Mining demand chain knowledge of life insurance market for new product development

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ABSTRACT

Demand chain management (DCM) can be defined as "extending the view of operations from a single business unit or a company to the whole chain. Essentially, demand chain management focuses not only on generating drawing power from customers to purchase merchandises on the supply chain; but also on exploring satisfaction, participation, and involvement from customers in order for enterprises to understand customer needs and wants. Thus, customers have changed their position in the demand chain to assume a leading role in bringing more benefit for enterprises. This article investigates what functionalities best fit the consumers' needs and wants for life insurance products by extracting specific knowledge patterns and rules from consumers and their demand chain. By doing so, this paper uses the a priori algorithm and clustering analysis as methodologies for data mining. Knowledge extraction from data mining results is illustrated as market segments and demand chain analysis on life insurance market in Taiwan in order to propose suggestions and solutions to the insurance firms for new product development and marketing.

1. Introduction

In manufacturing or business activities, the transmission between information flow, money flow and logistics flow is generally according to supply chain management (SCM). SCM focuses on using the above information to optimize the material flow through the successive steps of inbound logistics, operations and outbound logistics across the supply chain (Landeghem & Vanmaele, 2002). However, in the demand chain, the focus is clearly customer-centric, as defined early by Brace (1989), who explained the concept of a demand chain as "...the whole manufacturing and distribution process may be seen as a sequence of events with but one end in view: it exists to serve the ultimate consumer." Demand chain management (DCM) can be defined as "extending the view of operations from a single business unit or a company to the whole chain. Essentially, DCM is a set of practices aimed at managing and coordinating the whole overall demand chain, starting from the end customer and working backward to raw material suppliers (Vollmann, Cordon, & Heikkilä, 2000). The information and communication infrastructure development has resulted in the continual evolution of the demand chain concept with a shift away from supply chains towards demand chains and DCM. The main stimulus behind this has been the shift in power away from

the supplier and towards the customer (Soliman & Youssef, 2001). Striking a balance between good customer satisfaction and supply chain efficiency begins with understanding the situation and needs of distinct customer segments (Heikkilä, 2002). Thus, DCM is the management of supply production systems designed to promote higher customer satisfaction levels through electronic commerce (EC) that facilitates physical flow and information transfer, both forwards and backwards between suppliers, manufacturers, and customers (Williams, Maull, & Ellis, 2002). The generation of consumer-product ideas is usually "manufacturer-active", rather than "customer-active" (Hippel, 1978). With this in mind, demand chain management tries to obtain more reliable and detailed information about (prospective) consumers (Landeghem & Vanmaele, 2002), and this is the practice that manages and coordinates the supply chain from end-customers backwards to suppliers (Frohlich & Westbrook, 2002; Vollmann & Cordon, 1998). Accordingly, demand chain management focuses not only on generating drawing power from customers to purchase merchandises on the supply chain; but also on exploring satisfaction, participation, and involvement from customers in order for enterprises to understand customer needs and wants. Thus, customers have changed their position in the demand chain to assume a leading role in bringing more benefit for enterprises.

In addition, as an enterprise asset, the customer has an important position. Most of the parties involved in the production chain, such as the manufacturers, suppliers and retailers, are aware of the importance and need for enterprises to acquire

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and share better customer knowledge. But this is easier said than done since customers' knowledge is concealed within the customers. It is available but not accessible, and there is little possibility of exploring the full volume of data that should be collected for its potential value. Inefficient utilization would render the data collected useless, causing databases to become 'data dumps' (Keim, Pansea, Sipsa, & Northb, 2004). How to effectively process and use data is becoming increasingly important. This calls for new techniques to help analyze, understand or even visualize the huge amounts of stored data gathered from business and scientific applications (Liao, 2003; Liao & Chen, 2004; Liao, Hsieh, & Huang, 2008). Among the new techniques developed, data mining is the process of discovering significant knowledge, such as patterns, associations, changes, anomalies and significant structures from large amounts of data stored in databases, data warehouses, or other information repositories (Hui & Jha, 2000; Keim et al., 2004). Customer knowledge extracted through data mining can be integrated with product and marketing knowledge from research and can be provided to up stream suppliers as well as downstream retailers. Thus it can serve as a reference for product development, product promotion and customer relationship management. When effectively utilized, such knowledge extraction can enable enterprises to gain a competitive edge through production of customer-oriented goods that provide better consumer satisfaction (Shaw, Subramaniam, & Tan, 2001).

Accordingly, this paper investigates the following research issues in Taiwan's life insurance business: What exactly are the customers' "needs" and "wants" for life insurance? Are insurers knowledge of the customers and the product itself reflected in the needs of the market? Can product design and planning for product mix be developed according to the knowledge of customers? Can the knowledge of customers be transformed into knowledge assets of the enterprises during the stage of new product development (NPD)? In addition, regarding the marketing methods, apart from the conventional supply chain marketing model, the demand chain marketing model can also be considered to ensure that the products developed are customer-oriented. Clustering analysis and the a priori algorithm are methodologies for data mining, which is implemented to mine demand chain knowledge from customers for NPD and marketing. The knowledge extracted from data mining results is illustrated as knowledge patterns and rules in order to propose suggestions and solutions to the case firm for NPD and marketing. The rest of this paper is organized as follows. In Section 2, we present the background of the current life insurance market in Taiwan. Section 3 introduces the proposed data mining system, which includes system framework, and physical database design. Section 4 presents the data mining process, including clustering analysis, a priori algorithm, knowledge extraction process, and result analysis for NPD and marketing. Managerial implications are presented in Section 5; and Section 6 presents a brief conclusion.

2. Analysis of Taiwan's current life insurance market

2.1. Taiwan life insurance at present

To date, there are a total of 53 insurance companies – including 37 local firms and 16 foreign establishments (including property and life insurance) in active operation in Taiwan, since the first insurance organization was started 60 years ago. In 2005, Taiwan was ranked 19th worldwide with total premium revenue of US$38,808 million, and 20th in life insurance frequency distribution with US$2145, according to the Swiss reinsurance company Sigma. This indicates that Taiwan's insurance market has expanded to a significant position in the international insurance arena.

Taiwan's citizens have grown in their notions and acceptance of insurance, supported by their increased annual earnings and a robust economic system, which has prompted an increasingly open life insurance market since 1968. At the beginning of this upsurge in insurance firms, permission was given to foreign insurers to set up branches in Taiwan. And as local insurance market has expanded over the years, the growth of life insurance effective contracts and contractual sums has been assured. Over the course of this development, life insurance purchase ratio and policy availability have well surpassed 100%; Taiwan is now running neck and neck with Japan, the US, and other developed countries in regard to insurance prevalence. This imports a certain degree of market maturity and saturation; however, the annual number of new life insurance contracts has shrunk significantly, which indicates that the life insurance market may be glutted. The insurance market seem to have stalemated since there is no growth or improvement in the market other than to continually encourage current policyholders to procure new policies and items, plunging the market into a high level of competition.

Moreover, top-ranking insurers with large market shares have dominated the market and set the rules, forcing emerging insurance companies to blindly follow suit. Of course, in order to survive, these start-ups devise to move in at an opportune moment to for their share of the pie with low-prices, dumping and other "Red ocean strategies". The only thing works to the start-ups' advantages, is pricing, which hinges upon their ability – and it happens to be their own strength – to mass-produce and undercut for profit. This has led to an upsurge of very similar insurance packages and copycat service items and marketing approaches, leaving very little room for diversity. An influx of insurers has flocked to develop new products in order to stay afloat amidst the fierce competition and vie for more earnings. However, low market interest rates have turned the formerly high-interest policies into troublesome deadweight to the insurers, and it significantly exacerbates company's financial operability; worse of all, market orientation is absent in new product development directions, increasing the difficulty in successfully expanding life insurance product lines, and this signifies the difficult viability and development bottlenecks for Taiwan's life insurers.

2.2. Demand chain of the insurance industry

Since there are great risks from market fluctuations and fierce competition, it behooves insurers to preempt the market by targeting customer preferences in order to obtain competitive advantage, and to explore customer demand chains for better understanding of customer demands so as to translate these findings into new insurance products and opportunities. However, there have been few previous studies to closely examine the market segments together with the demands and needs of customers of different stages of life; most of the studies oriented around visible profits to policy buyers. For example, buyers are usually drawn to service qualities, such as claims or company and agent ministrations; but this particular study hopes to delve deeper into the unspoken, personal needs of prospective policy buyers, to design well-rounded packages and services that cater exactly to their needs. As a result, this study is contingent upon the requirements of insurance buyers of different backgrounds, and policies that best suit them (see Fig. 1).

Personal favors may have propelled policyholders in the past to take out insurance policies; but the main motivation of buyers now is their needs. A specific need inspires an intention to buy, and consumers who have different life cycles certainly have different needs. Fig. 1 indicates that the need for insurance arises concurrently at birth and for schooling, the policyholder, who very rarely has any income at this point, needs to be supported to cover substantial education cost. Next, people from 23 to 28 years of age are