

# **Business Intelligence Using Data Mining for Organizational Sustainability: A Case Study of Digi Telecommunication Sdn Bhd**

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## **Abstract**

*In today business, meeting consumer satisfaction and needs is an unquestionable requirement. The organizations need to incorporate the vast volumes of data accessible and to utilize this information to bolster the nature of their decision making, in order to remain competitive advantage (sustainability) and to expand the profit. This paper displays a log information explanatory process in telecommunication industry, for business intelligence intrigued by breaking down client and behavioural data to enhance their comprehension of client dependability and client's satisfaction. The data mining procedure to accomplish key client management goals is introduced. This paper gives a demonstrated information explanatory strategy used to recognize variety kinds of attributes in telecommunication industry, specifically in Digi Telecommunication Sdn. Bhd, Malaysia.*

**Keywords:** Business Intelligence, Data Mining, Telecommunication Industry.

## **Introduction**

The organizations are becoming more and more cognizant about the importance and advantages of data and information kept in their organization. In order to stay competitive and remains sustain in business world, telecommunications company has to capture the right information at the right time and utilize that information to create profit and achieving customer satisfaction. In the 21st century, associations are developing into new structures in view of knowledge and networks in light of a turbulent and obscure condition characterized by indistinct organizational boundaries and fast- paced change (Seufert and Schiefer, 2005; Drucker, 1993; Kelly, 1998; Grove, 1999). In such conditions, information based resources are acknowledged to be the base of practical upper hand and the establishment of achievement in this century (Wiig 1997; Ross et al., 1996; Groom and David, 2001).

Fortunately, telecommunications companies know more about their customer than anyone else. With the help of Business Intelligence (BI) techniques, the telecommunication companies can easily tracking theirs customers' activities and data. The organization have to extract and integrate large volume of data available for the quality of the decision-making and to improve customer relationship in order to increase profit and sustainability. One of the part of Business Intelligence (BI), data mining is the process of automatically discovering useful information in large data repositories (Tan, Steinbach and Kumar, 2006). Business intelligence (data mining) techniques are used to turn business data into valuable information and generate business intelligence, helping organizations to make effective

decisions. Data mining can be applied or nurture to any kind of business in any field, but this paper will describe why it is valuable to the telecommunication industry. One telecommunication company in Malaysia, Digi Telecommunication Sdn. Bhd. is an example of large organization actively performing business intelligence (BI) coupled with data mining for their sustainability.

## **Literature Review**

### **Business Intelligence**

Business Intelligence (BI) is data- driven decision making. According to Negash and Gray, 2006, Business Intelligence consolidates data gathering, information stockpiling, and knowledge management with systematic and analytical tools in order to present complex and complete information to the organization's stakeholders and decision makers. In the making of the better and accurate decisions, every procedures and process in BI must been includes to bolster data gathering, sharing and reporting, however BI not entirely technological. As indicated by Castellanosm and Dayal, 2008, Business Intelligence (BI) includes the integration of core data with important business information to distinguish huge events, discover the new business situations and foresee business circumstances. BI incorporates the generation, aggregation, analysis, and visualization of data to illuminate and encourage business administration and strategizing. BI is top of the information and not exactly just how the data is assembled or crunched, yet BI is the thing that the business pioneers and top administrations really do with the insights information and decisions they gather from it. Turban, et al., 2002, defined BI as a computer based decision analysis normally done online by administrators and managers. It incorporates gauging, examining options and assessing danger (risk) and execution.

McLeod and Schell, 2001, contend that BI is an expansion of competitive intelligence (CI). Competitive intelligence (CI) involves investigating the business environment to impact its emerging technique for business improvement. It is characterized as significant proposals emerging from a precise procedure, including arranging, assembling, examining and scattering data on the external environment, for circumstances or advancements that can possibly influence an organization or a country's competitive situation.

Furthermore, McLeod and Schell, 2001, aggressive global competition has constrained organizations to re-evaluate the path in which they accumulate information. Today, the gathering, storage and dissemination of environmental information represent an important computer application in many organizations around the globe. Initially, the application was devoted to gather information on the competitors and in this way the term competitive intelligence was instituted. At the point when characterized extensively to incorporate data on every single natural component, the best possible term is Business Intelligence (BI).

The way of characterizing BI is extremely complex. In any case, it can be reasoned that BI is a kind of decision support system (DSS). According to Rob and Coronel, 2002, DSS help the management of the organization in making the managerial decisions with the assistance of extensive data 'massaging' usage in order to produce the information.

In this way, BI improves productivity in the telecommunication industry and can help administration to define methodologies, bolster decision making, foresee for circumstances, recognize issues or problems and substantiate activities. The utilization of expert systems such as Customer Relationship Management (CRM) system, it demonstrates the prevalence of data mining in the telecommunication industry these days.

### **Data Mining**

Discovering answers you didn't have any acquaintance with you were searching for in advance is the thing that Data Mining is about. With so much data accessible, you can never make sure you're not ignoring some key certainty indicating the way better execution. Data mining is the act of filtering through all the proof looking for already unrecognized examples. A few organizations are notwithstanding procuring Data Scientists, specialists in insights and software engineering who know every one of the traps for finding the signs covered up in the clamour. Data mining likely fits inside the classification of investigation, however most examination depends on information from frameworks set up to track known KPIs—so it's generally more measuring than mining. Data mining; where the data is prepared under measurable based calculations or algorithms, which could retrieve useful information from it.

Managing the centrality of large amount of data, rather than single information, is an exceptionally recognizable activities to each type of human knowledge. In that way, utilizing statics as reason for data analysis turns out to be increasingly important for creating productive and supportive knowledge in business. Data mining is the way of applying rational analytical process - statical techniques - to measure of data in order to make merged patterns. Data mining exploits computational capacity to plunge further in meaning of patterns than immaculate statics. At the point when aligned with an information distribution centre stockpiling ability and the ideas of BI, data mining can provide for a business or organization, accuracy and security while making decisions.

Vast amount of data, for example the customers' profile of a major organization, would be practically difficult to extract reasonable information without the assistance of precise strategies and procedures. Understanding the dimensions of issues like these, insightful managing this data requests appropriate data mining processes.

In the real business setting, data mining procedure can be separated into four principal stages:

- **Classification:** Is the part which crude information must be isolated into gatherings, keeping in mind the end goal to isolate the common examples (the noticeable ones).
- **Clustering:** With the assistance of innovation and particular hierarchical strategies, information is figured out how to make littler gatherings (less noticeable to human's eyes).
- **Statistical fitting:** In this stage, is hunt down knowing scientific examples in information qualities.
- **Association:** Useful data regularly agree numerous factors, which bonds can be found in affiliation forms.

### **Telecommunications Industry in Malaysia**

Telecommunication industry in Malaysia has entered a very competitive for as far back as couple of decades. According to Mazlan, 2005, the end of monopoly by the telecommunication services since 1992 is one of the top priorities made by the government of Malaysia in order to become the developed country in 2020. The extension and improvement of telecommunication services are imperative for the development of country. The initial step included the joining of Telekom Malaysia in 1987 as a government- owned company. Afterward, new telecommunication companies were authorized to provide certain services, for example, mobile cell phones, pagers, trunked radio, two-way radio systems and other services, according to The National Media transmission Policy of Malaysia (NTP), 1994. Mohamad, 2004 believes that the development in Malaysia's telecommunication sectors will be fuelled by more prominent customer enthusiasm for rapid broadband Internet. The government has had its influence in this improvement through its National Broadband Plan.

Rapid development of the internet and information technology sector has made telecommunications companies into a new competitive business environment. According to Chong et al., 2006, Malaysia's telecommunications company need to be proactive in driving and transforming the Malaysian economy into a knowledge- based economy (K-Economy).The integration between the telecommunications and IT industries additionally brings the rapid development of complex innovation, which introduces a new information technology- based century. Malaysian Communications and Multimedia Commission in 2007 reported that there were five telecommunication services companies in Malaysia to provide services for 26 million populations.

- (1) Telekom Malaysia Berhad (TM Bhd) - a large government-linked company,
- (2) MAXIS Mobile Berhad (MAXIS),
- (3) Celcom Berhad,
- (4) Time Telecommunications, large locally-owned private companies, and
- (5) DIGI Communication Bhd – multinational company.

These organizations are competing for market share of 4.60 million fixed line telephone services, 11.43 million services and 2.89 million dial-up internet clients (Malaysian Correspondence and Multimedia Commission, 2008). The competition among these companies are stiff in order to attract the customers and remain sustain. The existing customers as well the potential customers were promoted to the services provided via advertisements such as billboards, brochures, campaigns and through social media platforms. Various benefits and incentives for example, price reduction, flexible services and attractive packages were offered to the customers to join or switch into their plans.

### **Links between Data Mining, BI, and Knowledge Management**

#### **Distinction between BI and KM**

Cook and Cook, 2000, stated that BI is the uses of applications and technologies to capture, access, and analyse the vast amount of data processes into useful information for the organization or management to make effective business decisions. This statement also supported by Williams and Williams in 2006. Loshin,2003, believes the basic technologies of BI which includes business rule modelling, data warehousing, data

profiling and online analytical processing also data mining, fully utilized and integrated massive data to help the organization gain competitive advantages. Meanwhile, Knowledge Management (KM) is a set of practices of creation, development and application of knowledge to enhance and increase the organization's performance, cited by Wiig, 1999; Buckman, 2004; Feng and Chen, 2007; Lee and Change, 2007; Smoliar, 2007; Wu et al., 2007; Paiva and Goncalo, 2008; Ramachandran et al., 2008. KM improves the knowledge and information usage in organization, similarly to BI, yet different in many aspects. KM is more focusing to human subjective knowledge, not data or objective information. According to Nonaka and Takeuchi, 1995, majority of models in KM such as tacit and explicit knowledge framework are purposely used for a dynamic human process to justify personal belief and truth; which are basically non-technology oriented.

### **Data Mining is a bond between BI and KM**

Data mining (DM) is known as a powerful BI tool for knowledge discovery. Brachman et al., 1996, sees the process of DM is a KM process because of the involvement of human knowledge.

Data mining can be valuable for KM in two ways:

1. To share mutual understanding of BI context among the data miners and analyst.
2. The practices and usages of DM tools to extend human knowledge.

The integration of DM and KM can be found at the conceptual level. Malhotra, 2004 proposed the integration models between KM and DM for routine structured information processing and non- routine unstructured sense making. In addition, White, 2005, provides a flowchart model on the use of BI in the KM for decision making process which includes the involvement, collaboration and integration between knowledge workers and knowledge managers in socialization.

### **Methodology**

The case study examines a Customer Relationship Management (CRM) system developed and implemented by Digi Telecommunication Sdn. Bhd., a telecommunication company in Malaysia. CRM empowers the information accumulation over the clients profile and lessen the operational cost. CRM turns into an indispensable part to the development of the data mining keeping and the end goal is to bolster association applications and business insight capacities. A definitive objective is to catch and order the information on clients from different stages – email, site, live visit, phone discussion and online networking input from the present and potential clients. All the data will be processes and analyses to produce useful information for the management in making the decisions.

This case study is based on in- depth interviews with the management of Digi Telecommunication Sdn. Bhd., alongside the optional information gotten to from multi-sources, for example, Digi's sites, Digi's yearly journals and reports. The main fieldwork was conducted with semi-structured interviews of the most knowledgeable manager and informant at Digi's corporate headquarter. The scope of the meetings shrouded many variables required in the improvement and usage procedure of the CRM framework. Documentary evidence permitted cross-checking of much of the interview materials. The utilization of remotely situated articles gave yet another strategy to triangulate the

legitimacy of the meeting data. In addition, the document and interview data were transcribed, investigated and triangulated with iterative confirmation with interviewees until organized discoveries were shaped. Given the nature and contextual conditions of the CRM system, the report of this case study is qualitative.

## **Findings**

### **Organization Background**

Digi Telecommunications Sdn Bhd is a telecommunications company based in Malaysia that provides wireless telecommunications services across the nation. The offers provided by Digi Telecommunication Sdn. Bhd. are mobile and fixed telephony products and services which includes the package of prepaid, postpaid, and international services. The data services is widely serves to individual and corporate customers. The company was formerly known as Mutiara Telecommunications Sdn Bhd before changing the name to Digi Telecommunications Sdn Bhd in January 1999. Digi Telecommunications Sdn Bhd was founded in 1995 and is based in Shah Alam, Malaysia. Digi Telecommunications Sdn Bhd operates as a subsidiary of DiGi.Com Berhad.

Digi Telecommunications Sdn Bhd is telephone and internet connection provider enabling 12.3 million Malaysians to connect with everyone in the world. With the aim to become Malaysians' favourite life partner, Digi Telecommunications Sdn Bhd focusing on digital connection and lifestyles thanks to 4G+ network. This is because Digi Telecommunications Sdn Bhd believes connection is the important part of human life to build a better world and a better future. As part of the Telenor Group and leader of the rapid pace business growth, Digi has been listed in Bursa Malaysia.

### **Case Analysis**

To remain sustain in the fierce competition, Digi Telecommunications Sdn Bhd took an approach by introducing BI in their business work. The BI modelling has been implemented in every department in order to be more standardized the whole departments. A structural equation modelling (SEM) consists of Quality BI Information, Quality BI Users, Quality BI System, BI Governance, Business Strategy, Organization Culture and Use of BI Tool are important criteria in order to guarantee of Successful BI Deployment. The interrelated between all these factors can be seen in Figure 1.

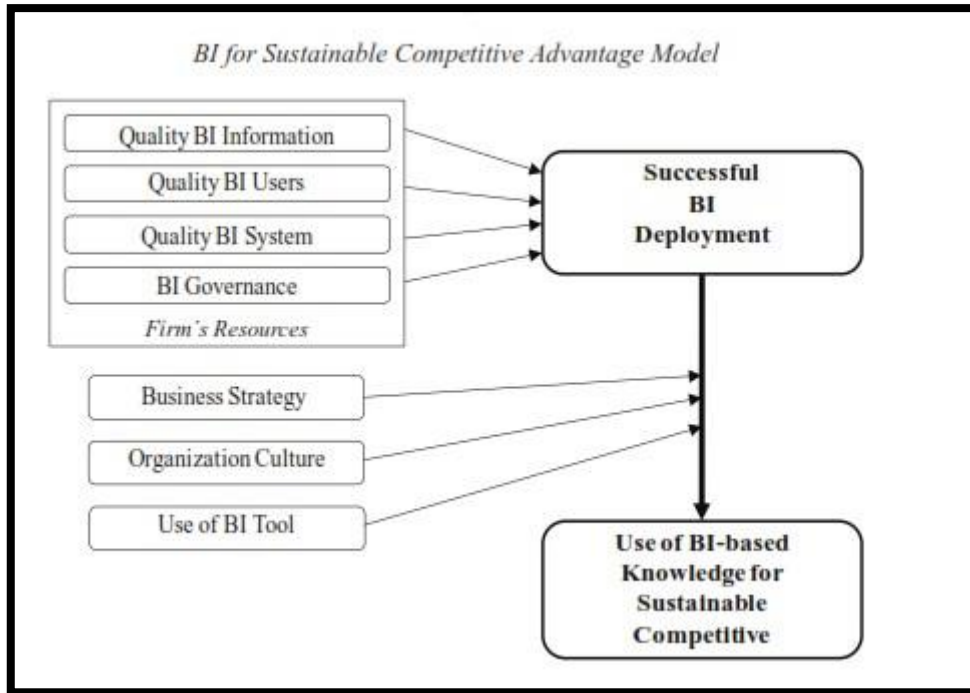


Figure 1. BI for sustainable competitive advantage model.

Since Digi Telecommunications Sdn Bhd are keen to implement the foundation of customer-centric organization, they are implemented with CRM system as one of the BI tools. CRM system used in Digi Telecommunications Sdn Bhd presented a full integration in fulfilment order and the billing system that will reduced the manual data entry; reducing the workload and more time-saving. This would help the sales department more focusing on sales and marketing activities and CRM also allows sales agent to foresee the sales progress. For management, this system allows the top managements to create charts and making reports in accounts, sales and marketing, and business line performance. CRM applications is the tool that use Online Analytical Processing (OLAP) and data mining to perform the analytical processes of the data. This section will be focusing on how CRM data mining the vast amount of data in order to produce high quality information for decision making with a reason to stay competitive advantage. The strategy of data collecting and mining using CRM as presented in Figure 2.

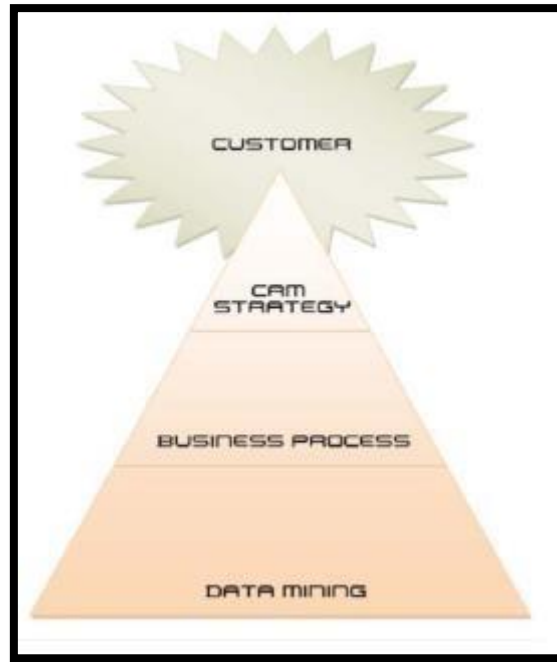


Figure 2. CRM strategy business and data mining processes.

Raw information ought to be gathered and aggregated to the customer level. Various summary factors can be utilized. The recommendation of data collected are based on the normal call length, the rate of no-answer calls, the rate of calls to/from an alternate region code, the rate of weekday calls (Monday – Friday), the rate of daytime calls (9:00 A.M. – 5:00 P.M.), the average number of calls every day, the average number of calls originated every day. Some different components, as minutes of calls in standard time period, minutes of calls in rebate time period, minutes of calls in evening outline, minutes of local call, minutes of international call, or minutes of the aggregate call can be utilized too. These factors are gotten from call detail information gathered over some day and age (e.g. one, three, or six months).

All components above can be utilized for client profiling, which is a standout amongst the most important data mining applications in Digi Telecommunication Sdn Bhd. Aside than call detail records, CRM store numerous other information in their databases. For instance, it gather data about their clients (name, address, age and sex data). Client information can be utilized as a part of conjunction with call detail information in order to get better data mining result, as shown on Figure 3.



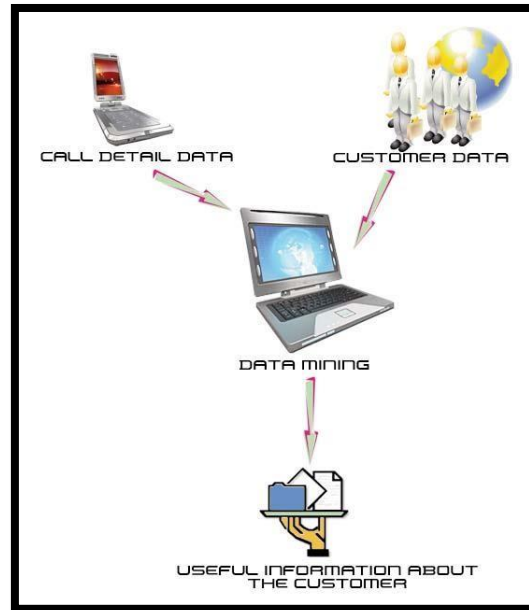


Figure 3. Combining call detail and customer data for better data mining results.

CRM will acquire all the related data of all the organization and how it is interconnected with customers' data. Then, CRM works into three different areas which are:

- Operational Group - This stage will focus on the automation of business processes that involve the first person contact point of Digi Staff. This application plays a major role in sales force automation, customer service, and marketing.
- Analytical Group - This stage will focus on customer data analysis, modeling, and evaluation. It plays major roles in fraud detection.
- Collaborative Group - This stage will focus on collaborative services and infrastructure that enable the interaction between companies, mainly in Network Management.

Table 1. Data Mining using CRM in Digi Telecommunication Sdn Bhd

BI and Data Mining Application Areas	Scope Area

<p>Marketing, Sales and Customer Service</p>	<ul style="list-style-type: none"> <li>• Generating client profiles from call detail records and digging these profiles for showcasing purposes</li> <li>• Measuring client esteem and holding productive clients</li> <li>• Maximizing the benefit gotten from every client</li> <li>• Discovering affiliation and successive examples to advance Telecommunication administrations</li> <li>• Acquiring new clients</li> <li>• Churn Analysis :-             <ol style="list-style-type: none"> <li>I. Churn forecast: anticipating whether a specific client will agitate and when it will happen</li> <li>II. Churn administration: understanding why specific clients beat and applying endeavours to hold them</li> </ol> </li> </ul>
<p>Fraud Detection</p>	<ul style="list-style-type: none"> <li>• Identification of potentially fraudulent users and their atypical usage patterns (subscription fraud)</li> <li>• Detecting attempts to gain fraudulent entry to customer accounts (superimposed fraud)</li> <li>• Discovering unusual patterns that may need special attention such as busy-hour, frustrated call attempts, switch and route congestion patterns, etc.</li> </ul>
<p>Network Management</p>	<ul style="list-style-type: none"> <li>• Network blame ID</li> <li>• Alarm connection (for relating different alerts to a solitary blame)</li> <li>• Network blame forecast</li> <li>• Identifying and looking at information movement</li> <li>• System work stack administration</li> <li>• Resource use administration</li> <li>• User aggregate conduct</li> </ul>

In order to extract the data mining from customers, CRM concerning on two factors which are customer segmentation and churn prediction. These two factors are important to build relevance patterns to CRM for better decision making.

### **Customer Segmentation**

Customer Segmentation is gathering comparative clients together, in light of numerous diverse criteria. Along these lines it is conceivable to focus on every last gathering relying upon their qualities. Client division helps organizations create suitable advertising efforts and evaluating systems. One of the famous method using in this process is clustering. By clustering, the data miners or analyst can sort the large amount of data into groups with similar characteristics. The advantages of using clustering techniques is because it covers the complete set of data, findings the missing or dirty data, forming the patterns as shown in Figure 4.

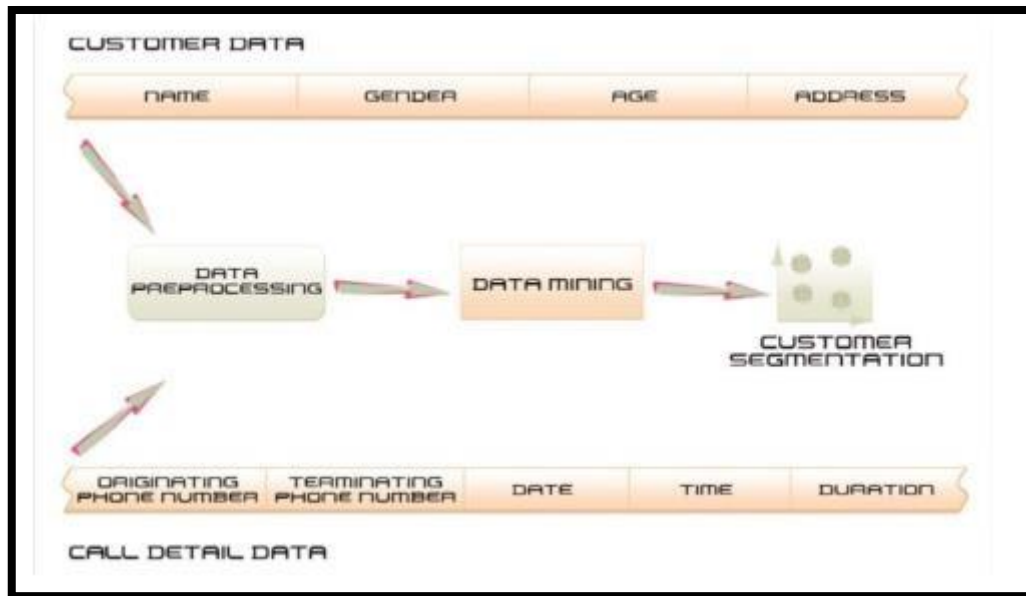


Figure 4. The data available for customer segmentation

## Churn Prediction

Churn prediction is more focus on the future prediction which impact on customer loyalty. By this method, CRM can produce the patterns on how loyal one customer using DiGi services. It is important because the cost of keeping the loyal customers is ten times lower than recruiting the new customers. With the help of CRM, the management can predict the list of possible customers who have high probability leaving the company or port out to other telecommunication companies (competitors). This churn prediction can be break down into two which are voluntary churn and involuntary churn. In voluntary churn, the customers are the first who engages the action. Meanwhile, in involuntary churn, the company took the first action mostly related to service's cut off, billing and payment process as can be seen in Figure 5.

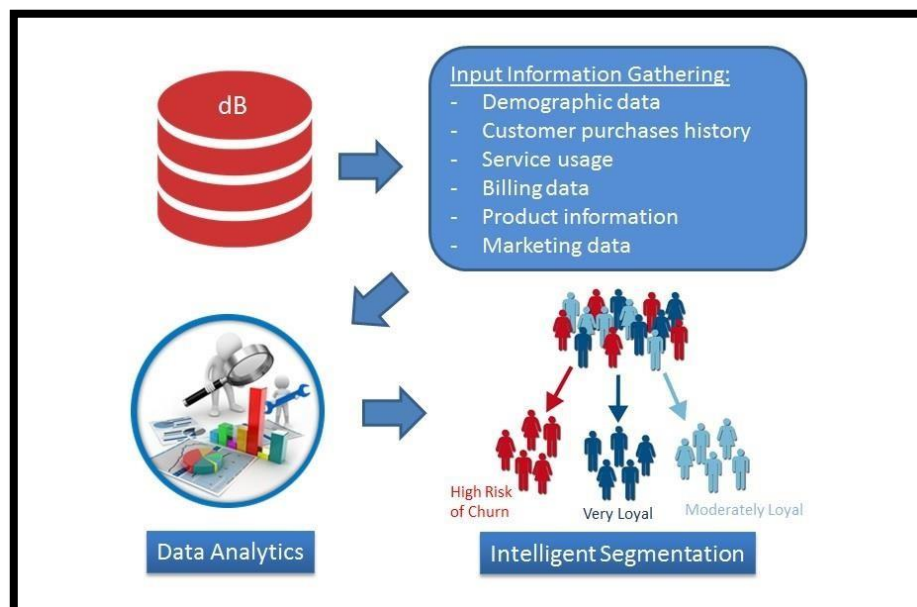


Figure 5. The data available for churn prediction.

Abilities for data collection have been expanding quickly in all department in Digi Telecommunication Sdn Bhd. The volume of data is relied upon to keep on growing in the future and the organization must be able to handle all these processes very well. That is the reason Digi Telecommunication Sdn Bhd needs to use CRM that can change these immense measures of data into helpful information and knowledge with one ultimate goal; to remain sustain in the competition.

## **Discussion and Recommendations**

With the use CRM in Digi Telecommunication Sdn Bhd, not only the use of BI help the organization to stay sustain, but also affected the whole operational in the organization in the good ways. One thing that we can see from the changes of environment in Digi Telecommunication Sdn Bhd is through the improvement of intellectual capital. The four capital that affected are Customer capital, Relationship capital, Human capital and Innovation capital.

**Customer capital** – The use of BI tools (CRM) has improved the customer relationship to the company. Once the service quality improved, more new customers joining Digi and more loyal customers has been made.

**Relationship capital** –Through the service network or Digi application on smartphones, the relationship gap between customers and Digi agents also become close. A quick response and feedback can be given to the customers in short time.

**Human capital**- With the use of CRM, it help to bolster the worker’s knowledge, encourage the staff to learn new skills and things and becoming the knowledge- worker. Thus, it will nurture the knowledge sharing culture not only among the workers but to the management also.

**Innovation capital**- CRM provides the knowledge analysis based on behaviour, problems and resources about the clients, services and experiences. This will help Digi Telecommunication Sdn Bhd to keep growing and compete with other competitors.

However, Digi Telecommunication Sdn Bhd also faces a few problems regarding of BI and Data Mining in daily business line. One of the biggest problems is data quality. Some of the processed data did not produced high quality of information for the decision making even though undergone BI and data mining process. Getting of the cross-functional or comprehensive view of information also extremely hard for the company. Another important problem is regarding the needed of more complex pre-processing data, especially data aggregation of semantic level due to data availability in the form of transactions. Besides, scalability is the one of concern that the company need to focus, due to vast amount of data processed day by day and large databases needed to store all of these information. Real-time operation also brings the great importance to the company as far as fraud detection and network connection; since the operation is continuous 24/7 daily. In addition, prediction and strategizing for “unique” events also a challenge to CRM due to the constraints of Data mining algorithms and calculations; resulting to poor decision making and need to rely on to the management experiences in handling similar cases.

## **Conclusion**

Business Intelligence (BI) is a business management tool, which comprises of application and technologies that are utilized to accumulate and examine data about the business. Business Intelligence frameworks are used by telecommunication company to break down the components (or information from inside and outside the organization) influencing the nature of business, in order to help them in settling on a decision making process. Different strategy and technologies of Business Intelligence include query reporting and investigation instruments, data mining techniques and data warehousing device. Business Intelligence tool enable the telecommunication company to make the decision at all levels; for example key, strategic and operational, with the help of analytics and powerful data mining tools. In addition, BI will help reducing time for reporting in all level of organization. Telecom organizations work in a profoundly competitive environment.

So, why it is important to the telecommunication industry to use data mining? Since the telecommunication industry is undergoing rapid growth and facing the competition challenge every day, they need to handle and process vast amount of data to produce high quality of information for decision making and remain sustain. With a specific end goal to increase competitive advantage they need to:

- Understand clients' conduct and behaviour
- Interact with clients and convey them progressed and quality services according by customers' needs.

Data mining models can help them accomplish these objectives by empowering customer segmentation and churn prediction. Data mining can be an extremely successful methods for keeping the customer and for the sustainability of the organization. In today's focused business scene the client is a king, and the sooner one organization understands and deliver the customer's needs, the better.

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