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Business intelligence approach to supporting strategy-making of ISP service management

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Abstract

The recent deregulation of telecommunication industry by the Taiwanese government has brought about the acute competition for Internet Service Providers (ISP). Taiwan's ISP industry is characterized by the heavy pressure for raising revenue after hefty capital investments of last decade and the lack of knowledge to develop competitive strategies. To attract subscribers, all ISP dealers are making an all-out effort to improve their service management. This study proposes a Business Intelligence process for ISP dealers in Taiwan to assist management in developing effective service management strategies. We explore the customers' usage characteristics and preference knowledge through applying the attribute-oriented induction (AOI) method on IP traffic data of users. Using the self-organizing map (SOM) method, we are able to divide customers into clusters with different usage behavior patterns. We then apply RFM modeling to calibrate customers' value of each cluster, which will enable the management to develop direct and effective marketing strategies. For network resource management, this research mines the facility utilization over various administrative districts of the region, which could assist management in planning for effective network facilities investment. With actual data from one major ISP, we develop a BI decision support system with visual presentation, which is well received by its management staff.
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1. Introduction

Following the wave of global liberalization on telecommunication, the Taiwanese government deregulated the telecommunication industry in 1997. Soon after, a host of ISP (Internet Service Provider) companies entered the market to provide value-added services over the network infrastructure and compete for customers. Over the years, network bandwidth has been upgraded from narrowband to broadband, and the network population has grown substantially. It has since grown from 3% of national households at the end of 1996 to 38% at the end of 2002, and reaching 43% in June of 2006 (Institute for Information Industry, 2006). The growth shows a very steep curve in the first few years and a somewhat slower pace lately. During this period of fast growth, one can imagine the fury of ISP dealers in trying to offer various products with different fee schemes to attract subscribers. Initially, pricing strategies did work in recruiting new subscribers. However, after these years, the marketing emphasis may have shifted from product and cost orientation to that of customer needs. Users have started realizing that service quality may be more important than slight differences in fees. At the same time, ISP management has also realized the well-known fact that, the cost of developing a new customer is five to seven times the cost of retaining an existing one (Wayland & Cole, 1997). Management discovered that the need of

network stability, data security, usage convenience, and personal preference should be high on the customers' service agenda. This is also evidenced by McCue's (2006) ISP satisfaction survey, which indicated that reliability is the most important factor for 78% of business customers (McCue, 2006), and more than half of them indicated they would switch to another ISP to get improved reliability. Thus, how to develop a service management strategy, which recognizes the shift from market share to percentage of life-long customers, has become a major issue for all ISP companies. The service management for the Telecom industry, in general, consists of customer and product management and resource management (Ericsson, 2005). It aims to ensure that customers experience quality and perceive the value of services delivered, and improve operational readiness for short time-to-market of new innovative services, as well as enhances utilization of existing network facilities. In order to develop a relevant management strategy in this increasingly competitive ISP market, management must understand customers' needs and preferences and network facility utilization, before any proactive actions for customer care can be devised.

Users' needs and preference may be expressed in terms of usage patterns. However, the nature of ISP industry, where users and management may never see each other face to face, makes it impossible to develop a traditional in-depth mutual understanding. Currently, the most common means in servicing customers in ISP industry in Taiwan is through call center. Over the years, it was found that a call center is a rather passive way to service customers; it basically waits for customers to call to present problems. The most management can do with a call center is to call customers to understand the reasons for switching to another company. In addition, management has found the following problems with a call center. Firstly, staff of a different shift may not be able to respond properly to the customers who call at an earlier shift. Secondly, it is difficult to market effectively, because customers are usually not in a happy mood when they call. Thirdly, it is difficult to measure the effectiveness of each individual staff. Overall, most ISP providers in the nation today are lacking the knowledge of their customers' network usage behaviors; they are not able to raise the profile of customer loyalty. As Oracle stated, customer loyalty might be the only sustainable competitive advantage in this very challenging economical time (Oracle Corporation, 2006). Thus, at this stage, any company who knows how to deal with customers effectively will have the definite strategic edge over others. In addition to customers' usage patterns, the network resource management is also an important issue that can benefit both customers and the company. With proper management of network resources, an ISP company must plan for resource allocation according to users' needs of geographical nature, which will aid in achieving better cost effectiveness.

The objective of this research is to propose a Business Intelligence (BI) process for the ISP industry in Taiwan, which could assist management in developing effective service management strategies. The ISP industry in Taiwan is characterized by the heavy pressure for raising revenue after hefty capital investments in the last decade and the lack of knowledge to develop effective competitive strategies. The process applies data mining, visualization, and RFM customer value modeling as the underlying methodologies to identify various knowledge patterns. These patterns form the basis for discovering business intelligence, which includes the identification of VIP status, characteristics of different usage group, users' monetary contribution, and network facility utilization. A BI decision support system is developed with MVC (Model-View-Controller) architecture to facilitate the intelligence dissemination. The performance of the system is empirically and subjectively evaluated by the company staff. The remaining structure of this paper is as follows. In Section 2, we present a review of underlying methodologies that are utilized in the study. Section 3 describes various phases of the proposed BI process. In Section 4, we implement BI process with actual data from the company and describe the development of a BI decision support system. The system evaluation is described in Section 5, and Section 6 concludes this paper.

2. Review of methodologies

This part provides a brief review of the concepts of BI as well as the methodologies that are utilized in various phases of this study.

2.1. Business intelligence

The effective management and leverage of data represent both the greatest opportunity and the most difficult challenge for most enterprises. Gartner's 2006 CIO survey showed BI as their highest rating technology issue; as they focus on projects that enable users to positively affect financial and business performance (Gartner, 2007). BI is a set of concepts, methods, and processes (Maria, 2005) to improve business decisions, which use information from multiple sources and apply experience and assumptions to develop an accurate understanding of business dynamics. It integrates the analysis of data with decision support system to provide information to people throughout the organization in order to improve strategic and tactical decisions. With appropriate BI a company will be able to develop intelligent decision support systems to gain the competitive advantage of the industry (Davis, 2002). It has been applied to many areas that are related to the enterprise management process, and some of them have formed their own systems with specific characteristics. Typical application scopes include: ERP (enterprise resource planning), CRM (customer relationship management), HRM (human resource management), SCM (supply chain management) and E-business (Xie et al., 2001). Buytendijk (2001) has reported that, based on a study from 2001 to