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A re-examination of experience service offering and regular service pricing under profit maximization

Zhaotong Lian[a], Xinhua Gu[a], Jinbiao Wu[b,*]

[a] Faculty of Business Administration, University of Macau, Macau SAR, China
[b] School of Mathematics and Statistics, Central South University, Changsha 410075, Hunan, China

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ABSTRACT

A firm may offer an experience service free of charge to attract more customers to buy its regular service. This paper provides an economic analysis for interactions between the capacity-constrained firm and its waiting-averse customers, generating certain managerial insights. Free services should be sped up to move customers onto the paid service if it is idle, or slowed down to hold onto customers and avoid exacerbating congestion in the paid service if it is busy. A lower price should be charged for the regular service as compensation to customers for service delay if more of them buy that service. When more customers arrive for experience services, a greater price reduction should be offered to attract them into the regular service if it becomes more congested.

1. Introduction

While businesses increasingly treat the improvement of customer experience as a competition differentiator, academics remain inactive about this subject providing little formal research so far. In fact, like “innovation” and “design”, “customer experience” still has no commonly-agreed definition (Richardson, 2010). Moreover, controversies exist among business analyses over the effects of customer experience management. According to a survey study (Allen, Frederick, & Barney, 2005), 80 percent of businesses state that they offer a “great customer experience” but only 8 percent of customers say that they feel the same way. Although some commentators still concern the actual functioning of a product or a service by pointing out that there is no substitute for its acceptable quality or reasonable price, others emphasize the importance of sensory experience in affecting consumer behavior by pointing to the fact that non-monetary burdens (e.g., a disorganized store or a long line at the checkout) can outweigh customers’ consideration of prices. Companies, if insensitive to customer experience while focusing only on low-price competition, may actually decrease the value of their offerings (Berry, Carbone, & Haeckel, 2002). Thus companies are expected to perform best if able to integrate both functional and emotional benefits in their offerings.

Along this line, our paper addresses the question of how service systems can strike a proper balance between those two benefits offered to customers. Providing free experience service is an increasingly popular strategy in practice. Examples include online games, data communications, call centers etc. (Chu & Zhang, 2011; Edvardsson, Enquist, & Johnston, 2005; Froehle & Roth, 2004). The functionality of services may be observably embodied in their prices or has been known to experienced customers (who have tried these services before). Information on the unobserved quality of services can be conveyed to inexperienced customers through free experience service. This business strategy is often useful in managing the emotional component of customers’ experience and enhancing their perception of service received as they learn more about quality (Crawford & Shum, 2005; Osborne, 2005). Firms with more unobserved characteristics offer more such experience service, and customers rightfully interpret it as a signal of their higher quality. It is observed that informative advertising or experience service is unlikely to affect experienced consumers but can impact inexperienced consumers (Ackerberg, 2003). Our work considers a typical service firm that provides potential customers with paid regular service and free experience service. This practice is good for business by attracting more customers, especially when there are a limited number of informed (or experienced) customers.

This paper presents a queueing-theoretic formulation of service systems with free experience service. In queueing systems, a capacity-constrained service provider is often faced with delay-sensitive customers (Afèche & Mendelson, 2004). In our work all customers are assumed to be homogenous in valuation of service offerings, and each customer decides whether to join the queue or balk at it based on such valuation relative to the posted price

* Corresponding author. Tel.: +86 15973135021.
E-mail address: wujinbiao@csu.edu.cn (J. Wu).

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and on the expected cost of waiting (Cachon & Harker, 2002; Van Mieghem, 2000). A customer may try experience service first or buy regular service directly. After experiencing the free service, the customer with more information about the service offered may move on to the paid service or just leave the service system altogether. These decisions of customers are affected by their sensory experience and their aversion to waiting, among other things. Given the limited capacity, supplying experience service to some customers is likely to prolong the waiting time for other customers who want to purchase regular service. While longer waiting may drive away some customers, free experience service or discounted service prices can act as an attraction to keep other customers in waiting rooms. It is then natural to ask under what conditions the free experience service should be offered, what price should be charged for the regular service, and what rate of experience service should be maintained in order to maximize profits. This paper addresses those questions by analyzing equilibrium strategies of a monopolistic service firm. Such market structure is also assumed in Chen and Frank (2004). Our analysis is conducted for a Markovian single server queueing system (i.e., the M/M/1 queue) as the most suitable model for our purposes.

Since our paper is an application of queueing theory to service firms, it is necessary to briefly review the related literature on queueing issues and other applications. This literature was initiated by Naor (1969) and Edelson and Hildebrand (1975) using a reward-cost structure to capture customers' desire for service and their dislike for waiting. Private decisions are made not only by servers to maximize revenue or profit but also by customers to determine whether to join or balk. A growing number of papers have arisen later on as variants of early M/M/1 models to examine various queueing characteristics. Those subsequent extensions include: priorities (Gilland & Warsing, 2009; Hassin & Haviv, 1997), consumer heterogeneity (Mendelson & Whang, 1990), reneging and jockeying (Hassin & Haviv, 1994), schedules and retrials (Economou & Kanta, 2011), setup and closedown times (Burnetas & Economou, 2007; Sun, Guo, & Tian, 2010), unreliable servers and delaying repairs (Wang & Zhang, 2011, 2013), customer intensity and congestion (Anand, Fazil Pac, & Veeraraghavan, 2011), information and uncertainty (Guo & Zipkin, 2007; Hassin, 2007), etc. Analyses of queueing systems have also emerged in the form of monographs (see (Hassin & Haviv, 2003) for pricing with queues and (Stidham, 2009) for main approaches and associated results in broader areas). Our paper analyzes the optimal pricing of service firms by incorporating into queueing systems the free experience service, which may increase the service load and affect the joining-balking decision due to the resulting congestion and delay.

Our queueing-theoretic treatment of customer experience is related to a recent study in the literature (Zhou, Lian, & Wu, 2014), but differs from it in three important aspects. First, providing free experience service is costly to firms, but such costliness is missing from the formulation of the firm decision problem in the previous study that maximizes revenue rather than profit. Our work considers the cost of free experience service to the firm as well as the cost of waiting to its customers, thus making analyses more realistic and precise. Second, distinguishing between informed and uninformed customers with different Poisson arrival rates, the previous study has to deal with the separate effects of such a distinction on firm pricing. To examine the combined effects of different types of customers on the same capacity-constrained server, we introduce the ratio of customers interested in experience service to all arriving customers with an overall Poisson rate. This new treatment offers us more flexibility in analyzing the impacts of changes in the ratio on firm pricing. Third, the previous study considers priorities given to informed customers to examine optimal firm decisions in various cases. In contrast, with this ratio in our work, there is no need to derive main results through priorities. Instead, we can now flexibly treat the ratio as an underlying parameter to shed new light on related management issues: whether to offer free experience service and by how much; how to effectively promote regular service and at what price. Obviously, our extension of the previous study allows us to generate more insights into service pricing issues in a more precise manner.

The rest of the paper proceeds as follows. Section 2 incorporates free experience service into a queueing model. Section 3 examines the steady-state distribution of the queueing system and associated measures of stationary queueing performance. Section 4 derives equilibrium strategies for the unobservable case. Section 5 analyzes the optimal price of regular service and the optimal rate of experience service offering. Section 6 presents a motivational example with numerical experiments. Section 7 contains concluding remarks, followed by a technical appendix.

2. Model formulation

Consider a monopolistic firm that provides consumers with two kinds of services (paid regular service and free experience service). This setting of services operated by the firm is depicted in Fig. 1, and modeled as a Markovian single-server queueing system, with customers arriving at the rate of λ according to a Poisson process.

The time of servicing is assumed to be exponentially distributed at the rate of μ for experience service and at the rate of μ_1 for regular service, where $\mu \geq \mu_1$. This kind of distribution describes the time between service events, which occur continuously and independently at a constant average rate (of μ or μ_1 per unit of time). The mean duration of a service event is therefore shorter for the free service (with $1/\mu$ units of time) than for the paid service (with $1/\mu_1$ units of time). The rate μ is treated in our modeling as a choice variable for the firm: the greater this rate, the faster a customer is handled for free service and the shorter this type of service will last.

If an arriving customer finds the server idle, he may try the experience service with probability β or instead buy the regular service directly with probability $\overline{\beta}(\equiv 1-\beta)$. There are two interpretations of this probability distribution. First, β (or $\overline{\beta}$) can be viewed as the proportion of new (or member) customers to all arriving customers. Second, if allowing for possible free-riding by member customers, β (or $\overline{\beta}$) can be alternatively regarded as the proportion of customers using (or not using) the experience service to all arriving customers.[1]

After experiencing the free service, the customer may either buy the regular service with probability α or leave the service system with probability $\overline{\alpha}(\equiv 1-\alpha)$. Such probability distribution can be thought of as the customer's choice variable based on his perception of the experience service. The role of learning about service quality for consumption decision is not the focus in this paper, and can be further analyzed in future research.

Arriving customers, if interested in services offered, will have to wait for service on an FCFS basis. For simplicity we assume that the Poisson process for customer arrivals and the two exponential

[1] Since experience service is enjoyable but free of charge, some of informed customers can consume it again to increase their utility if at no cost. However, such free riding is costly not only to the firm (see Carlton and Chevalier, 2001 and Antia, Bergen, and Dutta, 2004 for other kinds of free riding) but also to those customers since their utility increase carries an implicit cost (i.e., waiting) even under no explicit cost (i.e., money). Since experience service is offered in a limited amount and since regular service, though not free of charge, may be supplied with no congestion, those informed customers are effectively faced with a tradeoff between the value of experience service and the cost of waiting for it. They may choose to buy regular service directly when seeing the free service section is too busy. Thus the capacity constraint on experience service can actually act as a device to reduce the problem of free riding, and we will not deal explicitly with this problem given that customers are usually impatient and averse to waiting.