MAKING ISP BUSINESS PROFITABLE USING DATA MINING

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ABSTRACT

This Data mining is a new powerful technology with great potential to extract hidden predictive information from large databases. Tools of data mining scour databases for hidden patterns, predict future trends and behaviours which allow businesses to make proactive, knowledge driven decision. This paper analyzes ISP's (Internet Service Provider) data to generate association rules for frequent patterns and apply the criteria support and confidence to identify the most important relationships. Here, Apriori algorithm is used to mine association rules. Furthermore, the conclusion point out business challenges and provides the proposals of making ISP business profitable.

KEYWORDS

Data mining, ISP business, Business intelligence.

1. INTRODUCTION

Now-a-days ISP's (Internet Service Provider) are continuing business in a challenging environment. It has undergone intensive growth and development throughout the last decades. Increasing Customer dissatisfaction with existing services, limited market capital, expensive limited bandwidth, market uncertainty, inflexible IT infrastructure are the main reasons behind challenging business environment for ISP. In brief it can be said that customer service, competition, consolidation and limitation are main challenges for ISPs. Most ISPs are moving their business model from product based strategy to customer based strategy to remain competitive and survive. To make this business profitable, customer care/service related database of ISPs can be utilized to find out useful information and knowledge with the help of data mining technologies.

2. BACKGROUND

Internet Service Provider (ISP) provides internet services to access internet for both personal and business. Flat rate pricing and per minute pricing are two main types of pricing offered by ISPs. In Bangladesh, number of internet user is growing day by day. At present ISPs have been providing Internet services to about 5,437,000 users. According to BTRC the average growth rate is 3.83% [2].

 All the licensed ISP organizations under Bangladesh Telecommunication Regulatory Commission (BTRC) are divided into two categories: Nationwide and Non-Nationwide ISP License. Approximately 94 organizations are providing their services throughout the country using Nationwide ISP License. Under Non-Nationwide ISP License, there are Zonal and

Category A, B, C (Police Station Based) licensees. Six Mobile and 12 PSTN Operators provide Internet services to their subscribers under Value Added Services (VAS). The subscriber number of ISPs are collected by BTRC on the basis of a monthly report.

3. BACKGROUND

This is the age of information technology. The concept of having everything online is now becomes the facets of work and personal life. The scope of online Internet service is largely underutilized in Bangladesh. High service charges, low buying power of potential clients, lack of awareness, Government policy, lack of institutional support and poor telecommunication systems are main reasons for this situation. On 4th June 1996, online Internet was legalized in Bangladesh. The Information Services Network (ISN) of one Internet service provider (ISP) started work on that day. On 15 July 1996, Grameen CyberNet started service within one and a half months [9]. Two other off-line providers went online at the same time. According to Bangladesh Telecommunication Regulatory Commission (BTRC) number of service providers under Nationwide ISP License is 94. At present, about 5,437,000 users are taking services from ISPs in Bangladesh and numbers of users are growing day by day. According to BTRC the average growth rate is 3.83% [2]. ISP companies have undergone intensive growth and development during the last decade. Today, they are operating in an extremely challenging business environment for the increasing customer dissatisfaction with existing services, market uncertainty, bandwidth limitation, limited market capital and inflexible IT infrastructures.

The Major finding of this paper is, how data mining can help to make ISP business profitable? We used Infobase Ltd. ISP Data for experiment.

As we are using Billing Data for Data mining, we like to see what information can be generated in terms of infrastructure Development or in terms of Marketing Development or in terms of Investment and return.

We will consider all significant rules which will exhilarate the Business of ISP.

4. LITERATURE REVIEW

In the paper "REVIEW OF LITERATURE ON DATA MINING" Mrs. Tejaswini Abhijit Hilage1 & R. V. Kulkarni researched in market basket analysis using three different algorithms like Association Rule Mining, Rule Induction Technique and Apriori Algorithm. Authors made a comparative study of three techniques. In Association Rule Mining, they generate association rules and calculate support and confidence. They assume minimum support and minimum confidence. The rules are true if they fulfilling the criteria of minimum support and confidence otherwise false. All interesting patterns can be retrieved from the database by Rule induction technique. "If this and this and this then this", is the simple form of rule induction systems. Accuracy is called the confidence where it refers to the probability that if the antecedent is true that the precedent will be true. High accuracy means a rule that is highly dependable. Coverage is called the support. It refers to the number of records where the rule applies to, in the database. The criteria of minimum accuracy and coverage is true, if it is assumed that the rules satisfy minimum accuracy and coverage otherwise false. According to the authors, all nonempty subsets of a frequent item set must also be frequent in the theory of Apriori algorithm. This property prunes the candidate which is not in any of the category and thus the numbers of candidates reduce. The data from shopping mall was also collected by authors. They applied the data mining algorithms to find out the association between the products [3].

Customer relationship management strategy can be built using customer data and information technology (IT) tools. To build profitable and long term relationships with specific customers, CRM comprises a set of processes and enabling systems supporting a business strategy (Ling & Yen, 2001).

The way relationships between companies and their customers are managed has been transformed and the opportunities for marketing have increased greatly by the rapid growth of the Internet and its associated technologies (Ngai, 2005). CRM has become renowned significant business approach but there is no universally established definition of CRM (Ling & Yen, 2001; Ngai, 2005). Swift (2001, p. 12) defined CRM as an ''Enterprise approach to understanding and influencing customer behaviour through meaningful communications in order to improve customer acquisition, customer retention, customer loyalty and customer profitability''. Kincaid (2003, p. 41) viewed 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''. Parvatiyar and Sheth (2001, p. 5) defined 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''. These definitions highlight the importance of viewing CRM as a comprehensive process of acquiring and retaining customers, with the help of business intelligence, to maximize the customer value to the organization which will lead the business profitable.

All ISPs collect and store data about their current customers, potential customers, suppliers and business partners. These data cannot be transformed into valuable and useful knowledge for the incapability to discover valuable information hidden in the data (Berson et al., 2000). Data mining tools could help to discover the hidden knowledge in the enormous amount of data for these organizations. Turban, Aronson, Liang, and Sharda (2007, p.305) 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''. Berson et al. (2000), Lejeune (2001), Ahmed (2004) and Berry and Linoff (2004) also provide a similar definition about data mining as the process of extracting or detecting hidden patterns or information from large databases.

Data mining technology can provide business intelligence with comprehensive customer data to generate new opportunities (Bortiz & Kennedy, 1995; Fletcher & Goss, 1993; Langley & Simon, 1995; Lau, Wong, Hui, & Pun, 2003; Salchenberger, Cinar, & Lash, 1992; Su, Hsu, & Tsai, 2002; Tam & Kiang, 1992; Zhang, Hu, Patuwo, & Indro, 1999). The application of data mining tools is an emerging trend in the global economy.

Data mining tools are good at extracting and identifying useful information and knowledge from enormous customer databases. These tools are one of the best supporting tools for making different decisions (Berson et al., 2000).

5. PROBLEM STATEMENT AND METHODOLOGY

In industry level, data mining applications depend on two main factors. First factor is the availability of business problems that could be successfully approached and solved with the help of Data Mining technologies. The second factor is the availability of data for the implementation of such technologies. The ISPs are surrounded with many business problems that need urgent handling by using innovative powerful methods and tools.

ISPs data can be generally classify as three main types: (1) customer contractual data – personal data about the customers including name, address, contact information, service plan, payment history, family income and credit score; (2) bandwidth usage data –detailed bandwidth usage including the date, time and duration of the usage from which knowledge can be extracted about customers usage behavior; (3) and billing data – data resulting bad debt.

The availability of large volumes of ISP data is the important reason for interests in Data Mining in the ISP sector. The application areas can be generalized as data mining is one of the most refined data analytical techniques used in business intelligence systems.

In this research work we identify three main application areas which need to be focus to make the ISP business profitable. The areas are (1) marketing, sales and customer relationship management; (2) Bad debt and (3) Bandwidth management.

6. GENERAL ALGORITHM

Association rule mining means to discover association rules that satisfy the predefined minimum support and confidence from a given database. The problem is generally divided into two subproblems. First subproblem is to find itemsets whose occurrences exceed a predefined threshold in the database. Those are called frequent or large itemsets. The second subproblem is to generate association rules from large itemsets with the constraints of minimal confidence. Suppose one of the large itemsets is Lp, Lp = {I1, I2, … , Ip}, association rules with this itemsets are generated in the following way: the first rule is {I1, I2, … , Ip-1}⇒ {Ip}. This rule can be determined either interesting or not by checking the confidence. Other rules are generated by deleting the last items in the antecedent and inserting it to the consequent. To determine the interestingness of them, confidences of the new rules are checked. Until the antecedent becomes empty, the processes iterated. The second subproblem is straight forward so most of the researches focus on the first subproblem.

For frequent itemset mining, many efficient and scalable algorithms have been developed. Association and correlation rules can be derived from itemset mining. These algorithms are classified into three categories: (1) Apriori-like algorithms, (2) frequent pattern growth-based algorithms, like FP-growth (3) and algorithms that use the vertical data format. We are going to use Ariori algorithm for our research. In Apriori algorithm, mining is applied on frequent itemsets for Boolean association rules. All nonempty subsets of a frequent itemset must be frequent is the level-wise mining Apriori property. At the pth iteration (for p>=2), it forms frequent p-itemset candidates based on the frequent (p-1)-itemsets, and scans the database once to find the complete set of frequent p-itemsets, Lp.

Generally, an association rules mining algorithm contains the following steps:

• The set of candidate p-itemsets is generated by 1-extensions of the large (p -1)- itemsets generated in the previous iteration.
• Supports for the candidate p-itemsets are generated by a pass over the database.
• Itemsets that do not have the minimum support are discarded and the remaining itemsets are called large p-itemsets.

This process is repeated until no more large itemsets are found.

Apriori is more proficient during the candidate generation process [8]. Apriori uses pruning techniques to avoid measuring certain itemsets, while guaranteeing completeness. These are the itemsets that the algorithm can prove will not turn out to be large. There are two bottlenecks of

the Apriori algorithm. One is the complex candidate generation process that uses most of the time, space and memory. Another bottleneck is the multiple scan of the database [7].

6. DATA PREPARATION

Data preprocessing includes data cleaning, integration, transformation, and reduction.

Data cleaning routines fill in missing values, correct inconsistencies and smooth out noise while identifying outliers in the data. This process is usually performed as an iterative two-step process. Steps consist of data transformation and discrepancy detection.

In data integration, to form a coherent data store, data are combined from multiple sources. For smooth data integration, data conflict detection, correlation analysis, metadata and the resolution of semantic heterogeneity contributes. Data transformation routines convert the data into suitable forms for mining.

For example, attribute data may be normalized and fall between a small range, like 0:0 to 1:0. Data reduction techniques such as data cube aggregation, attribute subset selection, discretization, dimensionality reduction and numerosity reduction can be used to obtain a reduced representation of the data to minimizing the loss of information content.

Data discretization and automatic generation of concept hierarchies for numerical data can involve techniques such as binning, histogram analysis, entropy-based discretization, c2 analysis, cluster analysis, and discretization by intuitive partitioning. Concept hierarchies is generated based on the number of distinct values of the attributes for categorical data.

Although numerous methods of data preprocessing have been developed we followed the following steps for data preparation:

First of all, we need to remove all columns from the database which seems to be not necessary for mining. As ISP deals with large database, this work reduces the size of the database.

Second, we convert the data in appropriate form for mining. Three different methods are available:

– Discretization-based
– Statistics-based
– Non-discretization based

We have transformed categorical attribute into asymmetric binary variables and introduce a new "item" for each distinct attribute-value pair. We have also used statistical-based transformation. Average, median and variance are generated for Total_Charge, Total_Payment, Current_Due and Bad_Debt field. After transformation we get the following table Table-I. Though we are presenting the table with 100 records, in practical experiment we have used 2555 transition data for mining.

CLINT_ID	CLINT_NAME	BACK_BONE_NAME	AREA_NAME	ACTIVATION_MONTH	CONN_TYPE_NAME	PLAN_NAME	STATUS_NAME	BAD_DEBT	TOTAL_PAYMENT	CURRENT_DUES	TOTAL_CHARGES
0020604	George	Kaltabazar	Kaltabazar Road	May	Home User	Economy	Running	Low	High	Low	High
0040804	Rizwan Rasool	Sutrapur	Banglabazar	January	Corporate User	Day	Pending	Low	Low	Low	Low

0100804	S.K. Suman	Sutrapur	Patla Khan Lane	January	Home User	Day	Pending	Low	Low	Low	Low
010212	Nannu Spinning Mill	Corporate	Islampur Road	February	Corporate User	1 Mbps	Pending	Low	High	Very High	Very High
0120804	Samsad	Capital	H.K Das Road	January	Home User	Economy	Pending	Low	High	Low	High
0150804	Kaushik Dey	Capital	H.K Das Road	January	Home User	Night	Running	Low	High	Low	High
0200904	Mihir Sarkar	Capital	Thakur Das Len	January	Home User	Economy	Pending	Low	High	Low	High
020212	New Appollo Cutting &corporation	Corporate	Mandil	February	Corporate User	1 Mbps	Pending	Very High	Very High	Low	Very High
0210904	Sayem-ur-Rahman	Sutrapur	Patla Khan Lane	January	Home User	Economy-2	Running	Low	High	Low	High
0280904	Prof.Ashraf Uddin	Kaltabazar	Kaltabazar Road	January	Home User	Economy-2	Running	Low	High	Low	High
0290904	Ariful Islam Bidduth.	Capital	Nandalal	January	Home User	Economy	Pending	Low	High	Low	High
030112	Sigma oil Ind. Ltd	Corporate	North Brook Hall Road	January	Corporate User	1 Mbps	Running	Low	Very High	Very High	Very High
0341004	Robin.	Sutrapur	Kagojitola	January	Home User	Deluxe	Pending	Low	Low	Low	Low
0361004	Nazrul Sohel	Sutrapur	Patla Khan Lane	January	Home User	Economy	Running	Low	Very High	Low	Very High
040312	Concord Book House	Corporate	Banglabazar	March	Corporate User	1 Mbps	Running	Very High	Very High	High	Very High
0411004	Sakhawat Hossain Molla	Capital	Nandalal	January	Home User	Economy	Running	High	Very High	Low	Very High
0481004	Kazi Deen Mohammad Dipu.	Nawabpur	Bangshall	January	Home User	Exclusive	Running	High	Very High	Low	Very High
0491104	Maruf Hasan	Capital	H.K Das Road	January	Home User	Deluxe	Pending	High	Very High	Low	Very High
050312	Naba Puthighar	Corporate	Wari	March	Corporate User	1 Mbps	Running	Very High	Very High	High	Very High
0531204	Gazi Azizul Haque	Capital	Pach Vai Ghat Len	January	Home User	Standard	Pending	Low	Low	Low	Low
0551204	Md. Sabbir	Sutrapur	Pari Das Road	January	Home User	Night	Pending	Low	Low	Low	Low
0581204	Shahedul Alam	Gandaria	Satis Sarkar Road	January	Home User	Night	Pending	Low	Low	Low	Low
060412	M/S.Rajdhani Enterprise	Corporate	Banglabazar	April	Corporate User	1MB	Running	Low	Very High	Very High	Very High
0620205	Mohammad Rana.	Sutrapur	Walter Road	January	Home User	Night	Running	Low	High	Low	High
0630205	Nasimul Matin	Nawabpur	Nawabpur Road	January	Corporate User	Buseness Hour	Pending	Low	Low	Low	Low
0660205	Asad Mahmud Bipu	Sutrapur	Walter Road	January	Home User	Standard	Pending	Low	Very High	Low	High
071012	Safety Plus	Corporate	Islampur Road	October	Corporate User	DD-256	Running	Low	High	Very High	High
0710205	Syed Tareque mahboob(Evan)	Gandaria	Rojoni Chowdhury Road	January	Home User	Exclusive	Running	Low	Very High	Low	Very High
0730205	Salauddin Rumi	Sutrapur	Kagojitola	January	Home User	Night	Pending	Low	Low	Low	Low
0780305	Hazi Saleh Ahmed	Sutrapur	Banglabazar	January	Corporate User	Exclusive	Running	Low	Very High	Low	Very High
080113	Bikrampur Auto Traders	Corporate	Banglabazar	January	Home User	DD2-256	Running	Low	Low	Low	Low

0920405	Everlink International	Nawabpur	Nawabpur Road	January	Corporate User	Standard	Running	High	Very High	Low	Very High
0960405	Enayet Hossain	Sutrapur	Shingtola	January	Home User	Economy	Running	High	Very High	Low	Very High
0990505	Taraqqi kamal	Gandaria	100 Khata	January	Home User	Standard	Running	Low	Very High	Low	Very High
10000609	Priom	Capital	H.K Das Road	June	Home User	Economy-2	Pending	Low	High	Low	High
10010609	Sutrapur Thana	Sutrapur	Sutrapur	June	Corporate User	Economy	Pending	Very High	Low	Low	Low
10020609	impex Pharmac Euticals	Islampur	Islampur Road	June	Corporate User	Day	Running	Low	High	Low	High
10030609	Shovon Routh	Capital	Kulu Tula	June	Home User	Standard	Running	High	High	Low	High
10040609	M. Salman Siddiqur Rahman	Kaltabazar	GOAL NOGAR	June	Home User	Economy	Pending	Low	Low	Low	Low
10050609	DR.Sharif hossain Ikbal	Nawabpur	Wari	June	Home User	Economy	Pending	Low	Low	Low	Low
10060609	Smrity	Sutrapur	Shingtola	June	Home User	Night	Pending	Low	Low	Low	Low
10080609	Bangladesh Commerce Bank Ltd.	Nawabpur	Bangshall	June	Corporate User	Day	Pending	Low	Low	Low	Low
10090609	Prof. Jasim Uddin	Kaltabazar	JHONSON ROAD	June	Home User	Day-3	Pending	High	Low	Low	Low
10100609	Dr. Belal Ahmed	Kaltabazar	JHONSON ROAD	June	Home User	Day	Pending	Low	Low	Low	Low
10110609	Apu Shaha	Sutrapur	Patla Khan Lane	June	Home User	Economy	Pending	Low	Low	Low	Low
10120609	Sumata mostak Esha	Sutrapur	Patla Khan Lane	June	Home User	Night	Pending	Low	Low	Low	Low
10130609	KH . Anik Ahmed	Capital	Distilary Road	June	Home User	Night	Pending	Low	Low	Low	Low
10140609	Pubali Bank Ltd. 1	Nawabpur	Bangshall	June	Corporate User	Day	Pending	Low	Low	Low	Low
10150609	Pubali Bank Ltd. 2	Nawabpur	Bangshall	June	Corporate User	Day	Pending	High	Low	Low	Low
10160609	Rony	Gandaria	R- Singhate	June	Home User	Night	Pending	Low	Low	Low	Low
10170609	Gandaria High School	Gandaria	Satis Sarkar Road	June	Corporate User	Day	Pending	Low	Low	Low	Low
10180609	A1 Gsm	Islampur	Sadar ghat	June	Corporate User	Day	Running	Low	High	Low	High
10190609	Abdur Razzak	Sutrapur	Malaka Tola	June	Home User	Night	Running	Low	High	Low	High
10200609	Anamica Chowdhury	Capital	Nandalal	June	Home User	Standard	Pending	Low	Low	Low	Low
1020505	Xian	Kaltabazar	Kaltabazar Road	January	Home User	Standard	Pending	Low	High	Low	High
10210609	Rony	Gandaria	R- Singhate	June	Home User	Night-2	Running	Very High	High	Low	High
10220609	Raj Narayan Saha	Capital	Nandalal	June	Home User	Economy	Running	Low	High	Low	High
10230609	Md. Shirazul Islam	Gandaria	R- Singhate	June	Home User	Economy	Pending	Low	Low	Low	Low
10240609	Dr. Mithu Malaker	Islampur	Shakharibazar	July	Home User	Night	Pending	Low	Low	Low	Low
10250709	Antara Barai	Capital	H.K Das Road	July	Home User	Economy	Pending	Very High	High	Low	High
10260709	Bodrun Naher	Kaltabazar	Kaltabazar Road	July	Home User	Economy	Running	Low	Very High	Low	Very High

10270709	Arun Chandra Roy	Kaltabazar	Kaltabazar Road	July	Home User	Economy	Pending	High	Low	Low	Low
10280709	Sumon Miah	Nawabpur	Bangshall	July	Home User	Night	Pending	Low	Low	Low	Low
10290709	Kazi Asaduzzaman	Islampur	Islampur Road	July	Corporate User	Day	Pending	Low	Low	Low	Low
10300709	Md. Ashik Mridha	Kaltabazar	Kaltabazar Road	July	Home User	Deluxe	Pending	Low	Low	Low	Low
10310709	Sujon	Sutrapur	Pari Das Road	July	Home User	Economy	Pending	Fail	Low	High	Low
10320709	Md. Shafiqul Islam Sohel	Kaltabazar	JHONSON ROAD	July	Home User	Deluxe	Pending	Low	Very High	Very High	Very High
10330709	Shobuj	Islampur	Sadar ghat	July	Corporate User	Deluxe	Running	Low	Very High	Low	Very High
10340709	Goutam Roy	Nawabpur	Wari	July	Home User	Standard	Pending	High	Low	Low	Low
10360709	Md. Zahidul Hasan	Sutrapur	Patla Khan Lane	July	Home User	Economy	Pending	Low	Low	Low	Low
10370709	Robin	Nawabpur	Bangshall	July	Home User	Standard	Pending	Very High	Low	Low	Low
10380709	Sharif Rubber Industries	Gandaria	Postogola	July	Corporate User	Day	Pending	Low	Low	Low	Low
10410709	Anik	Nawabpur	Nawabpur Road	July	Home User	Economy	Pending	Low	High	Low	High
10420709	Pronai	Islampur	Shakharibazar	July	Home User	Deluxe	Running	Very High	High	High	High
10430709	Adr. Rifat Ahmed Mintu	Capital	Thakur Das Len	July	Home User	Economy	Pending	Low	Low	Low	Low
10440709	Mohammed Al Amin	Gandaria	R- Singhate	July	Home User	Economy	Pending	Low	Low	Low	Low
10460709	M. Shahidul Islam	Islampur	Jhonson Road	July	Corporate User	Day	Pending	Low	Low	Low	Low
10470709	Shafin	Capital	Capital	July	Home User	Standard	Pending	Low	Low	Low	Low
10480709	Jasim Uddin	Gandaria	Postogola	July	Home User	Economy	Pending	Low	Low	Low	Low
10490709	DR. Jannnatul Ferdousi	Kaltabazar	JHONSON ROAD	July	Corporate User	Day	Pending	Low	Low	Low	Low
10500709	Qazi Liton	Nawabpur	Goal Ghat	July	Home User	Standard	Running	Low	Very High	Low	Very High

1051070 9	Md. Tushar	Islampur	Simpson Road	July	Corporate User	Day	Pending	Ver y Hig h	Low	Low	Low
1052070 9	Al- Amin Garmrents	Nawabp ur	Bangshall	July	Corporate User	Economy	Pending	Low	Low	Low	Low
1053070 9	Nargis Aktar	Capital	Narinda	July	Home User	Economy	Pending	Low	Low	Low	Low
1054070 9	Ridoan Khan Anik	Sutrapur	Patla Khan Lane	July	Home User	Exclusive	Pending	Low	Low	Low	Low
1055070 9	Hriday International	Nawabp ur	Nawabpur Road	July	Corporate User	Day	Running	Low	High	Low	High
1056070 9	Syed Nahidur Rashid	Capital	Dholaikhal	July	Corporate User	Buseness Hour	Pending	Low	Low	Low	Low
1057070 9	Bappy Electronics	Islampur	Patuatuli	July	Corporate User	Day	Pending	Low	High	Low	High
1058070 9	Mohammad Sajib	Capital	Narinda	July	Home User	Night	Pending	Low	Low	Low	Low
1059070 9	MR. Tuku	Sutrapur	Farashgonj	July	Home User	Standard	Pending	Hig h	High	High	High
1060070 9	Masudur Rahman	Sutrapur	Banglabaza r	July	Corporate User	Economy	Pending	Hig h	High	Low	High
1061070 9	Fahim Hossain	Nawabp ur	Wari	July	Home User	Night	Pending	Low	Low	Low	Low
1062070 9	Md. nizam Uddin	Kaltabaz ar	Court House Street	July	Corporate User	Economy	Running	Ver y Low	High	Low	High
1063070 9	Munna Kar	Islampur	Shakhariba zar	July	Corporate User	Day	Pending	Low	Low	Low	Low
1064070 9	Samir Enterprise	Nawabp ur	Nawabpur Road	July	Corporate User	Standard	Pending	Low	Low	Low	Low
1065070 9	Jack Nelson	Sutrapur	Patla Khan Lane	July	Home User	Night	Running	Low	High	Low	High
1066070 9	Partha Saha	Gandaria	Dino Nath sen Road	August	Home User	Economy	Pending	Low	High	Low	Low
1067070 9	Milon	Nawabp ur	Nawabpur Road	August	Home User	Day	Pending	Low	Low	Low	Low

7. COLLECTED RULE

Trivial and Inexplicable Rules occur most often. We used Clementine 11.1 to mine our data using Apriori Algorithm. We found various association rules, among them we Collect Actionable rules with their support and confidence. Collected rules with explanations are given bellow:

Plan Wise:

PLAN_NAME = Economy-2	BACK_BONE_NAME = Gandaria and STATUS_NAME = Running and BAD_DEBT = Low and CURRENT_DUES = Low	3.48(suport)	40.16(Confi)	1.39(R.Sup)
PLAN_NAME = Economy	BACK_BONE_NAME = Sutrapur and STATUS_NAME = Pending	10.85(S)	32.63(C)	3.54(RS)

Back Bone Wise:

BACK_BONE_NAME = Islampur	TOTAL_CHARGES = High and TOTAL_PAYMENT = High and STATUS_NAME = Running and BAD_DEBT = Low and CURRENT_DUES = Low	4.39(S)	31.81(C)	1.39(RS)
BACK_BONE_NAME = Jatrabari	CURRENT_DUES = High and TOTAL_PAYMENT = Low and TOTAL_CHARGES = Low	2.42(S)	36.47(C)	0.88(RS)

Area Wise:

AREA_NAME = Nawabpur Road	PLAN_NAME = Day and STATUS_NAME = Running and BAD_DEBT = Low and CURRENT_DUES = Low	3.79(S)	12.78(C)	0.48(RS)
AREA_NAME = Sadar ghat	PLAN_NAME = Day and STATUS_NAME = Running and TOTAL_PAYMENT = Low and BAD_DEBT = Low	2.68(S)	11.70(C)	0.31(RS)

Status Wise:

STATUS_NAME = Pending	PLAN_NAME = Economy	25.81(S)	64.71(C)	16.70(RS)
STATUS_NAME = Running	PLAN_NAME = Economy-2	20.95(S)	49.31(C)	10.33(RS)
STATUS_NAME = Pending	BACK_BONE_NAME = Islampur	21.50(S)	57.23(C)	12.30(RS)
STATUS_NAME = Pending	BACK_BONE_NAME = Sutrapur	19.07(S)	56.88(C)	10.85(RS)

8. BUSINESS GOAL ACHIEVEMENT

Internet Form the above information the following business decisions are taken:

1.   We conclude form data mining, The Particular ISP's existing bandwidth & service is enough for existing Customers who are using Day package as their stable probability is so high. By more marketing activity The Particular ISP can increase their clients on day user area like Nawabpur, Sadargat.

2.   Night Package user have higher probability of un-stable customer, we can conclude Night user has some dissatisfaction with bandwidth & service. The Particular ISP can increase their bandwidth and service on the night package only. Regarding they can arrange some bandwidth only for night Time. And The ISP can take some extra management effort to follow-up in night time Customer service.
3.   As the Jatrabari backbone has the high probability for Payment Due and Payment rate is low The ISP can take a business viability analysis to make decision that they will continue with this backbone or not.

9. FUTURE TASK OF THIS RESEARCH

Internet The task that we have done in this thesis can be extended more. A lot research is possible in this field.

We tried to generate some rule based on billing database Mining. If we can arrange some data against particular Customer wise bandwidth use and from data mining we can generate some more interesting and useful information which can make a more contribution for business growth of ISP.

Beside ISP this research can contribute and extended to any business logic where hues customer data is used.

10. CONCLUSIONS

Internet The market of ISP is highly competitive. This business induces higher charges to win new customers than to keep existing ones. A lot of research is needed to discover those customers who have a high possibility of altering. Customer retention efforts have also been costing large amounts of resources to the organizations. Besides this every ISP has some offer packages, cover area, customer group. Nature of user packages depends on the type of customer, their needs, business covered area's type (Like Commercial Area, Residence Area, Sub-urban Area Etc). These Specific ISP data can be used for data mining to make services better. Thus business will flourish to new level of acceptance.

REFERENCES

[1]   Jiawei Han, Micheline Kamber, Data Mining:Concepts and Techniques, Second Edition
[2]   BTRC, http://www.btrc.gov.bd/index.php Date:21-02-2013
[3]   R. V. Kulkarni, Mrs. Tejaswini Abhijit Hilage, Professor and HOD, Chh. Shahu Institute of Business Education And Research Centre, Kolhapur, India, REVIEW OF LITERATURE ON DATA MINING, Vol10Issue1, January 2012.
[4]   Jiao, J.R., Zhang, Y., & Helander, M. (2006). A Kansei mining system for affective design. Expert Systems with Applications, 30, 658–673.

[5] Mitra, S., Pal, S. K., & Mitra, P. (2002). Data mining in soft computing framework: A survey. IEEE Transactions on Neural Networks, 13, 3–14

[6] E.W.T. Ngai a,*, Li Xiu b, D.C.K. Chau a, Application of data mining techniques in customer relationship management: A literature review and classification, Expert Systems with Applications 36 (2009) 2592–2602.

[7] Qiankun Zhao, Nanyang Technological University, Singapore and Sourav S. Bhowmick Nanyang Technological University, Singapore, Association Rule Mining: A Survey.

[8] Agrawal, R. and Srikant, R. 1994. Fast algorithms for mining association rules. In Proc. 20th Int. Conf. Very Large Data Bases, 487-499.

[9] Chowdhury, M.T.M. Grameen CyberNet comes forward to provide Internet service. Computer Jagat, 1996; July, 6(3): 36-7.

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