه الدراسة على عدة مصادر لجمع المعلومات المتعلقة بالبحث وهي المقابلات مع أشخاص من ذوي المعرفة في المجال ، الأدبيات والدراسات السابقة ، الموقع الالكتروني للشركة. اعتمد الباحث على الأدبيات والدراسات السابقة في بناء تصور شامل عن موضوع الدراسة مما ساعده في إجراء تحليل عميق وفي صياغة الأسئلة المناسبة للمقابلات وفي استخراج وتقديم نتائج وتوصيات قيمة. اعتمد الباحث على عملية التحليل للمقارنة بين الدراسات والنظريات السابقة وبين نتائج التحليل. كذلك اعتمد الباحث على الموقع الالكتروني لشركة جوال في أخذ عينة من الحملات والخدمات التسويقية للشركة وتحليلها.

خلصت الدارسة إلى أن عملية جميع البيانات وبناء قاعدة البيانات الكبرى وجودة البيانات عوامل مهمة لابد أن تتوفر لبناء تطبيقات تنقيب البيانات وأن معظم الخدمات والعروض والبرامج التسويقية التي تبنيها الشركة تعتمد بشكل كبير على تقنية تنقيب البيانات. وأن هذه التقنية تعتبر أداة إستراتيجية وفعالة في بناء إستراتيجية التسويق وإدارة العلاقة مع الزبائن بالنسبة لكافة المحاور التي تم اختبارها سواء في تحديد الفئة المستهدفة ، أو في استقطاب زبائن جدد ، أو في الحفاظ على الزبائن الحاليين للشركة أو أخيرا في تعظيم قيمة الزبون والربحية العائدة.

فكان دور تقنية البيانات واضحا في تحليل خصائص الزبائن وفي استكشاف تصنيفات جديدة و متنوعة من الزبائن ،وفي عملية التسويق المباشر واستقطاب زبائن جدد حيث تساند الشركة في اختيار قنوات التسويق المناسبة وفي اختيار المكان والزمان المناسب لإطلاق الحملات التسويقية وكما تساهم في تحديد طبيعة وصفات العروض التي يتم تقديمها بالإضافة إلى أنها تساعد في اختيار الإعلانات ووسائل الترويج المناسبة لخصائص الصفة المستهدفة . ومن جانب الحفاظ على زبائن الشركة ، فقد أثبتت الدراسة أن هذه التقنية تستخدم بشكل فعال في تتبع سلوك الزبائن والتنبؤ بالزبائن الذين من المحتمل أن تفقدهم الشركة ومن ثم تقوم الشركة باستهدافهم بعروض مناسبة لاحتياجاتهم للحفاظ عليهم ، كذلك تساهم هذه التقنية في التعرف على الزبائن الأكثر ربحية والأكثر ومن ثم تقوم الشركة بتصميم الامتيازات والحوافز اللازمة للحفاظ عليهم . أما من ناحية تعظيم قيمة الزبون ، فان هذه التقنية تساعد الشركات في تصميم خدمات مضافة متنوعة تساعد في زيادة المبيعات وكثافة الاستخدام وتعظيم ربحية الزبائن. وأخيرا استطاع الباحث أن يلخص الدراسة في استنتاج مخطط مبسط يوضح دور تقنية تنقيب البيانات في بناء إستراتيجية العلاقة مع الزبائن والتسويق.

ولقد أوصت الدراسة الشركة بضرورة تصنيف الزبائن بناءً على الخصائص الديموغرافية للزبون مثل (الجنس ، المنطقة والمؤهل العلمي) والخصائص السلوكية للزبون مثل نوع الجهاز أو الجوال . أهمية اختبار الحملة التسويقية قبل تنفيذها عن طريق الاهتمام بردود الزبائن على الحملات التسويقية ، وأيضا أوصت الدراسة الشركة بضرورة تفعيل الانترنت في التواصل والتفاعل مع الزبائن.

Chapter 1 : Introduction

- Background
- Research Problem
- Research Questions
- Research Objectives
- Importance of Study
- The Conceptual Framework
- Research Limitations
- Research Structure
- Previous Studies
- Distinction of Study Among Previous studies

1.1 Background

In the modern economy a priority of business activities becomes a two-way communication between the company and its customers. This communication is based on the interests of both sides: companies that seek to profit, survive and grow, and customers who want to achieve added value. The most successful companies today are those that create their business processes in line with customer expectations (Habul & Velic, 2010). Customers are the most important asset of an organization. There cannot be any business prospects without satisfied customers who remain loyal and develop their relationship with the organization. That is why an organization should plan and employ a clear strategy for treating customers. CRM (Customer Relationship Management) is the strategy for building, managing, and strengthening loyal and long-lasting customer relationships. CRM has two main objectives: Customer retention through customer satisfaction and Customer development through customer insight (Tsiptsis and Chorianopoulos, 2009).

CRM technologies are the tools enabling the firms to get the right information to the right person at the right time and are divided into three parts of, communicational, operational and analytical‘ technologies (Keramati et al., 2010).

To succeed with CRM and address the aforementioned objectives, organizations need to gain insight into customers, their needs, and wants through data analysis. This is where analytical CRM comes in. Analytical CRM is about analyzing customer information to better address the CRM objectives and deliver the right message to the right customer. It involves the use of data mining models in order to assess the value of the customers, understand, and predict their behavior (Tsiptsis and Chorianopoulos, 2009).

In the 21st century, the focus is moved toward scientific research on Data Mining applications of real environment, which have real necessity for these applications on the market (Berry & Linoff, 2004). Data mining support analytical CRM to capture customer dynamics, and creating different models and applications such as customer acquisitions models to identify and attract new customers, Cross/up and deep selling models to increase the customer value and profitability, customer retention models to

identify the customers who most likely to churn and trying to keep the profitable customers (GHENT University, 2012).

Data Mining is the process of discovering interesting knowledge from large amounts of data stored either in databases, data warehouses, or other information repositories. Simply stated, data mining refers to extracting or "mining" knowledge from large amounts of data (Han and Kamber, 2006). Berry and Linoff (2011) state data mining has gone by many different names, such as knowledge discovery, business intelligence, predictive modeling, predictive analytics. There are many software support DM such as Weka, Clementine, IBM SPSS, SAS, SAP and etc.

Data mining (DM) technology is one dimension of the analytical CRM, where the CRM specialist should combine between three main dimensions, marketing & market research, IT (databases) , and statistics & data mining. (see figure 1.1).

Figure 1-1: CRM Specialists & DM (*Source: GHENT University, 2012*)

According to Tsiptsis & Chorianopoulos (2009), classification, clustering and association are considered effective data mining techniques to support building CRM strategy, and the following table illustrate this.

Table 1-1: Data mining modeling techniques and their applications in CRM (*Source: Tsiptsis & Chorianopoulos , 2009*)

Category of DM modeling techniques	Modeling techniques	Applications
Classification models	Neural networks, decision trees, logistic regression, etc.	•Voluntary churn prediction • Cross/up/deep selling
Clustering models	K-means, TwoStep, Kohonen network, etc.	• Segmentation
Association and sequence Models	A priori, Generalized Rule Induction, sequence	• Market basket analysis • Web path analysis

The efficient telecomm. companies adopt data mining technology and market research to develop their business in many fields such as marketing, customer relationship management (CRM), financial analysis, network optimization and etc. (Kabakchieva, 2009).

This research highlights the reality of applying the marketing and CRM applications that can be built using DM with respect to telecomm. industry; such as customer segmentation, cross/ up selling, churn treatment, direct marketing and etc, more than focusing on the technical details. Jawwal mobile operator was selected as case study to conduct this research. The largest market share in Palestine (Jawwal Annual Report, 2011)

1.2 Research Problem

With sharp increase in the competition between the different businesses on over the world and with the accelerated growth of the globalization and the global markets, the companies become to research about new methods and technologies support them to keep their market share and their current customers, and to decrease the attrition rate of their customers into another competitors. In 21st century some of the large companies in various businesses such as telecommunication, retailing and banking and other have adopted data mining technology (DM) as emergent technology to support their marketing and their customer relationship management (CRM) strategy. DM mainly depended on a different analytical software that support statistics and machine learning. This technology help the company to convert the huge volume of the customer data that are stored in the databases into meaningful information and actionable knowledge, this information support the mangers to take effective and critical decisions in terms of designing active marketing programs and building effective CRM activities.

This research focus on mobile telecommunication industry, and purposes to study the reality of applying DM applications in marketing and CRM with respect to customer identification (specifying the target segment), customer attraction(attract the customers with marketing campaigns), customer retention (keep the customers who intend to attrite and keeping profitable customers) and customer development (to increase the value and profitability of the customers). Focused on the real marketing applications

that can be built using DM such as customer segmentation, cross/ up selling, churn treatment, direct marketing and etc, more than focusing on the technical details.

Jawwal telecommunication company (the dominant and the largest market share in Palestine) was selected as case study to achieve the purpose of this study. And this research will contribute to increase the economic development in Palestine.

1.3 Research Questions

This study considers the following questions to answer:

1. What are the major technological requirements of CRM system that support building data mining applications ?
2. How can data mining technology be applied in customer identification for telecomm. industry in terms of customer analysis and segmentation ?
3. How can data mining technology be applied in customer attraction for telecomm. industry in terms of direct marketing ?
4. How can data mining technology be applied in customer retention for telecomm. industry in terms of customer churn treatment, profitable customers and complaints analysis ?
5. How can data mining technology be applied in customer development for telecomm. industry in terms of cross/up and deep selling, market basket analysis and customer life time value?

It was benefited from *Ngai, Xiu, & Chau, (2009)* to formulate the research questions and the following figure summarizes them.

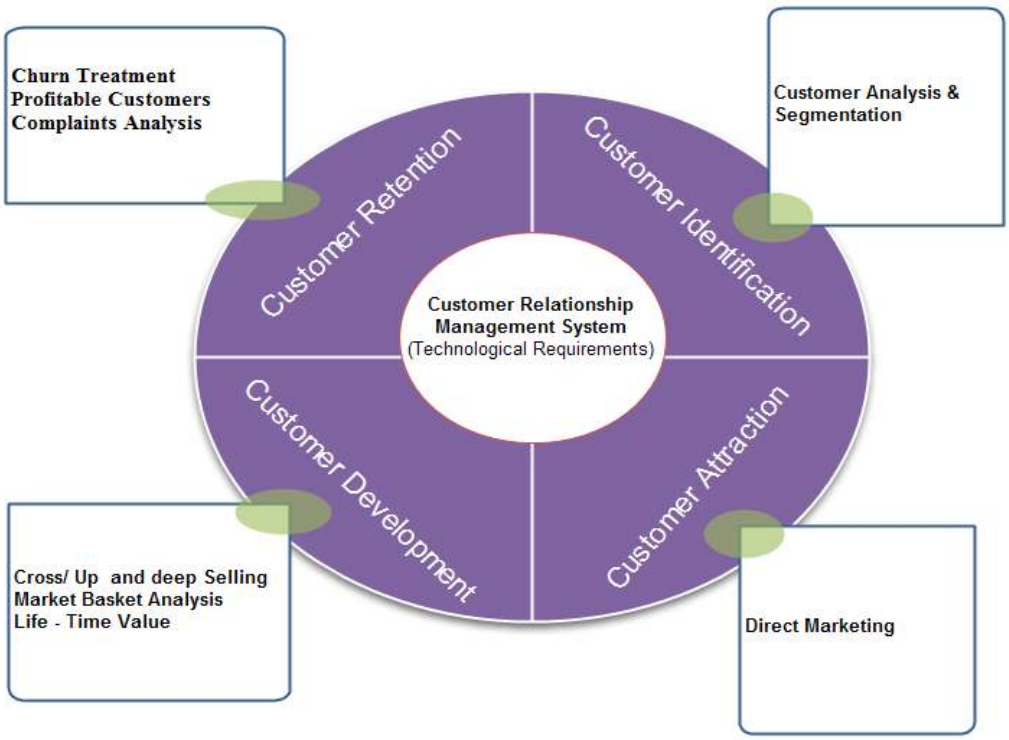

Figure 1-2 :CRM and Marketing Applications of DM (*cited from Ngai, Xiu, & Chau, 2009*)

1.4 Research Objectives

This study intended to achieve the following objectives:

1. Recognize the Marketing and CRM applications that can be built by using data mining technology.
2. Recognize the previous studies and literature that discussed CRM and Marketing applications of data mining.
3. Study the major technological requirements of CRM system that support building data mining applications.
4. Extracting a diagram illustrate the contribution of DM in marketing and CRM.
5. Study the reality of applying the CRM and Marketing applications of DM for customer identification and customer attraction in telecomm. industry such as customer segmentation and direct marketing respectively.
6. Study the reality of applying the CRM and Marketing applications of DM for customer retention and customer development in telecomm. industry such as customer churn treatment and cross/up selling respectively.
7. Introduce the necessary recommendations for the company.

1.5 Importance of Study

After reviewing and studying the research area and the related previous studies and literature, the following points abstracted to illustrate the importance of study:

1. Using DM in marketing and CRM is considered new and emergent science for business research.
2. The importance of this study to other researchers who interested in the field of CRM and marketing
3. Pay the companies attention to the significant of using data mining technology to benefit from the large databases, and turning the massive data into meaningful information. That used to develop their work either for marketing, CRM, financial analysis, demand forecasting and etc. Where mobile telecomm. companies worldwide have got large volumes of data which is not easy to handle.
4. This area will has positive impact on the economic development in Palestine, and this develop and enhance the marketing performance to the companies.
5. Increase companies' awareness about the importance of DM to understand the customers behaviors and delivering the offers and services to match their needs. Specially telecommunication companies.

1.6 The Conceptual Framework

The following conceptual framework is considered as a reference to review all the related literature.

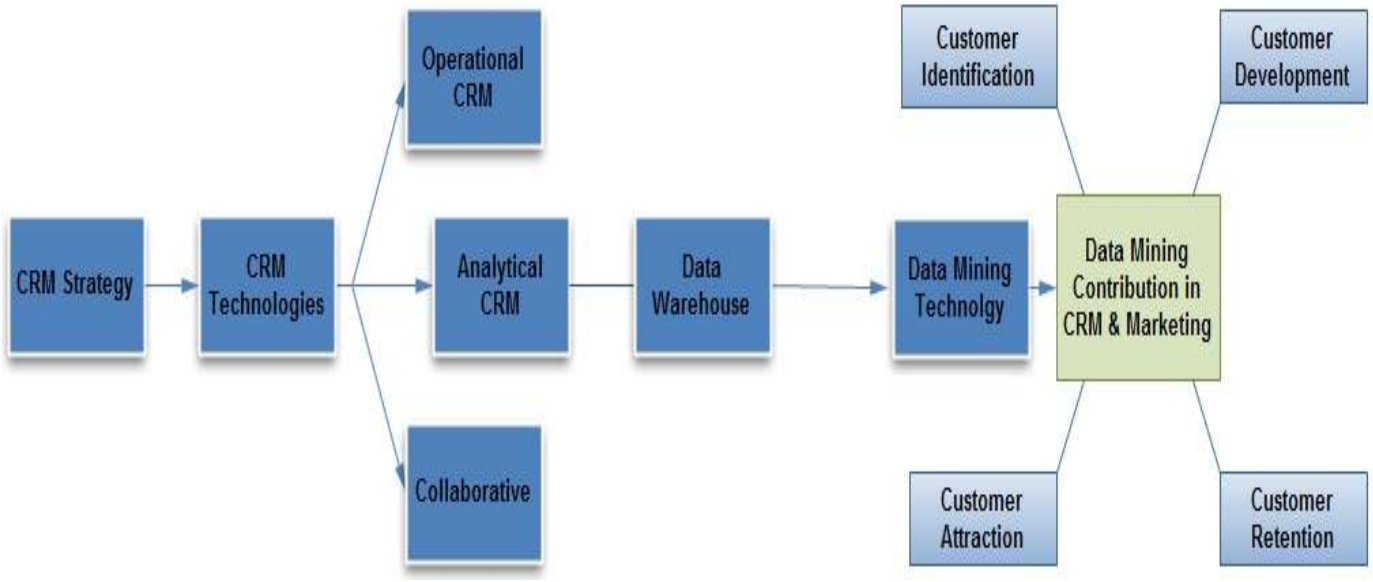

Figure 1-3: The Conceptual Framework (*Conceptualized by the researche*r)

1.7 Research Limitations

There are some barriers were faced to perform this study :

- The research area is new, emergent and has some complexity. Therefore the researcher consumed more time and efforts to build perspective about data the marketing and CRM applications of DM.
- The company refused to give large database to implement customer churn prediction model, because there is stiff competition in the market.
- Some of the interviewees don't have a complete knowledge the research area, Therefore the data analysis process became more hard and difficult. The analysis process was enhanced by applying content analysis for some marketing campaigns and services.
- Since Jawwal was the sole telecommunication company that work in Gaza strip, there was a big difficulty to choose another case study.
- Data gathering obstacles, there was some difficulty to recognize, coordinate and communicate with the different persons who participated in the interviews. Moreover, some of them were busy.

1.8 Research Structure

This research structured as follow, Chapter 1 will discuss the research problem, research questions, research objectives, the importance of research and etc., also this chapter includes the related previous studies. Chapter 2 presents a theoretical framework about CRM strategy and data mining. Methodology of the study is explained in Chapter 3. Chapter 4 provides the analysis of the data collected and finally Chapter 5 will discuss the conclusions and the recommendations that investigated from the study. Abstract, glossary and definitions are listed in the beginning of study.

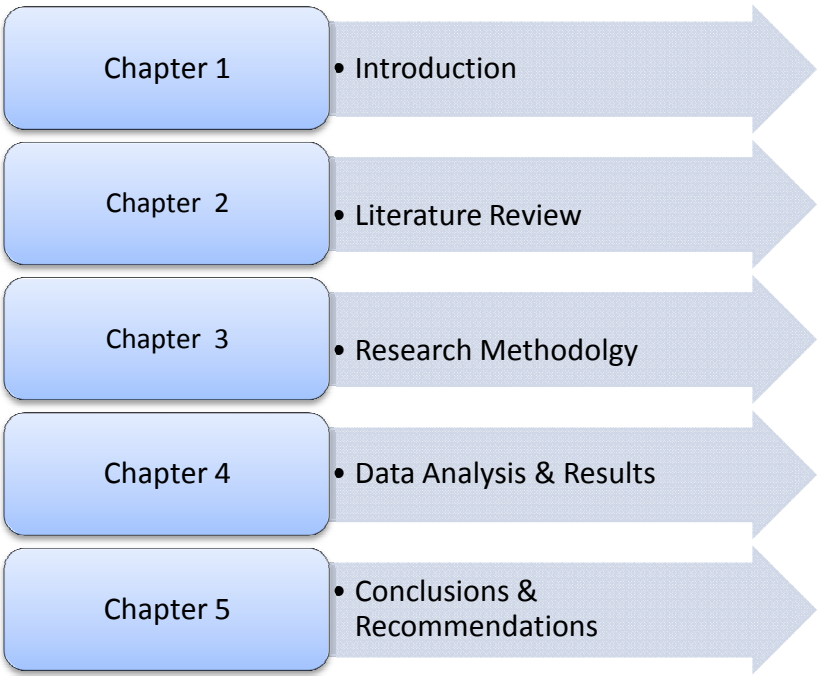

Figure 1-4: Research Structure

1.9 Previous Studies

The following studies discussed and investigated to conduct this study.

1. **(D'Haen, Van den Poel & Thorleuchter, 2012),** *"Predicting Customer Profitability During Acquisition: Finding the Optimal Combination of Data Source and Data Mining Technique"*

This study focuses on, Firstly, investigation the predictive performance of two types of data: web data and commercially available data. Secondly, the predictive performance of different data mining techniques is investigated. The customer acquisition process is generally a stressful undertaking for sales representatives. Luckily there are models that assist them in selecting the 'right' leads to pursue. Two factors play a role in this process: the probability of converting into a customer and the profitability once the lead is in fact a customer.

Findings:

Results show that bagged decision trees are consistently higher in accuracy. Web data is better in predicting profitability than commercial data, but combining both is even better. The added value of commercial data is, although statistically significant, fairly limited.

2. ***(Soeini & Rodpysh, 2012*)**, *Evaluations of Data Mining Methods in Order to Provide the Optimum Method for Customer Churn Prediction: Case Study Insurance Industry*

This study using Clementine software and the database contains 300 records of customers Iran Insurance Company in the city of Anzali, Iran will be collected using a questionnaire. First, determine the optimal number of clusters in K-means clustering and clustering customers based on demographic variables. And then the second step is to evaluate binary classification methods (decision tree QUEST, decision tree C5.0, decision tree CHAID, decision trees CART, Bayesian networks, Neural networks) to predict customers churn.

Findings:

- Better performance than other techniques CART decision tree technique ,perhaps that algorithm shows a better performance but due to the fact that the data collection results are not far-fetched.
- Patterns were extracted by decision tree and show that most churn customers are in officers or engineers.
- Results of data mining methods provide an opportunity for managers and marketing professionals to make decision and choose suitable strategies to prevent churn of customers and let them go to other companies

3. **(Farooqi & Raza, 2011),** *"A Comprehensive Study of CRM through Data Mining Techniques"*

This study attempts to bring a new perspective by focusing the issue of data mining applications, opportunities and challenges in CRM. It covers the topic such as customer retention, customer services, risk assessment, fraud detection and some of the data mining tools which are widely used in CRM.

Findings:

- Application of customer relationship management tool in business gives a new dimension. It proved beneficial but applying data mining in customer relationship management was further more beneficial.
- Data Mining would fasten up the process of searching large databases so as to extract customer buying patterns, to classify customers into groups which also make databases to be handled efficiently.

- Modeling those customers who have defected to identify patterns that led to their defection. These models are then applied to the current customers to identify likely defectors so that preventive actions can be initiated.

4. **(Chopra, Bhambri & Krishan, 2011)**,*" Implementation of Data Mining Techniques for Strategic CRM Issues*"

This study throws light on the underlying technology and the perspective applications of data mining in customer relationship management.

Findings:

- Data Mining techniques can be of immense help to the organization in solving business problems by finding patterns, associations and correlations which are hidden in the business information stored in the data bases.
- Organizations can use these techniques for acquiring new customers, fraud detection in real time, providing segment based products for better targeting the customers.
- Organizations can use data mining techniques to analysis of the customers' purchase patterns over time for better retention and relationship, detection of emerging trends to take proactive approach in a highly competitive market, adding a lot more value to existing products and services and launching of new product and service bundles.
- By using data mining techniques, the organizations will be able to offer the right product to right set of customers through right offer and through right delivery channel, which will in turn lead to better customer relationship management.

5. **(Bolbol, 2011),** *"Evaluate the success of applying customer relationship management system in Jawwal to maintain customer loyalty"*

The purpose of this study is to study of the impact of applying best CRM practices on Customers loyalty, in order to achieve the main goal of the company which is to retain existing subscribers and attract new ones in a competitive environment.

Findings:

- The study concluded that there is a strong influence 79.25% among the study areas of customer focus, CRM organization, knowledge management, technological solutions and the level of loyalty according to the Jawwal staff.

- Study also found that there is a strong positive relationship between the company's success to implement "CRM applications" to enhance loyalty level from subscribers perspective, where the level of approval were average 63.16%.
- The study recommended the company to pay more attention to CRM implementation because loyalty level was average, and to have the initiative to contact its customers in order to strengthen the relationship with them through identifying their desires and preferences regarding its services, and to develop a clear mechanisms to restore those customers who have stopped dealing with the company.

6. **(Dhman 2011),** *"The Effect of Customer Relationship Management (CRM) Concept Adoption on Customer Satisfaction – Customers Perspective, Case Study: Coastal Municipalities Water Utility CMWU- Rafah Branch"*

This study aims to investigate the effect of applying the concept of customer relationship management (CRM) on customer's acquisition, satisfaction, retention and decreasing customer's loss.

Findings:

- CRM concept in the CMWU was significantly correlated in positive direction with reaching customer acquisition, satisfaction, retention and decreasing customer loss.
- CRM has effect on decreasing customer loss more than the other tested factors, where proportional mean for the customer loss was 82.24%, yet the mean for the other factors together was around 76.00%.

7. **(AbuAli & Abu-Addose, 2010),** *"Data Warehouse Critical Success Factors -CSF"*

The aim of this study is to discover the main critical success factors(CSF) that leaded to an efficient implementation of DW in different organizations.

Findings:

CSFs categorized to help other organization in implementing DW efficiently and avoiding data warehouse killers, based on these factors, which be as follow :

- Organizational factors (such as top management sponsorship).
- Environmental factors (such as business competition).

- Project-related factors (such as skills of project team and end-user involvement).
- Technical factors (such as quality of data sources).
- Educational factors (such as training courses).

8. **(Kraljevi´c & Gotovac, 2010),** *"Modeling Data Mining Applications for Prediction of Prepaid Churn in Telecommunication Services"*

The main emphasis of this study was defining of a successful model for prediction of potential Prepaid churners, in which the most important part was to identify the very set of input variables that were high enough to make the prediction model precise and reliable. Several models have been created and compared on the basis of different Data Mining methods and algorithms (neural networks, decision trees, logistic regression). For the modeling examples WEKA analysis tool was used.

Findings:

- Definition of Prepaid churn and the very modeling of an application is more complex than the same task for Postpaid users.
- A successful model for prediction and prevention of Prepaid churn in telecommunication companies can influence very positively an overall profit of companies, due to the fact that far less money needs to be invested into development of a predictive Data Mining model and marketing preventive action to retain users, as compared to the possible loss cause by these users churn.

9. **(Mazumdar, 2010),** *"Predicting customer purchase in an online retail business, a Data Mining approach".*

The purpose of this thesis is to study, implement and analyze various Data-mining tools and techniques and then do an analysis of the sample / raw data to obtain a meaningful interpretation.

Findings:

- Some of the data mining algorithms I have used, are a vector quantization based clustering algorithm, and then an 'Apriori' based Association rule mining algorithm. The first one is aimed at a meaningful segregation of the various customers based on their RFM values, while the latter algorithm tries to find out relationships and patterns among the purchases made by the customer, over several transactions.

- The customer purchase patterns approach, using the association rules mining technique, is an effective way of extracting the rules from the raw data and inferring the buying patterns among them.

10. (Kabakchieva, 2009), *"Business Intelligence (BI) Applications and Data Mining Methods in Telecommunications: A Literature Review"*

The main purpose of this study is to present a literature review related to BI and Data Mining in Telecommunications, from business perspective - defining the main areas of BI and Data Mining applications, and from research perspective - identifying the most common Data Mining techniques and methods used.

Findings:

- BI solutions and Data Mining play an important and increasing role in the Telecommunications industry due to the severe competition in the sector, the availability of large quantities of data generated and possessed by Telecommunication companies, and the existing technological capabilities for transforming that data into actionable knowledge to support strategic decision making.
- The main application areas include marketing, sales and CRM, fraud detection and network management.

11. (Ngai, Xiu & Chau, 2009), *"Application of data mining techniques in customer relationship management: A literature review and classification".*

This is the first identifiable academic literature review of the application of data mining techniques to CRM. It provides an academic database of literature between the period of 2000–2006 covering 24 journals and proposes a classification scheme to classify the articles:

Findings:

- Research on the application of data mining in CRM will increase significantly in the future based on past publication rates and the increasing interest in the area.
- The research area of customer retention received most research attention. Of these, most are related to one-to-one marketing and loyalty programs respectively.
- Classification and association models are the two commonly used models for data mining in CRM.

- The classification model is the most commonly applied model in CRM for predicting future customer behaviors. This is not surprising as classification modeling could be used to predict the effectiveness or profitability of a CRM strategy through the prediction of customer behaviors.
- Complaints management is a crucial requirement for successful businesses when managing customers' needs and changes in behavior. Data mining techniques could be applied to discover unseen patterns of complaints from a company's database. The root of the problems may also be uncovered by investigating the association between complaints from different customers.
- Data mining techniques, such as neural networks and decision trees, could be used to seek the profitable segments of customers through analysis of customers' underlying characteristics.

12. (Jahromi 2009), *" Predicting Customer Churn in Telecommunications Service Providers"*

The purpose of this study is Developing predictive model or application to analyze and predict customers churn or attrition which support the customer retention. And it help to recognize the customers with high probability of churn in close future and target them with incentives in order to convince them to stay.

Findings:

- Developed models are considerably able to distinguish the churners form non-churners and help the Talia Co. to conduct a more efficient retention campaign.

13. (Ranjan & Bhatnagar, 2008), *"Critical Success Factors for Implementing CRM Using Data Mining"*

This study presents the Critical success factors for implementing the Customer Relationship Management (CRM) in a firm using the Data mining (DM).

Findings:

- Critical success factors are normally identified in such areas as production processes, employee and organization skills, functions, techniques, and technologies.
- Data Mining in CRM of any firm gives a better understanding of customer relations and improved customer satisfaction, higher profitability for the company and higher

probability of attaining competitive advantage if the critical success factors are taken into consideration.

14. **(Javaheri, 2008),** "*Response Modeling in Direct Marketing - A Data Mining Based Approach for Target Selection"*

The purpose of this thesis is to identify the Parsian bank customers who are more likely to respond positively to a new product offering. data mining techniques and algorithms are used to implement each step of modeling and alleviate related difficulties.

Findings:

- Identifying customers who are more likely to respond to a product offering is an important issue in direct marketing.
- In direct marketing, data mining has been used extensively to identify potential customers for a new product (target selection). Using historical purchase data, a predictive response model with data mining techniques is developed to predict a probability that a customer is going to respond to a promotion or an offer.
- Using support vector machine (SVM) for Response modeling, maximize customers' response to a product offering, minimize the overall marketing cost and improve customer relationship management.

15. **(Jansen, 2007),** *"Customer Segmentation and Customer Profiling for a Mobile Telecommunications Company Based on Usage Behavior- A Vodafone Case Study"*

This research will address the question how to perform customer segmentation and customer profiling with data mining techniques.

Findings:

- A number of advanced and state-of-the-art clustering algorithms are modified and applied for creating customer segments.
- Customer segmentation based on usage call behavior, i.e. the behavior of a customer measured in the amounts of incoming voice calls, sms usage, call duration, international calls, different numbers called and percentage of weekday and daytime calls. or outgoing communication.

- A Support Vector Machine algorithm was used to classify the segment of a customer, based on the customer's profile. The profile exists of the age, gender, telephone type, subscription type, company size, and residential area of the customer.

16. **(Zavareh 2007),** *"The Role of Analytical CRM in Maximizing Customer Profitability in Private Banking, Case Study : Two Swedish Banks"*

The main objective of the study is to investigate the role of analytical CRM in maximizing customer profitability in private banking.

Findings:

- The analytical CRM system had been implemented and actively utilized by both banks.
- The Internet was found to assist collection of more precise data, to increase the analytical ability and to create faster degrees of performance.
- The results also indicate that customer profitability was highly considered by both banks and tactical measures were exercised to augment the customer profitability, particularly among the core customers, with providing them extra and personalized services.

17. **(Pinheiro, Evsukoff & Ebecken, 2005),** *"Neural Network to identify and prevent bad debt in Telephone Companies - Brasil Telecom"*

This study describes two main distinct results. The first is based on a cluster model to identify the insolvency behavior in a Telephone Company. Due to these clusters, the company can separate the customers into segments based on their characteristics and take different actions to increase revenue and avoid losses. The second result is based on a set of predicting models to classify the insolvent customers.

Findings

- The segmentation model of all Brasil Telecom clients helped identifying the value of each client for the company and allowed defining more efficient relationship actions.
- The classification models, even the unique predicting model or the predicting models based on the input sample segmentation, allow the creation of a highly

benefit business intelligence for the Company, enabling the Corporation to create pro-active actions to identify and prevent nonpayment of bills. and define a more efficient billing and collecting actions management.

- The classification models helped identifying the average percentage of good and bad clients according to a defined business rule and, therefore, monitoring these percentages on a long term basis.

18. (Sim, 2003), *" Critical Success Factors in Data Mining Projects"*

The purpose of this study is to identify the factors are important to the success of data mining projects and what factors are not, that for support evidence-based decision making.

Findings:

- The study show that (80.4%) from the data miner reported that their projects were completed successfully.
- Dataset factor from the research framework is a critical success factor that contributes to the successful data mining projects and significantly different.
- The factors Action, Communication, Output, Business mission, Consultation, Business environment are not significantly different worth the success of data mining projects.

19. (Rygielski, Wang & Yen, 2002), "*Data mining techniques for customer relationship management*"

This study examines the concepts of customer relationship management and one of its components, data mining. Through two studies, it offer a closer look at two data mining techniques: Chi-square Automatic Interaction Detection (CHAID) and Neural Networks. Based on those case studies.

Findings

- Data mining represents the link from the data stored over many years through various interactions with customers in diverse situations, and the knowledge necessary to be successful in relationship marketing concepts.
- Businesses that use customer data and personal information resources effectively will have an advantage in becoming successful.

- Data mining help to obtain nuggets of information that are used to improve customer retention, response rates, attraction, and cross selling.
- Through the full implementation of a CRM program, which must include data mining, organizations foster improved loyalty, increase the value of their customers, and attract the right customers.

20. (Esichaikul & Sikaramula, 2000), *"Data Mining for Customer Relations Management: A Case Study of an Internet Service Provider Company"*

The study describes the design and implementation of the data mining applications for customer relations management in order to improve the marketing operation in one Internet Service Provider (ISP) company. Customer segmentation model and the attrition model were developed using PowerBuilder software.

Findings:

- The purpose of the customer segmentation application is to use data mining to identify new business opportunities and to reduce the cost of marketing campaigns to existing customers.
- The purpose of the attrition model is to improve customer retention, and to identify which profitable customers are likely to leave or drop their service. After the marketing department obtains the list of customers who are likely to drop their service, the company can generate the direct mailing campaign to the target customers in order to improve their customer retention.
- These two applications can help the marketing staff know and decide who are their profitable customers and who are their prospect groups. When the business knows exactly who the customers are, the business then can pay close attention to that group.

21. (Ling & Li, 1998), "*Data mining for direct marketing : problems & solutions"*

This study discuss methods of coping with the problems of implementation data mining projects for direct marketing.

Findings:

- Direct marketing is the process of identifying likely buyers of certain products and promoting products accordingly.

- Data mining is effective tool for direct marketing, which can bring more profits to banks. Insurance companies and retail industry than the traditional means of mass marketing.

1.10 The Distinction of this among the previous studies

The previous studies that are listed above take care to cover all the research objectives, some of them focus on the technological requirements for building DM application such as the studies that are focus on the success factors for building data warehouse and data mining applications. Some of these studies focus on building data mining for different industries such banking and mobile telecommunications. And other studies focus on CRM concept. Where most of these studies are modern and from different author's views.

The previous studies supported this research through the following benefits:

1. Building comprehensive perspective about the contribution of data mining in marketing and customer relationship management.
2. Illustration the applications of data mining in CRM for the mobile telecommunication such as customer analysis and segmentations.
3. Extract and formulation of all research questions in order to cover all the necessary considerations of data mining and customer relationship management.
4. Extract and formulation of all interview questions in order to increase the research reliability and validity.
5. Increasing the power of the analysis, each of the interview questions may be approved by more than one previous study. Also they helped the researcher to analyze the content of some marketing activities of the company.
6. Investigation of a valuable conclusions and recommendations.

This research distinct among the previous study through the following:

1. Addressed the marketing and CRM applications of DM from of all aspects of customer relationship management (CRM); customer identification, customer attraction, customer retention and customer development, especially in mobile telecommunication business; such as customer segmentation, churn treatment, cross/up selling, direct marketing and etc.

2. This study extracted reality of applying the CRM and marketing applications of DM through holding five interviews with well informed persons, beside the content analysis of real marketing activities of mobile telecommunication business such as marketing campaigns, services and offers more than focusing on technical details.
3. This research will add a new and distinctive value to the local and arabic studies that discussed marketing and CRM; where the researches that discussed the marketing and CRM applications of DM extremely limited.
4. Extracting diagram shows the contribution of data mining technology in CRM and marketing through illustration the relationship between customer data (data warehouse), Data mining techniques, CRM and marketing applications and customer satisfaction and profitability.

Chapter 2 **:Literature Review**

- Relationship Marketing
- Customer Relationship Management (CRM)
- CRM Technologies
- Analytical CRM
  - Overview
  - Profiling & Segmentation
  - Behavior Modeling
- Data Warehousing (DW)
  - Overview
  - Data Sources
  - DW Implementation Method
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- Data Mining Technology
  - Definition and Importance
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  - Data Mining Vs. Statistics
- Data Mining Contribution For building CRM strategy
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  - Data Mining - Customer Attraction
  - Data Mining - Customer Development
  - Data Mining - Customer Retention
- How to Build Business Applications via Data Mining ?
- Telecomm. Industry
  - Telecom Core Segments
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  - Mobile Value Added Services
- Data Mining Challenges and Opportunities In CRM
- Success Factor for Adoption CRM

2.1 Relationship Marketing (RM)

The evolution of relationship marketing has been one of the most significant developments in marketing since the 1990'. (Chattananon et al., 2008). RM emerged as a popular new paradigm in the 1980s , this happened , in part , as a result of a shift in focus from customer acquisition to customer retention (Chakravorti 2006). Relationship marketing proposes that closer attention is paid to long term financial growth and other benefits or retained customers, (Heffernan et al., 2008). Although, relationship marketing has been heralded as an effective strategy to attract, maintains and enhances customer relationship (Robert et al., 2003). While traditional marketing tries to make the sale and find new customers (Zineldein et al., 2007), or it's about acquiring customers, rather that retaining them (Ward et al., 2005).

Gronroos (1994) defines relationship marketing as follows: "Marketing is to establish, maintain, and enhance relationships with customers and other partners, at a profit, so that the objectives of the parties involved are met. This is achieved by mutual exchange and fulfillment of promises". While, Zinkhan (2002) defines relationship marketing, "as an approach to establish, maintain, and enhance long-term associations with customers and other stakeholders." On the other hand, Copulinsky and Wolf (1990) define relationship marketing from a different prospective with emphasis on the role of the IT as a "process where the main activities are to create a database including existing and potential customers, to approach these customers using differentiated and customer-specific information about them, and to evaluate the life-term value of every single customer relationship and the costs of creating and maintaining them."
Referring to the above definitions, RM can also be called "one-to-one marketing, which shifts the focus of marketing exchange from transactions to relation with individual customers. (Chakravorti 2006) Fig(2.1).

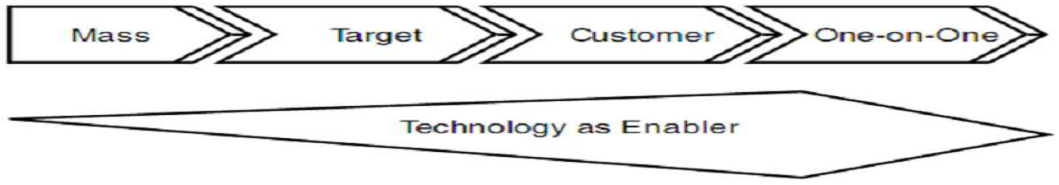


Figure 2-1: Marketing Evolution (*Source*: Chakravorti, 2006)

Therefore, In order to put the concept of relationship marketing into practice, firms need to identify the customers they want to enhance and maintain relationship with, differentiate each customer as to their unique needs and preferences , interact with those customers to enhance customers learning and finally customized product and services for each customer. This process of customer relationship management requires information and communication process to be in place, as well as technology and data repositories of customer data. The better and more sophisticated these are the more they will enable relationship (Chakravorti 2006). So CRM is the values and strategies or relationship marketing with particular emphasis on customer relationships turned into practical application (Peelen et al., 2006). Another trace of CRM's origins can be found in relationship marketing. Plakoyiannaki and Tzokas (2002) indicated that practitioners and academics suggest that customer relationship management (CRM) provides an actual plat for the operational manifestation of relationship marketing.

2.2 Customer Relationship Management (CRM) Strategy

Since the 1990s, customer relationship management (CRM) has grown rapidly (Buttle, 2004). Customer relationship management is built on relationship marketing philosophy and redefines the relationship between companies and their customers. Some researchers have defined CRM as a competitive strategy companies adopt to focus on their customer's needs, but others regard it as a discipline to concentrate on development and automation of business process in companies. However, despite the variety of definitions of CRM, they all intend to build customer relationship to create superior value for both the customers and firms (Chatterjee, 2000 cited in Shahin & Nikneshan, 2008). And Increased product availability and mass production techniques have given this chance to customers to be able to choose the items they really desire among the variety of products. Therefore, focusing on customers' expectations is the most important factor for firms to survive in today market places. On the other hand, knowing customer's needs and problems helps the companies to acquire and retain them easier and with less cost (Dimitriadis & Stevens, 2008).

There are many of CRM definition that listed below:

- "CRM as an enterprise approach to understanding and influencing customer behavior through meaningful communications in order to improve customer acquisition, customer retention, customer loyalty, and customer profitability (Swift 2001, p. 12).

- “(CRM) as the process of managing detailed information about individual customers and carefully managing all customer "touch points" to maximize customer loyalty" (Kotler & Keller, 2010).

- “CRM as the strategic use of information, processes, technology, and people to manage the customer's relationship with your company (Marketing, Sales, Services, and Support) across the whole customer life cycle" (Kincaid 2003) .

- “CRM as a comprehensive strategy and process of acquiring, retaining, and partnering with selective customers to create superior value for the company and the customer. It involves the integration of marketing, sales, customer service, and the supply chain functions of the organization to achieve greater efficiencies and effectiveness in delivering customer value (Parvatiyar and Sheth, 2001).

- Chen and Chin (2004) defined "CRM as a methodology that heavily employs certain information technology (IT) such as databases and the internet to leverage the effectiveness of the relationship marketing process (Chen and Chin, 2004).

- “CRM is an IT enhanced value process, which identifies, develops, integrates and focuses the various competencies of the firm to the “voice” of the customers in order to deliver long-term superior customer value, at a profit, to well identify existing and potential customer segments.” (Starkey, 2002).

- "CRM is a process designed to gather data of customers, to grasp features of customers, and to apply those qualities in specific marketing activities" (Swift, 2001).

- "CRM is an information industry term for methodologies, software, and usually internet capabilities which focuses on leveraging and exploiting interactions with the customer to maximize customer satisfaction, ensure return business, and ultimately enhance customer profitability" (Choy *et al.*,2003).

After reviewing the illustrated definitions of the CRM strategy, the following points are concluded:

1. All definitions consider CRM as a supportive tool or process to increase the customer loyalty and profitability.
2. The definitions neglect the role of culture in motivation employees to adopt CRM philosophy.
3. Most of definitions focus on the customer satisfaction of the profitable customers.
4. Most of definitions include the customer loyalty, customer satisfaction and customer profitability.

This study considers the CRM strategy as business philosophy that must be particularly adopted by the top management. The process, technology, people and culture are considered as supportive tools to implement this philosophy, and if there are effective integration between these factors, the goal of the CRM in customer satisfaction and maximizing profits will be achieved. And these factors combined to do best efforts to acquire, retain and develop the customer.

Upon this, the following definition is suggested to CRM strategy **"as business philosophy that based on the strategic use and managing of technology, people, process and culture to increase the customer satisfaction and profitability and this investigated by managing and analysis of the customer data (demographic, behavior and financial) to acquire, develop and retain customer, with extra interest in valuable customers"**.

The following figure introduced to demonstrate the CRM strategy.

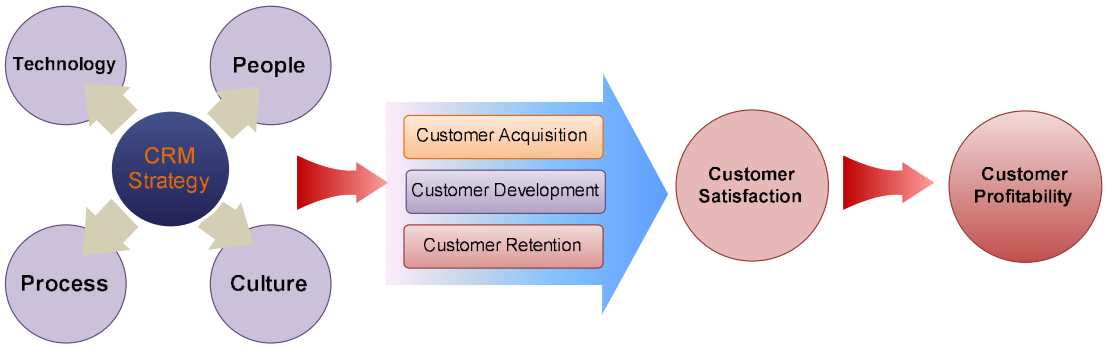


Figure 2-2: CRM Strategy (Source*: Conceptualized by the researcher*)

2.3 CRM Benefits

According to Xu and Walton (2005), the motivating factors for companies moving towards CRM technology are to improve customer satisfaction level, to retain existing customers, to improve customer lifetime value, to provide strategic information from the CRM systems and to attract new customers. The above-mentioned five factors are the results of four surveys done by Sweet (2001- 4) from 2001 to 2004. Among them, the first three factors have been appeared more important than the last two factors. This shows that most managers accept the view that gaining a new customer is more costly than retaining an existing customer.

The following benefits were collected and summarized from an extensive survey of recent CRM studies (Keith et al., 2008):

1. Help to target profitable customers;
2. Introducing integrated offering through across channels;
3. Improve sales force efficiency and effectiveness;
4. Individualized marketing messages;
5. Customized products and services;
6. Improved customer service efficiency and effectiveness; and
7. Improved pricing.

Based on Newell (2000), Persson (2004) discusses that a real value to a firm is the value it creates for the customers as well as the value its customers deliver back to that firm. Farooqi & Raza (2011) illustrate the benefits of CRM in the following points:

- CRM permits business to leverage information from their databases to achieve customer retention and to cross sell new products.
- Companies that implement CRM make better relationships with their customers achieve loyal customers and a substantial payback increased revenues and reduced cost.
- Low maintenance and expansion cost owing to the use of modern administration tool which allow bank employee to make a wide range of modification to the system.
- CRM focus upon profitable client through efficient segmentation according to individual behavior.

- CRM results both in higher revenue and lower cost making companies more effective and efficient.

2.4 CRM Technologies

CRM is an information industry term for methodologies, software, and usually internet capabilities which focuses on leveraging and exploiting interactions with the customer to maximize customer satisfaction, ensure return business, and ultimately enhance customer profitability (Xu & Walton, 2005). For example, Rowley (2004) suggests that CRM systems include online order, e-mail and knowledge bases that can be used to generate customer profiles, and to personalize service. Park and Kim (2003) argue that companies empowered with advanced information technologies can collect huge amount of data on their customers and turn them into information Park and Kim for their strategic business purposes.

According to Xu et al. (2002), the first wave of CRM solutions came in the late 1980s and early 1990s. The providers of these products are Clarify (now owned by Nortel Networks Corp.), Onyx Software, Oracle, Vantive (acquired by PeopleSoft) and Siebel Systems. These packaged solutions emphasize automating and standardizing the internal processes that relate to acquiring, servicing and keeping customers. As mentioned, CRM technologies are the tools enabling the firms to get the right information to the right person at the right time and are divided into three parts of, communicational, operational and analytical‘ technologies (Keramati et al., 2010).:

Operational CRM:

Includes daily communication with clients. It provides support for **"front office"** business processes. Customer data is collected through a whole range of touch points such as, contact centre, contact management system, mail, fax, sales force, web, marketing and service departments, etc. The data then are stored and organized in a customer centric database, which is made available to all users who interact with the customer. This system gives employees immediate access to important information about the customer (Habul & Velic, 2010).

The benefit of this type of CRM is to personalize the relationship with the customer, and to broaden the organizational response to the customer’s needs. (Xu & Walton, 2005). The results of the analytical CRM procedures should be loaded and

integrated into the operational CRM front-line systems so that all customer interactions can be more effectively handled (Tsiptsis & Chorianopoulos, 2009).

Collaborative / Communicational CRM:

The CRM systems are integrated with enterprise-wide systems to allow greater responsiveness to customers throughout the supply chain (Kracklauer and Mills, 2004). A CRM can be extended to "front office " sources such incorporate employees, suppliers, or partners. includes all channels of interaction with them; offices, telephone contacts, e-mail, web pages, contacts, etc.

Analytical CRM:

Analytical Customer Relationship Management means the collection, storage, extraction, processing, reporting and interpreting customer data. The advantage of these applications is the use of data from multiple sources and their interpretation through appropriate procedures, depending on the needs and purposes which are trying to achieve (Habul & Velic, 2010). Analytical CRM, also known as back-office or strategic CRM involves understanding the customer activities that occurred in the front office and enables an organization to analyze customer relationships through data mining (Gefen & Ridings, 2002; Shaw, 2001).

Connection between business intelligence (BI) applications and CRM is the most pronounced within analytical CRM, given that customers related data analysis tools need management support. (Habul & Velic, 2010).

Figure 2.3 illustrate the relationship between the CRM technologies, and each technology plays role for building customer insight. Analytical CRM is referred by Kotorov (2002) as a 360° view of the customer.

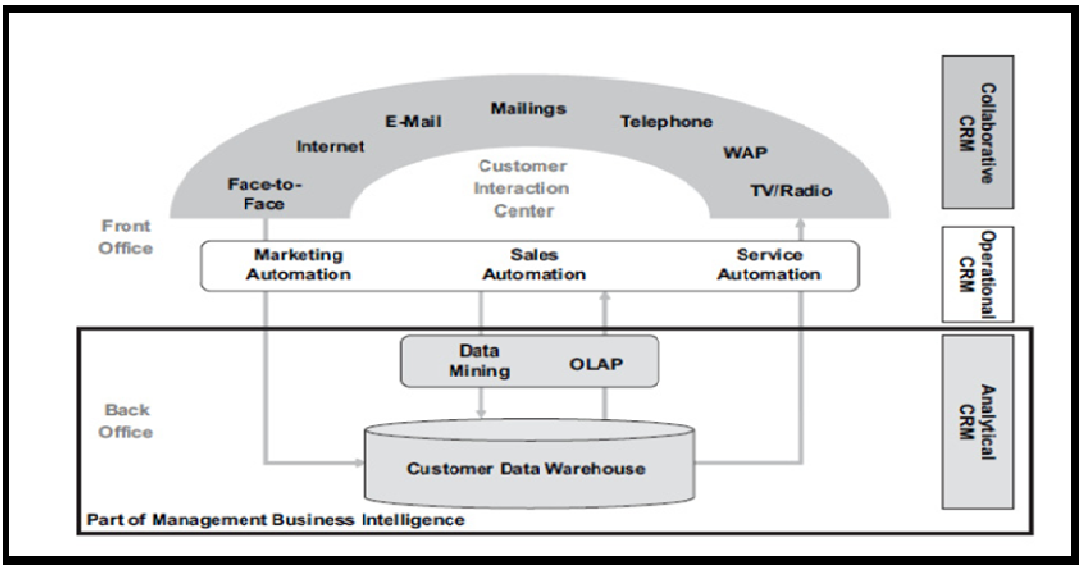


Figure 2-3: Customer relationship management and Business intelligence (*Source: Baars & Kemper, 2008; Hippner & Wilde, 2004*)

2.5 The Analytical CRM

2.5.1 Analytical CRM - Overview

The CRM analytics model is an earlier concept that has evolved to meet modern-day requirements. Analytical CRM is the mining of data and the application of mathematical, and sometimes common-sense, models to better understand the consumer. By extrapolating useful insights into market and customer behaviors, companies can adjust business rules and react to customers in a relevant, personalized manner (Sharp, 2003).

Analytical CRM is about analyzing customer information to better address the CRM objectives and deliver the right message to the right customer. It involves the use of data mining models in order to assess the value of the customers, understand, and predict their behavior. It is about analyzing data patterns to extract knowledge for optimizing the customer relationships (Tsiptsis & Chorianopoulos, 2009).

Technologies supporting the analytical CRM system include CRM portals, data warehouses, predictive and analytical engines (Eckerson and Watson, 2001); pattern discovery association rules, sequential patterns; clustering, classification and evaluation of customer value (Ahn *et al.*, 2003).

Xu and Walton (2005) assert that the essential of acquiring customer knowledge is to know not only who they are (customer profiling and segmentation) but also how they behave and what pattern they follow. Customer knowledge acquisition should be considered as a continuous and dynamic process, to collect information about new customers, existing customers (internal) and defecting customers (cross-organizational boundary). Knowledge about prospective customers and customers who are loyal to competitors (external) should also be attained. Managers need to be aware of the power of analytical CRM systems and the strategic importance of gaining customer knowledge (cited from Zavareh, 2007).

An analytical CRM system model that enables customer knowledge provision is developed and shown in Figure 2.4

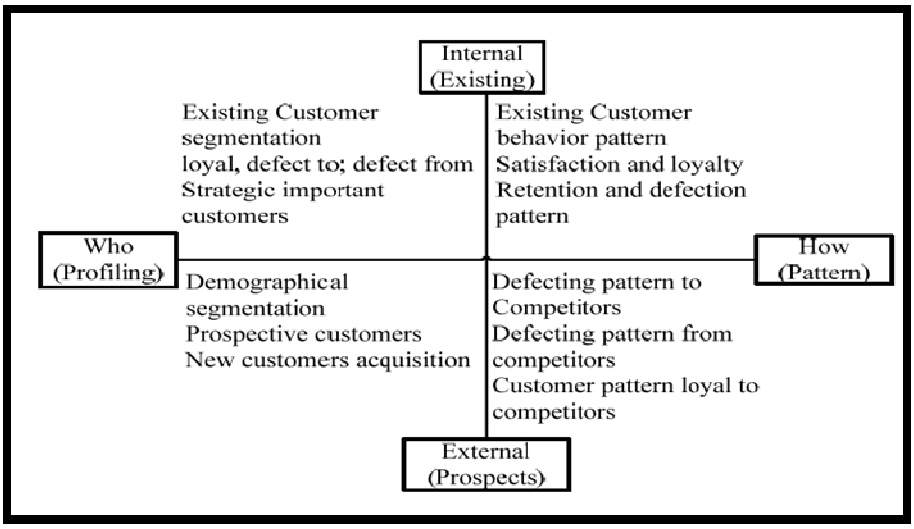


Figure 2-4: An Analytical CRM for Customer Knowledge Acquisition(*Source: Adopted from Xu and Walton, 2005, p. 963*)

Xu and Walton (2005) further state that although retaining existing customers is perceived more important than acquiring new customers, turning external and potential prospective customers into the company's customer is often the battleground between competitors. Attracting external customers reflects a manager's open and forward vision which is often judged as a strategic competence of senior managers. Knowing prospective customers and customers loyal (or defecting) to competitors is an asset to CRM. The analytical CRM system offers the function of profiling and analyzing prospective customers. This requires data to be fed into the CRM from both internal and external sources. The CRM may also need to be integrated with a competitive

intelligence system in order to profile and analyze customers that are loyal or have defected to the competitors (cited from Zavareh, 2007).

2.5.2 Analytical CRM – Profiling & Segmentation

In addition to identifying strategically significant customers, the analytical CRM system will help profile and segment existing customers. Customer profiling integrates several aspects of customers into a rational evaluation, such as customer details, historical records and contact details, customer attractiveness, or customer satisfaction (Zavareh, 2007).

It should be noted that the collected information through different channels must be integrated in a proper database. In the next step, with the help of operational CRM and considering the gained feedbacks, analytical CRM creates various customer segments to help designing proper customer strategies. All in all, to perform this process efficiently, all of these activities should be arranged and conducted one after another (Keramati et al., 2009a; Reinartz et al., 2004).

Xu & Walton (2005) also argue for the benefits of profiling customers to find each customer value to the firm. To find out which customers are of high value they view the following factors as important:

- Product cost
- Cost to acquire
- Cost to serve
- Cost to retain
- Retention & Loyalty Probability

Smith (2006) contends that segmenting customers provides approaches to better understand their preferences and to more efficiently allocate resources based on the information. The benefit is twofold: First, it enables companies to differentiate themselves by providing appropriate and suitable services for their customers' needs; therefore, building up a competitive advantage. Second, it guides the companies to where their most valuable customers are located and helps allocate major capital, effort and time to generate the most profit (Zavareh, 2007).

Meadows and Dibb (1998a) argue that segmentation is a key method employed by banks to better understand and service their customers in this increasingly competitive environment (Durkin M. G., 2004).

Xu and Walton (2005) distinguished four criteria for segmenting customers: customer profitability score, retention score, satisfaction and loyalty score, response to promotion. People-Soft uses a customer scorecard to track key performance measurements and communicate progress against CRM-related goals.

According to Tsiptsis & Chorianopoulos (2009), different segmentation types are used for different business situations. The following segmentation types are most widely used:

a) **Value based:** In value-based segmentation customers are grouped according to their value. This is one of the most important segmentation types since it can be used to identify the most valuable customers and to track value and value changes over time. Customer Lifetime Value (CLV) is generally defined as the present value of all future generated profits (Gupta. Hanssens. et al. 2006).
b) **Behavioral:** This is a very efficient and useful segmentation type. It is also widely used since it presents minimal difficulties in terms of data availability.
c) **Propensity based:** In propensity-based segmentation customers are grouped according to propensity scores, such as churn scores, cross-selling scores, and so on.
d) **Loyalty based:** Loyalty segmentation involves the investigation of the customers' loyalty status and the identification of loyalty-based segments such as loyals and switchers/ migrators.
e) **Socio-demographic and life-stage:** This type reveals different customer groupings based on socio-demographic and/or life-stage information such as age, income, marital status. This type of segmentation is appropriate for promoting specific life-stage-based products as well as supporting life-stage marketing.
f) **Needs/attitudinal:** This segmentation type is typically based on market research data and identifies customer segments according to their needs, wants, attitudes, preferences.

2.5.3 Analytical CRM – Behavior Modeling

Brige (2006) argues that in CRM environment, the database is used primarily as a resource from which commercial benefit is derived by leveraging patterns of customer behavior. Xu and Walton (2005) defined customer behavior modeling as a process that consists of segmenting target customer groups, establishing criteria for measuring behavior, monitoring and tracking behavior changes, generating behavior patterns, and predicting possible future behavior. They further explore that different customer segments may have different behavior patterns and therefore modeling customer behavior needs to select a particular customer group. For example, it would be useful to know how strategically significant customers perceive the company, interact with the company and respond to the company's offerings and promotions.

Xu and Walton (2005) further explain that customer behavior needs to be continuously monitored and tracked in order to identify customer behavior patterns and trends, and to detect any abnormal behavior or emerging patterns for managers' attention. Monitoring and tracking should be based on the pre-defined criteria to guide what to monitor and how.

To succeed with CRM and address the aforementioned objectives, organizations need to gain insight into customers, their needs, and wants through data analysis. This is where analytical CRM comes in. Analytical CRM is about analyzing customer information to better address the CRM objectives and deliver the right message to the right customer. It involves the use of data mining models in order to assess the value of the customers, understand, and predict their behavior. It is about analyzing data patterns to extract knowledge for optimizing the customer relationships (Tsiptsis & Chorianopoulos , 2009).

2.6 Data warehousing (DW)

2.6.1 Overview

Companies that do not have an integrated information about customers, actually does not know their customers and can't offer personalized products and services and don't satisfy their customers. For this reason, it is important that information about customers are stored in one place and available to everyone in the organization. This can be achieved by building Customer Data Warehouse. Without functional integration

of DW as the foundation, there is no successful relationship with customers or acquiring new knowledge in the form of Business Intelligence (Habul & Velic , 2010).

Also DW is The first step toward building any data mining project or program is to gather data. Most business already performs these data gathering tasks to a very high extent (Chapple, 2005). DW is a database system designed to support organizational decision processes and is separate from traditional transaction processing systems (Gray & Watson, 1998). And according to Mannino, Hong & Choi (2007), DW as A central depository where data from operational databases and other sources are integrated, cleaned, and archived to support decision making. So it considered more comprehensive and reality.

Data mart is a mini version from the data warehouse of the organization, data marts are databases or systems that designed for a specific department such as marketing, sales or logistics. A data mart is a subset of the DW that contains data relating to a portion of the firm's transactions (Zikmund, Raymond & Gilbert, 2003), and the data mart is considered more popular for building data mining and business intelligence applications, where this save more time, cost and effort and less risk.

2.6.2 Data Sources

According Vercellis (2009), It is possible to identify two main categories of data feeding into a data warehouse: internal data , external data.

Internal Data :

Internal data are gathered through transactional applications that routinely preside over the operations of a company, such as administration, accounting, production and logistics. This collection of transactional software applications is termed enterprise resource planning (ERP).The data stored in the operational systems usually deal with the main entities involved in a company processes, namely customers, products, sales, employees and suppliers.

These data usually come from different components of the information system:

- **Back-office systems ,** that collect basic transactional records such as orders, invoices, inventories, production and logistics data;

• **Front-office systems** , that contain data originating from call-center activities, customer assistance, execution of marketing campaigns;

• **Web-based systems** , that gather sales transactions on e-commerce web-sites, visits to websites, data available on forms filled out by existing and prospective customers.

External Data :

There are several sources of external data that may be used to extend the wealth of information stored in the internal databases. For example, some agencies gather and make available data relative to sales, market share and future trend predictions for specific business industries, as well as economic and financial indicators. Other agencies provide data market surveys and consumer opinions collected through questionnaires. A further significant source of external data is provided by geographic information systems (GIS), which represent a set of applications for acquiring, organizing, storing and presenting territorial data.

Finally, according Pareek (2007), data warehouse (DW) databases are popular sources for data-mining applications because they contain a wealth of internal data from across business boundaries, which was gathered, consolidated, validated, and cleansed in the extract/transform/load process. DW databases may also contain valuable external data, such as regulations, demographic, or geographic data, which when combined with internal organizational data offer a firm foundation for data mining.

2.6.3 Data Warehouse Implementation Methods

There are numerous ways to build and deploy a data warehouse environment, but a few primary methods have emerged (see Figure 2.5).

Top-Down Approach

The top-down approach calls for a single, centralized data warehouse containing both summary and detailed data and smaller dependent data marts that derive all their data from the data warehouse.

The Bottom-Up Approach

The goal of the bottom-up approach is to "deliver business value by deploying dimensional data marts as quickly as possible." This approach is both flexible and user-friendly. And, because heavy infrastructure is not required at the outset, value is delivered quickly.

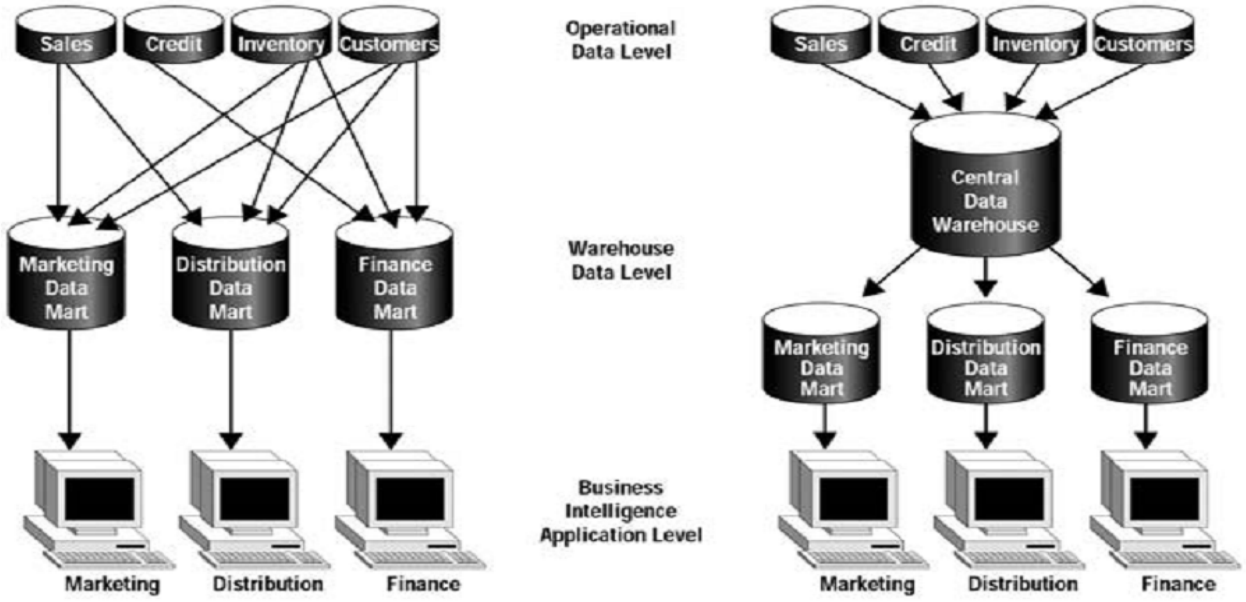


Figure 2-5: Data Warehouse Implementation Methods (*Source: Pareek, 2007*)

2.6.4 Data Quality

Vercellis (2009) identified the following major factors that may affect data quality:

- **Accuracy.** To be useful for subsequent analyses, data must be highly accurate. For instance, it is necessary to verify that names and encodings are correctly represented and values are within admissible ranges.
- **Completeness.** In order to avoid compromising the accuracy of business intelligence analyses, data should not include a large number of missing values. However, one should keep in mind that most learning and data mining techniques are capable of minimizing in a robust way the effects of partial incompleteness in the data.
- **Consistency.** The form and content of the data must be consistent across the different data sources after the integration procedures, with respect to currency and measurement units.

- **Timeliness.** Data must be frequently updated, based on the objectives of the analysis. It is customary to arrange an update of the data warehouse regularly on a daily or at most weekly basis.
- **Non-redundancy.** Data repetition and redundancy should be avoided in order to prevent waste of memory and possible inconsistencies. However, data can be replicated when the denormalization of a data warehouse may result in reduced response times to complex queries.
- **Relevance.** Data must be relevant to the needs of the business intelligence system in order to add real value to the analyses that will be subsequently performed.
- **Interpretability.** The meaning of the data should be well understood and correctly interpreted by the analysts, also based on the documentation available in the metadata describing a data warehouse.
- **Accessibility.** Data must be easily accessible by analysts and decision support applications.

Also, Vercellis (2009) affirmed the significance to verify, preserve and improve the quality of data is a constant concern of those responsible for the design and updating of a data warehouse. The main problems that might compromise the validity and integrity of the data are shown in Table 2.1.

Table 2-1: Main problems that might compromise the validity and integrity of the data (*Source: Vercellis, 2009*)

Problem	Cause	Remedy
Incorrect data	• data collected without due care. • data entered incorrectly. • uncontrolled modification of data.	• systematic checking of input data • data entry automation • implementation of a safety program for access and modifications
Data not updated	• data collection does no match user needs	• timely updating and collection of data • retrieval of updated data from the web
Missing data	• failure to collect the required data	• identification of data needed via preliminary analysis and estimation of missing data

2.7 Data Mining Technology

2.7.1 Data, Information & Knowledge

Data now play very important role in the business development and business intelligence. a vast amount of data are accumulated within the information systems of public and private organizations. These data originate partly from internal transactions of an administrative, logistical and commercial nature and partly from external sources. even though these data can gathered and stored in organized and structured way, but these data not useful to for decision making processes. They need to be processes by means of extraction, analytical and statistical tools able to transforming data into information and knowledge that be used by decision makers (Vercellis, 2009). Adderly (2002, p.5) considered the primary challenge for businesses is how to make the database a competitive business advantage by converting seemingly meaningless data into useful information.

The difference between data, information and knowledge can be better understood through the following remarks.

Data : Generally, data represent a structured codification of single primary entities, as well as of transactions involving two or more primary entities such as customers points of sale and items.

Information: Information is the outcome of extraction and processing activities data generated from different activities , and it appears meaningful for users. For example, to the sales manager of a retail company, the proportion of sales that exceed 100 per week, or the number of customers that their minutes of usage (MOU) exceed 3,000 minutes per month for telecom company, this represent meaningful pieces of information that can be extracted from raw stored data.

Knowledge. Information is transformed into knowledge when it is used to make decisions and develop the corresponding actions. For a retail company, a sales analysis may detect most of customers ages full between 18-25 year, so the knowledge extracted in this case will lead to do specific actions, where the marketing manager can as design marketing campaign suitable for those customers.

Data, information and knowledge have become valuable resources for societies, organizations, actors and governments of all kind. Many organizations have recognized the importance of data that is has accumulated over time and seek ways to increase its value. Hence, the need for both organizations and government agencies to generate, to collect and to utilize data in public and private sector activities is increasing. For example, organizational and governmental complexities are growing and simultaneously the potential of data mining is becoming more evident (*Syväjärvi* a el, 2009).

Data is at the heart of many core business processes. It is generated by transactions in operational systems regardless of industry — retail, telecommunications, manufacturing, health care, utilities, transportation, insurance, credit cards, and financial services, for example. Adding to the deluge of internal data are external sources of demographic, lifestyle, and credit information on retail customers; credit, financial, and marketing information on business customers; and demographic information on neighborhoods of all sizes (Linoff & Berry, 2011).

Vercellis (2009) demonstrate the different between that knowledge management and business intelligence, where the that knowledge management method primarily focus on the treatment of information that is usually unstructured, at times implicit, contained mostly in documents, conversations and past experience. And conversely business intelligence systems are based on structured information, most often of a quantitative nature and usually organized in a database. And this distinction is sometimes fuzzy where Business intelligence systems also has the ability to analyze unstructured information such as emails and web pages through text mining methods.

Terblanche and Du Toit (1996) assert that information has increasingly been considered as an important resource to be utilized by business enterprises. They acknowledge that information is a resource that can be effectively used in marketing, decision-making which improves productivity, competition and performance in enterprises.

Du Toit and De Villiers (1995) state that an enterprise's ability to develop appropriate competitive advantage depends largely on the quality and the value of its knowledge and information resources. If information is efficiently managed, the competitive position of the business enterprise can be strengthened at a strategic level. Hence meaningful information can be used as a strategic weapon for achieving greater value and gain competitive advantage among competitors (DuToit,1995:29).

Du Toit and De Villiers (1995) argue that information can make the difference in the enterprise's survival against aggressive competitors. Hence the enterprise's ability to develop an appropriate competitive strategy depends largely on the quality and the value of information. Wilson (1993) as quoted in De Villiers and Du Toit (1995:2) postulates that the value of information can be ascribed by many factors such as relevancy, accuracy, clarity, timeliness and Comprehensiveness.

2.7.2 Data mining & Knowledge Discovery

The digital revolution has made digitized information easy to capture, process, store, distribute, and transmit (Fayyad *et al*., 1996). With significant progress in computing and related technologies and their ever-expanding usage in different fields, a huge volume of data are collected and stored in the different databases in all industries such as: Manufacturing and Production, Business and Marketing, Finance and Investment, Telecommunication, Digital library, Health care, Internet and etc. This make discovery of knowledge from this huge volume of data is a challenge indeed. Data mining is an attempt to make sense of the information explosion embedded in this huge volume of data (Frawley *et al.*,1991). Where Berry and Linoff (2011), see the promise of data mining is to find the interesting patterns from all these billions and trillions of bits stored on disk or in computer memory. And necessity to turning data into information, information into action, and action into value. And modern, Berry and Linoff (2011) state data mining has gone by many different names, such as knowledge discovery, business intelligence, predictive modeling, predictive analytics, and so on. And they defined Data mining as a business process for exploring large amounts of data to discover meaningful patterns and rules. This study considers this definition. And there are other definitions as follow:

- Data Mining is the nontrivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data (Fayyad *et al.*, 1996).
- Data Mining is the process of exploration and analysis of large quantities of data in order to discover meaningful patterns and rules from large amounts of data (Berry and Linoff, 2004).
- Data mining is "the process of selecting exploring and modeling large amount of data to uncover previously unknown data patterns for business advantage" (SAS Institute, 2000).
- Turban, Aronson, Liang, and Sharda (2007), defines data mining as "the process that uses statistical, mathematical, artificial intelligence and machine-learning techniques to extract and identify useful information and subsequently gain knowledge from large databases".
- Data Mining is the process of discovering interesting knowledge from large amounts of data stored either in databases, data warehouses, or other information repositories. Simply stated, data
- Data mining refers to extracting or "mining" knowledge from large amounts of data (Han and Kamber, 2006).
- Data mining involves the use of sophisticated data analysis tools to discover previously unknown, valid patterns and relationships in large data sets. These tools can include statistical models, mathematical algorithms, and machine learning methods. Thus, data mining is not only collecting and managing data; it also includes analysis and prediction (Kaptan et al., 2002).

Actually the major reason that data mining has attracted a great deal of attention in the information industry and in society as a whole in recent years is due to the wide availability of huge amounts of data and the imminent need for turning such data into useful information and knowledge (Han and Kamber, 2006).

The data mining process is sometimes referred to as knowledge discovery or KDD (knowledge discovery in databases). The term "KDD" (Knowledge Discovery in Databases) refer to the overall process of discovering useful knowledge from data. There is a difference in understanding the terms "knowledge discovery" and "data mining" between people from different areas contributing to this new field (Javaheri,

2008). Knowledge discovery in databases is the process of identifying valid, novel, potentially useful, and ultimately understandable patterns/models in data.

Data mining is a step in the knowledge discovery process consisting of particular data mining algorithms that, under some acceptable computational efficiency limitations, finds patterns or models in data (Ho, nd).

Although Knowledge Discovery term is more appropriate but is assumed that Data mining is equal to Knowledge Discovery, and this returned t causes that data mining step is the most significant and critical step in KKD and his lead to be more common between knowledge workers, also "data mining" is attractive name and come from mining of gold, finally data mining term is older than KDD term which was invented in Statistics Data Analysis Association (Shapiro, 2000), and Linoff & Berry (2011), mention that data mining has gone by many different names, such as knowledge discovery, business intelligence, predictive modeling, predictive analytics.

2.7.3 Data Mining - Evolution & Adoption

The process of research in DM applications is modern approach for all businesses, and in the late 20th century, scientists were focused on theoretical bases for Data Mining, and improvements and upgrading of the Data Mining algorithms and methods (Witten & Frank, 2005). Also In the 21st century, the focus is moved toward scientific research on Data Mining applications of real environment, which have real necessity for these applications on the market (Berry & Linoff, 2004).

Due to the constant increase in the amount of data efficiently operable to managers and policy makers through high speed computers and rapid data communication, there has grown and will continue to grow a greater dependency on statistical methods as a means of extracting useful information from the abundant data sources (Jahromi, 2009).

Data mining techniques are the result of a long term research and product development and their origin have roots in the first storage of data on computers, which was followed by improvement in data access (Rygielski, Wang, & Yen, 2002). and the evolution of data mining lies within four stages classified as follow :

1. **First stage :** Data Collection

Related with collecting data from different sites to make simple calculations such as summations or averages.

2. **Second stage** :Data Access

Using databases to store data in a structured format, and using them to provide queries about historical events.

3. **Third stage :** Data Warehousing and Decision Support

This stage include building large data propensity or data warehouse that contains data from different sites, providing online information and queries, also adopting multidimensional databases for decision making process.

4. **Fourth stage :** Data Mining

Relying on Advanced algorithms and statistical tool to support decisions specially for prediction, classification and analysis purposes.

Table2-2: Evolutionary stages of data mining (*Source: Rygielski, Wang, & Yen, 2002*)

Evolutionary Step	Business Question	Enabling Technologies	Product Providers	Characteristics
Data Collection (1960s)	"What was my total revenue in the last five years?"	Computers, tapes, disks	IBM, CDC	Retrospective, static data delivery
Data Access (1980s)	"What were unit sales in New England last March?"	Relational databases (RDBMS), Structured Query Language (SQL), ODBC	Oracle, Sybase, Informix, IBM, Microsoft	Retrospective, dynamic data delivery at record level
Data Warehousing & Decision Support (1990s)	"What were unit sales in New England last March? Drill down to Boston."	On-line analytic processing (OLAP), multidimensional databases, data warehouses	Pilot, Comshare, Arbor, Cognos, Microstrategy	Retrospective, dynamic data delivery at multiple levels
Data Mining (Emerging Today-1996)	"What's likely to happen to Boston unit sales next month? Why?"	Advanced algorithms, multiprocessor computers, massive databases	Pilot, Lockheed, IBM, SGI, numerous startups (nascent industry)	Prospective, proactive information delivery

There are many some factors contribute to increase the interest of business in data mining technology, that listed follow :

- The rapid growth in the means of technology such as hardware (Disks, tapes , computers, networks and communications) and software (SPSS, SAP, SAS and etc.).
- The accelerated growth in data and a large volume databases induced the firms to looking for new techniques and tools that used for turning data into meaningful information and knowledge.
- The increase of the competition level in most of industries (Retailing, Telecommunication, Banking and manufacturing), this induces the companies to use data mining to develop their business and to increase their profitability.
- Increase the dependency of manager on the information to make critical and timely decisions.
- The diversity of data mining use in many fields such as marketing, customer relationship management (CRM), defect detection, network management and etc.

Data mining technology extremely based on predictive modeling, which considered the recent and the modern approach between the business to support decision makers. this matched with The Enterprise Data Management Maturity Model that developed by Software Engineering Institute (SEI) and Carnegie Mellon University.

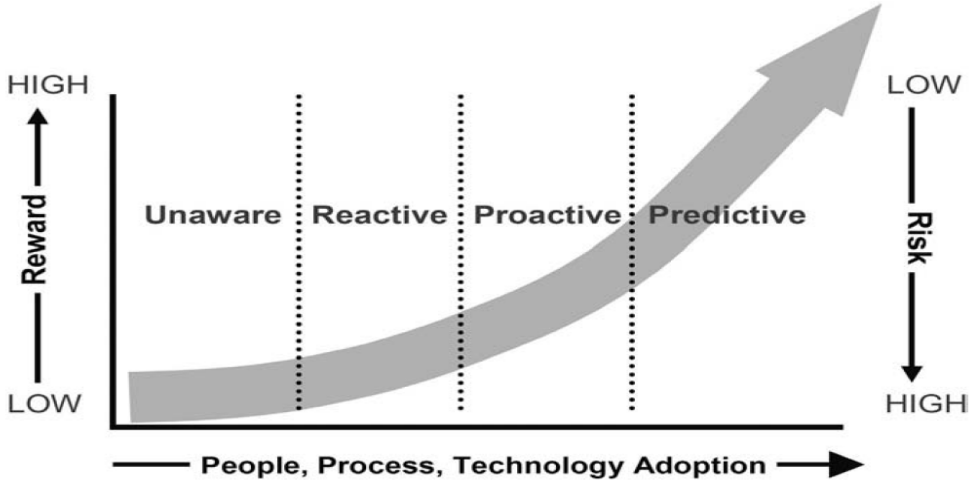


Figure 2-6: The Enterprise Data Management Maturity Model (*Source : Pareek, 2007*)

The Enterprise Data Management Maturity Model recognizes that an examination of people, processes, and technology identifies ways to improve data integrity over time for the different companies. Unaware, an organization has few defined rules and policies regarding data management. Reactive, And the organization comprehends that data is critical to its success. Data quality issues are addressed only as major problems occur or projects start to derail. Proactive, At this stage, data management starts to play a critical role within an organization, as data goes from being an undervalued commodity to an asset that can be used to help organizations make better decisions. Predictive, organizations achieve almost complete certainty of results Data quality is an integral part of all business processes, and it is engrained throughout the enterprise. In this stage the company adopt data mining technology to take critical decisions (Pareek, 2007).

2.7.4 Data Mining – Tasks & Methods

The modeling Process of the business problems using data mining technology fall in two categories of tasks:

1. **Descriptive Modeling (unsupervised):** That related with analysis of the data to understand its content and find the hidden patterns. In unsupervised or undirected models there is no output field, just inputs. The pattern recognition is undirected; it is not guided by a specific target attribute.

2. **Predictive Modeling (supervised):** that based on taking patterns discovered from the analysis of data and using them for perdition, forecasting and orienting decisions. In supervised, or predictive, directed, or targeted modeling, the goal is to predict an event or estimate the values of a continuous numeric attribute. In these models there are input fields or attributes and an output or target field.

Based on the different mining tasks, we can categorize date mining methods as classification, clustering, regression, association rules, sequence discovery, prediction, and so on (Dunham, 2002). Data mining functionalities are used to specify the kind of patterns to be found in data mining tasks (Han and Kamber, 2006). Data mining methods is shown in **Figure2.7.**

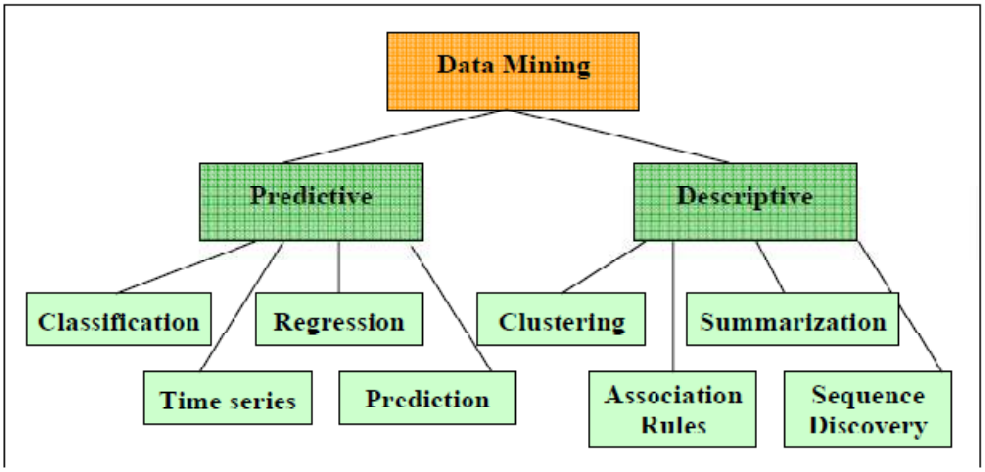


Figure 2-7 : Data Mining Tasks & Methods (*Source: Dunham, 2002*)

According to Berry and Linoff (2004) basic data mining functionalities are: Classification, Estimation, Prediction, Affinity grouping or associating rules, Clustering, Description and visualization. The first three are all examples of directed tasks of data mining, where the goal is to find the value of a particular target variable. Affinity grouping and clustering are undirected tasks where the goal is to uncover structure in data without respect to a particular target variable.

1. Classification (Supervised learning):

Classification is the most common modeling method in data mining, especially in CRM field and it is capable of predicting the effectiveness or profitability of a CRM strategy through prediction of the customers' behavior (Ngai, Xiu, &Chau, 2009). It aims at building a model to predict future customer behaviors through classifying database records into a number of predefined classes based on specific criteria (Chen, Hsu, & Chou, 2003). Classification techniques are: Decision Tree: CART, C4.5, Bayesian Classification: Consists of two type, Naive Bayesian Classification and Bayesian Belief Networks, Neural Network, Support Vector Machines, Associative Classification, Lazy Learners (or Learning from Your Neighbors): k-Nearest Neighbor Classifiers, Case-Based Reasoning. And other Classification Methods. Among all existing classification techniques Neural Network and Decision Tree are of high frequency of use respectively, but since the logic of Decision Tree is more understandable for business people than Neural Network, it should be a good choice for non-experts in data mining (Ngai, Xiu, & Chau,

2009). As Olafsson, Li, and Wu, (2008) mentioned one of the main reasons behind their popularity appears to be their transparency.

Decision tree

Decision Tree is a tree-shaped structure that represents sets of decisions and is able to generate rules for the classification of a data set (Lee & Siau, 2001. Decision tree technique is considered one of the top three popular techniques of data mining in CRM (Ngai, Xiu, & Chau, 2009). The Decision Tree technique is suitable for describing sequence of interrelated decisions or predicting future data trends (Berry & Linoff, 2004; Chen, Hsu, & Chou, 2003). A decision tree is a hierarchical collection of rules that describes how to divide a large collection of records into successively smaller segments of records. the members of the resulting segments become more and more similar to one another with respect to the target(Berry & Linoff, 2011). Specific decision tree methods include Classification and Regression Trees (CART) and Chi Square Automatic Interaction Detection (CHAID). The following figure illustrate a simplified churn prediction decision tree for the telecommunication sector:

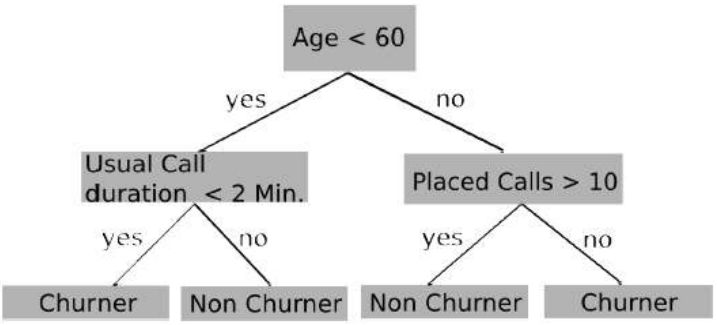


Figure 2-8: A simplified churn prediction decision tree

Each node in a decision tree is a test condition and the branching is based on the value of the attribute being tested, where if (the customer age less than 60 & the usual call duration number less than two minutes) , then the customer is likely to churn and left the company.

2. Clustering (Unsupervised learning):

Clustering is the method by which similar type of records are grouped together. Usually, clustering is done to give the end user a high-level view of what is going on in the database. Clustering is the task of segmenting a heterogeneous population into a number of more homogenous clusters (Ahmed, 2004; Berry & Linoff, 2004). As Tan, Steinbach, & Kumar (2006) defined “Partitional Clustering” is the simple splitting of a set of data objects into non-overlapping segments such that each data object is in

exactly one segment and if we permit clusters to have sub-clusters then we obtain a "Hierarchical Clustering". Clustering techniques provide the company with overall view about customers behaviors and characteristics which help the company to generate different clusters and segments, but classification techniques similar to Top-Town approach, where the company has specific and known segments and use classification techniques to extract the characteristics of each segment and to predict the similar segments that may occur in the future.

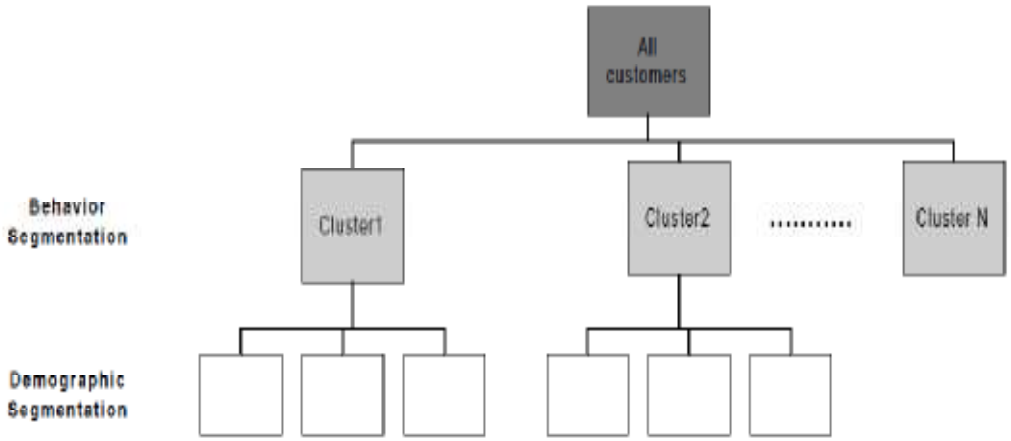


Figure 2-9:Customer Segmentation Model (*Source: Esichaikul, 2000*)

3. Estimation: Estimation deals with continuously valued outcomes. Given some input data, estimation is used to assign a value for some unknown continuous variable such as income, height, credit balance, or donation amount. Often, classification and estimation are used together, as when data mining is used to predict who is likely to respond to the fund raising campaigns of a charity organization and also to estimate the amount of money donated by each supporter (Berry and Linoff, 2004).

4. Affinity grouping or associating rules: Association rules alternatively referred to as affinity analysis. An association rule is a model that identifies specific types of data associations. Is known market basket analysis to uncover the hidden patterns(alluri, 2005) . Association aims to establishing relationships between items which exist together in a given record (Jiao, Zhang, & Helander, 2006; Mitra et al.,2002). Also association analysis enables the company to recognize about the products and services

that customers tend to purchase in the same time (allure, 2005). They are usually used in the retail sales community to identify items which are often purchased together. The task of affinity grouping is to determine which things go together (e.g. what usually goes together at a shopping cart at the supermarket). Affinity grouping can also be used to identify cross-selling opportunities and to design attractive packages or groupings of products and services (Berry and Linoff, 2004).

5. **Description and visualization:** Visualization refers to the presentation of data so that users can view complex patterns (Shaw et al., 2001). It is used in conjunction with other data mining models to provide a clearer understanding of the discovered patterns or relationships (Turban et al., 2007). Sometimes the purpose of data mining is simply to describe what is going on in a complex database, in a way that increases our understanding of the people, the products, or the processes that produced the data in the first place. A good enough description of a behavior will often suggest an explanation for it as well, or at least where to start looking for it (Berry and Linoff, 2004).

2.8 Data Mining vs. Statistical Analysis

According Pareek (2007), data mining has various purposes and different in the statistical analysis, and he propose the following table to illustrate this difference.

Table 2-3 : Data Mining vs. Statistical Analysis *(Source: Pareek, 2007)*

Data Mining	Statistical Analysis
Data mining does not require a hypothesis.	Statisticians usually start with a hypothesis (a question or assumption).
Data-mining algorithms in the tool can automatically develop the equations.	Statisticians have to develop their own equations to match their hypotheses.
Data-mining tools can use different types of data, not just numerical data.	Statistical analysis uses only numerical data.
Data mining depends on clean, well documented data.	Statisticians can find and filter dirty data during their analysis.
Data-mining results are not easy to interpret, and a statistician must still be involved in analyzing the data-mining results and conveying the findings to the business managers and executives.	Statisticians interpret their own results and convey these results to business managers and executives.

According to Vercellis (2009), in statistical analyses, decision makers formulate a hypothesis that then has to be confirmed on the basis of sample evidence by using different statistical validation techniques. But learning models, which represent the core of data mining projects, are capable of playing an active role by generating predictions and interpretations which actually represent new knowledge available to the users. The following table illustrate this.

Table 2-4: Data Mining vs. Statistics *(Source : Vercellise 2009)*

Statistics	Data Mining
Verification of hypotheses formulated by analysts to validate it. **Ex.** analysis of variance of incomes of home loan applicants	Identification of patterns and recurrences in Data to obtain knowledge **Ex.** characterization of home loan applicants and prediction of future applicants

2.9 Data mining Contribution for building CRM Strategy

Dyche (2002), the data of the customer which has to be analyzed is stored in Data warehouse, which includes the information about the company that will provide value to the customers Hence, it is very important while gathering the data of the company since it can be understandable by the user very easily, see **Figure 2.10 .**

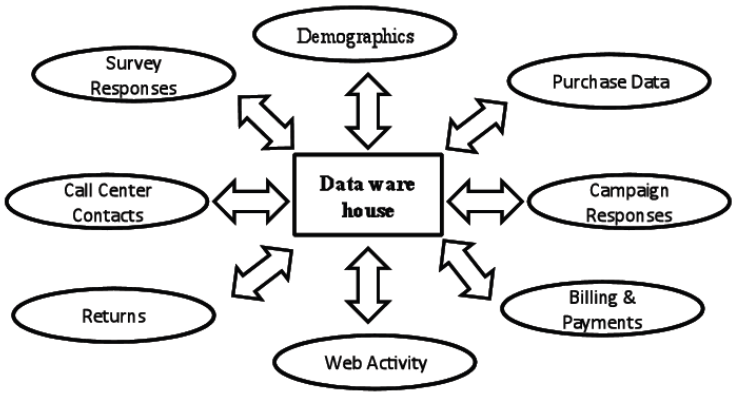


Figure 2-10: Integrated customer data on a data warehouse (*Source: Dyche, 2002*)

According to Rygielski, Wang & Yen (2002), DM support us to transform customer data, which is a company asset, into useful information and knowledge and using this knowledge for identifying valuable customers, predicting future behaviors, and make proactive and knowledge based decisions. Data mining is intelligent analysis key, and Smith (2006) states that analysis of customer data is a key part of CRM. And a

solid analysis will provide companies with a clear picture of who their customer are and what their needs are (Zavareh, 2007).

Building long-run relationship with customers and increasing the loyalty of customers need deep understanding for the customer lifecycle, Olafsson, Li, and Wu (2008) believe that a valuable customer is usually dynamic and the relationship evolves and changes over time. so, a critical role of CRM is to understand this dynamic relationship. This is achievable by studying the customer life-cycle, or customer lifetime, which refers to various stages of the relationship between customer and business (Olafsson, Li, & Wu, 2008). And most of CRM definitions extracted from the lifecycle of the customers figure (2.11).

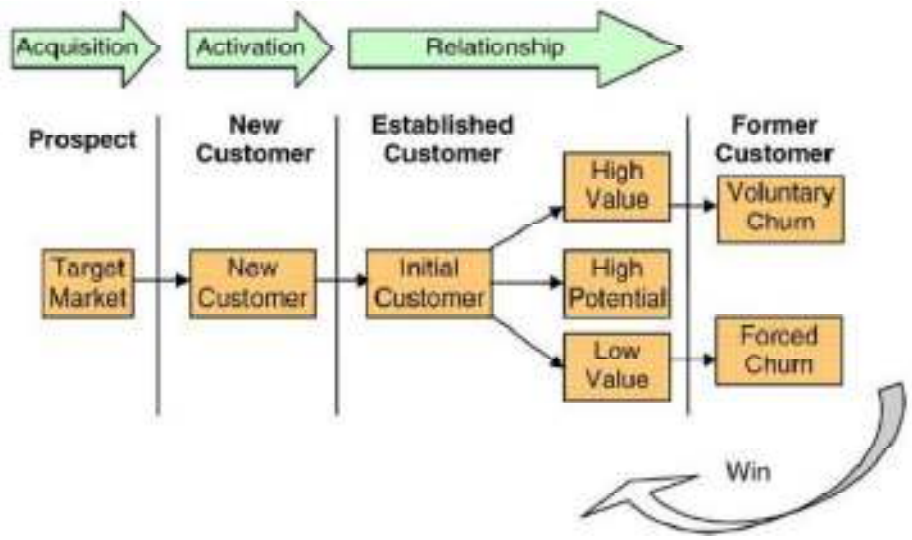


Figure 2-11: Illustration of a customer life-cycle (*Source: Olafsson, Li, & Wu, 2008*)

As it is presented in the above figure, a prospect that responds to the marketing campaigns of the company in acquisition phase, becomes a customer and this "New Customer" becomes a established one once the relationship between him/her and the company has been established and this is the point that in which the company can benefit from its established customers by revenue that comes from cross – selling and up – selling, but the peril that threatens the company in this stage is that at some point established customers stop being customers (Churn) (Olafsson, Li, & Wu, 2008). Thus, in simple words, the main goal of customer relationship management is to create satisfaction and delight among customers in order to prevent customer churn which is the most important threat that threatens all companies. It has been shown that a small change in retention rate can result in significant changes in contribution (Van den Poel & Larivie're, 2004). CRM falls in two categories; attracting new customers what he

calls offensive marketing, and keeping the existing customers, known as defensive marketing (Ryals, 2005). While acquiring new customers is the first step for any businesses to start growing, the importance of retaining customers should not be overlooked. Reinartz, Thomas & Kumar (2005) showed that insufficient allocation to customer-retention efforts will have a greater impact on long-term customer profitability as compared to insufficient allocation to customer-acquisition efforts (Reinartz, Thomas, & Kumar, 2005). As Chu, Tsai, and Ho have highlighted the cost of acquiring a new customer is five to ten times greater than that of retaining existing subscribers (Chu, Tsai, & Ho, 2007). Even if we put aside the existing studies, which mentioned that it costs more to acquire new customers than to retain the existing customers, we can consider that customer retention is more important than customer acquisition because lack of information on new customers makes it difficult to select target customers and this will cause inefficient marketing efforts (Jahromi, 2009).

According to Tsiptsis & Chorianopoulos (2009), Data mining has the ability to provide customer insight, that help to build an effective CRM strategy, where it lead personalized interactions with customers and hence increased satisfaction and profitable customer relationships through data analysis. thus have mentioned DM support an 'individualized' and optimized customer management throughout all the phases of the customer lifecycle, from the acquisition and establishment of a strong relationship to the prevention of attrition and the winning back of lost customers. Data mining models can help in all these tasks, as shown in Figure 2.12.

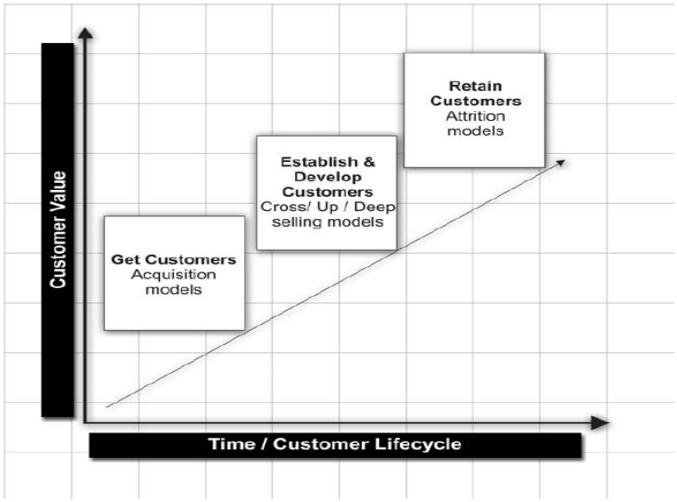


Figure 2-12: Data Mining and Customer lifecycle management (*Source: Tsiptsis & Chorianopoulos, 2009*)

According (Linoff & Berry, 2011), Every stage of the customer lifecycle offers opportunities for customer relationship management and data mining, as described throughout the chapter. The customer lifecycle is a central theme because the business processes supported by data mining are organized around that lifecycle, and they defined data mining as a business process for exploring large amounts of data to discover meaningful patterns and rules. The application of data mining tools in CRM is an emerging trend in the global economy. Analyzing and understanding customer behaviors and characteristics is the foundation of the development of a competitive CRM strategy, so as to acquire and retain potential customers and maximize customer value. Appropriate data mining tools, which are good at extracting and identifying useful information and knowledge from enormous customer databases, are one of the best supporting tools for making different CRM decisions (Berson et al., 2000).
According to Swift (2001, p. 12), Parvatiyar and Sheth (2001, p. 5) and Kracklauer, Mills, and Seifert (2004, p. 4), CRM consists of four dimensions:

(1) Customer Identification;
(2) Customer Attraction;
(3) Customer Retention;
(4) Customer Development.

These four dimensions can be seen as a closed cycle of a customer management system (Au & Chan, 2003; Kracklauer et al., 2004; Ling & Yen, 2001). They share the common goal of creating a deeper understanding of customers to maximize customer value to the organization in the long term. Data mining techniques, therefore, can help to accomplish such a goal by extracting or detecting hidden customer characteristics and behaviors from large databases. The four dimensions of the CRM cycle are essential efforts to gain customer insight (Ling & Yen, 2001).

This study considers these four dimensions to examine the role of the data mining technology for each stage of customer life cycle.

There are numerous machine learning techniques available for each type of data mining model. Choices of data mining techniques should be based on the data characteristics and business requirements (Carrier & Povel, 2003). Here are some examples of some widely used data mining algorithms:

(1) Association rule.

(2) Decision tree.

(3) Genetic algorithm.

(4) Neural networks.

(5) K-Nearest neighbor

A review of literature from 2000 to 2006 shows that 54 out of 87 papers (62%) in field of data mining and CRM have focused on customer retention dimension of CRM. Besides, the and there were increasing trend toward this area of research that makes us to expect more publications in it (Ngai, Xiu, & Chau, 2009). Regarding former customers, data mining can be used to analyze the reasons for churns and to predict churn (Chiang et al., 2003; cited by Olafsson, Li,and Wu, 2008). Neural networks is the most commonly used technique and it has been described in 30 (34.5%) out of 87 articles in total. Following are decision tree and association rules which have been described in 21 (24.1%) and 20 (23.0%) articles respectively.

2.9.1 Data Mining – Customer Identification

Customer identification means analyzing the characteristics and behavior of the customers and selection the target segment.

The Role of Data Mining:

According Vercellis (2009), data mining & business intelligence have impact on the relational marketing and customer acquisition, The acquisition process requires the identification of new prospects, as they are potential customers who may be totally or partially unaware of the products and services offered by the company, or did not possess in the past the characteristics to become customers, or were customers of competitors. It may also happen that some of the prospects were former customers who switched their custom to competitors, in which case much more information is usually available on them.

According Woo, Bae, & Park, 2005, Elements for customer identification include target customer analysis and customer segmentation. Target customer analysis involves seeking the profitable segments of customers through analysis of customers underlying characteristics, whereas customer segmentation involves the subdivision of an entire customer base into smaller customer groups or segments, consisting of

customers who are relatively similar within each specific segment. This phase involves targeting the population who are most likely to become customers or most profitable to the company. Moreover, it involves analyzing customers who are being lost to the competition and how they can be won back (Kracklauer et al., 2004).

According to Bhambri et al. (2011), To expand the customer base, Data mining can answer questions like:

- Which new market the organization can intrude into?
- Which kind of customers would you like to acquire?
- Which kind of customers will drive your growth in future?
- Which new customers are likely to be interested in your products?

As Tan, Steinbach, & Kumar (2006) defined "Partitional Clustering" is the simple division of a set of data objects into non-overlapping segments such that each data object is in exactly one segment and if we permit clusters to have sub-clusters then we obtain a "Hierarchical Clustering". Among existing clustering methods TwoStep Cluster technique is a clustering algorithm which has been designed to handle very large data sets (SPSS Inc, 2007).

Tsiptsis & Chorianopoulos (2009), Clustering techniques are quite popular and their use is widespread in data mining and market research. They can support the development of different segmentation schemes according to the clustering attributes used: namely, behavioral, attitudinal, or demographic segmentation.

2.9.2 Data Mining – Customer Attraction

After identification of the target customers, the organization allocate and direct its efforts and resources toward these customers, organization start to design and perform effective marketing campaigns through pursuing direct marketing approach. This is the phase following customer identification. After identifying the segments of potential customers, organizations can direct effort and resources into attracting the target customer segments. An element of customer attraction is direct marketing. Direct marketing is a promotion process which motivates customers to place orders through various channels (Cheung, Kwok, Law, & Tsui, 2003; He et al., 2004; Liao & Chen, 2004; Prinzie & Poel, 2005). The purpose of direct marketing is to reduce cost and increase efficiency by selling products or services to customers directly instead of the

utilization of merchandisers or wholesalers (Adderly, 2002). Direct communication with customers are done via media such as mail, television, direct email, internet, telephone, coupon distribution..etc, and customers can response television to the company from indicated channels and immediately. Direct marketing is returning as a valuable tool in modern business as mass marketing loses effectiveness (Forcht, 1999).

The Role of Data Mining:

According Berry & Linoff (2011), Data mining can play many roles in prospecting. The most important of these are:

- Identifying good prospects.
- Choosing a communication channel for reaching prospects.
- Picking appropriate messages for different groups of prospects.

And thus assert that identifying good prospects — is the most widely implemented.

According to Tsiptsis & Chorianopoulos (2009), DM can play important role in direct marketing in all the following stages **:** (see Fig. 2.11)

1. Gathering and integrating the necessary data from different data sources.
2. Customer analysis and segmentation into distinct customer groups.
3. Development of targeted marketing campaigns by using propensity models in order to select the right customers.
4. Campaign execution by choosing the appropriate channel, the appropriate time, and the appropriate offer for each campaign.
5. Campaign evaluation through the use of test and control groups. The evaluation involves the partition of the population into test and control groups and comparison of the positive responses.
6. Analysis of campaign results in order to improve the campaign for the next round in terms of targeting, time, offer, product, communication, and so on.

Figure 2-13:Stages of direct marketing (*Source: Tsiptsis & Chorianopoulos, 2009*)

According Berry & Linoff (2011), Data mining contributes to improve Direct Marketing Campaigns in terms of :

- Response models that used to improve response rates by identifying prospects who are more likely to respond to a direct solicitation. The most useful response models provide an actual estimate of the likelihood of response, but this is not a strict requirement. Response modeling is a well known technique commonly used by direct marketing analysts (Desarbo and Ramaswamy, 1994).
- Using Current Customers to learn about prospects, a good way to find good prospects is to look where today's best customers came from.
- Gather Information from New Customers.
- Reaching the People Most Influenced by the Message.
- Choosing the best place to advertise

Direct marketing can be found in many industries, applications in financial, retail, telecom are mentioned in this research. Direct marketing is returning as a valuable tool in modern business as mass marketing loses effectiveness (Forcht, 1999).

Many modeling techniques can be used to generate response scores, including regression models, decision trees, and neural networks (Berry & Linoff, 2011).

2.9.3 Data Mining – Customer Retention

It is considered the focal point of the CRM strategy, where the customer difficult to stay in company if he not satisfied. And This is the central concern for CRM. Customer satisfaction, which refers to the comparison of customers' expectations with his or her perception of being satisfied, is the essential condition for retaining customers (Kracklauer et al., 2004).

The phenomenon of customer attrition related with the customers that switch from their company to a competitor, and many companies invest significant amounts of resources in analyzing and characterizing the phenomenon of attrition (Vercellis, 2009).

The Role of Data Mining:

Ngai, Xiu, & Chau (2009) suggests three data mining activities that used for customer retention:

1. **One-to-one marketing:** refers to personalized marketing campaigns which are supported by analyzing, detecting and predicting changes in customer behaviours (Chen, Chiu, & Chang, 2005; Jiang & Tuzhilin, 2006; Kim & Moon, 2006). Thus, customer profiling, recommender systems or replenishment systems are related to one-to-one marketing.
2. **Loyalty programs:** involve campaigns or supporting activities which aim at maintaining a long term relationship with customers. Specifically, churn analysis, credit scoring, service quality or satisfaction form part of loyalty programs.
3. **Complaints Management:** analyzing the complaints, nature of complaint, the regular complaints, the specifications of the customer that complaint.

From other hand, Tsiptsis & Chorianopoulos (2009) refer to The voluntary churn models of DM have the ability to identify early churn signals and spot those customers with an increased likelihood to leave voluntarily. Regarding former customers, data mining can be used to analyze the reasons for churns and to predict churn (Chiang et al., 2003; cited by Olafsson, Li,and Wu, 2008). And Classification is the most common modeling method in data mining, especially in CRM field and it is capable of predicting the effectiveness or profitability of a CRM strategy through prediction of the customers' behavior (Ahmad, 2004; Carrier & Povel, 2003; Ngai, Xiu, &Chau, 2009).

Lewis (1994) defines credit scoring as a process to convert the characteristics of the applicants in numbers that are combined in order to obtain a score. This score represents the risk profile of the applicant. Verstraeten and Van den Poel (2004) refer to credit scoring as statistical methods used to classify applicants for credit in "good" versus "bad" risk classes.

According to Bhambri et al ,2011 To lengthen the customer relationships, Data mining can answer these questions:

- Which customers in particular do you want to keep?
- Which customers will drive most of your profits?
- Which customers might switch to your competitors and why?
- Which customers are dissatisfied with your services and products?

2.9.4 Data Mining – Customer Development

This involves consistent expansion of transaction intensity, transaction value and individual customer profitability (Ngai, Xiu, &Chau, 2009).

The Role of Data Mining :

According Ngai, Xiu, &Chau, (2009), Three basic data mining applications of customer development are lifetime value, up/cross selling and market basket analysis.

- Up / Cross and deep selling model:

Up/Cross selling refers to promotion activities which aim at augmenting the number of associated or closely related services that a customer uses within a firm (Prinzie & Poel, 2006). Tsiptsis & Chorianopoulos (2009) identified cross/up and deep selling as data mining applications. Cross selling is promoting and selling additional products or services to existing customers. Up selling is offering and switching customers to premium products, other products more profitable than the ones that they already have. Deep selling is increasing usage of the products or services that customers already have Where persuading customers to buy more than one product would increases both sales and customer loyalty. The advantages of cross-selling strategy are threefold. First, targeting customers with products they are more likely to buy should increase sales and therefore increase profits. Second, reducing the amount of people targeted through more selective targeting should reduce costs. Finally, it is a established fact in the financial

sector that loyal customers (from the perspective of their length of relationship with the organization) normally possess more than two products on average. Therefore, persuading customers to buy more than one product would increases both sales and customer loyalty.

There are four component tasks that can be identified for the cross-sales problem. They are (Anand et. al. 1997):

1. Finding sets of attributes that identify customers in the customer base that are most likely to buy a particular product.
2. Choosing the best sets of these sets of attributes to identify customers to target in a marketing campaign.
3. Implementing this marketing campaign and analyzing the results to see if a high rate was achieved.
4. Feeding back results into the customer database, to carry out the refinement of the rules used for targeting customers with the product.

- Market Basket Analysis Model:

Market basket analysis aims at maximizing the customer transaction intensity and value by revealing regularities in the purchase behavior of customers (Aggarval & Yu, 2002; Brijs, Swinnen, Vanhoof, & Wets, 2004; Carrier & Povel, 2003). Market basket analysis is a well known association application; it can be performed on the retail data of customer transactions to find out what items are frequently purchased together. Market basket analysis is a well known association application; it can be performed on the retail data of customer transactions to find out what items are frequently purchased together . Apriori is the basic algorithm for finding frequent item sets. The extension of Apriori can further handle multi-level, multi-dimensional, and more complex data structure.

- Customer lifetime value model:

Customer lifetime value analysis is defined as the prediction of the total net income a company can expect from a customer (Drew, Mani, Betz, & Datta, 2001; Etzion, Fisher, & Wasserkrug, 2005). This allows to optimize marketing campaigns, to increase the effectiveness of acquisition initiatives and to reduce the waste of resources due to offers addressed to unpromising market segments.

According to Bhambri et al ,(2011) The company needs to explore:

- Which customers are likely to give you more business?
- Which products and services interest a particular customer?
- Which products are typically bought together and by which set of customers?
- What cross selling opportunities should you consider?

According to Berry & Linoff, (2011), identify the following data mining activities to support customer development:

- Reducing Exposure to Credit Risk: Learning to avoid bad customers is important as holding on to good customers.
- Determining Customer Value: Data mining plays an important role in customer value calculations, although such calculations also require getting financial definitions right. A simple definition of customer value is the total revenue due to the customer minus the total cost of maintaining the customer over some period of time.
- Cross-selling, Up-selling: Data mining is used for figuring out what to offer to whom and when to offer it.

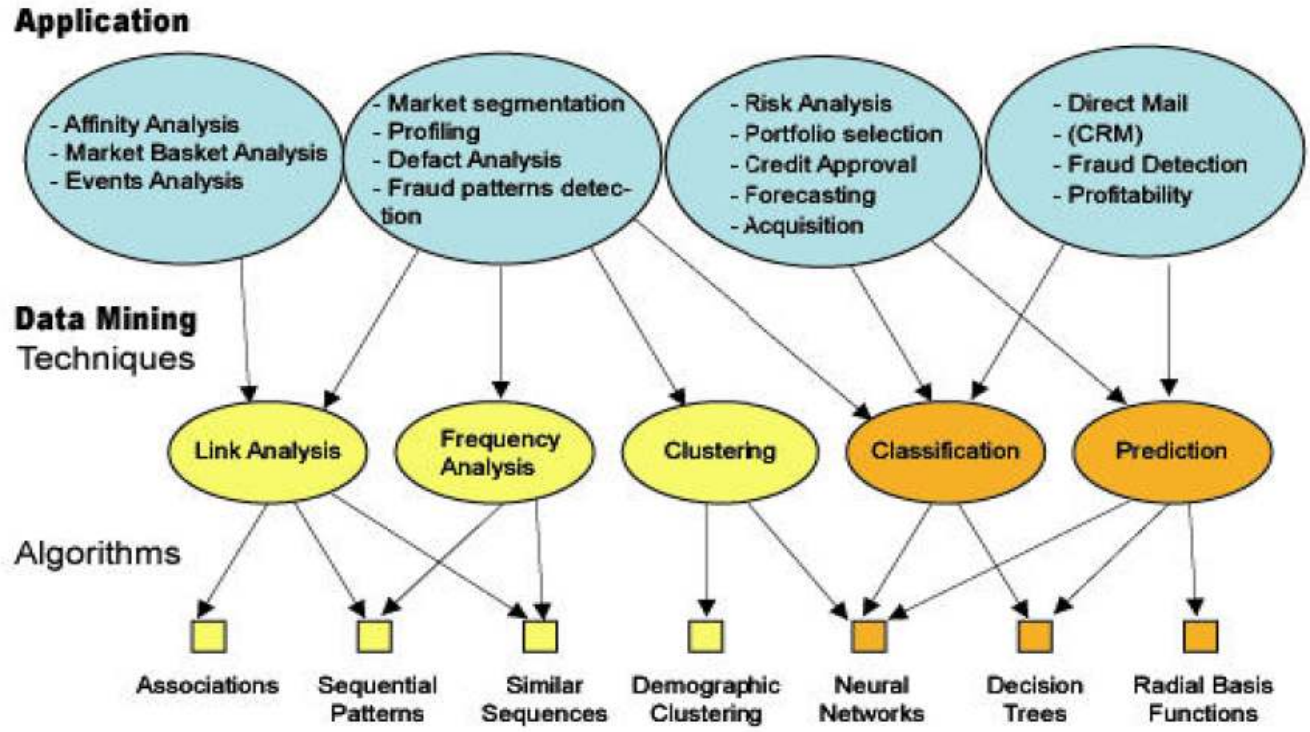
Adderly (2002) presents three advantages of cross-selling listed as follow:.

1. Targeting customers that are more likely to buy should increase sales and therefore increase profits.
2. Reducing the amount of people targeted through more selective targeting should reduce costs.
3. It is an established fact that loyal customers normally possess more than two products on average. Therefore, cross selling increase customer loyalty.

Association rules are used to find groups of products that usually sell together or tend to be purchased by the same person over time (Berry & Linoff, 2011).

Summary

Marketing based on data mining usually can give the customer sales promotion according to his previous purchase records. It should be emphasized data mining is application-oriented. There are several typical applications in banking, insurance, traffic-system, retail and such kind of commercial field. Generally speaking, the problems that can be solved by data mining technologies include: analysis of market, such as Database Marketing, Customer Segmentation & classification, Profile Analysis and Cross-selling. And they are also used for Churn Analysis, Credit Scoring and Fraud Detection (Dunham, 2002). Figure 2.14 shows the relationship between the business applications and data mining techniques.



Source: Dunham (2002)

Figure 2-14: Application of Data Mining for Marketing

According to Tsiptsis & Chorianopoulos (2009), the following table surmises the common DM modeling techniques and their applications in CRM.

Table 2-5: Data mining modeling techniques and their applications in CRM

Category of DM modeling techniques	Modeling techniques	Applications
Classification models	Neural networks, decision trees, logistic regression, etc.	•Voluntary churn prediction • Cross/up/deep selling
Clustering models	K-means, TwoStep, Kohonen network, etc.	• Segmentation
Association and sequence Models	A priori, Generalized Rule Induction, sequence	• Market basket analysis • Web path analysis

According to Ngai, Xiu, & Chau, (2009), A combination of data mining models is often required to support or forecast the effects of a CRM strategy. For instance, in the case of up/cross selling programs, customers can be segmented into clusters before an association model is applied to each cluster. In such cases, the up/cross selling program would be classified as being supported by an association model because relationships between products are the major concern; in the case of direct marketing, a certain portion of customers may be segmented into clusters to form the initial classes of the classification model. The direct marketing program would be classified as being supported by classification as prediction of customers' behaviour is the major concern.

2.10 How To build Business Data Mining Application ?

CRISP methodology is Cross-Industry Standard Process for Data Mining, which is considered as methodology and as process models. It includes descriptions of the typical phases of building DM project, and describe the tasks for each phase and the relationships between these tasks, and as process model , CRISP-DM provide an overview of the data mining lifecycle, and the sequence of the phases is not strict (IBM Corp, 2011). Where SPSS adopt CRISP Methodology.

The following figure summarize the phases of CRISP-DM model for building business applications.

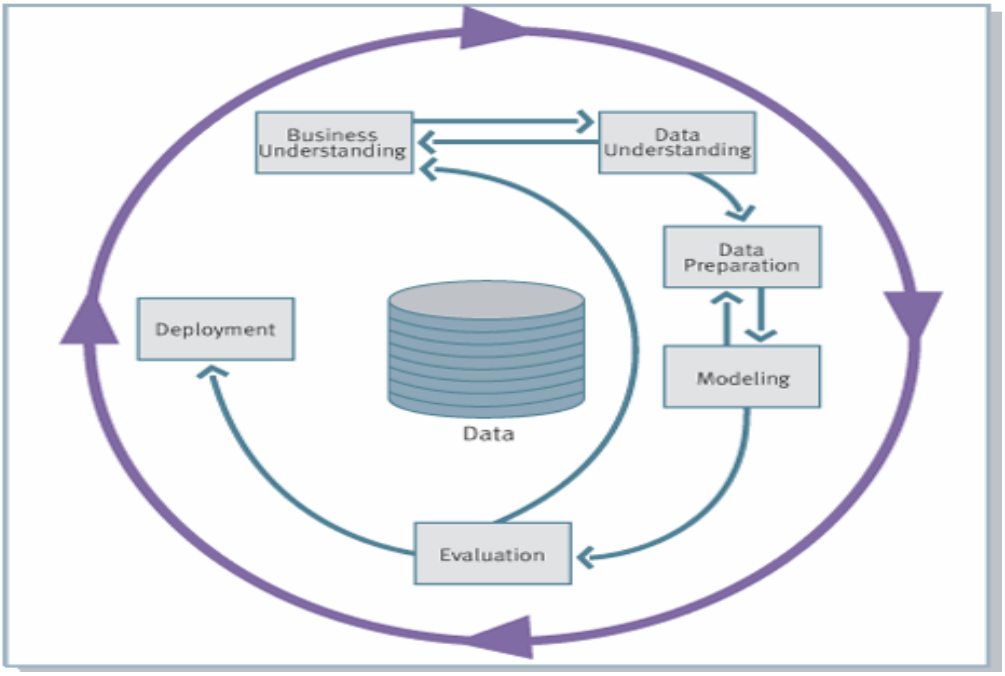


Figure 2-15: Phases of CRISP-DM Process Model (*Source: IBM Corp, 2011*)

According SPSS Inc., (2000), the basic steps of data mining for effective CRM are: the phases of CRISP-DM can described as follow:

1. **Business Understanding:** Determining the business objectives, situation assessment, determining the goal of the data mining, producing a project plan, such as “increasing the response rate of the direct marketing".

2. **Data Understanding**: Collecting the initial data, describing and exploring this data, and verifying its quality.

3. **Data Preparation:** Selecting, cleaning, constructing, integrating, and formatting the data. In this phase, new variables may be generated and considered such as the mean, stander deviation, summation and etc. , also processing the missing data and the outliers values.

4. **Modeling:** selection, building, testing and running different models. The modeling methods (classification, clustering, forecasting) should selected in this stage, in addition to the necessary techniques such as (Decision tree, TwoStep Clustering and etc.).

5. **Evaluation:** Approval of models and assessment of the results in accordance with the defined objectives and determining the next steps.

6. **Deployment:** Preparation of final reports, presentation, action plans and deployment of results and reviewing the project.

And according to Vercellis (2009), data mining process depends on three main actors who are database administrators, data mining analysts and the domain experts. And the following figure that illustrate the roles for each of them, and the researcher give some examples for more illustration.

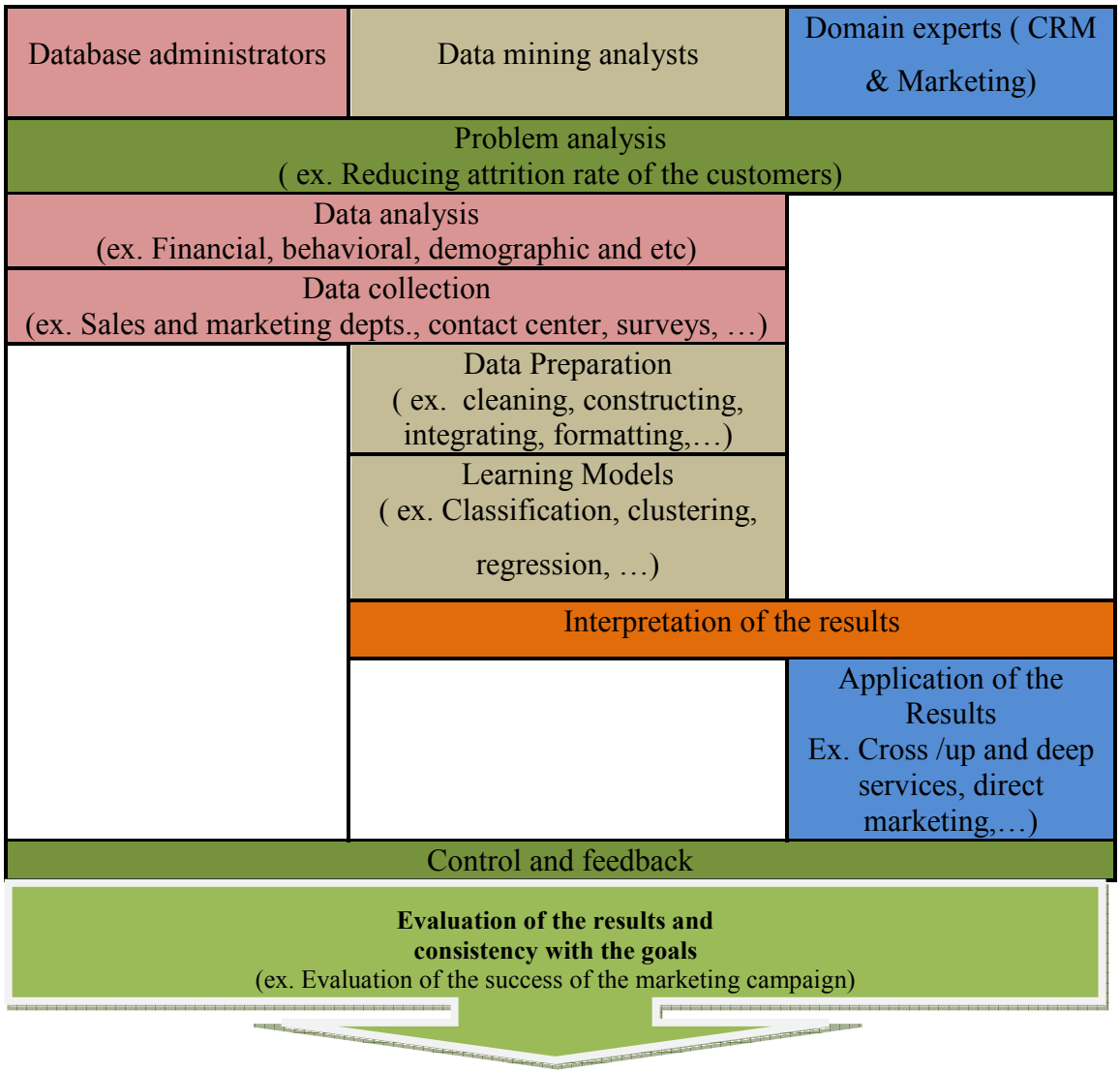


Figure 2-16 : Actors and Roles in data mining process (Source: Cited from, Vercellis 2009)

From the figure, we note all of the actors, database administrator, data mining analyst and the CRM expert, participate in the analysis of the business problem and specifying the goals and objectives, after that some tasks may be participated between two actors and so on.

2.11 Telecommunication industry

Telecommunication sector is one the biggest sector on over the world, and there are high competition between businesses in this field, it becomes very important for all individuals, and all different businesses such as banking, retailing, insurance become highly dependent on telecommunication and information technology.

This section discuss main concepts related in the focus of this study, basic segments of telecom business, customer data and the common value added services will be presented.

2.11.1 Telecom business – Core Segments

According to Tsiptsis & Chorianopoulos (2009), Mobile telephony customers are typically categorized in core segments according to their rate plans and the type of relationship with the operator. The first segmentation level differentiates residential (consumer) from business customers. Residential customers are further divided into two, postpaid and prepaid:

- **Postpaid – contractual customers:** Customers with mobile phone contracts. They have a contract and a long-term billing arrangement with the network operator for the services received. They are billed on a monthly basis and according to the Traffic of the past month.

- **Prepaid customers:** These customers do not have a contract-based relationship with the operator and buy credit in advance. They do not have ongoing billing and they pay for the services before actually using them. Additionally, business customers are further differentiated according to their size into Large Business – Corporate, SME (Small and Medium Enterprise), and SOHO (Small Office, Home Office) customers.

The typical core segments in mobile telephony are depicted in the following figure:

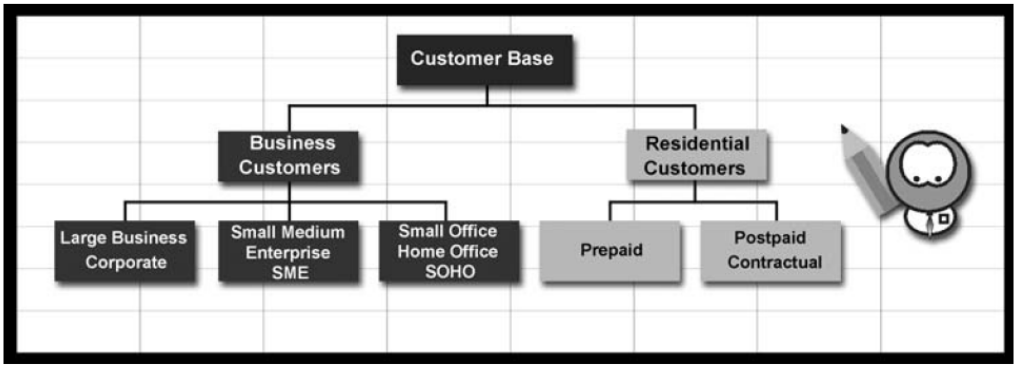


Figure 2-17:The typical core segments in mobile telephony (Source: Tsiptsis & Chorianopoulos (2009)

2.11.2 Customer Data

Each time a call is made its details are recorded and stored in CDRs. Call detail records (CDRs) carry all the information required to build the usage profile of each customer, so they comprise the main data source for extracting and retrieving behavioral data. Although the format of the CDRs and the information logged vary among operators, typically such records contain information about the type of call (voice, SMS, etc.), the call originator (who made the call or A-number), the called party (who received the call or B-number), the call duration/traffic, the amount billed for each call, and so on Tsiptsis & Choroianopoulos (2009) .

Also they affirmed data marts should cover at a minimum, the following data dimensions:

- Registration and socio-demographic information of each customer.
- Core segmentation information (consumer postpaid/contractual, consumer prepaid customers) and information on segment migrations.
- Outgoing traffic to identify outgoing usage patterns (number and traffic by call and destination type) over time.
- Incoming traffic to identify incoming usage patterns (number and traffic by call and origin type) over time.
- Financial information such as profit and cost for each customer (billed revenue, interconnection cost, incoming revenue, etc.).
- Purchases of handsets and accessories (e.g., hands free, Bluetooth, etc.).

- Value added services (VAS) such as news, music, etc.
- Campaign contacts and responses.
- Recorded complaint outcomes and results.
- Billing, payment, and credit history (average number of days till payment, number of times in suspension, average time remaining in suspension, etc.).

Data mining possesses a significant role in telecommunications industry. To be more specific, using data mining, companies would be able to analyze call detail records and identify customer segments with similar use patterns, and develop attractive pricing and feature promotions. Furthermore, data mining enables companies to identify the characteristics of customers who are likely to remain loyal and also determine the churners (Rygielski, Wang, & Yen, 2002).

2.11.3 Mobile Value added services (MVAS)

Value-added services (VAS) are unlike core services, they have unique characteristics and they relate to other services in a completely different way, they also provide benefits that core services cannot (pradhan,2008):

IDD (International Direct Dialing)

a. Call Forward.
b. Multi party calling.
c. Voicemail.
d. Short Message Service (SMS).
e. SMS to PRS.
f. Multimedia Messaging Service (MMS).
g. Fax .
h. WAP .
i. General packet Radio Service (GPRS) .
j. Third Generation (3G).

Short message service (SMS) accounted for over 60% of the overall mobile VAS revenue, making it the largest mobile VAS business followed by multimedia messaging service (MMS), polyphonic ringtones, and wireless application protocol (WAP). The increased information transmitting capacity in the 3G network will likely

drive the growth of content-intensive mobile VAS services such as mobile games, TV and music, while generally promoting the diversity of service offerings. At present, 3G-featured applications such as mobile audio/video, mobile payment and mobile gaming have been growing fast within a large group of users (APCO, 2010).

According to a CNNIC (China Internet Network Information Center), the four most popular uses for the internet are online music (83.5%), online news (80.1%), search engines (73.3%) and instant message (70.9%) Commercial applications in general grew the fastest with a yoy increase of 68% in 2009.

2.12 Data Mining Challenges and Opportunities In CRM

Very little research on the success factors of data mining exists because the field of data mining is new(Sim, 2003). The gap between DM and business is a problem that needs to be addressed (Weiss 2009; Puuronen& Pechenizkiy 2010; Cao 2010). Despite the existence of several methodologies for the DM process, the discipline has been slow to enter the world of business (Rexter 2011; Eckerson 2007).

From paper written by Farooqi & Raza (2011), there are conclude number of the data mining challenges and opportunities of building CRM applications. The following is list of these challenges:

- **Non-trivial results of DM applications almost need a combination of several DM techniques:** Where if we want to analyze CRM data, we need to explore the data from different angles and look at its different aspects.
- **There is a strong requirement for data integration before data mining:** this mean the data comes from multiple sources or departments of an organization and there is need to integrate these data before an actual data mining exploration start.
- **Diverse data types are often encountered:** dealing with this issue is not critical, where the Customer data comes in the form of structured records of different data types (e.g., demographic data), temporal data (e.g., weblogs), text (e.g., emails, consumer reviews, blogs and chat-room data),

- **Highly and unavoidably noisy data must be dealt with** : In CRM, weblog data has a lot of "noise" and other data of customer "touchpoints" has the usual cleaning problems seen in any business-related data.
- **Privacy and confidentiality considerations for data and analysis results** are a major issue. In CRM, lots of demographic data is highly confidential, as are email and phone logs.
- **Good actioning mechanisms:** It is common that after some data mining results are obtained, the marketer do not know how to use them in their activities. So this may require the participation business and marketing.

The procedures of data mining are detailed and complicated. Many essentials should be noticed during the flow of data mining, so challenges of developing data mining applications are one of the important issues in this area. Chen et. al. (1996) listed the challenges of development as follows:

- Handling of different types of data
- Efficiency and scalability of data mining algorithm
- Usefulness, certainty, and expressiveness of data mining results
- Expression of various kinds of data mining results
- Interactive mining knowledge at multiple abstraction levels
- Mining information from different sources of data
- Protection of privacy and data security

When Fayyad, Piatetsky-Shapiro, and Smyth (1996) suggested processes for successful data mining projects, they emphasized the following key steps:

- Understanding the application domain (including relevant prior knowledge and the goals of the application).
- Data cleaning and preprocessing (includes basic operations, such as removing noise or outliers if appropriate, collecting the necessary information to model, deciding on strategies for handling missing data fields and etc.
- Data reduction and projection (including finding useful features to represent the data depending on the goal of the task)
- Choosing the function of data mining.
- Choosing the data mining algorithm.

- Interpretation (including interpreting the discovered patterns and possibly returning to any of the previous steps.
- Using discovered knowledge where this knowledge should be actionable.

According to Chopra, Bhambri & Krishan (2011), there some of obstacles that faced while implementing data mining techniques illustrated as follow:

1. Various sources and through various angels, which needs the use of different data mining techniques in single query.
2. Some problems in organization need to explore data from various sources is to be integrated to derive at a particular result. And moreover this data is heterogeneous in nature and while transferring the data, large amount of noisy data is also added which creates problem. So data is to be preprocessed by filtering the noisy data. This step is usually time consuming.
3. Privacy Issues are the greatest obstacles. There is war like situation between the data miner and the subjects, as while mining the data the privacy of the subject is at the sake.
4. The results obtained from the various data mining tools are subject to validation, as these are to be tested before acceptance.
5. While studying the customer behavior usually the purchasing or transactional behavior is considered, but this analysis needs deep study of customers and their circumstances.

Sim (2003) has identified six major categories of critical success factors (CSFs) from the literature on data mining and related areas: task domain, human factor, dataset, tool, interpretation, and using discovered knowledge, dataset should be cleaned and preprocessed to handle missing data fields, noise or outliers in the data, accounting for time series, and known changes. Data should be easily accessible; accessing data or merging data from different sources increases the cost of an application. While datasets can be extracted from legacy data systems, flat files, data marts, or data warehouses, ideally the data warehouse is the best source for data mining. Data mining can be done without a data warehouse, but the data warehouse greatly improves the chances of success in data mining (Inmon, 1996).

2.13 The Success Factors for Adoption CRM Strategy

Identifying CRM success factors is a critical issue to ensure successful implementation. CRM success factors are related to their components (People, Business Process, and Technology) either directly or indirectly (Mendoza et al, 2007). And CRM success factors are embedded within these components (Shang and Lin, 2005). Where the causes of the problem of CRM failure has motivated many researchers and practitioners to contribute to the literature on CRM failure and its causes (Wisktron, 2004; Rigby et al. 2002).

Through an extensive review of literature on CRM success factors in the fields of IT and marketing, a wide range of factors have been identified by the researchers. Some studies emphasized the strategic nature of CRM success factors and the need to consider the importance of the holistic detention of CRM. For instance, Goodhue et al (2002) identified the following as CRM success factors: Top management support, vision, willingness to share data, and willingness to change process. Similarly, Alt and Puschmann (2004) highlighted a number of success factors that have a strategic and wide scope such as evolution path, timeframe, organizational redesign, system architecture, change management, and top management support. On the other hand, a number of studies concentrated on more specified or more technical factors. An example of this approach is the work of Roh et al (2005) in which the researcher identified the following factors as requirements for CRM success: process fit, customer information quality, system support, efficiency, customer satisfaction, and profitability. However, factors such as top management commitment and strategy development and communication received a wide acceptance by literature while some factors recorded rare mentions in the literature such as benchmarking and sales automation.

Chalmeta (2006) has supported some of the previous failure causes as he pointed out the following factors as causes for CRM failure: **1.** Thinking of CRM as a pure technology; **2.** Lack of management support; **3.** Lack of customer-centric culture; **4.** Lack of readiness process; **5.** Poor quality data; **6.** Lack of change management; **7.** Lack of vision and strategy; **8.** Lack of involving the final user in designing CRM solutions.
Kale (2004) ensure that, he has named seven reasons for CRM failure as the following: **1.** Viewing CRM as a technology; **2.** Lack of customer-centric vision; **3.** Insufficient

appreciation for customer life time value; **4.** Inadequate support by top management; **5**.Underestimating the importance of change management; **6.** Failing in re-engineering business processes; **7.** Underestimating difficulties related to data mining and data integration.

Almotairi (2009) was able to specify most of the common success factors of CRM that was discussed in the literature, the following table cited from his research and summarizes the common success factors of CRM implementation.

Table 2-6: CRM Success Factors in Literature (*Source : Almotairi, 2009*)

#.	Success Factor	Percentage in the Literature
1.	Top Management Commitment	80%
2.	IT systems (management/integration)	67%
3.	CRM strategy (clear development/ communication)	47%
4.	Culture change	47%
5.	Data management (quality / share)	40%
6.	Skilful, Motivated, and trained staff	40%
7.	Monitoring, controlling, measuring, and feedback	33%
8.	Inter-departmental integration	33%
9.	Process change/structure redesign	27%
10.	Customer involvement/consultation	27%

From the table , IT systems (management/integration) have 67% from the CRM success, and this refers to data warehouse, data mining and data integration have high positive impact on the CRM success and the companies should be more interested in these factors.

2.14 JAWWAL in Figures

According to Jawwal annual report of 2011, there are many of achievements & operational indicators :

1. Jawwal was able to keep their customers to reach 2.4 Mill (90% prepaid and 10% Postpaid) with average increase estimated 7% during 2011.
2. The number of employees reach 845 employee.
3. Jawwal market share represent 81.1% from the Palestinian market.
4. The average revenue per user (ARPU) reach 11 JD.
5. The coverage of JAWWAL network estimated 98% for the West bank & Gaza strip regions.
6. Jawwal delivers their services through 24 showrooms and more than 1,100 dealers distribute over the West bank and Gaza strip.
7. Jawwal introduces roaming services through joint cooperation with 387 mobile operators distributed through more than 159 countries over the world.
8. The company installed and operated 313 Jawwal stations, distributed 188 for West bank and 125 for Gaza strip.

The following figures show the annual increase of Jwwal subscribers and the increase in the average revenue per user (ARPU).

Figure 2-18 : JAWWAL Subscribers Annual Increase

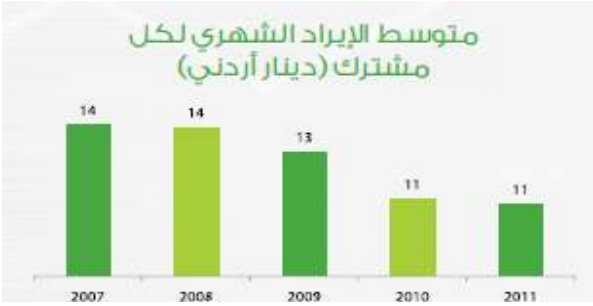


Figure 2-19 : ARPU , JAWWAL

Jawwal focus on the customer retention strategy and implement many of marketing programs, campaigns, offers and value added services (Jawwal Annual Report, 2011).

Chapter 3 : Research Methodology

- Introduction
- Research Method
- Population & Sampling
- Source of Data
- Data Analysis
- Reliability and Validity

3.1 Introduction

This chapter explains methodology that is followed. The qualitative approach pursued to conduct this study; presents the research method, population and sampling, source of data, data analysis and finally the validity and reliability of the research.

3.2 Research Method

The descriptive analytical approach was followed in conducting the research. This research is categorized under applied researches that depend mainly on data gathering from primary sources through holding the necessary interviews for research purposes, previous studies and the company website (Jawwal.ps) were considered as secondary sources for the research. The researcher answers the research questions through analyzing the gathered information by comparing the last previous and theories with the analysis results. Then deciding if the company apply or no. Reviewing and studying the previous literature and studies helped the researcher to formulate the interview questions, to make deep analysis, to investigate useful conclusions and to suggest valuable recommendations. Content analysis was considered to analyze some of the marketing campaigns and services that picked from the company website.

Since the research purpose and research questions were developed from the existing theories and studies, it is deductive. The selection of qualitative approach was found to be more appropriate to fulfill the stated purpose since case studies are being used and it requires assessing abundant information.

3.3 Population & Sampling

The non-probability or judgmental sampling were used for this study, Saunders *et al.* (2003) propose that non-probability or judgmental sampling is more frequently used for case study research. Jawwal company in Gaza strip was selected as case study to implement this research. This research combines between the role of information technology and marketing; therefore five persons were selected to perform the necessary interviews; those persons should distributed on different qualifications; specially in management, marketing and information technology (IT). Also they should have positions related in the research area such as from: (Review Appendices. A, B)

1. Top management.
2. Marketing management.
3. IT specialization.

There was difficulty to take another case study; since Jawwal is the sole mobile telecommunication in Gaza strip until now.

3.4 Source of Data

Since the research area is emergent and modern science, the researcher adopt many of sources to implement this study. Interviews, previous literature & studies, and the company website as the main sources of data analysis process and to answer the research questions. The researcher consider the following sources to collect the data:

1. **Secondary sources:** This data was collected depending on reviewing of published data including papers, articles, documents, books, Researches, and previous studies that are related in using data mining for CRM and marketing. In the same line, the company website (Jawwal.ps) includes many of marketing programs, services & offers. The researcher selected some of them to support data analysis process and to answer the research questions clearly. Which be illustrated as follow:.
    - Marketing Campaign (A): *Dardaesh-Shabab* program for youth segment.
    - Marketing Campaign (B): *Jama3ty* program for the students that stay in university compasses.
    - The Company Services: such as SMS services.
2. **Primary sources:** The primary information was collected from two basic interviews.

- **Interview (I) :** This interview was used to answer the first research question *" What are the major technological requirements of CRM system that support building DM applications ? "* , and directed to the persons who have good knowledge in this side. **Appendix A.**
- **Interview (II) :** was used to cover the other research questions that related in the CRM and marketing applications of DM, and directed to the persons who have good knowledge in this side. **Appendix B.**

3.5 Data analysis

Cooper and Schindler (2006) state that data analysis is one step, and an important one, in the research process. In this study, The data analysis process includes three parts classified as follow:

1. **Part one:** The analysis will be for the interviews, interview (I) will answer the first research question *" What are the major technological requirements of CRM system that support building DM applications ? ",* and interview (II) will answer the other research questions that related to the marketing and CRM applications of DM.
2. **Part Two:** includes the content analysis of the marketing campaigns (A) and (B) that were picked from the company website (Jawwal.ps). This part support the analysis in part one.
3. **Part three:** includes the content analysis of some of the company services that gathered from the company website , this part support the answering of the last research question *" How can data mining technology be applied in customer development for telecomm. Industry…?"*

Case studies are especially difficult to analyze as there are no well defined techniques for doing so. Every study should however have a general framework for how data is analyzed (Yin 2003). The analysis process was used to test if there is agreement between the previous studies & literature, and the analysis results.

3.6 Study Frame of Reference

The following table constructed as frame of reference in order to illustrate the relationship between the research questions, the dimensions covered, the source of data, the interview questions and source of these questions.

Table 3-1: Frame of Reference (Conceptualized by the researcher)

Research Question	Dimensions covered	Data source	Interview Questions	Source of interview Questions
What are the major technological requirements of CRM system that support building DM applications?	• Data collection & Data warehouse • Data Quality	• Interview (I) • Literature & Previous studies	All Questions	Section 1.9 Section 2.6 Section 2.12 Section 2.13
How can data mining technology be applied in customer identification for telecom industry?	• Customer Analysis & segmentation	• Interview (II), Part (A) • Literature & Previous studies • company website	Part(A)	Section 1.9 Section 2.5 Subsection 2.9.1

How can data mining technology be applied in customer attraction for telecom industry ?	• Direct Marketing	• Interview (II), Part (B) • Literature & Previous studies • The company website	Part(B)	Section 1.9 Subsection 2.9.2
How can data mining technology be applied in customer attraction for telecom industry ?	• Churn Treatment • Profitable Customers • Complaints management	• Interview (II), Part (C) • Literature & Previous studies • The company website	Part(C)	Section 1.9 Subsection 2.9.2
How can data mining technology be applied in customer development for telecom industry ?	• Cross/up & deep selling • Market basket analysis • Customer Life time value	• Interview (II) , Part(D) • Literature & Previous studies • Company Website	Part(D)	Section 1.9 Subsection 2.9.2

3.7 Reliability and Validity

According to Saunders (2000) reliability is of special concern when conducting interviews, specifically towards the bias of the interviewer. This type of bias can be reduced by structuring the interview beforehand. Therefore Interviews were only performed in a structured manner, as in appendices A & B. Moreover all the interview questions extracted from the literature that mentioned in chapters one and two, many interviews was held to increase the reliability. In addition to, the interview questions have supported with giving real marketing examples such as services and campaigns..

Validity is an important aspect of every research paper, in order to deal with this a multiple case study type of research is preferred, as it is more likely that the findings are valid if they are from multiple sources (Yin. 2003). Therefore, most of the previous studies that used in the analysis process are new and modern, also present different author's views.

Chapter 4 : Data Analysis & Results

- **Part one :** Analysis of the Interviews
- **Part Two :** Content Analysis of the Marketing Campaigns A, B
- **Part Three:** Content Analysis of Value added Services (VAS)

4.1 Part one : Interviews Analysis

In this section, analysis of interview (I) and (II) will be investigated . interview (I) answers the first research question that about the requirement of CRM system that support building DM applications. interview (II) will answer the other questions related applying data mining in customer identification, customer attraction, customer retention and customer development.

Research Question # 1	Dimensions Covered
What are the major technological requirements of CRM system that support building DM applications ?	• Data collection & Data warehouse
	• Data Quality

Interview (I)	
Data collection & Data warehouse	How the company collect the customer information ?
	How the company store the customer data ?
	Are the company consider integration between all the data sources, marketing ,sales…?
	How data integration increase the quality of service ?
	How data integration has positive impact on the customer satisfaction?

Successful CRM implementation requires different technological factors such as Factors such as type of CRM systems (analytical, operational, and collaborative), back and front office requirements **(Boon et al, 2002; Shang and Ko, 2006; Ocker and Mudambi, 2002; Sin, 2003).** With regard to operational CRM, customer data is collected through a whole range of touch points such as, contact centre, contact management system, mail, fax, sales force, website, internet, marketing and service departments, etc. The data then are stored and organized in a customer centric database, which is made available to all users who interact with the customer. This system gives employees immediate access to important information about the customer (**Habul & Velic, 2010).** This is in line with **Bolbol & Albaba** opinion, company collects data from all company sources, sales dept. marketing dept., customer care dept, call center, showrooms, and (Interactive Voice Response) IVR unit, or from Survey unit, dealers and suppliers . This is consistent with **Chen et. al. (1996)**, Mining information from different sources of data is challenge for building data mining application.

Technologies supporting the analytical CRM system include CRM portals, data warehouses, predictive and analytical engines (Eckerson and Watson, 2001); pattern discovery association rules, sequential patterns; clustering, classification and evaluation of customer value **(Ahn *et al.*, 2003). Albaba** asserted that**,** in the past there were multisystems used to deal with customer, and customer data was distributed between these systems. each system has separate database and there was difficulty to build full perspective about the customer and to treat customer transactions, after that the company built large data warehouse, that stores all the customer data and integrate between the data sources. This is consistent with **Dyche (2002),** who affirmed that the data of the customer which has to be analyzed is stored in Data warehouse, which includes the information about the company that will provide value to the customers, and this data warehouse may contains demographic data, purchase data, billing data and etc. **Bolbo**l asserted, he doesn't have enough knowledge in this field. **Abedelmenem** confirmed, all databases of different departments should be combined in massive data repository, meaning data warehouse.

Bolbol & Albaba agreed about the significant to integrate between all the databases of the different departments and data sources, where the employee have the ability to see all information related in the customers in one screen. **Abedelmenem** affirmed this, any CRM system should include six basic modules, sales module, customer module, complaints & feedback module, marketing module, technical support module and reporting module. And each module has one data mart and all data marts combined in large repository which called data warehouse. And it should support the integration between the data marts and with other system such as HR system. This is in line with **Farooqi & Raza (2011)** who state, there is a strong requirement for data integration before data mining. Also this in line with **Chopra, Bhambri & Krishan (2011)** who mentioned Some problems of building DM application; organization need to explore data from various sources is to be integrated to derive at a particular result. This goes with **Almotairi (2009)**, 67% of the previous studies and literature investigated that IT systems (management / integration) is a success factor for CRM implementation. **Inmon (1996)** illustrated that data mining can be done without a data warehouse, but the data warehouse greatly improves the chances of success in data mining.

Abedelmenem & Albaba, data integration has some benefits such as saving employee time and effort, saving cost, increasing service quality and customer satisfaction. **Albaba** added, data warehouse support the CRM system, where the employee can obtain a comprehensive information about all the customers, and this allow the employee to understand the customer and he/she may give some exceptions and privileges for the profitable customers. This is consistent with, companies that do not have an integrated information about customers, actually does not know their customers and can't offer personalized products and services and don't satisfy their customers. For this reason, it is important that information about customers are stored in one place and available to everyone in the organization. This can be achieved by building Customer Data Warehouse. Without functional integration of DW as the foundation, there is no successful relationship with customers or acquiring new knowledge in the form of Business Intelligence **(Habul & Velic , 2010).** And According to **Tsiptsis & Chorianopoulos (2009),** Data mining has the ability to provide customer insight, that help to build an effective CRM strategy, where it lead to personalized interactions with customers and hence increased satisfaction and profitable customer relationships through data analysis. The researcher considered data integration to demonstrate the relationship between data mining, data warehouse, service quality and customer satisfaction.

Interview (I)	
Data Quality	Does customer data should be clean and free of errors ?
	Does the customer data should be free of missings and outliers ?
	Does the customer data are new and up to date ?
	Is it necessary to access the customer data easily?

Abedelmenem confirmed, to build any CRM system data should reprocessed from any errors and data should be normalized (separated into different parts). **Albaba** also affirmed the significant to enter correct data in CRM system to get accurate information. **Bolbol** don't have enough knowledge in this question. **This is consistent with** According **Almotairi, (2009)**, 40% of the literature and previous studies affirmed the significance of data management (quality / share) for the CRM success.

Abedelmenem indicated to the significant of reprocessing the data from any missing and outliers during establishment of CRM system. This is consistent with

Farooqi & Raza (2011), highly and unavoidably noisy data must be dealt with for building data mining application for CRM. And according to **Fayyad, Piatetsky-Shapiro, and Smyth (1996),** data cleaning and preprocessing (includes basic operations, such as removing noise or outliers if appropriate, collecting the necessary information to model, deciding on strategies for handling missing data fields and etc.) are necessary for building data mining projects. This goes through with, **Sim (2003),** dataset is critical success factor for data mining project, dataset should be cleaned and preprocessed to handle missing data fields, noise or outliers in the data, accounting for time series, and known changes. **Bolbol & Albaba** don't have enough knowledge to answer this question.

Bolbol, data update is important process, where the company update the customers data periodically, where it motivates the customers to update their information in charge of getting several incentives and privileges. This is consistent with **Henon and Gauches (1999),** a critical success factor (CSF) for data marts requires that the data mart be refreshed periodically and constantly updated with new information from all end users, including the field and customer service representatives. **According Vercellis (2009**), must be frequently updated, based on the objectives of the analysis that related in building DM applications. **Albaba & Abedelmenem** confirmed the significant of data update to obtain accurate reports.

Albaba, CRM system gives employees immediate access to important information about the customer to deal with them. This is consistent with, **Vercellis (** 2009) data must be easily accessible by analysts and decision support applications. **Abedelmenem**, the developer should considers accessibility and flexibility to build any CRM system. This is consistent with **AbuAli & Abu-Addose (2010),** Friendliness, easiness and flexibility of user interface tools lead to reduce the resistance from end users to new information technology and increase the adaptability. Bolbol not have enough knowledge to answer.

The Results

RQ # 1 : ***What are the major technological requirements of CRM system that support building DM applications in terms of data collection & data warehouse, and data quality ?***

Interview (I)	How the company collect the customer information ?
Data collection & Data warehouse	How the company store the customer data ?
	Are the company consider integration between all the data sources, marketing ,sales…?
	How data integration increase the quality of service ?
	How data integration has positive impact on the customer satisfaction?

From above, the following points are concluded :

1. The company collects the customer data from internal sources such as sales, marketing, customer care, call center, showrooms, and IVR (interactive voice record) unit. External data from Survey unit, dealers and suppliers. It's noted the internet not primary source to collect data and the company not depended more on web based data. Data collection is necessary for building data warehouse and data mining application.
2. The company have data warehouse gather the customer data from the different sources and integrate between them. Data warehouse and data integration are necessary to build data mining applications.
3. Data integration increases the efficiency of the employees and facilitate them to interact with the customers. This mean data integration has positive impact on service quality.
4. Data integration increase the service quality then increase customer satisfaction. Also support building data mining application. This is reflected on the customer loyalty and profitability.
5. The company very interested in data quality. They update the customer data periodically and the CRM system facilitate the employees to access the customer data easily.

Interview (I)	Does customer data should be clean and free of errors ?
Data Quality	Does the customer data should be free of missings and outliers ?
	Does the customer data are new and up to date ?
	Is it necessary to access the customer data easily?

From above, the following points are concluded :

1. Some interviews don't have enough knowledge about these questions or have some sensitivity to answer. This make the analysis process more complicated.
2. There is high interest in the quality of data, data should be clean from any noisy data, and should updated periodically. These an important conditions in building data warehouse and data mining applications.
3. Normalization is important issue to build CRM system, that refers to dividing data in to separated parts, for ex., dividing the customer full name into three parts each part in single column.
4. It's necessary to reprocessing data from missings and outliers data, missings refer to lost data, outliers refers to data that have non normal form in relevant to other data.
5. The employees have immediate access to the customer data, but there was small difficulty to access data that was stored in the old system.

Research Question # 2	Dimensions Covered
How can data mining technology be applied in customer identification for telecom industry in terms of customer analysis and segmentation ?	• Customer Analysis & Segmentation

Interview (II), Part (A) Customer Analysis & Segmentation	Does the company interested in data mining and market research to understand their customers ?
	How does the company profile their customers?
	How does the company create the customer segments based on the demographic information such as (position, age.. ?
	How does the company create the customer segments based on the behavioral information such as (call periods, call time.. ?
	How does the company discover new segments ?
	Does the company the company interested in web-based customer data ?

According to **Ngai, Xiu, & Chau, (2009),** The application of data mining tools in CRM is an emerging trend in global economy. Since most companies try to analyze and understand their customers' behaviors and characteristics, for developing a competitive CRM strategy, data mining tools has become of high popularity. This is consistent with what **Alagha** assert, the company makes all efforts to satisfy their customer and they depends marketing analysis and market research as new marketing approach, to support the CRM policy, and more investment adopted in this field to design tailored campaigns, services and offers; and there are two agencies do that. That for satisfy the customer needs and to retain them. **Abu Amra** assured, the company uses all modern and new means to satisfy their customers. This is in line with, (**Kabakchieva**, **2009)** affirmed that, the implementation and enhancement of existing Data Mining techniques and methods, and the recent advances in the BI and Data Mining fields, reveal their great potential for ensuring sustainable growth and compatibility of Telecommunication companies that are using them. And according **Rygielski, Wang, and Yen (2002),** there are a wide continuum of applications for data

mining in marketing in different industries, from retailing to banking and telecommunications industry.

Abu Amra & Aagha agreed, each customer has one profile contains all the historical data about his transaction beside other information such as age, position, registration date, billing data and etc. **Dyche (2002),** mentioned many of the customer data that analyzed by the company to obtain useful information demographic, billing and payments, call center contacts, purchase data, survey responses, campaign responses, returns, web activity and returns. And according **Zavareh (2007)**, Customer profiling integrates several aspects of customers into a rational evaluation, such as customer details, historical records and contact details, customer attractiveness, or customer satisfaction.

With respect to customer segmentation, **Abu Amra** informed, the company divide the customers into two basic categories prepaid and postpaid. Prepaid type , customers do not have a contract-based relationship with the operator and buy credit in advance. Postpaid type, Customers with mobile phone contract and they are billed on a monthly basis and according to the traffic of the past month. **Alagha** agreed with him. This is in line with, **Esichaikul & Sikaramula (2000)** confirmed, When the business knows exactly who the customers are, the business then can pay close attention to that group.

Alagha & Abu Amra agreed**,** we try to target all the segments in the society and cover all the consumers needs, such as "youth sector", "government sector" , "military sector" and handicaps. This is in line with **Farooqi & Raza, (2011),** data mining help the companies to classify customers into groups which also make databases to be handled efficiently. And according to **Jansen (2007),** A Support Vector Machine algorithm (VAS) of data mining was used to classify the segment of a customer, based on the customer's profile. The profile exists of the age, gender, telephone type, subscription type, company size, and residential area of the customer.

Alagha & Abu Amra, the company designed "Thawani Marketing program" to meet the need of the customers that have a lot of calls but in limited period. And this tailored for the prices sensitive customers. This is consistent with **Rygielski, Wang, and**

Yen (2002), data mining possesses a significant role in telecommunications industry and the companies use to analyze call detail records (CDR) and identify customer segments with similar use patterns. And according to **Jansen (2007)**, Clustering algorithms of data mining used to perform Customer segmentation based on usage call behavior, i.e. the behavior of a customer measured in the amounts of incoming voice calls, sms usage, call duration, international calls, different numbers called and percentage of weekday and daytime calls. or outgoing communication.

Alagha, the company designed "Daradesh Shabab Marketing Program" for youth, where the company discover that many of youth not subscribed and this cluster represent more than 40% from the society. This is consistent with **Vercellis, (2009)** who affirmed the benefit of data mining in extracting characteristics and behavior of the potential buyers who may partially or totally unaware of the product and services offered by the company. This goes through with, **(Chopra, Bhambri & Krishan, 2011)**, data mining help the companies in specifying, which new market the organization can intrude into? And which kind of customers would you like to acquire?.

Alagha & Abu Amra, the company website is famous and has many of visitors, it has high rank between the websites. And each customer has internet count to benefit from some services. According **D'Haen, Van den Poel & Thorleuchter, (2012)**, web data is better in predicting profitability than commercial data, but combining both is even better, bagged decision trees are consistently higher in accuracy.

The Results

RQ # 2 : ***How can data mining technology be applied in customer identification for telecom industry in terms of customer analysis and segmentation ?***

Interview (II), Part (A)	How does the company interested in data mining and market research to understand their customers ?
Customer Analysis & Segmentation	How does the company profile their customers?
	How does the company create the customer segments based on the demographic information such as (position, age.. ?
	How does the company create the customer segments based on the behavioral information such as (call periods, call time.. ?
	How does the company discover new segments ?
	Does the company the company interested in web-based customer data ?

From above the following points are concluded :

1. The company interested in market research and marketing analysis and pay more investment in this field.
2. The company profile their customers based on the historical data, age, position, transactions and etc. the customer profile should include the customer attractiveness, or customer satisfaction. Data mining and analytical CRM support customer profiling such as using SVM techniques (support vector machine).
3. The company use demographic data (age , position) to create new target segment such as "Daradesh Shabab Program" for youth segment, government segment and military segment for these positions. They may consider type of telephone, sex and qualification and etc. Data mining support customer segmentation using clustering techniques such as Two step clustering.
4. The company use behavioral data to create new segments such as " Thawani Program" for price sensitive customers who call a lot but in limited periods. Data mining support building customer segmentation using clustering techniques such as Two step clustering.

5. The company benefit from data mining technology in extracting characteristics and behavior of the potential buyers who may partially or totally unaware of the product and services offered by the company such as "Dardesh shabab program" for youth.
6. The company interested to develop its electronic website, but they should be more interested to increase the online transaction with the customer and analyze the active internet accounts for each customer. Where web data is better in predicting profitability than commercial data.

Research Question # 3	Dimensions Covered
How can data mining technology be applied in customer attraction for telecom industry?	• Direct Marketing

Interview (II), Part (B)	Does the company build data repository for all customers who more responsiveness for the marketing campaigns ?
	Does the company Test the marketing campaign before the implementation, via prediction the customers that most likely to response ?
	How does the CRM system help the company to select the appropriate channel ?
Direct Marketing	How does the CRM system help the company to select the appropriate time to release the campaign ?
	How does the CRM system help the company to select the appropriate promotions and advertisements ?
	Does the company evaluate the marketing campaigns ?
	Does the direct marketing save the cost ?.

According **Ling & Li, (1998),** Data mining is effective tool for direct marketing, which can bring more profits to banks. Insurance companies and retail industry than the traditional means of mass marketing.

Alagha & Abu Amra agreed, the company very interested to implement optimized marketing campaigns and careful to reach a wide range of people. They don't have enough knowledge to answer the first two questions. But according to **Adomavicius & Tuzhilin (2003),** In acquisition campaigns data mining can be used to profile people who have responded to previous similar campaigns and these data mining profiles is helpful to find the best customer segments that the company should target. In the same line **Javaheri (2008)** assert**,** using historical purchase data, a predictive response model with data mining techniques can be developed to predict a probability that a customer is going to respond to a promotion or an offer. Response modeling is an

important issue of direct marketing, and useful to maximize customers' response to a product offering, minimize the overall marketing cost and improve customer relationship management (**Javaheri, 2008).**

Alagha & Abu Amra agreed**,** there are many channels used to reach customers, show rooms, dealers, call center, social networks (Facebook & Twitter), the electronic mail, website, the short messages (SMS). **Abu Amra** indicated, the E-mail usually used to contact with the business customers and with the public relations. Also he referred that SMS used only to target specific segments. This is in line with **(Jaroszewicz, 2008),** In case of telecommunication companies, there exist several marketing communication channels through which a customer can be reached, offers made to customer when he/she contacts the call-center, a phone call to the customer, an SMS sent to the customer and a standard mail sent to customer (may accompany the monthly bill). **Alagha & Abu Amra** confirmed, the CRM system support the companies to evaluate and assess the marketing power of the different channels that help the company to select the better channels to perform their marketing campaign, and this help to improve the performance of channels. This is consistent with **Berry & Linoff (2011),** Data mining can play many roles in identifying good prospects and choosing a communication channel for reaching prospects. In line with this, **Tsiptsis & Chorianopoulos, (2009)**, data mining can play important role in direct marketing such in campaign execution by choosing the appropriate channel.

Abu Amra, CRM system help the company to select best time to implement the marketing campaign, for example that marketing campaign that occurred in occasion such as AL-Haj occasion, Tawjihi. Also he added the company designed "Jama3ty marketing program" by detecting high calling traffic on the GSM station of university zones in specific times (analyzed in section 4.2). **Alagha & Abu Amra** agreed that**,** the CRM system help the company to specify the best place and time to perform the marketing campaigns. And this is consistent with **Berry & Linoff (2011),** data mining help the companies to specify the best place to advertise. This is consistent with **Tsiptsis & Chorianopoulos (2009),** data mining can play an important role in direct marketing such in campaign execution by choosing the appropriate channel, the appropriate time, and the appropriate offer for each campaign.

Abu Amra, based on the characteristic of each segment, the marketing department design the suitable promotions and advertisement to deliver the intended message. This is consistent with **Rygielski, Wang & Yen, (2002)**, Firms in telecommunication sector have detailed call records. These firms can segment their customers by using call records for developing price and promotion strategies. **Chopra, Bhambri & Krishan, (2011)** affirmed, by using data mining techniques, the organizations will be able to offer the right product to right set of customers through right offer and through right delivery channel, which will in turn lead to better customer relationship management.

According to **Tsiptsis & Chorianopoulos, (2009)**, the data mining role also pronounced in the analysis of campaign results in order to improve the campaign for the next round in terms of targeting, time, offer, product, communication, and so on**.** It goes through what **Alagha and Abu Ameara** ensured, the company careful to evaluate the success of marketing campaigns and benefit from the results in the next marketing campaigns. **Abu Amra** added, the evaluation may lead to release the campaign in different way and shape.

With respect of cost, According to **Adderly (2002),** Reducing the amount of people targeted through more selective targeting should reduce costs. This confirmed by **Abu Ameara**, focusing on specific target segment save the money more to target all customers.

The Results

RQ # 3 : ***How can data mining technology be applied in customer attraction for telecommunication industry in terms of direct marketing ?***

Interview (II), Part (B)	Does the company build data repository for all customers who more responsiveness for the marketing campaigns ?
	Does the company Test the marketing campaign before the implementation, via prediction the customers that most likely to response ?
	How does the CRM system help the company to select the appropriate channel ?
Direct Marketing	How does the CRM system help the company to select the appropriate place and time to release the campaign ?
	How does the CRM system help the company to select the appropriate promotions and advertisements ?
	Does the company evaluate the marketing campaigns ?
	Does the direct marketing save the cost ?.

From above the following points are concluded :

1. The interviews don't have complete knowledge about the first two question, but the previous studies proved the importance of testing marketing campaign before implementation via prediction the customers that most likely to response, where the company should build data repository for all customers who more responsiveness for the marketing campaigns.
2. The company choose the appropriate channel to implement specific marketing campaign. DM play important role in this area. Where the company can evaluate the marketing power for each channel in relevant to purchase size, region, target segment.
3. The company select the appropriate time and place to release new marketing campaign such as "AL-Haj", and "Tawjihe" occasions. DM play important role in this area. Where the company can evaluate the calling traffic for GSM station in specific times or places.
4. The company depends on the characteristics of target segment and design the suitable promotions and advertisements to deliver the intended message such as "dardesh shabab" program for youth. DM play indirect role in this area that contributes in selecting the target segment. Also this reduce the cost instead of mass marketing.
5. The company evaluate the success of the marketing campaigns. DM play very important role in this to avoid the risk in the second round to release new campaign.

Research Question # 4	Dimensions Covered
How can data mining technology be applied in customer retention for telecommunication industry?	• Customer churn Treatment • Profitable customers • Complaints analysis

Interview (II), Part (C) Customer churn Treatment	How does the company Interested in customer retention strategy ?
	How does the company treat the customer churn of postpaid type ?
	How does the company treat the customer churn of prepaid type ?
	Does the company try to winback the lost customers ?
	What are the type of services that the company design for the customers who most likely to churn ?

Alagha and Abu Amra, the company make and intensive efforts to retain their customers and to increase their loyalty. And the company perform many of marketing applications and services that intended for this goal. And the company very interested to prevent the churn before occurring either for prepaid or postpaid. This is consistent with **Neslin, Gupta, Kamakura, Lu, & Mason (2006),** Nowadays Customer churn has become the main concern for firms in all industries and companies. Also, **Reichheld & Sasser (1990)** contends, Customer churn can blemish a company by decreasing profit level, losing a great deal of price premium, and losing referrals from continuing service customers. This is in line with, **Van den Poel & Larivie're, (2004),** the main goal of customer relationship management is to create satisfaction and delight among customers in order to prevent customer churn which is the most important threat that threatens all companies. From the other hand, A review of literature from 2000 to 2006 shows that 54 out of 87 papers (62%) in field of data mining and CRM have focused on customer retention dimension of CRM **(Ngai, Xiu, & Chau, 2009).**

For postpaid customers, **Alagha & Abu Amra** agreed that, the company have a specific administrative procedures for customers who don't pay the subscriptions for three cycle consequently, and after that the company deactivates the service automatically. In line with this, **(Pinheiro, Evsukoff & Ebecken, 2005),** The

classification models of the data mining enabling the corporation to create proactive actions to identify and prevent nonpayment of bills. and define a more efficient billing and collecting actions management. **Kraljevi´c & Gotovac (2010)** state the definition of Prepaid churn and modeling of an application is more complex than the same task for Postpaid users.

With respect for prepaid customers**, Algha,** the company tracks the behavior of the customer, if there are drop in the recharging behavior (ex. from 100 NIS to 50 NIS) or in the number of usage minutes, then the company target them with tailored services. this is in line with, (**Jahromi 2009**), in past researches on churn prediction in the telecommunications industry mainly had employed classification analysis techniques for the construction of churn prediction models and they had used user demographics, contractual data, customer service logs and call patterns extracted from call details (e.g. average call duration, number of outgoing calls, etc.). And according to **(Ahn, Han, & Lee, 2006),** the results show that dissatisfaction indicators such as number of complaints and call drop rate have a significant impact on the probability of churn. Besides, it has been revealed that loyalty points such as membership card programs have a significant negative impact on the probability of customer churn. This is consistent with **Chiang et al., (2003)**, regarding former customers, data mining can be used to analyze the reasons for churns and to predict churn. In this line**, Kraljevi´c & Gotovac, (2010)** affirmed that, A successful model for prediction and prevention of Prepaid churn in telecommunication companies can influence very positively an overall profit of companies, due to the fact that less money needs to be invested into development of a predictive Data Mining model as preventive action to retain users not compared to the possible loss cause by these users churn.

And about the customer loss, **Abu Amra** said, the company exerts extra efforts to activate and retain their customers. And according **Bolbol (2011),** he recommended Jawwal to pay more attention to CRM implementation because loyalty level was average, and to have the initiative to contact its customers in order to strengthen the relationship with them through identifying their desires and preferences regarding its services, and to develop a clear mechanisms to restore those customers who have stopped dealing with the company.

Alagha, the company deliver different marketing offers that intended to treat the customers that are most likely to be churn such as the following ;

1. **Off – Peak Usage Offer**: give the customer 10 minutes free in any time, if he consumed 3 minutes, and 15 minutes free if he consumed 10 minutes.
2. **Bonus on incoming:** the customer gets free credit if he receive calls from any foreign network.
3. **Talk one minute and get 10 minutes free** : this offer tailored to the youth customers between 16 -25 year.
4. **Fill Offer:** if the customer recharges his balance with 10 - 20NIS, he will get 15% free for 3 days. And if he recharge with 40 -59 NIS he will get 20% free for 7 days.
5. **MI Offer** : for internet users, discount on internet prices.
6. **Daily Bundle :** 2 hours in 2NIS, consume 2 SMS and get free 20

This is consistent with **Esichaikul & Sikaramula (2000),** The purpose of the attrition model is to improve customer retention, and to identify which profitable customers are likely to leave or drop their services. After the marketing department obtains the list of customers who are likely to drop their service, the company can generate the direct mailing campaign to the target customers in order to improve their customer retention. This is goes through with **Farooqi & Raza (2011),** Modeling those customers who have defected to identify patterns that led to their defection. These models are then applied to the current customers to identify likely defectors so that preventive actions can be initiated. Finally, **Soeini & Rodpysh (2012)** affirmed, Results of data mining methods provide an opportunity for managers and marketing professionals to make decision and choose suitable strategies to prevent churn of customers and let them go to other companies.

Interview (II), Part (C)	Does the company Interested to target their profitable customer ?
Profitable customers	How does the company measure the profitability or the loyalty for the different customers ?
	What are the type of services that the company design for the profitable customers ?

Alagha & Abu Amra agreed, the company makes extra efforts to keep their customers and targets them with specific services, privileges and offers. That to satisfy them and increase their loyalty. This is consistent with **Kracklauer et al., (2004)**

affirmed the role of data mining in discovering the characteristics and behavior of the buyers who are most likely to become customers or profitable customers. This is consistent with **Ngai, Xiu & Chau, (2008),** Data mining techniques, such as neural networks and decision trees, could be used to seek the profitable segments of customers through analysis of customers' underlying characteristics. And according to **Esichaikul & Sikaramula (2000**),data mining help the marketing staff to know and decide who are their profitable customers and who are their prospect groups.

Alagha & Abu Amra, there are five main categories to classify the customers. This categories be as follow, Prime, Diamond, Golden and Silver, where the prime is the maxim scores. This in line with, **Tsiptsis & Chorianopoulos (2009),** the postpaid customer can classified into Platinum, Gold, Silver, Bronze and Mass. This is consistent off **Xu and Walton (2005),** that distinguished four criteria for segmenting customers: customer profitability score, retention score, satisfaction and loyalty score, response to promotion. Furthermore, data mining enables companies to identify the characteristics of customers who are likely to remain loyal and also determine the churners **(Rygielski, Wang, & Yen, 2002). Alagha** state, this scoring or classification depends on many measures such as the customer revenue, the date of registration, the commitment in paying. According to **Tsiptsis & Chorianopoulos (2009),** RFM (Recency, Frequency, and money) analysis can be used to identify good customers with the best scores who generally tend to be good prospects for additional purchases. Recency measurement indicates the time since the last purchase transaction of the customer. Frequency denotes the number and rate of purchase transactions. Monetary indicates the value of the purchases. Abu Amra don't have enough knowledge in this side.

Alagha, the company very interested to increase the loyalty of the profitable customers such as prime and diamond classify, so they tailored many of services and privileges for thus customers. And he mentions some of these privileges:

- Free SIM card with distinctive number.
- Postpaid subscription without insurance.
- Roaming and international calls with without insurance.
- Discounts on the call and SMS prices.

This is consistent with, **Esichaikul & Sikaramula (2000),** data mining help the company to decide who are their profitable customers and who are their prospect groups. When the business knows exactly who the customers are, the business then can pay close attention to that group. And according to **Ngai, Xiu & Chau (2008)**, Data mining techniques, such as neural networks and decision trees, could be used to seek the profitable segments of customers through analysis of customers' underlying characteristics.

Interview (II), Part (C) Complaints Analysis	Does the company Interested in solving customer complaints and analyzing them ?

Regarding to complaints management, **Alagha & Abu Amra agreed**, there is a specialist department that receive and solve all the complaints and the maximum time to solve problem reach 48 hours. **Abu Amra** , if the department disable to solve a specific problem, the system help to forward the problem to the specialist destination to treat the complaint. This is partially consistent with **Ngai, Xiu, & Chau (2008)**, data mining may used to solve and analysis the regular complaints. According **Ngai, Xiu, & Chau (2009)** Complaints management is a crucial requirement for successful businesses when managing customers' needs and changes in behavior. Data mining techniques could be applied to discover unseen patterns of complaints from a company's database. The root of the problems may also be uncovered by investigating the association between complaints from different customers.

Alagha & Abu Amra agreed, the company has IVR unit that calls the customer after each transaction and record his feedback and measure if the customer satisfied or no.

The Results

RQ # 4 : ***How can data mining technology be applied in customer retention for telecom industry in terms of churn treatment, profitable customers and complaints analysis ?***

Interview (II), Part (C) Customer churn Treatment	How does the company Interested in customer retention strategy ?
	How does the company treat the customer churn of postpaid type ?
	How does the company treat the customer churn of prepaid type ?
	Does the company try to winback the lost customers ?
	What are the type of services that the company design for the customers who most likely to churn ?

From above the following points are concluded :

1. The company interested in customer retention strategy. They provide acceptable services to the customers who most likely to churn.
2. For prepaid customer churn, the company deactivate the service after three unpaid bills. Modeling of postpaid is easier than prepaid.
3. The company treat prepaid customer churn by tracking the change of customer behavior such as the drop in the recharging amount and the minutes of usage (MOU). DM can be used to specify the customers who most likely to switch into another competitors via using classification models.
4. The company observe and monitor the drop in customer usage for different services SMS, internet and other. And design tailored offers to retain thus customers such as Daily Bundled offer.

Interview (II), Part (C) Profitable customers	Does the company Interested to target their profitable customer ?
	How does the company measure the profitability or the loyalty for the different customers ?
	What are the type of services that the company design for the profitable customers ?

1. The company interested in the profitable customers and classify the customers into five categories prim, diamond and etc. They can use platinum and mass score. DM help to discover the profitable customers and the customers tend to be profitable.
2. The company classify the customers based on many variables such as date of registration, revenue, payment commitment and etc.
3. The company target the profitable customer with many off privileges and incentives such as SIM card without insurance and etc.
7. Data mining techniques, such as neural networks and decision trees, could be used to seek the profitable segments of customers through analysis of customers' underlying characteristics.

Interview (II), Part (C) Complaints Analysis	Does the company interested in solving customer complaints and analyzing them ?

1. There is a specialist department that receive and solve all the complaints and the maximum time to solve problem reach 48 hours. The company should be more interested in complaints analysis. Data mining techniques could be applied to discover unseen patterns of complaints from a company's database.
2. The company has IVR unit that calls the customer after each transaction and record his feedback and measure if the customer satisfied or no. the company should be interested in satisfaction scores.

Research Question # 5	Dimensions Covered
How can data mining technology be applied in customer development for telecom industry?	• Cross/Up/ deep selling
	• Market Basket analysis
	• Customer Life time value

Interview (II), Part (D)	
Cross/ Up & deep Selling	How does the company develop and increase their customer profitability ?
	How does the company design their value added services (VAS) ?
	Does the company design additional services and products for the existing customers (cross selling)?
	Does Offer and switch customers to premium products more profitable than the ones that they already have (up selling) ?
	Does the company tend to increase usage of the products or services that customers already have (deep selling) ?
	Does the company think these services increase the customer satisfaction and loyalty ?

Alagha, Jawwal interested to increase the value and the profitability of the customers and to increase the customer usage of the different services. **Abu Amra** added**,** the company deliver massive package of value added services (VAS) and incentives. There are many services mainly related in Calls, SMS, Internet and recharging. This is in line with **Ngai, Xiu, &Chau, (2009),** customer development refers to consistent expansion of transaction intensity, transaction value and individual customer profitability. And according **Pinheiro, Evsukoff & Ebecken, (2005)**, The segmentation model of all Brasil Telecom clients helped identifying the value of each client for the company and allowed defining more efficient relationship actions.

Alagha & Abu Amra agreed , the company builds their services based on the analysis of the customer needs and behaviors. where the company design many and divers SMS services to customers who like messaging and chatting, and design internet services to customers who like browsing internet and Email. Also the company design many of calling services to meet the customer needs. **Abu Amra**, for example, the company designed "Messagety marketing program " to satisfy the customer who like

using SMS. This is consistent with o **Bhambri et al. , (2011),** the company use data mining technology to explore; which customers are likely to give you more business?, which products and services interest a particular customer?,

According to **Tsiptsis and Chorianopoulos, (2009),** cross selling refers to promoting and selling additional products or services to existing customers . **Alagha & Abu Amra** agreed, the company developed different marketing programs and services based on the customer usage such as calling, SMS, MMS, internet, international access, roaming and access into other local or international network. This is consistent with **Rygielski, Wang, and Yen (2002),** data mining possesses a significant role in telecommunications industry and the companies use to analyze call detail records (CDR) and identify customer segments with similar use patterns. And according to **Jansen (2007)**, Clustering algorithms of data mining used to perform customer segmentation based on usage call behavior, i.e. the behavior of a customer measured in the amounts of incoming voice calls, SMS usage, call duration, international calls, different numbers called and percentage of weekday and daytime calls. or outgoing communication.

Alagha mentioned some examples, "Messagety Program for the customer that like using SMS largely, and **Blackberry Service** for the customers that interested in using internet and other services related to the customers who connect into other foreign networks. And there are services related in charging methods such as **Hat W Khod** that allows to transfer credit from your mobile to your friends. Also he ensured that main objectives of this services are to increase the customer value and revenue and to satisfy the customers and meet their needs and expectations. This is in line with **Bhambri et al. (2011)**, To expand the customer base, Data mining support you to discover new customers are likely to be interested in your products or services ?.

Alagha, value added services (VAS) increase the customer satisfaction and loyalty, beside they stimulate the customer to buy more and more from the different services. This is consistent with **adderely (2000)**, It is an established fact that loyal customers normally possess more than two products on average. Therefore, cross selling increase customer loyalty. And according to **Jaroszewicz (2008)**, Cross-selling very important for cellular operator since the more services a user has activated the closer he/she is tied to the company, and the harder to switch to another provider.

Interview (II), Part (D)	
Market basket Analysis	Does The company specify the products or services are typically bought together and by which set of customers?

According Market basket analysis, **Alagha & Abu Ameara** ensured, the company considers the relationship between the different services, where the company deliver the suitable service to the suitable customer. This is goes through to **Bhambri et al , (2011**), data mining help the company to explore Which products are typically bought together and by which set of customers?**.** And according **Berry & Linoff, (2011**), Association rules data mining techniques, are used to find groups of products that usually sell together or tend to be purchased by the same person over time**. This is consistent with Mazumdar, (2010),** 'Apriori' based Association rule mining algorithm tries to find out relationships and patterns among the purchases made by the customer, over several transactions.

Interview (II), Part (D)	
Customer Life time value	Does The company calculate or predict the net income expected from the customer ?

Regarding the life -time value of the customer, **Alagha** affirmed that the company consider the revenue of each customer and this reflected in his score such prime, diamond, golden or other. Customer lifetime value analysis is defined as the prediction of the total net income a company can expect from a customer **(Etzion, Fisher, & Wasserkrug, 2005**). **Marcus (2001)** affirmed, some customers have higher value to an organization than others. Thus, organizations need to calculate and predict customer lifetime value. **Tsiptsis & Chorianopoulos (2009),** with relevance to value segemantion, the postpaid customer can classified into Platinum, Gold, Silver, Bronze and Mass. This is consistent

More analysis and conclusions will be investigated during the analysis in part two and three.

The Results

RQ # 5 : ***How can data mining technology be applied in customer retention for telecom industry in terms of cross/up & deep selling, market basket analysis & customer life time value ?***

Interview (II), Part (D)	How does the company develop and increase their customer profitability ?
	How does the company design their value added services (VAS) ?
	Does the company design additional services and products for the existing customers (cross selling)?
Cross/ Up & deep Selling	Does the company Offer and switch customers to premium products more profitable than the ones that they already have (up selling) ?
	Does the company tend to increase usage of the products or services that customers already have (deep selling) ?
	Does the company think these services increase the customer satisfaction and loyalty ?

From above the following points are concluded :

1. The company interested to design different value added services (VAS) such calling, SMS, internet and recharging that intended to increase the customer profitability and value. Where DM help in identifying the value of each client for the company and allowed defining more efficient relationship actions.
2. The company design services based on analysis the usage and needs of the customers such as " Messagety Marketing program". DM help to identify which products and services interest a particular customer.
3. The company need to design cross selling services such as SMS, Internet, GPS and recharging services. it's noted that the company need increase their internet and GPS services.
4. The company depends on customer usage behavior such as calling, SMS, MMS, international calls, access to foreign networks, roaming and etc. to build their different services.
5. Value added services (VAS) develop the value of customer, stimulate them to by more and more and increase their loyalty.

Interview (II), Part (D)	
Market basket Analysis	Does the company The company specify the products or services are typically bought together and by which set of customers ?

From above the following points are concluded :

1. The company partially interested in market basket analysis, where they interested in the relationship between different services. They should be more interested. DM help to identify and predict he customer value.

Interview (II), Part (D)	
Customer Life time value	Does The company calculate or predict the net income expected from the customer ?

From above the following points are concluded :

1. The company calculate the customer value and classify them by scores, prime, golden, diamond and silver. They should be more interested to predict the total net income a company can expect from a customer.

4.2 Part Two : Content Analysis of Marketing Campaigns

Campaign (A): Dardesh Shabab for youth

According **Rygielski, Wang & Yen, (2002),** Firms in telecommunication sector have detailed call records. These firms can segment their customers by using call records for developing price and promotion strategies. Clustering is the task of segmenting a heterogeneous population into a number of more homogenous clusters.

Dardesh Shabab for youth (Jawwal.ps, 2012)

The Offer

1. You are between 16 -25 year
2. Talk with your **nine friends** with 0.09 NIS for in **the night** and 0. 19 in the day.
3. Free 300 minutes , 900 SMS and 15 MB internet monthly.
4. The price of **the SMS** to the **nine friends** is 0. 16 NIS
5. The price of minute on the Friday is 0.19 for all JAWWAL subscribers.

Table 4-1: The Analysis of Marketing Campaign (A)

#.	Research Questions	The Results
1.	How can data mining technology be applied in customer identification for telecom industry in terms of customer analysis and segmentation ?	• Specify the characteristics of the segment based on the demographic data (Age, 16-25), and the behavioral data; call time, (sum of numbers that the customer contact) and SMS and internet usage. • Discovering most of this customers talk in the night. • Discovering most of this customers talk with limited numbers reach maximum 9 persons • Discovering most of this customers use the internet and SMS.
2.	How can data mining technology be applied in customer attraction for telecom industry in terms of direct marketing ?	• Delivering the appropriate offer , low price for calling in night, low price for using SMS.
3.	How can data mining technology be applied in customer retention for telecom industry in terms of customer churn treatment, profitable customers and complaints analysis ?	• The campaign include low price services and free SMS, free internet to acquire and retain this segment
4.	How can data mining technology be applied in customer development for telecom industry in terms of cross/up and deep selling, market basket analysis and customer life time value?	• Cross selling the SMS and the internet services beside the calling services • Discovering most customers of this segment use SMS services with internet services. • Design SMS and internet services to this segment such as SMS to twitter , SMS box and blackberry service for internet users. (up/ cross selling)

Campaign (B): Jami3aty Campaign for Youth

1. Jami3aty Campaign

Dardesh Shabab for youth (Jawwal.ps, 2012)

The Offer

1. The offer is dedicated to college students who are subscribed to **"Dardesh Shabab"** plan
2. Your phone calls are free **while you are present on the University's campus**, on daily basis from 7:00AM to 5:00PM.
3. Use **one minute** in your call and receive **10 free minutes** on daily subscribers.

Table 4-2: : The Analysis of Marketing Campaign (B)

#.	Research Questions	The Results
1.	How can data mining technology be applied in customer identification for telecom industry in terms of customer analysis and segmentation ?	• Similar to Campaign (A)
2.	How can data mining technology be applied in customer attraction for telecom industry in terms of direct marketing ?	• Discovering the appropriate place for the campaign by discovering the cell stations that have high traffic (universities zone) • Discovering the appropriate time to delivering the offer (7:00- 5:00), where the high calling traffic be in this time.
3.	How can data mining technology be applied in customer retention for telecom industry in terms of customer churn treatment, profitable customers and complaints analysis ?	• The offer talk 1 minute and get free 10 minute, to retain the customer and prevent churn
4.	How can data mining technology be applied in customer development for telecom industry in terms of cross/up and deep selling, market basket analysis and customer life time value?	• Similar to Campaign (A)

4.3 Part Three: Content Analysis of value added Services (VAS)

This part support answering the fourth research question, part of cross / up and deep selling.

" ***How can data mining technology be applied in customer development for telecom industry in terms of cross/up and deep selling…?"***

Tsiptsis and Chorianopoulos, (2009) suggested cross/up and deep selling as data mining applications to develop the customer value. And they introduced the following definitions as shown in table:

Table 4-3: Illustration of Cross/Up and deep Selling (Source : Tsiptsis and Chorianopoulos, 2009)

Marketing Application	
Cross Selling	Promoting and selling additional products or services to existing customers
Up Selling	Offering and switching customers to premium products, other products more profitable than the ones that they already have
Deep Selling	Increasing usage of the products or services that customers already have

According to *(www.Jawwal.ps, 2012*), the researcher observes the main services that the company delivers, calling services, and other services considered additional or cross selling services such messaging services, internet services, GPS and recharging services. The services mainly designed to increase the customer usage in two directions horizontally (Deep Selling) and vertically (up selling). This is consistent with, Established customers are also a significant area for data mining. Identifying customer behavior patterns from customer usage data and predicting which customers are likely to respond to cross-sell and up-sell campaigns, which are very important to the business **(Chiang and Lin, 2000 cited by Olafsson, Li,and Wu, 2008).**

The messaging services will be analyzed as follow:

The Company designs the following Messaging services:

Table 4-4: Services of Increasing the Intensity of SMS usage

Services of Increasing the Intensity of SMS usage	
SMS	Text message
MMS	images, songs and videos

Voice SMS	Voice SMS
SMS Box	SMS Bundles with special reduced prices
SMS to twitter	Sending SMS to Twitter
GOOGLE SMS	SMS from Gmail Account!
Chat & Comment	Send SMS to Facebook

The company designed the services to satisfy all the customer needs and behavior. They considered the expansion of the customer usage in deep when they deliver many SMS services with same price and the same features. And they expanded the customer usage into up when they delivered the SMS services in different price and different style. The following figure illustrates this.

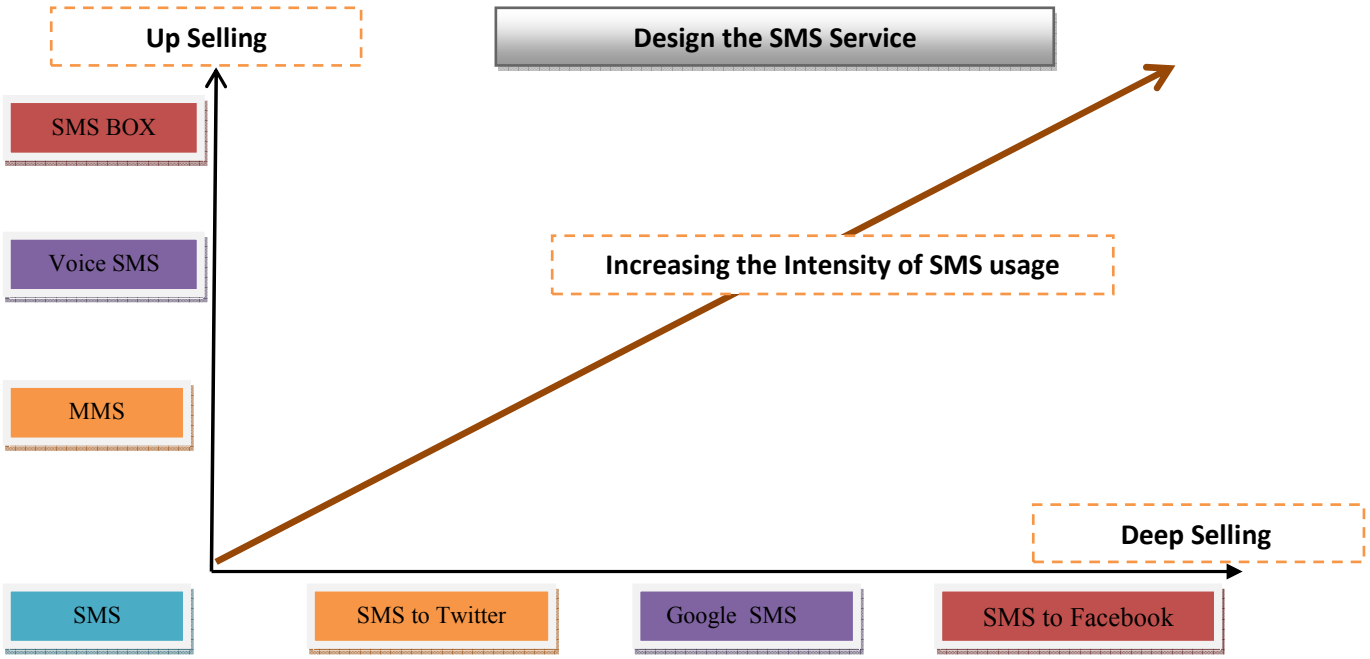


Figure 4-1: Design the SMS services

It's concluded, the company designed the services (SMS to Twitter, Google SMS and SMS to Facebook) based on the customers usage of the internet (Social networks websites) and the number of messages that received from this websites. And the company designed the services (MMS, Voice SMS, SMS Box and etc) based the analysis of the customer preferences. Cross selling services such as SMS, Internet, GPS, recharging services and selling mobile equipment.

Chapter 5 :Conclusions & Recommendations

5.1 Introduction

After analysis process and reviewing the previous studies and literature, the study conclusions were investigated beside extraction a diagram shows the contribution of DM in CRM and marketing.

5.2 Conclusions

This research aim to study the reality of applying the marketing and CRM applications of DM for the telecommunications industry. And the following tables illustrates the conclusions of the research questions.

According the first research question, the following point were concluded:

Dimensions Covered	**Conclusion**
Data collection & Data warehouse	**From the company performance, the following points proofed:** - Gathering the customer information from all sources, externally such as dealers, suppliers, foreign agencies, or internally such as sales, marketing, contact center, Interactive voice response, and etc. - Building data warehouse to integrate between all data marts or database of different sources. - Data warehouse support the CRM system to show all the customer information on one screen. - Data integration within DW saving employee time, efforts and saving cost. - Data integration within DW, increase the service quality and the customer satisfaction and profitability. - DM applications that depend on DW will increase the customer satisfaction and profitability.
Data Quality	**The company interested in the quality of data as follow:** - Customer data updated periodically, it's may to deliver many incentives to motivate the customer to update their information. - The CRM system was accessible to support building DM applications. - Customer data repressed and entered correctly.

According the second research question, the following point were concluded:

Dimensions Covered	Conclusion
Customer analysis	**Data mining supports the company to analyze the customer data based on:** • **Demographic data**: such as age, gender, position, healthy state. • **Behavioral data**: such as, • The minutes of usage (MOU) • The sum of numbers that the customer contact • The number of calls • The period of calls • The Time of calling (night, daytime …) • Using the internet • Using the SMS • Using the MMS • Incoming & outgoing calls • **Financial data**: such as, • The amount of recharging per time • The number of recharging times • The commitment in recharging
Customer Segmentation	**Data mining support the company for the following:** 1. Analysis the customer data and creating new segments based on the demographic data or behavioral data. 2. Extracting characteristics and behavior of the potential buyers who may partially or totally unaware of the product and services offered by the company. 3. To discover new customers are likely to be interested in specific products or services such as (SMS, internet…). 4. Discovering the characteristics and behavior of the profitable customer or the buyers who are most likely to become customers or profitable customers. 5. To detect the price sensitive customers who call a lot of calls but in limited periods.

According the third research question the following points were concluded:

Dimensions Covered	Conclusion
Direct Marketing	**Data mining support the company as follow:** • Evaluation the marketing power of the different channels, and this help to select the efficient channels to implement the campaign. • Detection the best time to release the campaign, for instant in some occasion, there is more calling traffic on the network. • Designing the suitable offer based on the customer or the segment preferences and behavior. • Designing the suitable promotion, advertisements and messages base on the segment characteristics. • Targeting specific segment, save the cost rather than mass marketing. • To discover the good place to advertise and to deliver services. and this based on discovering the GSM stations or cells that have higher calling traffic. • To evaluate the efficiency of the marketing campaign, to avoid errors in the second round.

According the fourth research question the following points were concluded:

Dimensions Covered	**Conclusion**
Churn Treatment	**Data mining help the company in the following :** • For postpaid, the company deactivate the service after specific times. • For prepaid, the company track the behavior of the customers, and discover the customers that are most likely to churn based on the following factors: - Recharging amount. - Minutes of usage (drop in calling minutes). • Tracking the drop of usage for the other services such as SMS and internet. • To tailor offers that intended to retain and activate thus customers. • To offer discounts, incentives, scores and free packages (SMS, minutes and internet) to retain thus customers.
Profitable Customers	**Data mining help the company in the following**: • To Classify the customers into different categories based on the analysis of different factors such as (revenue, date of registration, commitment in paying, minutes after program and etc.) • Classifying the customers into different scoring categories based on their value (Prime, Diamond, Golden, Silver, Mass ,..). • Discovering the characteristics and behavior of the profitable customer or the buyers who are most likely to become customers or profitable customers. • Designing & Delivering the privileges and incentives to retain the profitable customers (Prime, diamond..) and to increase their loyalty; such as free roaming services without insurance, free SIM card without insurance, free line for one year and etc.
Complaints analysis	• There is a specialist department that receive and solve all the complaints and the maximum time to solve problem reach 48 hours.

According the third research question the following points were concluded:

Dimensions Covered	**Conclusion**
Cross selling	**Data mining help the company in the following:** • Design additional services to increase the customer value beside calling services such as Messaging services, internet services, GPS services, recharging services and selling mobile equipment. • Help the company to deliver the appropriate service to the appropriate person based on the analysis of his usage and preferences. • To Evaluate the different services and its intensity.
Up/ deep selling	**Data mining help the company in the following:** • To Design many of value added services to increase the intensity of the customer usage, this serviced designed to satisfy the customer needs behavior. • To Design the messaging services horizontally (deep selling) in the same shape and price, such as SMS to twitter, Google SMS and etc. • To Design the messaging services vertically (up selling) in d, such as SMS to different shape and style such SMS vouchers, SMS box and etc.
Market Basket Analysis	• The company interested to consider the relationship between the different services.
Customer Life Time Value (LTV)	• Help The company to calculate the revenue of each customer and this help the company to develop scoring policy.

5.3 Contribution of Data Mining Technology to Support CRM Strategy

After reviewing the literature and the analysis process, the researcher extracts the following figure that supports companies to build a perspective about using DM in CRM.

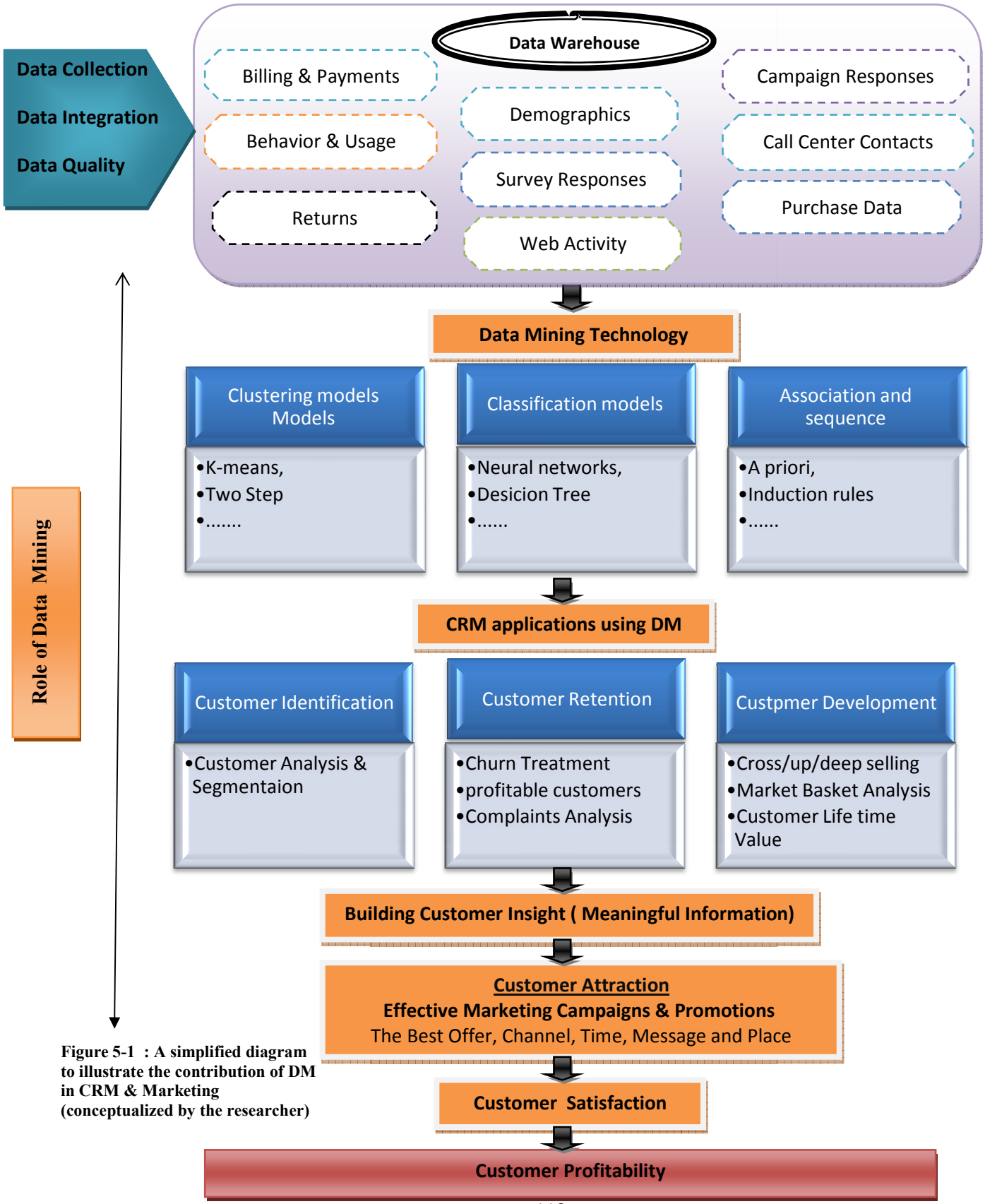


Figure 5-1 : A simplified diagram to illustrate the contribution of DM in CRM & Marketing (conceptualized by the researcher)

5.4 Recommendations for the company

The analysis results and discussion showed the following key milestones that need to be developed in order to reach the ultimate benefits from using data mining technology in CRM and marketing.

Technological Requirements of CRM system that support building DM applications	• The customer data should be collected from all sources specially web-based data. • It's recommended to enhance their procedures to collect, update, process and clean customer data. • The CRM system or the data warehouse should include the customers data related in their satisfaction scores, survey responses, campaign responses, churn scores and services responses. • The CRM system should be more compatible with the old system
Customer Identification	• Enhancing their marketing analysis by using all the critical data (financial , behavioral and demographic). • Enhance using DM in analyzing the demographic data of the customer such as (gender, region, qualification…) • Should consider the geographic region on their segmentation based on the analysis of the calling traffic for each GSM cells in this regions. • It is preferred to consider the type of mobile to create new segments and design new services, such as tailoring specific services for mobiles that support advances features for example GPS and internet services. • It's recommended to create and develop more segments based on demographic data such as the martial statutes, age, gender , number of sons and etc. • It's good to identify the bad customers or risk customers and developing procedures to deal with them. • Ought to be more interested to create and develop new segments based new the behavioral data such as the recharge amount, recharging times, call periods, internet usage and etc. • It's recommended to consider the segmentation based on market research data and identifies customer segments according to their needs, wants, attitudes.

Customer Attraction	• Should build data repository for the customers who are more responsiveness for the company services and campaigns, then targeted them. • Should benefit from this repository to test the marketing campaign before implementation, by prediction the customers who are most likely to response. • It's recommended to develop and create new marketing channels that are more closer to all customers such as Email, SMS, internet accounts and etc. • It's preferred to consider data mining in selection appropriate time, channels, offer and time to implement a marketing campaign. . • Should be more interested to reach customers via the internet accounts, by analysis the active accounts and deliver the advertisements and the promotion that match the characteristics of the customers who own this accounts. • It is good to activate the online transactions via internet, where this increase the customer satisfaction and loyalty. for ex. , customers may has ability to recharge credit via internet directly.
Customer Retention	• It's recommended to enhance their interest in identifying the customers churn or the lost customers and make extra efforts to winback or to activate them. • It's recommended to enhance their performance in identifying valuable customers and predict the customer that are most likely to be profitable. • Should be more interested in data mining to create satisfaction scores, churn scores, profitability scores and migration scores. • Ought to be more careful to create and design different services to retain customers and to increase their loyalty. • It is preferred to analyze the different complaints in terms of the nature of complaints, the region of the customers that complaint and the relation with the quality of service. • It's recommended to use data mining technology to improve the service quality of the network such as network fault identification & prediction, Identifying and comparing data traffic and System work load management. This increase the customer retention.

Customer Development	• Should be more interested to design new internet, recharging and GPS services to match the customer needs. • It's recommended to enhance their interests to track customer value and value changes over time and to calculate the customer net profit . • Should consider data mining to predict the expected generated profit from the customer over time, that help the company develop the customers profitability and to avoid risk. • It's preferred to develop cross/up and deep selling scores for the customers subscribed in more than service. • Ought to be more interested in market basket analysis that help the company to specify the products or the services that may be bought together and by which set of customers.

5.5 Further Studies:

In light of this study and the results that have been achieved the researcher recommends the following studies.

1. The interest of the Palestinian universities in course of marketing analysis, data mining, business intelligence, market research and database marketing.
2. Assessment of the technological capabilities of the small and medium enterprise in field of database marketing, data mining and CRM in Palestine such as the internet service providers.
3. The interest of the Palestinian banks and universities in applying data mining technology and market research in their CRM strategy.
4. Building data mining applications for CRM and marketing such as churn prediction model or response modeling.

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Appendix A

Interview (I)

Name of the Interviewees	The position	The Qualification
Emad Abed Elmenem	External CRM systems Analyst – Attareq Company	Computer Engineering
Hisham Al baba	Representative form customer care department and participated in developing CRM system	Management & Marketing
Adham Bolbol	representative form sales department	Computer Engineering

The major Technological Requirements of CRM system that support building DM applications	Data collection & Data Warehouse	How the company collect the customer information ?
		How the company store the customer data ?
		Are the company consider integration between all the data sources, marketing ,sales…?
		How data integration increase the quality of service ?
		How data integration has positive impact on the customer satisfaction?
	Data Quality	Does customer data should be clean and free of errors ?
		Does the customer data should be free of missings and outliers ?
		Does the customer data are new and up to date ?
		Is it necessary to access the customer data easily?

Appendix B

Interview (II)

Name of the Interviewees	The position	The Qualification
Rami Alalgha	The commercial manger – from the top management	Management & Marketing
Mohammed Abu Amra	The Marketing Manager	Management & Marketing

Part (A) The Role of Data mining for customer identification	Customer Analysis & Segmentation	Does the company interested in data mining and market research to understand their customers ?
		How does the company profile their customers?
		How does the company create the customer segments based on the demographic information such as (position, age.. ?
		How does the company create the customer segments based on the behavioral information such as (call periods, call time.. ?
		How does the company discover new segments ?
		Does the company the company interested in web-based customer data ?

Part(B) The Role of Data mining in Customer Attraction	Direct marketing	Does the company build data repository for all customers who more responsiveness for the marketing campaigns ?
		Does the company Test the marketing campaign before the implementation, via prediction the customers that most likely to response ?
		How does the CRM system help the company to select the appropriate channel ?
		How does the CRM system help the company to select the appropriate time to release the campaign ?
		How does the CRM system help the company to select the appropriate promotions and advertisements ?
		Does the company evaluate the marketing campaigns ?
		Does the direct marketing save the cost ?.

Part (C) The Role of Data mining in Customer Retention	Customer Churn treatment	How does the company Interested in customer retention strategy ?
		How does the company treat the customer churn of postpaid type ?
		How does the company treat the customer churn of prepaid type ?
		Does the company try to winback the lost customers ?
		What are the type of services that the company design for the customers who most likely to churn ?
	Profitable Customers	Does the company Interested to target their profitable customer ?
		How does the company measure the profitability or the loyalty for the different customers ?
		What are the type of services that the company design for the profitable customers ?
	Complaint analysis	Does the company interested in solving customer complaints and analyzing them?

Part(D) The Role of Data mining for Customer Development	Cross Selling	How does the company develop and increase their customer profitability ?
		How does the company design their value added services (VAS) ?
		Does the company design additional services and products for the existing customers (cross selling)?
		Does Offer and switch customers to premium products more profitable than the ones that they already have (up selling) ?
		Does the company tend to increase usage of the products or services that customers already have (deep selling) ?
		Does the company think these services increase the customer satisfaction and loyalty ?
	Market Basket Analysis	Does The company specify the products or services are typically bought together and by which set of customers?
	Customer Life time value	Does the company calculate the net income expected from the customer ?