

Application of neural networks to recognize profitable customers for dental services marketing—a case of dental clinics in Taiwan

Wan-I Lee ^{a,*}, Bih-Yaw Shih ^{b,1}

^a National Kaohsiung First University of Science and Technology, No. 2, JuoYue Road, Nantz District, Kaohsiung City 811, Taiwan, ROC

^b National PingTung University of Education, No. 4-18, Ming-Shen Road, PingTung 900, Taiwan, ROC

Abstract

The purpose of the research was the development of a neural networks model to recognize profitable customers for dental services marketing. Data set was built up from proprietary customer databases and survey of seven dental clinics in Taiwan. Multi-layer feed-forward neural networks with sigmoid function trained by back-propagation training algorithm were utilized to build the recognition model. The result reveals that the recognition accuracy of the test on the model is greater than that expected by chance. Meanwhile, a set of contribution weights representing the general importance of each independent variable was produced and their marketing implications were illustrated. This research confirms that the neural network model is useful in recognizing existing patterns of customers' data. The advantages of using the model are highlighted and marketing implications are demonstrated. Authors believe that the model is useful and suitable as an analyzing tool for dental marketers on market strategy planning.

© 2007 Elsevier Ltd. All rights reserved.

Keywords: Dental marketing; Neural networks; Profitable customer; Recognition; Marketing strategy

1. Introduction

Since the 1970s, the medical care cost has been rapidly raised. The cost-containment mechanism and global budgeting system are used to arrest the untamed growth of medical care expenditures in many countries (Chu, 1992; Detsky, Naylor O'Rourke, Stacey, & Kitchens, 1990; Henke, Murray, & Ade, 1994; Lave, Jacobs, & Markel, 1992; Redmon & Yakoboski, 1995; Wiley, 1992). Nearly 98% of all care is reimbursed under Taiwanese National Health Insurance (TNHI) since its inception in 1995. The experience of cost-containment and global budgeting for dental care in Taiwan is different from other countries. Dental care is included as part of the benefit package in

TNHI. Although the dental care expenditures are growing, they are capped by the allocated budget in different regions (Six Health Insurance Regions in Taiwan). Except for the co-payment and registration fee per visit, there is no out-of-pocket cost for the insured that receive care. Hence, a dentist's income is limited. Therefore, providing dental cares which are not covered by TNHI and finding profitable customers have been urgent topics for increasing a dentist's income. Customer centricity is to grow enduring relationships with profitable customers, and retaining important customers is crucial to business success (Biong & Selnes, 1996; Sollner, 1998; Webster, 1992). How to retain profitable customers is the critical issue of relationship marketing. Segmentation is one of the most useful methods to discover profitable quotient. Michalski (1983) mentioned that the widely used traditional mathematical and statistical data analysis techniques, such as regression analysis, numerical taxonomy or factor analysis are not sufficiently powerful for the task of detecting interesting conceptual patterns or in revealing structure in a collection

* Corresponding author. Tel.: +886 7 601 1000x4226; fax: +886 7 370 2357.

E-mail addresses: wilee@ccms.nkfust.edu.tw (Wan-I Lee), Byshih@mail.npue.edu.tw (B.-Y. Shih).

¹ Tel.: +886 8 722 6141x3375; fax: +886 7 370 2357.

of observations (Michalski, 1983). The purpose of the research is to develop a neural networks model to recognize profitable customers for dental services marketing.

2. Background

The medical care industry has been dramatically developed in the last two decades in Taiwan and it has resulted in an extremely risky position. A lot of efforts have been made to keep the equity and accessibility by the Taiwan government. Meanwhile, global budgeting of Taiwanese National Health Insurance (TNHI) was conducted recently since TNHI's inception in 1995. The competition of medical care market is getting fierce. According to the report, more than 200 small hospitals are on the verge of out of business in last seven years (Public Television Service Online, 2005).

In 1945s, there were only 738 dentists in Taiwan (Department of Health Executive Yuan, 1995). After decades of the development of education in dental medicine, there are more than 11,000 dentists in 2005. There are seven medical universities which produce more than 500 dentists every year. Meanwhile, every 10,000 people were served by 4.8 dentists in 2004 (<http://www.doh.gov.tw>). Consequently, the supply of dental manpower will be saturated and the competition of dental industry will become fiercer. Therefore, how to gain competitive advantages in the dental market has become an urgent topic in the field of dental services marketing. Providing non-reimbursable services such as dental implants, orthodontics, and teeth prosthesis is a practicable strategy to increase and maximize dentists' incomes.

2.1. Dental services marketing

Dental clinics are accommodating themselves to the changing situation. Although, marketing may be unpopular in the past, managers of dental clinics start to choose the benefits of marketing nowadays (Gronroos, 1990). The viewpoint of the operation is evolving from manufacturing oriented, product oriented, sales oriented to marketing oriented (Webster, 1992). How to gain competitive advantage by enhance operating strategy is a crucial issue to dental clinic success. Therefore, dental clinics should learn to respect customers, develop distinguishing features of dental services, explore customers' needs and improve satisfaction.

As in other areas, marketing principles can be applied to the dental sector. In order to achieve and sustain long-term competitive advantage, managers need to focus on attributes which specific market segments value the most. Being different from common services, dental services may be far from customers' expectations because they are often characterized by complexity, inseparability, variability and customization (France & Grover, 1992). Attitudes toward a product or service were formed based on consumers' beliefs (d'Astous & Dubuc, 1986; Miniard, Page, Atwood, &

Ross, 1986). Choice criteria are the consideration set of alternative products and aspects including beliefs about psychosocial consequences, product consequences, or value consequences (Peter & Olson, 1993). Although product attributes could be considered in a particular situation, they vary in their relative contribution to alternative choice decision and the number of choice criteria and product attributes may be large (Sinclair & Stalling, 1990). Attributes are often termed as determinant attributes if they contribute highly to choice. How to perceive large differences of consideration alternatives in terms of an attribute is a critical issue for decision maker (Myer & Alpert, 1968).

Some researchers believed that dental marketing is the promotion of social responsibility and ethics in dental clinics management. The main idea is to shrink the difference between the suppliers and customers. It is clear that marketing has progressed from merely advertising to a comprehensive approach to satisfying patient needs. In short, patients are appraising their satisfaction with their overall service experience and dental clinics must embrace patient behavior to provide the desired service. Satisfied patients become loyal customers and contribute positively to the success of both their dental care experience (Corbin, Kelley, & Schwartz, 2001).

When patronize a dentist, different market segments prefer different sets of attributes. Consequently, figuring out what set of attributes are determinant attributes for each specific market segment has become relevant. Chakraborty, Gaeth, and Cunningham (1993) found that market segmentation was one area where prior research could be extended. Thus, in order to employ segmented marketing strategies, it is important for dentists to know whether different groups of customers emphasize different determinant attributes. Some research identified relevant factors considered by patients when first choosing a dentist (Barnes & Mowatt, 1986; Gopalakrishna & Mummalaneni, 1993; Hill, Garner, & Hanna, 1990). McAlexander, Kaldenburg, and Koenig (1994) pointed out that satisfaction with dental care contribute to intentions of patronizing a dentist. Motes, Huhmann, and Hill (1995) attempted to uncover differences between patients' search for specialized versus routine dental care.

According to the survey, 45% dental expenditures came from patients' out-of-pocket payments for non-reimbursable services in Taiwan. It reveals that patients and dentists were able to incur services beyond the mandated coverage of national health insurance depending on patients' ability to pay out-of-pocket and because of the lack of incentive for dentists to relocate their practice so long as they could maintain the same "target income" by providing additional services (Hsueh, Lee, & Huang, 2004). Alternatively, dentists might choose to provide fewer services if reimbursement rates decreased significantly. However, under the limitation of Taiwanese medical law, any medical services are not allowed to promote or advertise in the media. Thus, directing marketing or one-to-one marketing are good strategies for promoting non-reimbursable dental services.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات