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Analysis of pricing strategies for e-business companies providing information goods and services

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Abstract

In this paper, we introduce a mathematical model to analyze pricing and service quality strategies for e-business companies providing information services to customers. The basic strategy considered in this paper is that a monopolistic e-business company provides free services to try to earn a profit by developing premium goods or services to market created by their free goods or services. It is a kind of versioning strategy where lower quality versions of information goods are provided free. And a direct network effect was also considered. And we tried to find the profit maximizing strategies for monopolistic e-business companies. As a result, the optimal quality and price for the premium goods or services can be obtained at the same level of the intensity of the direct network effect. And the exact term related with the network externality is derived and insights are demonstrated through numerical explorations.
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1. Introduction

This paper develops and analyzes mathematical models for e-business companies that provide information goods and services with unlimited-usage (fixed-fee) pricing. The most basic definition of e-business is simply using the Internet to connect with customers, partners, and suppliers. e-business is becoming the trademark of the 2000s. Today, companies are using the Internet to communicate with their partners, connect with their back-end systems, and perform e-commerce transactions. To compete successfully, enterprises are demanding effective ways to implement and deliver information goods over the Internet. Information goods mean all products that can be digitized such as software, news stories, stock quotes,

music, photographs, video clips, and research reports. Information services are services providing information goods and access to them through the Internet. For the examples of the information services are e-mail, search and directory services. The basic strategy and the optimal pricing and quality strategy derived in this paper can be adapted to the companies that provide the information goods and/or services by through the Internet.

2. Pricing strategies for e-business companies

Since, information goods and services have to recover high fixed costs and their variable costs are near to zero, traditional pricing strategies that make price equal to marginal cost are not useful for information goods. The sellers of information goods have tried to develop many strategies based on the customer's willingness to pay to earn profit and still to create a competitive advantage over their competitors. The sellers have used versioning, bundling (Bakos & Brynjolfsson, 2000), fixed fee pricing (Sundararajan, 2003), and the other methods of price discrimination (Kauffman & Walden, 2001).

Versioning is a form of second-degree price discrimination based on product quality, and is especially useful if it is not expensive to degrade one's information good to create a lower quality version. Shapiro and Varian (1998) provide an excellent description of the concepts and implementation of this strategy, highlighting a number of bases for differentiation. Bhargava and Choudhary (2001) analyzed the versioning strategy using a generalized utility function, where the utility monotonically increases with product quality and consumer type. They proposed that for information goods, price discrimination is profitable only in markets where high-value consumers benefit relatively more than low-value consumers from increases in quality.

In this paper, we considered a kind of versioning strategy where lower quality versions of information goods are provided free. Many sellers already give free goods, whether it is a product like a cellular phone, a service like Yahoo's search and e-mail features, or information such as news services. It has become more popular, especially in the electronic market. Why do companies give goods away for free? Busa, Cunningham, Ho, and McCullough (1999) describe well the reasons for that: to attract eyeballs, build awareness, leverage network externalities, create a standard, build communities of value, attain follow-on sales, increase switching costs, gain competitive advantage, or simply as a hobby. Companies use the free model not for one reason described above, they usually pursue several strategic objectives at the same time.

We also considered the network externality, about which there have been a number of research publications such as Brynjolfsson and Kemerer (1996), Economides and Himmelberg (1995), and Fudenberg and Tirole (2000). Network externality can be classified into two categories: a direct network effect in that the number of customers using that service have a direct effect upon the usefulness of the service to customers; and the other is an indirect network effect. In this paper, we have only considered a direct network effect.

The basic strategy used by this paper is that a monopolistic e-business company provides free services to try to earn a profit by developing and providing premium goods or services to the market created by their free goods or services.

3. Mathematical model

We use the following notation in this paper:

θ	Heterogeneity in the population of customers is modeled using this type parameter θ, $\theta \in [0,1]$. We assume that θ is uniformly distributed in $[0,1]$ so that there are an equal number of customers for each type θ.
θ_f	The lowest customer type that uses a free (lower quality) service. This is the customer who is indifferent to using the free service or not using that service.
θ_c	The lowest customer type that uses a charged (higher quality) service.
q_i	The quality for each service. $i \in \{f, c\}$, index f means the free service and c means the charged service.