

2000

Data Mining for Customer Relations Management: A Case Study of an Internet Service Provider Company

Vatcharaporn Esichaikul
Asian Institute of Technology, vatchara@ait.ac.th

Pimchanok Sikaramula
Asian Institute of Technology

Follow this and additional works at: <http://aisel.aisnet.org/amcis2000>

Recommended Citation

Esichaikul, Vatcharaporn and Sikaramula, Pimchanok, "Data Mining for Customer Relations Management: A Case Study of an Internet Service Provider Company" (2000). *AMCIS 2000 Proceedings*. 99.
<http://aisel.aisnet.org/amcis2000/99>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2000 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Data Mining for Customer Relations Management: A Case Study of an Internet Service Provider Company

Vatcharaporn Esichaikul and Pimchanok Sukaramula
School of Advanced Technologies, Asian Institute of Technology, Thailand
vatchara@ait.ac.th

Abstract

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. The ISP business has become one of the most fiercely competitive sectors of the service industry. In such a competitive environment, traditional customer relations strategies of marketing department deployed to fuel business growth become less effective. The study therefore proposes two applications, customer segmentation and attrition analysis, to improve customer retention. The purpose of customer segmentation is to define new business opportunities in order to reduce the cost of marketing campaign. The purpose of the attrition model is to identify the profitable customers who are likely to drop their service, and thus improve customer retention.

Keywords: customer relations management, data mining, customer segmentation, attrition analysis, customer retention

INTRODUCTION

In response to the changing business environment, it is crucial for decision makers to analyze and utilize its critical data in order to make more accurate and timely decisions. Most companies encounter vast amounts of data in the business operation. The large collection of data may contain valuable information, but no one discovered information or knowledge. To cope with the rapidly growing volume of data, there is a need for new techniques and tools to help decision makers in extracting useful information from huge amounts of data and use them to make better, more timely, and more effective decisions.

These new techniques and tools are known as *data mining*, which is concerned with the process of extracting previously unknown, valid, and actionable information from a large database and then using the information to make crucial business decisions (Cabena et al., 1998). Data mining is the “non-trivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data” (Srikant and Agrawal, 1996).

Nowadays, data mining has become an emerging key technology with which enterprises can exploit operational and other available data to improve a company’s effectiveness, efficiency and value. The applications of data mining reach across industries and business functions (Brachman et al., 1996). In the banking industry, data mining is used extensively in the area of modeling and predicting credit fraud, in evaluating risk, and in performing trend analysis, as well as helping with direct marketing and campaigns.

Bank of America use data mining to study demographic views of the banking habits and financial assets of selected groups of customers (Hoffman and Nash, 1995). Wells Fargo, the United States’ tenth-largest bank holding company, is using data mining to improve its successful target-marketing strategies (SAS Institute, 1998). In the telecommunication industry, data mining can help organizations to change strategies in order to respond to the changing world. It will identify patterns of change in the market, allowing the marketing department to focus on customers with high acceptance ratio and longer usage lifecycles. Companies like AT&T, GTE Telecommunication, and Air Touch Communication have announced the use of data mining.

This study describes the design and implementation of the data mining applications for customer relations management. The main objectives of this study are to determine the integrated data mining techniques for customer relations management, to identify the data mining applications which highlight the role supporting customer relations management, and to develop a prototype system of data mining applications. In this study, one of the service companies will be selected and a data mining system will be constructed based on the company’s data warehouse. The company’s requirements are identified and analyzed and the prototype system is developed using data stored in a data warehouse.

DESCRIPTION OF A CASE STUDY

The telecommunication market is the fastest growing segment in today’s business environment. The number of customers is growing very fast. The Internet Service Provider (ISP) business has become one of the most fiercely competitive sectors of the service industry. Therefore, an Internet Service Provider company is

proposed as a specific area of study in order to apply data mining to the marketing department. The characteristics of data in the Internet Service Provider company, including type of services, marketing problems, and the needs of data mining, are described in detail later.

In this study, one authorized Internet Service Provider, will be studied because an ISP is a service company which has to deal with many customers to keep their business going. The company would like to improve the operation of marketing department in order to reduce cost and increase the likelihood of reaching customers and prospects before competitors.

Company's Mission

The main objectives are to:

- provide easy access to the Internet.
- provide the best customer service, utilizing state-of-the-art tools for all operations.
- provide turn-key solutions.
- develop new value-added services to suit customers' needs.
- focus on strategic partnerships with other businesses that will help the company to achieve the mission.

Company's Services

For the company under study, there are several services on offer for their customers as follows:

Individual Service

WebKiT

It is the first on-line subscription package in for permanent users which contains all the software that customers need to register on-line to create their own Internet account of specific hours on the package or 30 days from the date of registration, whichever comes first. It also allows customers to apply for the following month's service by simply selecting the type of service (Web 1, 2, or 3).

Web 1 Service (Monthly Type of Service)

Web 1 is a full Internet graphic service which is a monthly type of service. Customers will be entitled to use a specific amount of log-in time and disk space per month. Extra usage will be charged additionally according to the extra charge rate. There is no limit for sending/receiving email. This service allows the user to use E-mail as well as many powerful text-based utilities like Usenet News, Gopher, FTP, Archie, Telnet, IRC, Talk, Lynx, Hytelnet, and the multi-media-based World Wide Web (WWW).

Web 2 Service (Monthly Type of Service)

This service is exactly the same as the Web 1 service, except that customers will be entitled to longer log-in time per month with higher monthly fee and lower extra charge rate than the Web 1 service.

Web 3 Service (Renewal Type of Service)

Web 3 is another type of service available for WebKiT customers which complements the Web 1 and Web 2 services. This new service eliminates the need for paying a regular monthly fee, since it is a pre-paid service which allows customers to choose the number of hours to credit to their account. Their credit is then deducted according to the actual log-in time usage. This allows user to keep their log-in time credit for as long as they wish and they can carry on using the same account by periodically renewing their credit.

WebNet

This product was developed to serve the great demand for immediate Internet access for a limited period of time. This approach is quite attractive among foreign businessmen and tourists who visit Thailand temporarily. This temporary account service is available in 10 and 20 hours with expiration date within 1 year after activating. The card contains the user's identification number and account verification code necessary to get connected to the company's server.

Corporate Service

WebPro Service

WebPro is a service customized for corporate customers who need to have their own domain name for their Internet account allowing their employees to have E-mail address as "@company.co.th" or "@companyname.com." This service eliminates the need to set up a company Internet node, thus helping save leased line connection expense as well as computer server installation and system maintenance expenses.

WebSharing Service

WebSharing is one of the company Internet services designed to serve small to medium enterprises who need to have their own domain name. With WebSharing, multiple users can simultaneously access to the Internet with only one Internet account via one telephone line.

WebCafe Service

WebCafe is one of the company's Internet services designed to serve small to medium enterprises. With

WebCafe, multiple users can simultaneously access the Internet with only one Internet account via one telephone line.

Leased Line Service

This service is designed for companies with internal networks and Web servers that need connection to the Internet permanently, 24 hours a day. There is no need to call the ISP for using the Internet. The company can assist in setting up a Web server attached to customer's local area network (LAN) to provide Internet access to their staff. This server with its unique IP network address is connected via leased line to a company Internet gateway. The speed of a leased line can be from 64 kbps up to 2 Mbps.

Homepage (On-line Advertising) Service

Homepage Hosting

Maintaining a database machine is costly and requires a well-trained staff. To minimize the cost, the company and product information can be hosted at company's facility without the expense and hassle of setting up a dedicated, 24-hour connection to the Net. The company will maintain the customer's WWW pages so that the customer can concentrate on the main line of business instead. In addition, at the company's homepage, "Hot Links" are provided to direct visitors to customer Webpages as well.

Homepage Development

An experienced programmer assists customers in putting a presence on the Internet by creating customer's unique advertisement or homepage with an E-mail response card, information-links, graphic elements, customize organization's brochure or newsletter, product catalog and order form, as well as interface it with the customer's existing database.

Marketing Department's Problems

The Internet Service Provider business has become one of the most fiercely competitive sectors of the service industry. In such a competitive environment, traditional customer relations strategies of marketing department deployed to fuel business growth become less effective. The marketing manager has to realize that the company must invest in data mining to drive customer retention strategies to determine which customers are likely to leave or stop their service.

In marketing department of the company considered here, large amounts of money are spent on direct mail to random customers in order to encourage the customer's

attention. Unfortunately, there is a low response rate from the customers.

The Needs of Data Mining

The needs of data mining of the marketing department are stated below:

1. The marketing manager would like to know which customers are likely to drop their service (attrition) and he wants to minimize the attrition rate because the cost of bringing a customer back is much greater than the cost of retaining the old customer.
2. The marketing manager would like to improve direct marketing results by using data mining that further refines customers and prospect segments.
3. The marketing manager would like to accelerate marketing cycle times that reduce cost and increase the likelihood of reaching customers and prospects before competitors.
4. The marketing manager would like to increase accuracy through elimination of manually induced error of traditional strategies.
5. Due to the present financial crisis, the marketing manager wants to spend fewer marketing dollars on their low-potential customers and acquire new high-potential customers at a lower cost.

DATA MINING APPLICATIONS FOR CUSTOMER RELATIONS MANAGEMENT

According to the problems stated, the company needs data mining in order to improve the marketing department's operation. In this study, two applications that highlight the role supporting a customer relations management concept will be presented. The first application, *customer segmentation*, creates a customer segmentation that will be used in the second application. This application will use the characteristics of profitable customers to create the segmentation. For the second application, *attrition analysis to improve customer retention*, profitable customer segments are selected from the segmentation built in the first application. An attrition analysis is built identifying those profitable customers who are likely to drop the service. Figure 1 shows the existing data warehouse of the company.

The customer data warehouse will be used. The customer data warehouse contains many tables that involve customer information that will be useful in this study.

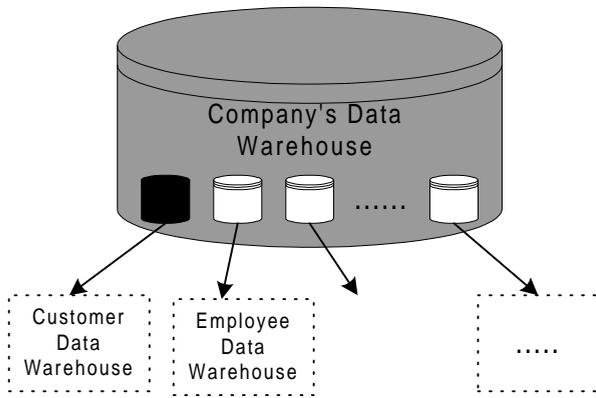


Figure 1: Existing Data Warehouse of Company

Application 1: Customer Segmentation

The purpose of this application is to use data mining to identify new business opportunities and to reduce the cost of marketing campaigns to the existing customers. Understanding the needs of customers, as exhibited through their purchase behavior, marketers can use the customer profile information to better serve these customers by targeting them for products/services that they are likely to purchase. Increased understanding of their customers also allows marketers to communicate relevant messages through customer-preferred channels such as direct mail or phone campaigns.

This application will create the segmentation of its customers to further understand customer behavior. The customer data warehouse will be used as the data source of this study. This application will use behavior segmentation to determine customer profitability. The customers who are in the profitable group will be identified. Within behavior segments, demographic segments allow the marketer to create relevant advertising, select the appropriate marketing channel, and identify campaigns or promotion to segments. Figure 2 shows the segmentation model of this application.

The data mining process used in this application (Cabena et al., 1998) includes the following steps:

1. Selection of segmentation variable
2. Data selection
3. Data preparation
4. Behavior clustering
5. Demographic clustering
6. Selection of clusters/segments for further study
7. Next application.

After developing this application, the company will know exactly who their customers are, and the results from this application can help the advertisers and marketers to plan and create the new advertising and new products by concentrating on the target group of customers. In addition, this result can help advertisers and marketers modify their advertising and product to match with the customers.

Application 2: Attrition Analysis to Improve Customer Retention

The purpose of this application is to identify which profitable customers are likely to leave or drop their service and how the company could use this information to increase the company's retention rate. This application will focus attrition management analysis on how to keep the customer satisfied, how to predict the customers who will leave, and how to make these loyal customers. It is more profitable to influence the non-loyal customers to be loyal to the company than to strive to gather new customers.

Many analysts estimate customer attrition rates at almost 50% every five years; therefore, the challenge to manage customer attrition drives a company to gain a more comprehensive understanding of their customers. 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.

The data mining process used in this application (Cabena et al., 1998) includes the following steps:

1. Segments from the first application
2. Data selection
3. Data preparation
4. Attrition analysis
5. Demographic clustering
6. Result analysis
7. Business implementation.

IMPLEMENTATION OF THE PROPOSED DATA MINING SYSTEM

The proposed data mining system is developed to respond to all user requirements. This system helps in facilitating the process and making the jobs easier and faster, thus accelerating marketing cycle time, reducing

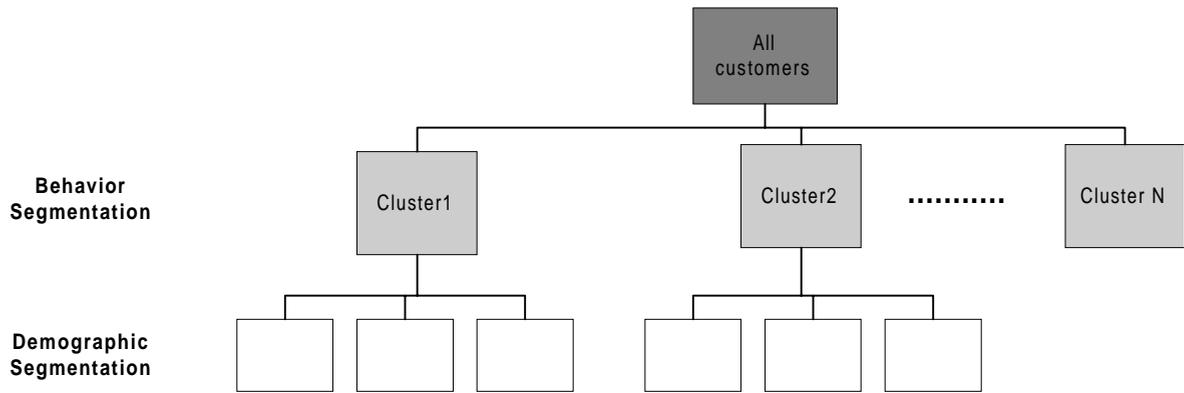


Figure 2: Customer Segmentation Model

cost, and increasing the likelihood of reaching customers and prospects. All marketing staff members can reduce the times of data mining process for customer relations management.

The *PowerBuilder* is used to build this data mining system. PowerBuilder is an object-oriented application tool that allows users to build powerful, multi-tier applications to run on multiple platforms and to interact with various databases. The system imports customer database from a company's data warehouse to *Sybase SQL Anywhere 5.0*.

Proposed Data Mining System for Customer Segmentation

If marketing staff would like to know who the profitable customers are, they can obtain this information by requesting the behavior clustering to show all profitable customers, as shown in Figure 3.

| Item | Customer No | Customer Name | Member Type | Date of Register |
|-------|-------------|------------------------------------|-------------|------------------|
| 1 | 000001 | Colgate Palmolive (Thailand) | Corporate | 21/03/1998 |
| 2 | 000002 | Delmax Machinery Co.,Ltd. | Corporate | 22/01/1998 |
| 3 | 000003 | The Union Frozen Products Co.,Ltd. | Corporate | 10/02/1998 |
| 4 | 000004 | Paja Engineering Machine | Corporate | 11/01/1999 |
| 5 | 000005 | Electromac Co., Ltd. | Corporate | 10/10/1998 |
| 6 | 000006 | Machicon Alimi Co.,Ltd. | Corporate | 06/03/1998 |
| 7 | 000007 | Hoechst Pharmaceutical Industry | Corporate | 09/04/1999 |
| 8 | 000009 | Sinco Technology Co.,Ltd. | Corporate | 09/01/1999 |
| 9 | 000010 | Siam Internet Co.,Ltd. | Corporate | 08/08/1998 |
| 10 | 000011 | Fashion Food Co.,Ltd. | Corporate | 10/11/1997 |
| Total | 290 | | | |

Figure 3: Behavior Clustering Screen

The system will respond to the request with a list of all customers who are in the profitable group. The information about customer number, customer name, customer types, and date of registration are provided. If the marketing staff would like to know who the profitable customers are that have ages between 21 and 30, they can get this information by requesting the demographic clustering to show all profitable customers who have ages in the range 21 to 30 and the system can show the result of this request, as shown in Figure 4.

| Age | Customer No | Customer Name | Service Type | Date of Register |
|--------------------|-------------|--------------------------|-------------------------|------------------|
| Sub Total 4 | | | | |
| 21 | 000204 | Verry Philippe | Web 1 Service | 11/08/1998 |
| 21 | 000222 | Nares Muangthong | Web 2 Service | 01/01/1999 |
| 21 | 000233 | Dranuch Vadyamae | Web 2 Service | 01/01/1999 |
| 21 | 000281 | Narong Muangthong | Web 1 Service | 02/02/1999 |
| Sub Total 3 | | | | |
| 22 | 000192 | Sataporn Rensuwan | Web 1 Service Promotion | 21/06/1998 |
| 22 | 000104 | Ukawan Chuwadee | Web 2 Service | 07/11/1987 |
| 22 | 000196 | Rongnapi Tanaratgrassart | Web 1 Service Promotion | 08/04/1998 |
| Sub Total 3 | | | | |
| 23 | 000296 | Chakdee Touksee | Web 2 Service | 03/02/1999 |
| 23 | 000206 | Vorong Soppipatt | Web HR 2 Service | 05/01/1998 |
| 23 | 000295 | Somsak Thanongkitchakul | Web 2 Service | 02/02/1999 |
| 23 | 000227 | Kisada Arthavech | Web 2 Service | 01/01/1999 |

Figure 4: Demographic Clustering Result (by Age) Screen

After interviewing and consulting all marketing staff about behavior clustering, the researchers learned that the characteristics of profitable customer are:

- Customers who always pay the balance within due date (80%).
- Customers who have registered more than 6 months.
- Customers whose member status is active.

For demographic clustering, this system will divide customers into 2 types: individual customer and corporate customer. For individual customer, this system will have 4 criteria for clustering customers:

- Age
- Income
- Education
- Sex

For the demographic clustering of corporate customers, the system will use business type as a criterion for clustering customers. There are 9 types of business:

- Not identified
- Corporate and Telecommunication
- Construction and Real Estate
- Education/Academy
- Financial Institute/ Banking/ Accounting
- Hotel and Restaurant and Tour
- Manufacturing
- Publishing and Media
- Service (Advertising, Hospital, Consult)
- Trading

This application can help the marketing staff know and decide who their profitable customers are and who their prospect groups are. Especially in the business world that the competition among companies is inevitable. If the business knows exactly who the customer is (e.g. the customer is in the educational group), the business then can pay close attention to that group (e.g. modifying advertisements or products to match the target customer). Moreover, the perceived benefits discovered are higher decision quality, cost reduction, increased productivity, time saving and improved customer satisfaction.

Proposed Data Mining System of Attrition Analysis

When the marketing staff would like to know the profitable customers who are likely to drop their service, they can obtain this information by requesting the attrition analysis. The system will respond to the request with a list of customers who are the profitable customers and are likely to drop their services. The information about customer number, customer name, addresses, and date of registration are provided in Figure 5.

For the second application, the system will select only the profitable customers from application 1. The

characteristics of profitable customers who are likely to drop the service are:

- More than 2 complaints within a month
- Amount of usage time is lower than a half of log-in time within 3 months

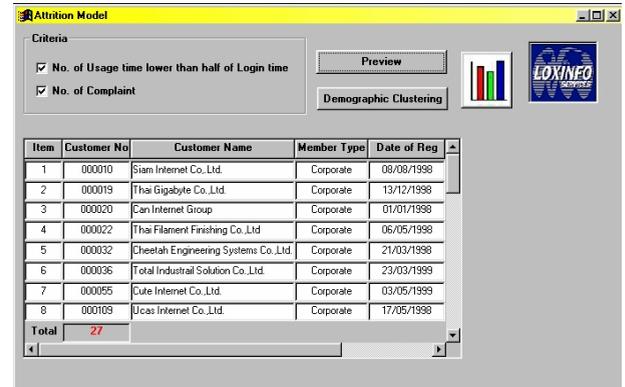


Figure 5: Attrition Analysis Result Screen

In this application, users can do the demographic clustering the same way as in the first application. If marketing staff would like to know the profitable customers who are likely to drop the service and who have income in a certain range, they can get this information by requesting the demographic clustering.

The Attrition Analysis application can help marketing staff know the profitable customers who are likely to drop the service; therefore, they can prepare the marketing strategies to reduce their attrition rate and improve their retention rate in order to make more benefits and reduce the cost of marketing campaign.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Since there is no standard approach to build data mining that will fit the needs of every organization, the data mining system must be developed case by case. In this research, a service company is studied and the data mining applications for customer relations management are proposed. The marketing manager and marketing staff need a new system for the decision-making process. Especially during the economic crisis, not only is the data important but also the availability of data at the desired time is the key issue. Consequently, the company needs to build data mining to support all relevant data for the marketing manager and staff.

To support customer relations management, two data mining applications are proposed in this study: the

customer segmentation and the attrition model to improve customer retention. 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 second application, the attrition model to improve customer retention, is 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 .

A prototype of data mining system to support customer relations management is developed using PowerBuilder. The system supports the needs of data mining of the marketing department. The company can use this system to accelerate the marketing cycle time and to increase the likelihood of reaching customers.

Recommendations for Further Study

The further study of this research can be done in many areas as follows:

1. *Design other applications that highlight the role supporting a customer relations management* such as cross selling (selling customers more products based on what they have already bought) and upgrading (selling customers higher-level services or products).
2. *Web mining* integrates Web traffic information with other databases in the corporation such as customer, accounting, profile, and e-commerce databases. The main purpose is to analyze online investments of the enterprise in order to maximize return. Web mining enables discovery of meaningful business correlations and trends by integrating and analyzing Internet/Intranet Web traffic information and traditional business data.

References and further readings

Agrawal, R., Imielinski, T., and Swami, A. "Mining associations between sets of items in massive databases," *Proceedings of the ACM SIGMOD International Conference on Management of Data*, Washington, D.C., May 1993, pp 207-216.

Babcock, C. "Parallel processing mines retail data," *Computertworld*, September 26, 1994, p 6.

Brachman, R., Khabaza, T., Kloesgen, W., Piatetsky-Shapiro, G., and Simoudis, E. "Mining Business Databases," *Communications of the ACM*(39:11), 1996, pp.42-48.

Cabana, P., Hadjinian, P., Stadler, R., Verhees, J., and Zanasi, A. *Discovering Data Mining: From Concept to Implementation*, Prentice Hall PTR, New Jersey, 1998.

Chung, M., and Gray, P. "Special Section: Data Mining," *Journal of Management Information Systems*(16:1), 1999, pp.11-16.

Connor, L. "*Data warehousing : Mining for data*," CMP Publications, February 1996. <http://techweb.cmp.com/cw/021296/close596.html>.

DePompe, B. "*There's Gold in Databases*," CMP Publications, January 1996. <http://techweb.cmp.com/iwk>.

Elena, B., and Giusepep, P. "Designing Templates for Mining Association Rules," *Intelligent Information System* (9), 1997, pp7-32.

Fayadd, U., Piatetsky-Shapiro, G., Smyth, P., and Uthurusamy, R. *Advances in Knowledge Discovery and Data Mining*, The AAAI Press / The MIT Press, Menlo Park, CA, 1996.

Gale, B. T. *Managing Customer Value*, The Free press, New York, 1994.

Groth, R. *Data Mining: A Hands-on Approach for Business Professionals*, Prentice Hall PTR, New Jersey, 1998.

Hoffman, T., and Nash, K. S., "Data mining unearths customers," *Computerworld*, July 10, 1995, p 128.

IBM Corp. "*Data mining: An IBM Overview*," 1995. <http://ibm.com>.

Michael, J. A. B., and Gordon, L. *Data Mining Techniques: For Marketing, Sales, and Customer Support*, John Wiley & Sons, New York, 1997.

Ng, K., Liu, H., and Kwah, H. "A data mining application: customer retention at the Port of Singapore Authority (SPA)," *Proceedings of the ACM SIGMOD International Conference on Management of Data*, Seattle, WA, June 1998, pp 522-525.

Srikant, R., and Agrawal, R. "Mining sequential patterns: Generalizations and performance improvements," *Proceedings of the 5th International Conference on Extending Database Technology*, France , March 1996.