

Impact of Net-Based Customer Service on Firm Profits and Consumer Welfare

김은진^a, 이병태^b

^a KAIST 테크노경영대학원 경영공학과
서울시 동대문구 청량리 2동 207-43

Tel: +82- 2-958-3656, Fax: +82- 2-958-3604, E-mail: kim_eunjin@kgsm.kaist.ac.kr

^b KAIST 테크노경영대학원
서울시 동대문구 청량리 2동 207-43

Tel: +82- 2-958-3629, Fax: +82- 2-958-3604, E-mail: btlee@kgsm.kaist.ac.kr

Abstract

The importance of the net-based customer service in delivering supplementary after-sale services associated with product has been well documented. The strategic advantages of a well-implemented the net-based customer service are enhanced customer loyalty and higher lock-in of customers, and the resulting reduction in competition and the consequent increase in profits. However, not all customers utilize such the net-based customer service. This is partly due to the e-commerce divide, and partly due to privacy and security concerns of the customer for sharing personal information with firms. The limited level of customer adoption of the net-based customer service affects the firm profits and the customers' welfare. We use a game-theoretic model in which we model the net-based customer service system as a mechanism to enhance customers' loyalty. We find that an increase in adoption of the net-based customer service by the customer base is not always desirable for firms, and that customers who utilize such services are better off only when the overall adoption is limited.

Keywords:

Net-based customer service, digital divide, e-commerce divide, customer loyalty

Introduction

With the service provision migrating to electronic channels, the net-based customer service plays an important role in service delivery (Piccoli et al., 2004). Supplementary service provided via the net-based customer service system includes 1) general information regarding the firm, 2) specific information requested by the customer via a dialogue with the Web site, 3) consultation and advice that address customers' individual needs by helping them find their way toward a tailored solution, 4) order taking, 5) billing and payment, 6) hospitality, 7) caretaking and safekeeping, 8) handling exception, and 9) new products and services (Lovelock, 1994; Piccoli et al., 2004).

Supplementary services associated with the product can provide a stronger source of competitive advantage than the characteristics of the product itself (Ives

& Vitale, 1988). Also, they are used to differentiate the service from similar competing offerings and to add value to customers (Anderson & Narus, 1995).

In the customer relationship domain, the net-based customer service strengthens relationship with customers, and increase customer satisfaction and loyalty (Alsop, 1999; Feinberg & Kadam, 2002; Liljander et al., 2006; Riel et al., 2001; Taylor & Hunter, 2002). Many studies report a positive relationship between customer loyalty and firm profits (Clark, 1997; Hallowell, 1996; Reichheld, 1996; Reichheld & Sasser, 1990). When customers are loyal to a particular company, then the customer base becomes a strategic asset of the firm, because the firm is able to increase its price as price competition reduces (Dowling, 2002; Kim et al., 2001; Reichheld & Sasser, 1990).

Despite the competitive advantage possible from use of the net-based customer service, a firm is not able to attract all customers to the service, because not all customers have similar access to a computer or the Internet, nor all customers similarly likely to share information with a firm. The adoption of the net-based customer service is heterogeneous across customers from the phenomena of the digital divide, and of privacy concerns. The digital divide is the phenomenon in our society that captures the observation that not all customers have equal access to computers (Hoffman & Novak, 1998). This is due to the differences in income and the ability to bear the cost of a computer, and differences in self-efficacy in the use of a technology, among other reasons. This concept, applied to e-commerce, has been called the "e-commerce divide" (Dewan & Riggins, 2005).

Customers are also heterogeneous with regards to privacy concerns. To accommodate personalized support, a customer must often provide personal information to the firm. This personal information includes not only name and address, but also preferences information and perhaps valuation information (Chellappa & Sin, 2005; Culnan, 2000; Payton, 2001). Each time a customer enters her personal, financial, or medical information at the portal of a firm, the customer is concerned if the firm will distribute information or mine the information in a way that causes her harm (in economic terms, whether she will be price discriminated in the future).

The main objective of this research is to verify the impact of the limited adoption by customers (the “haves” and the “have-nots”) of the net-based service on firm profits and consumer welfare. The specific research questions are: 1) if only a fraction of customers adopt the net-based customer service so that the number of loyal customers is small, and anticipating that another firm might poach its existing customer base, should a firm lower its price which results in a smaller profit? 2) How does the ability of the net-based customer service system to induce loyalty and the limited customer adoption of such a service affect the customer welfare?

To answer the above research questions, we model a market entry scenario where a firm (the incumbent) uses the net-based customer service system that has an effectiveness level (exogenously given) in inducing loyalty in its customer base. The firm sells one product through the traditional retailing channels and at a price set for these channels. Another firm (the entrant) enters the market, and having observed the price of the incumbent firm (and after deducing the loyalty levels in the customer base), chooses its price. The profits of the firms and the surplus of the two customers segments (the segment that utilizes the net-based customer service and the segment that does not) are analyzed in the Stackelberg leader-follower model of competition between the firms.

Interestingly, an increase in the adoption by customers of the net-based customer service does not always result in higher profits for either firm. At the same time, customers who utilize such service are better off only when the adoption is limited. The rest of the paper is organized as follows. In the next section, we discuss the background on the concepts that motivated this research. In Section 3, we describe the model. We then analyze the model and discuss our findings in section 4. We conclude our research in the final section.

Model

Without e-CRM adoption

Assume that the incumbent firm has an established customer base, and that the number of customers in the customer base of the incumbent is normalized to 1. The product offered by the incumbent (firm1) and the entrant (firm2) is commodity-like and the marginal costs associated with providing the product are normalized to 0. Customers buy one unit of the product if it is available from the firms at a price less than a reservation value, v , that is strictly positive. To avoid solutions at boundaries and simplicity of analysis, assume that v is sufficiently high.

For an entrant firm to survive in the market, it must poach customers from the incumbent’s customer base. This setup enables us to focus on the issue at hand, namely the strategic value of the net-based customer service system regarding loyalty enhancement, without confounding it with quality differentiation or market growth.

Assume that the entrant sets the price of its product after observing the price that the incumbent has set

for its product. This assumption is consistent with the market practice that a firm that intends to poach dominant rival’s customers will provide additional benefits or offer lower prices given dominant rival’s offer to customers (FinancialWire, 2005). In other words, the incumbent and the entrant play a sequential game in setting prices.

To incorporate the heterogeneity of loyalty among customers, assume that the level of customer loyalty is distributed $U[0, L]$. The incumbent maintains this level of loyalty among its customers, in addition to providing a good quality product, by providing a limited level of customer service through traditional (offline) channels. The level of customer loyalty is a mapping to the price premium that a customer is willing to pay for the product of the incumbent comparing to the product of any entrant (Raju et al., 1990).

Denote the price charged by the incumbent and the entrant as p_1 and p_2 . Since all customers in the market have some or no loyalty towards the incumbent, the entrant can attract customers only when it sets its price lower than the incumbent.

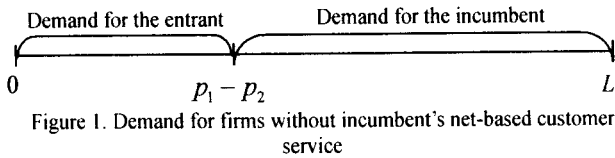
Now we introduce the net-based customer service system in the above traditional setting. The successful implementation of the net-based customer service by the incumbent increases the loyalty and lock-in of its customer exposed to the service. The increase in loyalty of such a customer at the level l loyalty shifts to γl loyalty. γ indicates the effectiveness of the net-based customer service in enhancing the loyalty. The loyalty of the customers who use such service becomes distributed as $U[0, \gamma L]$.

For aforementioned reasons of the digital divide and privacy concerns, only α portion of established customers are exposed to the net-based customer service and adopt it. The rest of customers do not utilize such service. For the incumbent, the marginal costs associated with the net-based customer service are negligible (Taylor & Hunter, 2002). Besides, to focus attention on the effect of the service on customer loyalty and price competition, we ignore the fixed cost of setting up the system by the incumbent.

Finally, the incumbent or the entrant is not able to set different prices for the product to customers (i.e., to price discriminate them) using the net-based customer service versus those customers who do not use it. One reason for this is that the product is sold through traditional channels. Second, incorporating price discrimination will confound the loyalty parameter, because customers of a firm practicing price discrimination, particularly those that receive the short end of the price discrimination, are likely to become less loyal. This was seen in the case of Amazon.com when its price discrimination practices became public and Amazon had to apologize and withdraw this pricing strategy.

The benchmark: the incumbent does not offer the net-based customer service

To analyze the full information sequential game, we first derive the sub-game equilibrium price of the entrant assuming that the price of the incumbent is given. We then use this result to analyze the pricing decision of the incumbent. The demand faced by the incumbent and the entrant can be illustrated as in Figure 1. Assume uniform density of customers of $1/L$ for the entire customer base. Recall that by definition, an entrant cannot have its loyal customers, because its “existing” customer base is zero.



As shown in Figure 1, the customers (of the incumbent) whose loyalty level is not less than the difference in the prices of the incumbent and the entrant will buy from the incumbent. The rest of customers whose loyalty level is less than the difference in the prices of the incumbent and the entrant will buy from the entrant. From the demand, we can derive profit functions of the incumbent and the entrant as follows:

$$\pi_1(p_1, p_2) = \{L - (p_1 - p_2)\} p_1 / L,$$

$$\pi_2(p_1, p_2) = (p_1 - p_2) p_2 / L.$$

Based on profit functions, we derive the sub-game perfect Nash prices and profits by applying backward induction. The sub-game perfect Nash prices of the incumbent and the entrant are:

$$p_1^* = L, \quad p_2^* = L/2. \quad (1)$$

The profits of the incumbent and the entrant are:

$$\pi_1^* = L/2 \quad \text{and} \quad \pi_2^* = L/4. \quad (2)$$

Since customer loyalty is the result of the incumbent's effort to leverage customer value, customer loyalty is the additional benefit that a customer gets from the incumbent firm. Then, a customer whose loyalty level is l and decides to buy from the incumbent can enjoy surplus, $v + l - p_1^*$ which is the sum of reservation value and loyalty minus the price paid to the incumbent. On the other hand, a customer who decides to buy from the entrant enjoys surplus, $v - p_2^*$. From this, the overall surplus of customers is:

$$CS_0 = \frac{1}{L} \int_{p_1^* - p_2^*}^{p_1^*} (v + l - p_1^*) dl + \frac{1}{L} \int_0^{p_1^* - p_2^*} (v - p_2^*) dl. \quad (3)$$

The incumbent offers net-based customer service

In this case, the incumbent sets up the net-based customer service system before the entrant arrives in the market. As explained earlier, the impact of the net-based customer service is that it generates customer loyalty. The incumbent sets the price of product as well. The entrant observes these choices, and chooses its price. If the firms

set prices so that $p_1 - p_2 < L$, the demands faced by the incumbent and the entrant are illustrated in Figure 2.

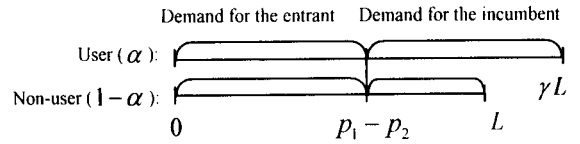


Figure 2. Demand for firms with incumbent's net-based customer service when the difference in the prices of the incumbent and the entrant is small

The difference in the prices of the incumbent and the entrant is not greater than L . Therefore, both the customers who use the net-based customer service and those who do not use the service buy from the incumbent if their loyalty to the incumbent is not less than the difference in the prices of the incumbent and the entrant. The rest of the customers buy from the entrant.

If the firms set prices so that $L \leq p_1 - p_2 < \gamma L$, the demand faced by the incumbent and the entrant can be illustrated as in Figure 3.

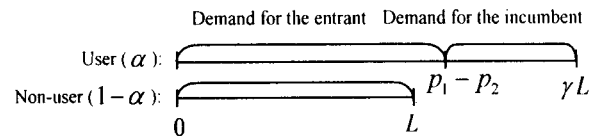


Figure 3. Demand for firms with incumbent's net-based customer service when the difference in the prices of the incumbent and the entrant is large

In this case, the difference in the prices of the incumbent and the entrant is greater than L . Therefore, customers who do not use the net-based customer service do not buy from the incumbent. Only the customers who use the service, and their loyalty to the incumbent is greater than the difference in the prices of the incumbent and the entrant, buy from the incumbent.

As before, given p_1 , the entrant sets its price p_2 that maximizes its profit function. The entrant has the following choices: 1) set p_2 to meet the condition $p_1 - p_2 < L$, or 2) set p_2 so that $L \leq p_1 - p_2 < \gamma L$. The incumbent anticipates sub-game equilibrium price of the entrant. Therefore, the incumbent set its price that maximizes its profit function substituting p_2 with sub-game equilibrium price of the entrant.

The net-based customer service induces a small change in loyalty

Suppose customer loyalty comes from other sources such as brand and reputation, so that the introduction of a net-based customer has a small change in loyalty. The small change in loyalty to the incumbent from the net-based customer service is quantified in this paper as $\gamma \leq 3/2$. The prices that satisfy the condition $p_1 - p_2 < L$ guarantees a higher profit for the incumbent than the prices that satisfies the condition $L \leq p_1 - p_2 < \gamma L$. Therefore, the sub-game perfect Nash prices of the firms are

$$p_1^* = \frac{\gamma L}{-\alpha\gamma + \gamma + \alpha} \quad \text{and} \quad p_2^* = \frac{\gamma L}{-2\alpha\gamma + 2\gamma + 2\alpha}. \quad (4)$$

The profits of the firms are

$$\pi_1^* = \frac{\gamma L}{-2\alpha\gamma + 2\gamma + 2\alpha} \quad \text{and} \quad \pi_2^* = \frac{\gamma L}{-4\alpha\gamma + 4\gamma + 4\alpha}, \quad (5)$$

where, p_1^* and p_2^* satisfy the condition $p_1^* - p_2^* < L$.

The net-based customer service induces a medium change in loyalty

In this case, the change in the loyalty to the incumbent from the net-based customer service is such that $3/2 < \gamma \leq 2$. The prices derived that satisfies the condition $L \leq p_1 - p_2 < \gamma L$ guarantees higher profit for the incumbent than the prices that satisfies the condition $p_1 - p_2 < L$ when $\alpha \leq \bar{\alpha}$. Therefore, the sub-game perfect Nash prices of firms are

$$p_1^* = \frac{2\alpha L + \gamma L - \alpha\gamma L}{\alpha} \quad \text{and} \quad p_2^* = \frac{\alpha L + \gamma L - \alpha\gamma L}{\alpha}. \quad (6)$$

when $\alpha \leq \bar{\alpha}$. The profits of the firms are:

$$\pi_1^* = (3\alpha\gamma L - \gamma L - 2\alpha L + \gamma^2 L - \alpha\gamma^2 L) / \gamma \quad \text{and} \quad (7)$$

$$\pi_2^* = (2\alpha\gamma L + \alpha^2 L + \gamma^2 L - 2\alpha\gamma^2 L - 2\alpha^2\gamma L + \alpha^2\gamma^2 L) / \alpha\gamma$$

Here, p_1^* and p_2^* satisfy $L \leq p_1^* - p_2^* < \gamma L$ as illustrated in Figure 3. When $\alpha > \bar{\alpha}$, prices and profits of firms are derived as in (4) and (5).

The net-based customer service induces a large change in loyalty

In this case of $\gamma > 2$, the prices of firms are:

$$p_1^* = \frac{\gamma L + \alpha\gamma L}{2\alpha} \quad \text{and} \quad p_2^* = \frac{3\gamma L - \alpha\gamma L}{4\alpha}. \quad (8)$$

when $\alpha > \hat{\alpha}$ ($\hat{\alpha} = \gamma / (3\gamma - 4)$). The profits of firms are:

$$\pi_1^* = (\gamma L + 2\alpha\gamma L + \alpha^2\gamma L) / 8\alpha \quad \text{and}$$

$$\pi_2^* = (9\gamma L - 6\alpha\gamma L + \alpha^2\gamma L) / 16\alpha. \quad (9)$$

Here, p_1^* and p_2^* satisfy $L \leq p_1^* - p_2^* < \gamma L$ as illustrated in Figure 3. When $\alpha \leq \hat{\alpha}$, prices and profits of firms are derived as in (6) and (7).

Customer surplus

Similar to equation (3), the surplus of the customers who use the net-based customer service can be derived.

Analysis and Propositions

A successful and ideal net-based customer service system has a positive impact on customer loyalty. Our results show that the incumbent is better off with such a system, which is an obvious result. Mathematically, the profit of the incumbent after the implementation of the net-based customer service in (5), (7) and (9) is greater than that

without the service in (2).

Proposition 1 and 2 show how a successful the net-based customer service portal creates strategic value regarding price competition. This is similar to other loyalty or lock-in enhancing mechanisms and has been addressed in previous literature (Dowling, 2002; Kim et al., 2001).

Proposition 1. The net-based customer service of the incumbent firm decreases price competition and leads to higher prices in the market.

Proof. Comparing p_i^* ($i=1$ or 2) in (1) with that in (4), (6) and (8), the reader will note that p_i^* in (4), (6), and (8) is always higher than that in (1).

Our results confirm the argument that enhanced customer loyalty reduces price competition and increases prices (Dowling, 2002; Kim et al., 2001). In our model, the incumbent's successful implementation of the net-based customer service increases the loyalty of customers who use it. A higher level of customer loyalty further enables the incumbent to charge higher price without losing customers. The incumbent thus prefers to avoid price competition. Also, a higher level of customer loyalty toward the incumbent makes the entrant gain less from cutting prices. The entrant also thus avoids price competition. As a result, price competition decreases and prices rise. Reduced competition and higher prices increases not only the profit of the incumbent but also that of the entrant. Mathematically, our results show that the profit of the entrant in (5), (7) and (9) is greater than its profit in (2). Thus, incumbent's the net-based customer service benefits even its rival. Hence, the net-based customer service can be a powerful source of win-win competition by creating customer loyalty, reducing competition, and finally increasing profits for both firms.

Proposition 2.

2.1. As customer adoption of the net-based customer service increases, prices increase, when the net-based customer service induces a small change in loyalty ($\gamma \leq 3/2$).

2.2. As customer adoption of the net-based customer service increases, prices decrease, when the net-based customer service induces a medium change in loyalty ($3/2 < \gamma \leq 2$) and the customer adoption is low ($\alpha \leq \bar{\alpha}$).

2.3. As customer adoption of the net-based customer service increases, prices increase, when the net-based customer service induces a medium change in loyalty ($3/2 < \gamma \leq 2$) and the customer adoption is high ($\alpha > \bar{\alpha}$).

2.4. As customer adoption of the net-based customer service increases, prices decrease, when the net-based customer service induces a large change in loyalty ($\gamma > 2$).

Proof. For prices as in (4), $\partial p_i^* / \partial \alpha > 0$ where $i=1$ or 2 . This implies that prices increase as the adoption of the net-based customer service increases. On the other hand, $\partial p_i^* / \partial \alpha < 0$ from (6) and (8). This means that prices decrease as the adoption of the net-based customer service

increases.

The above proposition indicates that an increase in the adoption by customers of the net-based customer service does not always have a positive impact on firms (in terms of a decrease in price competition and an increase in prices). When the effectiveness of the net-based customer service in enhancing customer loyalty is low ($\gamma = 3/2$), prices increase as customer adoption of the net-based customer service increases (Figure 4). On the other hand, when the effectiveness of the net-based customer service in enhancing customer loyalty is high ($\gamma = 3$), prices decrease as customer adoption of the service increases.

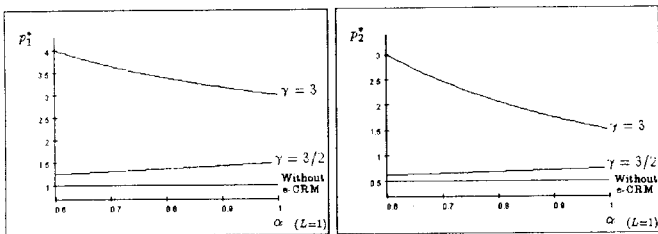


Figure 4. The effect of customer adoption of the net-based customer service on prices

While the former result appears intuitive, the latter result is counterintuitive. When the effectiveness of the net-based customer service in enhancing loyalty is high, the difference in the prices of the incumbent and the entrant is also large. In this case, the incumbent focuses on the highly loyal customers who adopt the net-based customer service. To generate a high profit from those limited customers, the incumbent is willing to charge higher price as the target market size is more limited, i.e. as the adoption α is low. Looking at the situation in reverse, this implies that as α increases, the incumbent lowers the price. Facing a price reduction by the incumbent firm, the entrant also cuts its price. The increased level of price competition between the incumbent and the entrant decreases their profits.

This logic also explains why the incumbent with medium loyalty enhancement focuses on the highly loyal customers when the adoption of the net-based customer service is low, i.e. $\alpha \leq \bar{\alpha}$. Catering to the highly loyal customers who adopt the net-based customer service reduces price competition and leads to higher prices when the overall adoption is low.

The propositions above showed how adoption by customers of the net-based customer service affects prices of firms. Consider now the effect of the net-based customer service on customer welfare.

Proposition 3. The net-based customer service makes customers who utilize the service better off if the adoption rate is low ($\alpha < \bar{\alpha}$) when the effectiveness of the net-based customer service in enhancing customer loyalty is low ($\gamma \leq 3/2$), or if the adoption rate is between $\bar{\alpha} < \alpha < \bar{\alpha}$ when the effectiveness of the net-based customer service in enhancing customer loyalty is medium ($3/2 < \gamma \leq 2$). Otherwise, it makes those customers worse off.

Proof. The surplus of customers who will utilize the net-based customer service in the benchmark case (without the incumbent's net-based customer service) is $\alpha(v - 3L/8)$. The surplus of those customers with the net-based customer service when prices in (6) are optimal is $(2\alpha\gamma v + \alpha L - 4\alpha\gamma L - 2\gamma^2 L + 3\alpha\gamma^2 L)/2\gamma$.

In comparison with $\alpha(v - 3L/8)$, the former is smaller than the latter under the condition that makes prices in (6) optimal. Likewise, CS_e when prices in (8) are optimal is $(32\alpha^2 v + \gamma L - 22\alpha\gamma L + 9\alpha^2 \gamma L)/32\alpha$.

Comparing with $\alpha(v - 3L/8)$, the former is smaller than the latter under the condition that makes prices in (8) optimal. However, under the condition that prices in (4) are optimal (i.e. $\gamma \leq 3/2$ or $3/2 < \gamma \leq 2$ and $\alpha > \bar{\alpha}$), CS_e (using prices given in (4)) is greater than $\alpha(v - 3L/8)$ when $\alpha < \bar{\alpha}$. Otherwise, the former is smaller than the latter.

The net-based customer service system provides individualized customer care, communications, rewards for customer value, and loyalty via the Web. Therefore, it is generally maintained that the net-based customer service provides additional welfare to customers. However, viewed from the perspective of the firms' prices as well, the net-based customer service reduces price competition and increases prices. Thus, firms extract the surplus from their customers. Customers who utilize the net-based customer service become better off only when the benefit acquired from the service is greater than the loss incurred by reduced price competition. This happens only when the adoption by customers of the net-based customer service is low.

Proposition 4. The net-based customer service makes customers who do not utilize the service worse off.

Proof. The surplus of customers who will not utilize the net-based customer service in the benchmark case (without the net-based customer service) is $(1 - \alpha)(v - 3L/8)$. Compared to the surplus of those customers with the net-based customer service, CS_w (using prices given in (4)), the latter is smaller than the former under the condition that makes prices in (4) optimal. Also, comparing $(1 - \alpha)(v - 3L/8)$ with CS_w (using prices given in (6) and (8)), the latter is smaller than the former under the condition that makes prices in (6) and (8) optimal.

Obviously customers who do not utilize the net-based customer service do not get any benefit from the service. Still, the net-based customer service reduces price competition and increases prices. Therefore, those customers become worse off with the loss incurred by reduced price competition, without any gain from the service.

Conclusion

With its ability to enhance customer loyalty and lock-in, the net-based customer service reduces competition and

increases profits. Therefore, as long as there are customers who are not able or ready to utilize online resources, policy makers and firms need to consider the effect of the limited adoption by customers of the net-based customer service on strategy and performance. Our game theoretic analysis of this scenario shows that firms should not always prefer an increase in customer adoption of the service, since more coverage can, under certain conditions, result in lower profits.

The paper examined how the effectiveness of the net-based customer service in enhancing customer loyalty and customer adoption of the service together impact the benefit realized from the net-based customer service to firms. We find that for a low effectiveness in enhancing customer loyalty, firms prefer a high level of customer adoption of the net-based customer service, because an increase in adoption rate decreases competition and increases profits. This implies that a firm in an industry where a net-based customer service is not an effective loyalty mechanism must focus on inducing large number of customers to its portal. A firm in an industry where a net-based customer service is highly effective loyalty mechanism, on the other hand, should prefer a low level of adoption by customers.

From the customers' perspective, our results show that customers who utilize the net-based customer service are better off when the level of customer adoption is low, because the benefit provided by the service is higher than the surplus extracted by the firms. Otherwise, the loss incurred by decreased competition and higher prices can overwhelm the benefit acquired via the service. In the case of low adoption of the net-based service, customers who do not use the service are worse off, unlike customers who utilize the service, which confirms the concern that the "rich get richer while the poor get poorer" in the digital divide context (Dewan & Riggins, 2005).

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