

Enabling customer relationship management in ISP services through mining usage patterns

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Abstract

The monopoly of state ownership of telecommunication industry in Taiwan was lifted in 1997. In choosing an ISP, pricing was and still is a main differentiating factor in the mind of customers; however, service quality has emerged as a major concern among users lately. Management of ISP has discovered that service quality is important not only for attracting new customers, but, more importantly, for retaining existing customers who may otherwise be lured away by lower fees. Hence, it is essential to develop a CRM system, which could help keeping existing customers and exploring further business opportunities at the same time. In this study, we, based on the IP traffic data, developed a CRM systematic approach for a major ISP company in Taiwan to enhance customers' longer-term loyalty. This approach employs CRISP-DM methodology, and applies Attribute-Oriented Induction as the mining technique to discover network usage behaviors of customers, which help management identify usage pattern and also pinpoint the time when usage is excessively heavy. The former allows management to make effective personal calls for services or maintenance, and the latter presents opportunities for management to offer personalized cares and advanced products. Pixel-oriented visualization is applied to improve the understanding of mining results.

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1. Introduction

The wave of liberalization of global telecommunication industry started in early 1980 s. It resulted in a great number of private ownerships, and the subsequent development of advanced technology in telecommunication and service delivery. Its effects in contributing toward world economy have been very obvious. Following the footsteps of the rest of the world, the telecommunication market in Taiwan was also liberalized in 1997. Since then, there has been several big players entering the market and competing for the services of the first tier, which include fixed telecommunication network, mobile telecommunication network, and satellite communication network. There are also a number of smaller players competing for the services of the second

tier and are called ISP (Internet Service Provider), which include mainly the telecommunication value-added services. Among the many services that are offered by ISP industry, the combination of mobile communication and Internet service is becoming the backbone of the present and future m-commerce. The state-of-the-art services offered by mobile services can be classified into four categories: (1) information services, (2) entertainment services, (3) communication services, and (4) transactional services (Adela, 2003). These four categories will enable users to make purchases, request services, access news and information, and pay bills, through mobile communication devices such as PDAs, laptops, and cellular phones. The Internet services that are offered by an ISP company in general include content service domain, access domain, Internet routing domain, authorization and accounting domain, and network management.

The fact that ISP industry deals with individual customers directly has led to more intense competition than other sectors of the industry. For an ISP company to become viable in the long run, the number of customer is

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essential in lowering the cost base. To achieve this end, most companies initially resort to pricing strategy to attract customers. However, after these years, they started to realize that service quality might be more important than small differences in fees; that means companies need to retain existing customers through better services. In a sense, the marketing mode has shifted from being product-oriented to customer-oriented, which fits well with the well accepted principle in marketing that keeping existing customers is more profitable than attracting new customers (Bitran & Mondschein, 1997). As a result, the pressing problem that is confronting ISP management is simply how to understand the service needs of users, and provide them accordingly.

The objective of this research is to apply the well-known data mining methodology CRISP-DM to investigate network usage behaviors of ISP subscribers in Taiwan, so that an appropriate CRM strategy may be developed for individual care and/or personalized marketing, which would contribute toward enhancing the long term relationships with existing customers. In particular, we apply Attribute-Oriented Induction (AOI) method (Cai, Cercone, & Han, 1991; Han & Kamber, 2001; Han, Cai, & Cercone, 1993) for discovering characteristics and discrimination knowledge of ISP customers from the IP traffic data. The AOI method is a useful data mining approach for generalizing and summarizing interesting concepts based an appropriate concept hierarchy. It has been successfully applied to a variety of domains such as mining intrusion detection alarms (Julisch & Dacier, 2002), mining high-level multimedia knowledge (Zaiane, Han, Li, Chee, & Chiang, 1998), and mining Web logs (Fu, Sandhu, & Shih, 2000). The structure of this paper is as follows. In Section 2, we provide the background information of ISP industry in Taiwan. Section 3 describes the methodology used in this

research. In Section 4, we present the data-mining model and describe the development process and the mining results, which is followed by Section 5 of conclusions.

2. ISP industry in Taiwan

Since the de-regulation of the telecommunication industry in Taiwan in 1997, the market has grown substantially in the first few years and has appeared to plateau lately. According to statistics from the Institute for Information Industry (III), population of Internet access in Taiwan had increased from 4.97 million in March 2000, to 6.27 million in December of the same year, to 7.82 million in 2001, and it reached 8.67 million in Mach 2003. There are five major ISP companies who entered the market, and it seems that they all have relied on pricing strategy to attract customers initially. As a result, many different varieties of fee schemes were offered, which could very well confuse customers. Table 1 shows the fee schemes of these five companies. These schemes were designed differently to appeal to different categories of users, who are mostly not capable of making a fair comparison. It is true that customers initially were much more fee conscious, and tend to select the company with the lowest fees. However, reports of complains of all kinds have never stopped. According to a recent survey by Institute for Information Industry, 75% of complains are related to network jams and slow connection, 55% are related to high connecting charges, 23% are related to lack of useful content information, and 21% are related to difficult in searching for information. In addition, most customers complain about long stoppage for maintenance, somewhat unfriendly attitude of maintenance personnel, and other related issues.

Table 1
Comparison with ADSL fees and services

Dealers	Network charges	Circuit charges	Hardware and services provided	Yearly charges
A	\$255 first 6 months; \$499 afterward	\$595	Network card	\$11,664
B	(1) \$249 for the 6 months; \$450 afterward (2) Advancing \$1,199, free for the first 4 months, \$399 every month from the 5 th month (3) Advancing \$249, \$249 between the second and the forth month, \$399 afterward	\$595	(1) 30MB Hardware (2) 30MB Hardware and HUB (3) 30MB and Network Card	(1) \$11,334 (2) \$11,531 (3) \$11,328
C	\$199 before 3 months, \$299 afterward	\$595	Fixed IP 100 MB E-mail capacity 100 MB web page capacity	\$10,428
D	Advancing \$504, free for the first months, \$276 from the forth month	\$500	56 K Dial 20MB E-mail capacity 10MB web page capacity Webvam	\$8988
E	\$2,999 for 300 h	\$595	E-mail mailbox	\$10,139 for 3000 h

P.S. Unit: NT dollars.

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