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IT Investment Strategy of B2B E-Commerce Website with Sequential Entry

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Abstract: In the competitive market of B2B e-commerce website, as customer switching cost and network externality could prevent customers to switch to later entrant, the earlier entrant has the advantage to build and retain its market share. However, the declining cost of information technology (IT) over time provides the later entrant a cost advantage. In order to maintain competitive advantage, what should the earlier and later entrant’s investment strategies be in the presence of customer switching costs, network externalities, and declining IT cost? To analyze this question, considering these three factors, the paper develops IT investment strategy model of a duopoly with sequential entry and discusses the impact of these three factors on IT investment strategy. The results show that, with the declining IT cost, the early entrant may increase its investment in quality, assume an aggressive investment strategy when switching cost is high, otherwise, the later entrant may increase its investment in quality, assume an aggressive investment strategy, and could offer a higher-quality system and capture a higher market share when switching cost is low. With the increase in network externality intensity, the early entrant may increase its investment in quality, assume an aggressive investment strategy, and the later entrant may decrease its investment in quality, assume a defensive investment strategy.

Keywords: IT investment strategy, declining IT cost, switching cost, network externality, B2B e-commerce website

1. INTRODUCTION

B2B e-commerce website is an online platform, providing services for transactions between corporate customers. Corporate customers of website are divided into sellers and buyers. B2B e-commerce website provides information release service for sellers, and information search, browsing, recommendation service for buyers. These services’ realization mainly relies on IT investment [1]. IT investment is directly related to service quality. Service quality would affect customer’s choice, furthermore, affect website’s market share. Thus, IT investment plays an important role in market share for B2B e-commerce website.

China Electronic Commerce Research Center reports that, in China, number of B2B e-commerce websites reaches 9200 in late 2010, an increase of more than 21.3% year on year. B2B market is in a high-speed development stage. With the emergence of new entrants in B2B market, earlier entrant has own a certain market share, and since customers’ choice is commonly affected by switching cost and network externality, earlier entrant has market share advantage through IT investment. Switching cost refers to the effort and expense involved in switching from one provider to another [2]. Switching cost discourages customers from moving to a competitor’s website. Network externality means ‘the extent to which the demand for a website is increased due to the fact that others are also choosing the same website’. Network externality makes customers prefer to choose earlier entrant that has a certain market share [3]. Switching cost and network externality help earlier entrant retain their customers.

Generally, in the B2B market with distinguishing characteristic of switching cost and network externality, earlier entrant easily comes into being ‘winner takes all’. In practice, the phenomenon that later entrant exceeds earlier entrant is also observed. For example, china.toocle.com was founded in 2007, website has introduced

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e-commerce vertical search, providing cross-platform search service for users, and introduced business relationship circle based on Social Networking Service (SNS), providing recommended services for users, successively. Taking advantage of high service quality, tootle quickly attracts a large number of users, be ranked fourth in B2B market with market share of 2.9%, exceeding many earlier entrants. Therefore, IT investment could create competitive advantage for later entrant. In fact, this advantage results from IT progress and declining IT cost. Empirical studies support this assertion \cite{4}. Reference \cite{5} showed that earlier entrant has lower market share when later entrant utilizes an advanced technology with lower costs and higher quality. Declining IT cost offers later entrant a potential advantage. In B2B market, the earlier entrant’s advantage is attributed to the existence of switching cost and network externality, whereas the later entrant’s advantage is due to technological progress that results in lower prices and better technologies for later entrant. What should the earlier and later entrant’s investment strategies be in the presence of switching cost, network externality, and declining IT cost? Should earlier entrant competes with later entrant aggressively, by investing more, or defensively, by investment less?

In the research on declining IT cost, Reference \cite{6} analyzed product positioning strategy of a duopoly with sequential entry, the results showed that when earlier entrant is difficult to determine cost structure of later entrant, the cost uncertainty would affect product positioning of earlier entrant. Reference \cite{7} studied IT investment strategy of a duopoly with sequential entry when IT cost declines, and reported that later entrant would exceed earlier entrant because of lower cost and higher-quality technology. Thus, declining IT cost has the opposite effect on the strategy choice of earlier entrant and later entrant. In the research on switching cost and network externality, many studies focused on the effect of switching cost and network externality on pricing strategy, and explored how to expand market share through price strategy \cite{8,9}. But the empirical research found that, except price, website quality also has an important effect on customer’s choice and use. The existing literatures is lack of analyzing the effect of IT investment on improving service quality and further expanding market share, in the perspective of switching cost and network externality. In summary, the existing literatures discuss the strategy problem when declining IT cost, switching cost and network externality affect respectively, less consider the investment strategy integrated with the interactive effect of these factors.

To analyze these questions, the paper develops IT investment strategy model of a duopoly with sequential entry, which incorporates sources of earlier entrant’s advantage and later entrant’s advantage. Furthermore, discusses the impact of switching cost, network externality, and declining IT cost on IT investment strategy.

2. MODEL SETUP

We consider two B2B e-commerce websites, labeled as website 1 and website 2. Website 1 prior to website 2 enters the market. When there are many websites in the market, users make their choice based on service quality, and all customers prefer higher to lower quality, although their valuations of quality may vary \cite{10}.

The specific assumptions of our model are as follows:

Website 1, the pioneer, makes IT investments, which results in service quality level $k_1$, and offers the service at price $p_1$. Website 2, the second mover, after observing $k_1$, makes IT investment, which results in service quality level $k_2$. Website 1 and 2 simultaneously set their respective prices, $p_1$ and $p_2$, after observing each other’s service quality. Customers who use website 1 initially and switch to website 2 after its entry incur a one-time nonnegative switching cost, $s$.

The differentiation of service quality provided by website 1 and website 2 is represented as horizontally differentiated line segment $[0,1]$. We assume that website 1 is located at zero, and website 2 is located at one. Customers are distributed uniformly on the line $[0,1]$, the perceived quality dimension of customer is modeled using parameter $x$, $x \in [0,1]$. Customers incur a utility loss of $\rho$ per unit distance between their ideal preference
and actual quality. Thus, customer at \( x \) receives a disutility of \( tx \) from choosing website 1’s service and a disutility of \( r(1-x) \) from choosing website 2’s service.

Customers are heterogeneous in their valuation of service quality. The value derived by a customer from service quality is given by \( i r k \theta \varepsilon \), where \( \theta (\theta > 0) \) is customer’s marginal utility for each additional unit of service quality, \( r \) is customer’s utility for service quality which only meets customer’s basic need, and \( \varepsilon \) is a random variable with zero mean and support \([-\varepsilon, \varepsilon]\).

Investment in service quality improvement program increases fixed costs. The fixed costs are increasing and convex in service quality. In this regard, IT investments \( C_1, C_2 \) of website 1 and 2 are given by \( C_1 = k_1^2/2, C_2 = \delta (k_2^2/2) \), where \( \delta (0 \leq \delta \leq 1) \) models the declining IT cost.

Network externality utility is defined as a function of network size and network externality intensity. Every customer derives utility from the network size of the website he has chosen. Since these sizes are actually determined after customers make their choices. Customers choose a website based on their expectations about each website’s network. Thus, customer derives network externality utility from website 1 with \( q_1 \), website 2 with \( q_2 \), where \( \alpha (0 \leq \alpha < 1) \) measures network externality intensity of B2B market, \( q_1 \) is the number of customers expected to choose website 1’s service, and \( q_2 \) is the number of customers expected to choose website 2’s service.

Based on above assumptions, after website 1 and 2’s entry, for a customer located at \( x \), the utility from choosing website 1 is

\[
U_1 = r + \theta k_1 + \varepsilon + \alpha q_i' - p_1 - tx.
\]

The utility from choosing website 2 is

\[
U_2 = r + \theta k_1 + \varepsilon + \alpha q'_2 - p_2 - t(1-x) - s.
\]

The customer, who is indifferent between choosing from website 1 and switching to website 2 after website 2 enters the market, is located at

\[
x = \frac{\theta (k_1 - k_2) + \alpha (q_i' - q_2') + (p_2 - p_1) + s}{2t}.
\]

According to rational expectations hypothesis, there exists \( q_1 = q_i' = \bar{x} \) and \( q_2 = q_2' = 1 - \bar{x} \). Thus, market share of website 1 and 2 can be computed as

\[
q_1 = \frac{1}{2} \left( \frac{\theta (k_1 - k_2) + (p_2 - p_1) + s}{2(t-\alpha)} \right)
\]

\[
q_2 = \frac{1}{2} \left( \frac{-\theta (k_1 - k_2) + (p_2 - p_1) + s}{2(t-\alpha)} \right)
\]

For simplicity, we assume that the marginal costs as well as other fixed costs are zero. Therefore, the profit for website 1 and 2, \( \pi_1, \pi_2 \), can be written as

\[
\pi_1 = p_1 q_1 - C_1 = p_1 \left( \frac{1}{2} + \frac{\theta (k_1 - k_2) + (p_2 - p_1) + s}{2(t-\alpha)} \right) - \frac{k_1^2}{2}
\]

\[
\pi_2 = p_2 q_2 - C_2 = p_2 \left( \frac{1}{2} - \frac{\theta (k_1 - k_2) + (p_2 - p_1) + s}{2(t-\alpha)} \right) - \frac{\delta k_2^2}{2}
\]

3. PRICE AND QUALITY EQUILIBRIUM

We use the backward induction procedure to derive the subgame perfect Nash equilibrium. Consequently, we start the last stage of the game, which is the price equilibrium after both websites have entered the market, then, the first stage of the game, which is the quality equilibrium, that website 2 sets its service quality level after observing website 1’s service quality.
3.1 Price equilibrium

Solving the first-order conditions for the equilibrium prices by maximizing the websites’ profit functions simultaneously, that is, simultaneously solving \( \frac{\partial \pi_1}{\partial p_1} = 0 \), \( \frac{\partial \pi_2}{\partial p_2} = 0 \), we obtain the following prices:

\[
p_1^* = \frac{3(t-\alpha) + \theta(k_1 - k_2) + s}{3}
\]
\[
p_2^* = \frac{3(t-\alpha) + \theta(k_2 - k_1) - s}{3}
\]

(1)

(2)

The price set by website is increasing in its own service quality, i.e., \( \frac{\partial p_1^*}{\partial k_1} > 0 \) and \( \frac{\partial p_2^*}{\partial k_2} > 0 \), and decreasing in the competitor’s service quality, i.e., \( \frac{\partial p_1^*}{\partial k_2} < 0 \) and \( \frac{\partial p_2^*}{\partial k_1} < 0 \). The price of website is decreasing in network externality intensity, i.e., \( \frac{\partial p_1^*}{\partial \alpha} < 0 \) and \( \frac{\partial p_2^*}{\partial \alpha} < 0 \). The price of website 1 (website 2) is increasing (decreasing) in the switching cost, i.e., \( \frac{\partial p_1^*}{\partial s} > 0 \) and \( \frac{\partial p_2^*}{\partial s} < 0 \).

The market share for website 1 and 2 can be computed as

\[
q_1 = \frac{3(t-\alpha) + \theta(k_1 - k_2) + s}{6(t-\alpha)}
\]
\[
q_2 = \frac{3(t-\alpha) + \theta(k_2 - k_1) - s}{6(t-\alpha)}
\]

3.2 Quality equilibrium

In the stage preceding the pricing subgame, website 2 sets its service quality level after observing website 1’s service quality. Given price function and market share function, the profit for website 2 can be written as

\[
\pi_2 = \frac{3(t-\alpha) - \theta(k_2 - k_1) - s^2}{18(t-\alpha)} + \delta \frac{k_2^2}{2}
\]

Website 2 maximizes \( \pi_2(k_1, k_2) \) over \( k_2 \). Consequently, \( k_2 \) is found to be

\[
k_2(k_1) = \arg \max \pi_2 = \frac{3\theta(t-\alpha) - \theta s - \theta s k_1}{9\delta(t-\alpha) - \theta^2}
\]

(3)

The second-order condition for this maximization problem is given as \( \delta > \theta^2/9(t-\alpha) \). Website 1 sets its service quality level by anticipating website 2’s optimal quality given by (3). After substituting (3) in website 1’s profit expression, we get website 1’s profit as

\[
\pi_1 = \frac{(t-\alpha)[9\delta(t-\alpha) - 2\theta^2 + 3\delta s]^2}{2[9\delta(t-\alpha) - \theta^2]^2} - \frac{k_1^2}{2}
\]

The first-order condition for website 1’s maximization problem gives the following equilibrium service quality level:

\[
k_1^* = \frac{3\theta(t-\alpha)[9\delta(t-\alpha) - 2\theta^2 + 3\delta s]}{[9\delta(t-\alpha) - \theta^2]^2} - \frac{9\delta^2 \theta^2}{2}(t-\alpha)
\]

(4)

The second-order condition for website 1’s quality setting optimization problem is given by \( \delta > \theta^2/\left[9(t-\alpha) - 3\theta \sqrt{t-\alpha}\right] \). This condition is more stringent than the second-order condition for website 2.

The condition provides a limit on the extent of decline in cost. We show later that if the condition is violated, then website 1’s profit becomes negative, i.e., it will not enter the market, and website 2 will be a monopoly.

After substituting (4) into (3), we get the following equilibrium service quality level for website 2

\[
k_2^* = \frac{9\delta(t-\alpha) - \theta^2}{9\delta(t-\alpha) - \theta^2 - \theta^2(t-\alpha)} - \theta^2(t-\alpha)
\]

To guarantee nonnegative prices and service quality, we require the condition \( s < \left[3(t-\alpha) - \theta \sqrt{t-\alpha}\right]/[9\delta(t-\alpha) - \theta^2] \). For website 2 to invest and enter the market, the
switching cost should satisfy the condition. The profits of website 1 and 2 in the equilibrium are determined to be

\[
\pi_1^* = \frac{(t-\alpha)\left[9\delta(t-\alpha)-2\theta^2+3\delta_s^2\right]}{2\left[9\delta(t-\alpha)-\theta^2\right]^2-9\delta^2\theta^2(t-\alpha)}
\]

\[
\pi_2^* = \frac{\delta\left[9\delta(t-\alpha)-\theta^2\right]\left[9\delta(t-\alpha)-\theta^2\right][3(t-\alpha)-s]-6\delta\theta^2(t-\alpha)^2}{2\left[9\delta(t-\alpha)-\theta^2\right]^2-9\delta^2\theta^2(t-\alpha)^2}
\]

4. THE IMPACT OF DECLINING IT COST

We analyze the impact of declining IT cost on websites’ investment strategies, measured by service quality offered by them, and their profits.

4.1 The impact of declining IT cost on service quality

Our intuition suggests that declining IT costs will favor website 2 because it incurs a lower cost to achieve the same service quality as website 1. However, the impact of declining IT cost on service quality depends on switching cost. If switching cost is low, service quality has an important effect on customers’ choice. Customers are prone to switch to other websites with higher service quality. If switching cost is high, customers have stronger stickiness of the website, keeping good relationship with original website easily.

The analysis is complicated by the fact that the cutoff values that separate low and high switching cost environments are different for each website. These cutoff values are derived through the first-order conditions of the equilibrium points over \( \delta \). Our first result summarizes the effect of declining IT cost on service quality offered by website.

**Proposition 1** For earlier entrant, website 1, there exists a switching cost \( s_1 = \frac{\theta^2\left[9\delta(1-\delta)(t-\alpha)-\theta^2\right]}{3\delta\left[9\delta(t-\alpha)-\theta^2\right]} \), if \( s < s_1 \) then \( \partial k^*_1 / \partial \delta > 0 \); if \( s > s_1 \), then \( \partial k^*_1 / \partial \delta < 0 \).

Proposition 1 shows that, with the declining IT cost, if switching cost is low, such that \( s < s_1 \), website 1 assumes defensive investment strategy, decreasing investment on service quality in the initial stage of entry. Thus, after website 2’s entry, since customers with low switching cost easily turn to website 2 with higher service quality, defensive investment strategy could reduce website 1’s loss. If switching cost is high, such that \( s > s_1 \), website 1 assumes aggressive investment strategy, increasing investment on service quality. This strategy could form higher switching cost, thus customers are less affected by service quality offered by website 2.

**Proposition 2** For later entrant, website 2, there exists a switching cost \( s_2 = \frac{9(t-\alpha)\left[9\delta(t-\alpha)-\theta^2\right]^2-\theta^2\left[243\delta^2(t-\alpha)^2-18\delta\theta^2(1+\delta)(t-\alpha)+\theta^4\right]}{3\left[9\delta(t-\alpha)-\theta^2\right]^2-3\delta^2\theta^2\left[9\delta(t-\alpha)-\theta^2\right]} \), if \( s < s_2 \), then \( \partial k^*_2 / \partial \delta < 0 \); if \( s > s_2 \), then \( \partial k^*_2 / \partial \delta > 0 \).

Proposition 2 shows that, with the declining IT cost, if switching cost is low, such that \( s < s_2 \), website 2 assumes aggressive investment strategy, increasing investment on service quality. Thus, when website 2 offers higher service quality at lower IT costs, the existence of low switching cost would make customer switch to website 2. If switching cost is high, such that \( s > s_2 \), website 2 assumes defensive investment strategy, decreasing investment on service quality. Customers with high switching cost have stronger stickiness of
website 1. Therefore, it is difficult for website 2 to attract customers even if offering higher service quality.

4.2 The impact of declining IT cost on profit

In Proposition 1, we found that a moderate or high switching cost offsets the IT cost disadvantage to website 1 and allows it to compete aggressively with website 2 on service quality. We show in the next proposition that website 1 is always hurt by declining IT cost. A surprising result is that website 2 may or may not benefit from declining IT cost depending on switching cost. The effects of declining IT cost on profits are summarized in the following result.

**Proposition 3**  
For earlier entrant, website 1, $\frac{\partial \pi_1}{\partial \delta} > 0$.

Proposition 3 shows that website 1’s profit decreases with declining IT cost. The primary effect of declining IT cost is decreasing market share of website 1, because declining IT cost help website 2 improve service quality to attract customers. If switching cost is low, website 1 does not find increasing service quality to be attractive, and then the lower market share causes a decline in its profit. However, as observed from Proposition 1, a sufficiently high switching cost may still allow website 1 to increase service quality and offset the drop in market share, but increased quality comes at increased cost. This increased cost to achieve the same level of market share reduces the profit when IT cost declines. Consequently, website 1 can never be better off when IT cost declines.

**Proposition 4**  
For later entrant, website 2, there exists a switching cost $s_s = 3(t - \alpha) - \frac{2\delta^2 (t - \alpha)}{9\delta(t - \alpha) - \theta^2} - \frac{16\delta^2(t - \alpha)|9\delta(t - \alpha) - \theta^2|}{[9\delta(t - \alpha) - \theta^2]^2 + 27\delta^2\theta^2(t - \alpha)}$, if $s < s_s$, then $\frac{\partial \pi_2}{\partial \delta} < 0$; if $s > s_s$, then $\frac{\partial \pi_2}{\partial \delta} > 0$.

Proposition 4 shows that, declining IT cost hurts website 2 if switching cost is sufficiently high. This finding can be attributed to the strategic response of website 1 in response to declining IT cost. When switching cost is high, website 1 finds it attractive to offset the potential decline in its market share from declining IT cost by increasing its service quality. The increase in website 1’s service quality could be so high that website 2 could find itself with a smaller market share than in the case when there is no decline in the IT cost. Website 2 attempts to restore its market share by increasing service quality in reaction to website 1’s aggressive response. Consequently, website 2 ends up spending more for the same market share, even with the lower cost per unit service quality.

5. THE IMPACT OF SWITCHING COST AND NETWORK EXTERNALITY

We analyze the impact of switching cost and network externality on service quality and profit.

5.1 The impact of switching cost on service quality and profit

The following results summarize the effects of switching cost on websites’ service quality and profits.

**Proposition 5**  
For earlier entrant, website 1, $\frac{\partial k_1}{\partial s} > 0$, $\frac{\partial \pi_1}{\partial s} > 0$. For later entrant, website 2, $\frac{\partial k_2}{\partial s} < 0$, $\frac{\partial \pi_2}{\partial s} < 0$.

Proposition 5 shows that, with an increase in switching cost, website 1 assume aggressive investment strategy, and profit increases. Website 2 assumes defensive investment strategy, and profit decreases. Switching cost helps website 1 rather than website 2 because customers that have already chosen website 1 will find it more costly to choose website 2 later when there is switching cost, as opposed to when there is no switching cost. Thus, the presence of a switching cost results in a higher market share for website 1. There is nothing to offset the disadvantage to website 2 when switching cost increases. Consequently, website 1 increases service quality, and website 2 decreases service quality in response to increase in the switching cost. The higher market share for website 1 increases its profit, and the lower market share for website decreases its profit.
Although the increase in switching cost helps website 1 rather than website 2, by comparing service quality and market share, we find that, only if switching cost is higher than some cutoff values, website 1 is service-quality leadership, market-share leadership.

**Proposition 6** There exists a switching cost
\[
s_1 = 3(t - \alpha) \left[ 1 - \frac{18 \delta^2 (t - \alpha)}{9 \delta^2 (t - \alpha) + 9 \delta (t - \alpha) - \theta^2} \right], \text{ if } s < s_1, \text{ then } k_1^* < k^*_2; \text{ if } s > s_1, \text{ then } k_1^* > k^*_2.
\]

There exists a switching cost \( s_5 \) = \( \frac{\theta^2 \left[ 96(1 - \delta)(t - \alpha) - \theta^2 \right]}{3 \delta \left[ 96(t - \alpha) - \theta^2 \right]} \), if \( s < s_5 \), then \( q_1^* < q^*_2 \); if \( s > s_5 \), then \( q_1^* > q^*_2 \).

### 5.2 The effect of network externality on service quality and profit

Generally, network externality increases entry barriers of later entrant. We illustrate the impact of network externality using numerical examples. By setting \( t = 1, \theta = 1, \delta = 1, s = 0 \), Table 1 presents market share, service quality, IT investment, price and profit of website 1 and 2 with the change of network externality intensity, such that \( \alpha \in [0, 1, 0.5] \).

<table>
<thead>
<tr>
<th>( \alpha )</th>
<th>( q_1 )</th>
<th>( q_2 )</th>
<th>( k_1 )</th>
<th>( k_2 )</th>
<th>( p_1 )</th>
<th>( p_2 )</th>
<th>( \pi_1 )</th>
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<td>0.565</td>
<td>0.436</td>
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<td>0.148</td>
</tr>
</tbody>
</table>

**Proposition 7** With the increase in network externality intensity, earlier entrant, website 1, assumes aggressive investment strategy, increasing investment on service quality. Later entrant, website 2, assumes defensive investment strategy, decreasing investment on service quality, profits of website 1 and website 2 decrease.

With the increase in network externality intensity, customers pay more attention on market share of website. Customers’ choice takes forecast of future market share of website as the base. Due to uncertainty and information asymmetry, this forecast is built on current market share. The larger the current market share of website is, the larger customers forecast that future market share is. Therefore, customers are inclined to choose the website with larger market share. Comparing with website 2, market share advantage of website 1 is very obvious. As a result, network externality intensity increases market share of website 1, and decreases market share of website 2.

In order to maintain market share advantage, website 1 could assume aggressive investment strategy, increasing investment on service quality, enlarging the gap between website 1 and website 2. Meanwhile, website 1 could decrease price to capture larger market share. But the increased quality comes at increased cost, and with the decrease in price, website 1’s profit decreases. With the decrease in market share, website 2 can only assume defensive investment strategy, decreasing investment on service quality. Even if website 2 attempts to lower the price to expand market share, aggressive investment strategy of website 1 makes market share of website 2 decrease, finally reducing website 2’s profit.
6 CONCLUSIONS

In this paper, we examine the problem of strategic IT investments in B2B market characterized by declining IT cost, switching cost and network externality using an analytical model of a sequentially duopoly. The principal implications of our study can be summarized as follows.

Our results highlight that, with the declining IT cost, if the switching cost is low, earlier entrant should assume defensive investment strategy. Currently, the switching cost is lower in B2B market. The reason is that, at the present time, operation patterns of B2B websites, such as www.alibaba.com, www.hc360.com, et al., are very single and homogeneity, customers could turn to different website easily. Therefore, earlier entrant should decrease investment on service quality at the early stage of its entry, and make decisions of additional investment according to actual needs and competitive environment, reducing risks from declining IT cost through multi-period investment.

Our results also showed that if the switching cost is high, earlier entrant should assume aggressive investment strategy. This finding is very important for B2B market. Single website can’t control IT progress and cost, but can improve switching cost by providing value-added services.

Our results highlight that, although switching cost is beneficial to assume aggressive investment strategy for earlier entrant, earlier entrant could provide higher service quality and capture higher market share when the switching cost is high. As a result, in the B2B market with lower switching cost, the advantage that earlier entrant enjoys “winner takes all” doesn’t exist, in accordance with practice.

Our results point that earlier and later entrant’s profit decrease when network externality intensity is stronger. This finding is concordant with practice. Specifically, B2B website is in the stage of calling two-side customers just after its entry, including buyers and sellers. Website would face the problem that buyer size and seller size interact with each other, that is, buyers are unwilling to choose the website because of small seller size, the same happens in sellers’ choice. So B2B website will relinquish profit, charge lower price and offer higher service quality in the development initial period. In B2B market with network externality, when later entrant enters the market, later entrant could heighten customer’s confidence through advertisement and promotion activities, increasing customer’s expectation with network size, finally strengthening competitive advantage.

There are some limitations. A critical assumption of the model is that we consider only two websites in our model. A worthwhile extension to our model would be to consider \( n(n > 2) \) competing websites. Thus, the competitive intensity, as measured by the number of websites, would be an additional factor that may affect the equilibrium service quality levels and profits. Furthermore, as technology develops over time, early entrant’s cost disadvantage becomes more severe. Thus, it would be interesting to further study how the early entrants are affected by increasing competition over time and they can sustain their profitability despite the switching cost.

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