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# **Battle for Dominance in the Word-Processing Software Market in Korea**

## ***How and Why Microsoft tipped the Market as an Entrant? Is it by Chance?***

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### **Abstract**

*Competition for dominance in the software market is crucial. Conventional economic theories suggest that those who enter the market first will be able to capture the market. Indeed, the first-mover will benefit because consumers will purchase from the first-mover since there is no other available option. This will allow the first-mover to expand the market to reach the tipping point with little competition and therefore garner the benefits of network effects. However, we do find contradicting examples in the real-world. For example, in the browser war, Netscape entered the market before Microsoft, yet Microsoft now manages to dominate the browser market. Since, in the real-world, rivals could have entered the market prior to Microsoft, given that Microsoft is the entrant, how can it compete for dominance? This study adopts a game theoretic approach towards analyzing the word-processing software war in Korea from 1997 to 2003. From the analysis we find that there are several factors leading to the dominance of Microsoft. This study will be a good source of reference for practitioners contemplating to enter a market or those who are still defending their fortress.*

**Keywords:** Software Market Competition, Network Effect, Switching Cost, Market Dominance, Strategy

## **1. Introduction**

Before the 1980s, software was not seen as a product but rather “given-away” for the purchase of hardware. For example, the company Apple Computer considered its profit to be from selling hardware; at the same time it developed and distributed the operating system that worked in the manufactured hardware. After the 1980s, personal computers (PC) emerged and with the proliferation of PCs, software could be sold in its own right. One of the greatest business successes in this area is Microsoft, which produces and sells software independent of the underlying hardware. Microsoft has dominated the software market in most parts of the world, and has done so for almost 15 years.

The question of how Microsoft is able to dominate the software market has been highly discussed (Bresnahan 2002). One common argument is that for any piece of software, it needs to gain widespread distributions to succeed (Brooks et al. 2000). The referenced economic theories include the network effects (defined as demand increases with expanded consumption), switching costs (defined as the costs associated for a customer of one firm to buy from another firm), and demand-side economies of scale (Shapiro and Varian 1999). In a market where an increase in the number of users increases returns, conventional wisdom

about market outcomes may no longer be appropriate. Essentially, the core argument is that the presence of any of these factors could lock-in the users, leaving the market with a winner-takes-all situation (Shapiro and Varian 1999).

To illustrate, consider the following scenario. When people choose word-processing software, a prime consideration is how valuable having learned that software will be towards facilitating their day-to-day operations (e.g. sharing of documents created) and signal to their existing or potential employers their Information Technology (IT) skills and know-hows. That is, since learning to use the word-processing software takes many hours, or even days, they want to maximize the benefits of using the software. Hence, they will only choose the software that is the most popular, one that will make them most efficient in completing a task, and one that will make them look as the most promising to potential employers.

Similarly for the employers, finding already-trained employees will dramatically reduce the training cost. They will choose one that is the most commonly available. If the competing software's lack of cross-software compatibility (e.g. file created in one word-processing software can be viewed and edited in another software), then we could see the outcome of one firm dominating almost 100% of the market. We call this the "tipping" of market.

Conventional economic theories could suggest that those who enter the market first will be able to capture the market (Shapiro and Varian 1999). Indeed, the first-mover will benefit because consumers will choose from the first-mover since there are no other choices. This will allow the first-mover to expand the market to reach the tipping point and therefore garner the benefits of network effects. However, we do find contradicting examples in the real-world. For example, in the browser war, Netscape entered the market before Microsoft, yet Microsoft managed to capture the browser market.

However, the extant literature mainly focuses on examining Microsoft as the dominant incumbent. Evidently, the discussion of the dominant presence of Microsoft is readily accessible given the number of antitrust cases in North America (see Liebowitz and Margolis 1998). The major assumption underlying these discussions is that Microsoft *has already dominated* that market. For instance, in a study by Hall, Royer and Audenrode (2003), they modeled the software competition from the perspective of Microsoft being the incumbent. Rather than taking the conventional approach of examining how to "reduce" the influence of the software giant, Microsoft, or studying how it protect its market position, this study takes a different perspective: examining how and why Microsoft emerged as the dominant market player. In other words, how Microsoft enters and dominates markets?

Indeed, since in the real-world firms could exist that had entered the market prior to Microsoft, given that Microsoft is the entrant, how can it manage to dominate the market? This study analyses the situation where Microsoft faces an incumbent through a game-theoretic perspective. To better fit the analysis into the real-world, we examine the word-processing software war in Korea from 1997 to 2003. The analysis is made up of four stages characterizing the major milestones of the competition. The first stage marks the entrance of Microsoft and the reason for failure to be the market dominance. The second stage denotes the market tipping. The third stage exemplifies the struggle of the incumbent's attempt to regain the market dominance position. The last stage sets the new phase of the competition.

From the analysis we find that there are several factors leading to the dominance of Microsoft. One factor is the “fat-cat” effect (Fudenberg and Tirole 1984). The incumbent thoughts by competing less aggressively with the entrant will “encourage” the entrant not to compete aggressively. This wrong strategic move is beneficial to Microsoft, which never planned on accepting a second place position in the market. This is a fatal decision of the incumbent to underestimate the aggressiveness of the entrant. More findings can be found in the analysis. Essentially, we contend that when dealing with an aggressive entrant, such as Microsoft, it is in the best interest of the incumbent to be cautious and it should never assume that the entrant will be satisfied with a smaller market share, especially in the software market where network effect predominates.

Empirically, the analyses of the competition will be a good source of reference for practitioners contemplating to enter a market or those who are still defending their fortress. Theoretically, a distinctive feature of this study is that it attempts to bridge the gap between the pure theoretical studies by researchers (e.g. Elzinga and Mills 1999; Katz and Shapiro 1985) to the empirical outcomes of the Korean market. While this attempt is “ambitious” to the extent that a longitude study may demand more intertwined causes that lead to the final observed outcome, it does allow us to view the software competition in a more holistic and systematic manner. With this, we believe we do not lose the novelty aspect of the study.

## **2. Literature Review**

In the software product market, where producers are competing with each other not only in terms of price but also technology innovation, a firm’s ability to attain critical mass of users assures survivability and profitability (Shapiro and Varian 1999). The underlying theory of explanation is network effect. Network effect refers the demand of a consumer for software product depends positively on the number of people who are using the software. In other words, more people using the software will increase the benefits of consumption by the others (Lewin 2001). Indeed, Brynjolfsson and Kemerer (1996) observe that consumers are willing to pay a premium to purchase software that is compatible with the dominant standards. This phenomenon is not only observable in the software market. The use of English as the international communication language (Lewin 2001) and the number of telephone users across the globe are some cases that can be explained by the theory of network effect.

Studies on competition in the presence of network effect often suggest that both the incumbent and the entrant will price low. Incumbent, presumably the dominant firm will reduce prices due to strategic entry deterrence, limit pricing or even predation (Fudenberg and Tirole 1986). As observed, in markets where Microsoft is the dominant firm, Microsoft usually favor the move price low so as to discourage new entrants by decreasing their incentives to enter. Particularly, the potential revenue of a new entrant will be sufficiently low to compensate for the resources required to produce the software and provide the necessary supports (Hall et al. 2003). Hence, potential competitors will be less likely to enter the market. Examining the economic effectiveness of such preemptive move, Friedman (1979) observes that cutting prices upon the entrance of new players may better deter entry, in both economically and effectively, than cutting prices prior to entry. Hence, it may not be optimum for incumbent to price low right at the beginning. While no conclusive argument can be derived on how incumbent should price the products, we can infer from the above argument that price may not be the only deterministic factor.

Reviewing the extant literature could suggest that software innovation could be another influential factor determining the outcome of the competition (Katz and Shapiro 1985). Majority of these studies focuses on the issue of product compatibility rather than technology sophistication. This is because it is not necessarily that a firm with more sophisticated or advanced technology will emerge as the dominance (Lewin 2001) as the cost to switch to another technology might be too high (Kelemperer 1989). Intuitively, for a new entrant, one would attempt to produce software that is compatible with the existing software in the market but in a theoretical study by Katz and Shapiro (1992), they show that firms introducing the new product may be biased against compatibility. Counter to Katz and Shapiro (1992) findings, we do observe that products in the market for similar domain are relatively compatible (e.g., WordPerfect and MsWord). Hence, it is empirically important to validate the Katz and Shapiro (1992) findings and to bridge the gap between theoretical studies and empirical observations.

### 3. Background

The distinctive characteristic of software products, as in all other information goods, is that it is costly to produce the first unit but costs almost nothing to reproduce. This gives the producers almost unlimited production capacity to meet any demand. Hence, among most of the other markets, the software market in Korea is deemed to be the most promising in terms of profit generation. This characteristic, together with the lure of the ability to charge a premium once customers are locked-in, many firms entered the software market with the dream of becoming the leader and the next Bill Gates. The attractiveness of entering the market is further fueled by the government supports of incentives such as financial aid, military service exemption for research workers<sup>1</sup>, and inducement of strategic alliance between venture capitals and public Research and Development (R&D) institutes.

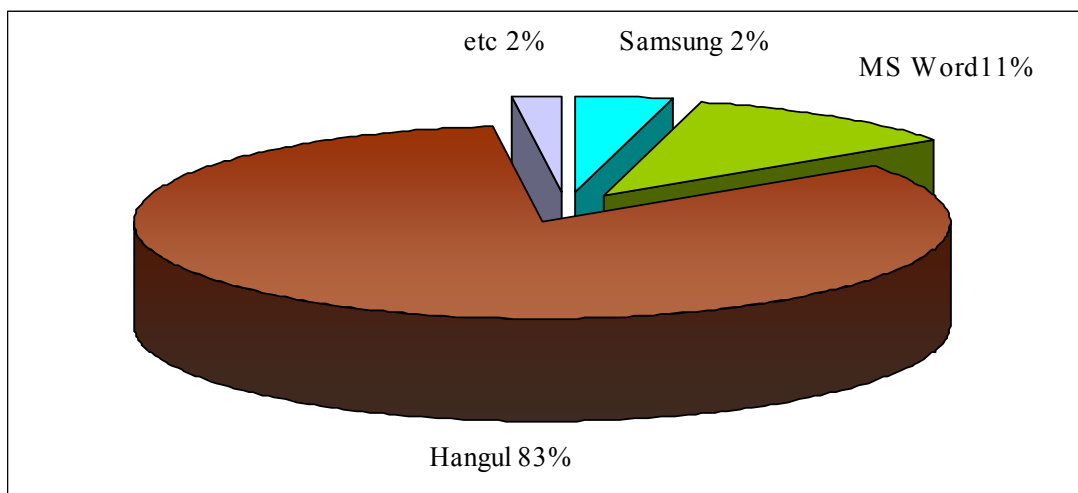


Figure 1. Market share distributions in word-processing software market

In the word-processing software market, Microsoft commands the bulk market share in most of the world, with few exceptions. Korea is one of the exceptions with Microsoft MS Word accounting for below 50% of the market share in early 1990s. The domestic firms command the largest market share. Particularly, Hangul & Computer controls 83% of the Korean word

<sup>1</sup> In Korea, it is mandated by law that all male citizens perform military service for 2 years.

processor market. Hancom's technologies are well known in the industry as seen in a survey conducted in 1997 (see figure 1).

### 3.1. *The Glory of Hancom*

Hangul & Computer Co., Ltd.<sup>2</sup> (*Hancom*) was officially founded in 1990. The software firm's key business is in the creation of word-processing software, named *Hangul*, office packages, termed *Hancom Office*, and groupware, known as *Hancom Groupware*. Among all these products, *Hangul* was grounded for the establishment of the company.

Looking back, with the proliferation of the PC in the late 1980s, *Hangul* was developed and widely used by university students who were the main consumers in the initial stage. This resulted in the "alumni effect" where the students were accustomed to the use of *Hangul* and such usage continued beyond educational institutions. The firm's astonishingly large market share in the market reached 83%<sup>3</sup> in 1997. Along with swift penetration of computers in homes and work places, *Hancom* continued to invest heavily on R&D to improve the quality of *Hangul*. Since its establishment, it is common that *Hancom* would invest over 30% of its annual sales every year in R&D. Such investment helped *Hancom* to strengthen its international competitiveness and sustain its growth so that the firm remained the top word-processor software developer and distributor in Korea.

### 3.2. *Troubles of Hancom*

*Hancom* had been able to profit from its dominant market share and the strong loyalty of consumers who had supported and loved the product since it entered the market (to a certain extent these consumers are locked-in). The firm was touted as the future of the Korean IT industry and the national pride of the Korean people in the mid 1990s.

In 1998 the Korean software industry was facing serious trouble due to the stagnant PC industry and piracy. Piracy especially was regarded as the main reason for the shrinking software market and the high price of the software products. In addition, the Asian financial crisis critically weakened the financial position of this small company. The slowdown in revenues from the development of *Hangul* coupled with the economic crisis contributed to its equity sell-off decision. *Hancom* was obliged to introduce foreign capital due to the financial pinch caused by the foreign exchange crisis. Its competitor, Microsoft, saw this as its opportunity to "turn over" the market. In June 1998, *Hancom* finally announced that it had agreed to introduce \$10-20 million from its archrival Microsoft on the condition that *Hancom* would stop investing in the word processor software and focus only on new software development.

Immediately after the announcement, the deal aroused hostile reaction from the public, who regarded it as an act damaging their national pride. In response to this anger over Microsoft's aggressive marketing in Korea, visiting Microsoft Chairman Bill Gates assured the people

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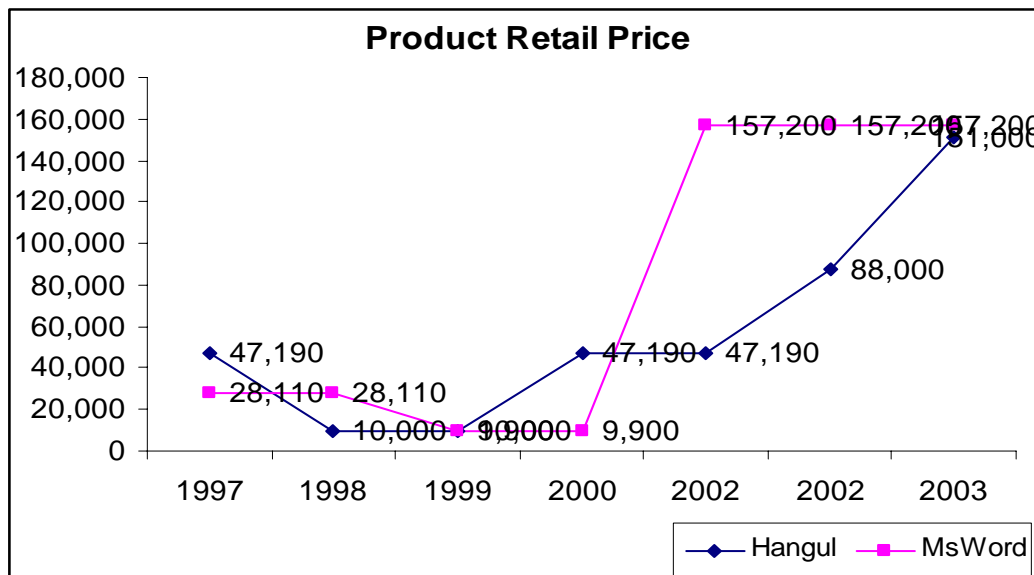
<sup>2</sup> <http://en.hancom.com/index.html>

<sup>3</sup> The company commanded 83% of domestic market in the word-processor market and occupied over 90% in the government-related organizations including public schools.

that he might reconsider a plan to take over a leading Korean-language word processor project. The private-level movement to revive the Korean-language word processor program had entered a new phase as the local parties concerned were about to form a union. A "*save Hangul campaign*" was started by the head of the Korean Venture Business Association. Finally, the public criticism forced *Hancom* to accept the rescue by this group of investors. Regretfully for Microsoft their deal was broken and the competition enters a new chapter.

### 3.3. Competition

The competition between Hancom and Microsoft intensified. A price war between the two companies started in 1998. Microsoft also achieved a technology break-through in 1999 when it introduced its new version of MS Word 2000. New factors of competition - technology compatibility, the financial strength of each company, and changes in software preference due to globalization – entered the situation. Detailed analysis of each factor is beyond the scope of this study but a brief discussion will be provided when appropriate.



Unit: Korean Won (KRW)

Figure 2. Price Competition

In this study we focus primarily on the pricing strategies of both firms. The products' prices from the year 1997 to 2003 are depicted in Figure 2. As mentioned earlier, this study analyzes the competition between Microsoft and Hancom in 4 stages.

## 4. Competition

### 4.1. First Stage (1997 and before)

*Hangul* was the dominant word-processor software used by Korea since the early 1990s. However, given the big market potential in Korea, Microsoft decided to enter the market. While Microsoft was the dominant software firm in most parts of the world, its presence was

not much felt in Korea until 1997. The main competitive strategy of Microsoft's market entrance was to introduce MS Word, which was popular in most parts of the world.

This market entrance was met with strong resistance not by the incumbent but by the users of Hancom. One of the primary reasons was that most of the consumers were accustomed to using Hancom. Furthermore, the compatibility of MS Word with Hancom was low and MS Word was not fully customized to accept Korean characters. Given these two reasons, Microsoft decided to introduce MS Word at KRW 28,110 in an attempt to win over some of the price sensitive consumers. Hancom's retail price remained at a premium of KRW 47,190. The low price was not sufficient to induce Hancom users to choose MS Word. Hangul continued to dominate the market with a market penetration of over 83%. Could Microsoft have done better in winning over the users of Hancom? Is the decision of the incumbent to charge at a premium (taking into consideration the user switching costs) wise?

#### **4.1.1. The Analysis**

In the model, we consider competition between two firms selling different software products, the "extant" (i.e. Hangul) and the "new" (MS Word), denoted H and M respectively. Firm H, selling software product H, is already in use when the analysis begins at period zero. In the game, both the dominant firms choose prices simultaneously. In period 1, only the incumbent exists in the market, and we assume the incumbent has captured the market by sufficiently lowering the price to attract the consumers. In period 2, the entrant enters the market.

All consumers enter the market in period 1 and are in the market in every period. In each period, the  $q^{\text{th}}$  consumers have a reservation price  $f(p)$ , net of switching costs, for a single unit of product. Any consumer, who purchases from a different firm than the one from which she purchased in the preceding period, or who did not purchase in the preceding period, incurs a "switching cost",  $s > 0$ . All firms have constant marginal costs,  $c$  per unit, and no fixed costs.

We examine the pricing game of the two firms, by varying the switching cost of the consumers to "switch" from the incumbent (i.e. Firm H) to the entrant (i.e. Firm M). Suppose the switching cost is small, in period 2 the entrant firm M will be willing to offer price at  $c$  and so would attract all consumers of firm H, whose price exceeded  $c + s$  to compensate for the loss in profit in period 1. Thus, knowing that firm M will be pricing at  $c$ , the dominant firm cannot set a price exceeding the entrant price by more than the switching cost. Ultimately, the dominant firm should set a price less than or equal to  $c + s$  in period 2 to remain dominant.

Suppose the switching cost is large, the incumbent firm H may be better off selling to higher-valuation price consumers than the entrant firm M, since the increase in profit from catering to the whole market may be less than the reduction in profit from a lower price. In this case, the price will be equal to the valuation price of the marginal consumers the incumbent sells to in period 1. These consumers will be "old" consumers, that is, repeated-purchasers, because firm H would have to set price  $c$ , yielding zero, to initially attract them to purchase before the entrant enters the market.

Furthermore, since these consumers will obtain zero surpluses (i.e. price set at valuation price) in period 2, the consumers' switching cost must be paid for in period 1 with a period-1 price that is at least  $s$  below his reservation price. Thus, the incumbent firm H's period 1 price is at



least  $s$  below the period-2 price. Additionally, since the dominant firm H will set a price higher than period 1 to cater to the higher-reservation price consumers, the entrant M will be better off to only cater to lower-reservation price consumers by setting a low price.

In both situations, firm H will be setting a higher price than firm M in period 2, but firm M is no better off in attracting the consumers to “switch” to firm M. This explained why Hancom continued to dominate the market by pricing at a higher price of KRW 47,190 even though MS Word was priced at a lower price of KRW 28,110. Furthermore, it is clear that from the background review of Hancom, the users of Hancom experienced a high level of lock-in (especially in terms of the “national pride”). Hence, although Microsoft priced aggressively, it failed to tip over the market and earned relatively low profit in stage 1.

#### **4.2. Second Stage (1998-1999)**

The market competition between 1998 and 1999 was intensified when Microsoft introduced a higher quality MS Word product. This product was able to be better tailored to the needs of the domestic users. This tailoring, plus the added functionality, led to the customers “tipping”. Essentially, the quality of MS Word was higher than, and compatible with, Hancom. The rationale for Microsoft to improve the quality and deal with compatibility of the product is that, as evident in stage 1, Microsoft realized that pricing the price relatively low was not sufficient to induce Hancom users to “switch” to MS Word. This led to Microsoft investing heavily on the MS Word product quality.

In 1999, Microsoft introduced MS Word which closely mirrored the system interface design of Hancom and incorporated multi-languages support (aimed to reduce the learning cost of the consumers). Essentially, Microsoft devoted 1998-1999 to improving MS Word. While Microsoft was improving the quality of MS Word, Hangul faced a financial crisis<sup>4</sup> and it under-invested in Hancom. This brings us to Stage 2.

##### **4.2.1. The Analysis**

Due to the complexity of stage 2, the analysis is split into two phases. Phase 1 gives an alternative reason of why Hangul under-invested. Phase 2 projects a dramatic change in the market dominance by analyzing why Microsoft is able to “tip” the market.

##### **4.2.2. Should Hangul innovate?**

Besides the cited reason for Hangul to spend less to improve on the quality of the product due to piracy and financial difficulties, there is another likely reason: there is less incentive to invest on improving the product quality given that it has captured the market. This analysis is framed by referencing the paper by Fudenberg and Tirole (1984). While little changes are done on the model by Fudenberg and Tirole (1984), we use the model to explain for the observed phenomenon. To the extent that this analysis is applied, it bridges the gap between theoretical argument and real-life observation.

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<sup>4</sup> One of the main reasons cited was software piracy.

In this model, we consider a two-period game. In period-1, the incumbent, firm H, spends  $k_1$  on research and development (R&D), and incurs a constant marginal cost of  $\acute{c}(k_1)$ . As in stage 1, the incumbent, firm H, is the dominant software firm and receives the monopoly profit  $V^m(\acute{c}(k_1))$  in period-1. In period-2, both firm H and M may decide on how much to invest on R&D in their own products, which allow an average marginal cost of  $c$ . If one firm develops the innovation, it could potentially capture the market and receive the monopoly value  $V^m(c)$ . Thus, the impact of innovation is “large” in this sense. If both firms develop the innovation, their profit is zero but the incumbent still remains dominant. If neither firm succeeds, then the incumbent receives  $V^m(c)$  since it could continue to leverage on the existing customer base. We further assume that the period-2 R&D technology is stochastic and  $\dot{u}_i(0) = \text{infinite}$ ,  $\dot{u}_i > 0$  and  $\ddot{u}_i < 0$ . In other words, if firm I spends  $x_i$  on R&D, it obtains the new technology with probability  $\mu_i(x_i)$ . The total profit for both firms in period-2 will be:

$$\begin{aligned}\pi^H &= \mu_H(1 - \mu_M) * V^m(c) + (1 - \mu_H)(1 - \mu_M) V^m(\acute{c}) - x_H \\ \pi^M &= \mu_M(1 - \mu_H) * V^m(c) - x_M\end{aligned}$$

After performing the first-order condition, we obtained:

$$\text{For firm M: } \dot{u}_M[V^m(c) - V^m(\acute{c})]*(1 - \mu_M) = 1$$

$$\text{For firm H: } \dot{u}_H * V^m(c) *(1 - \mu_H) = 1$$

From the first-order conditions, we do observe that the increase in profit for the firm M is the difference in monopoly profits and this leads to lower incentive for the incumbent to innovate compared to firm M. Essentially, the incumbent, firm H, only needs to invest sufficiently to remain in dominance in the market. Before the statement on whether firm H will “under-invest”, we need to trace back to period-1.

In period-1, the higher the investment  $k_1$  will lead to a lower profit for firm H (i.e. Hancock). Then, it is of firm H’s interest to lower the  $k_1$  to maximize the profit returns and focus more on the R&D competition in period-2. However, in period-2, we know intuitively that the increase in profit is relatively low and hence, there exists a relatively higher incentive for the firm H to “under-invest”. Furthermore,  $k_1$  has no direct impact on the profit in period-2 and hence, there is even more incentive to under-invest. Essentially, being an incumbent, firm H is more likely to under-invest than to invest heavily to improve the quality of the product. In addition, with the presence of switching costs (absent in this analysis model), the incumbent, firm H, may act less-aggressively, commonly termed as the “fat-cat” effect, where firm H competes less aggressively because they recognize that if they win fewer consumers today (not to the point of tipping), its rival will be bigger and hence would also compete less aggressively tomorrow. This creates an opportunity for the entrant firm M (i.e. Microsoft) to improve on the product quality, and in phase 2, we know that such a belief and decision could have a detrimental impact on the dominance of firm H in the market.

#### 4.2.3. How Microsoft “Tipped” the Market?

In phase 1, we only manage to provide an explanation why knowing that firm M will invest, firm H is likely to under-invest. However, the consequence of the difference in product quality is not examined. In phase 2, we address the issue of product compatibility and pricing.

In this model we reference the general discussion paper by Farrell and Klemperer (2001). Modifications to the reference model were done with the inclusion of 2-period game sequence and consumer valuation. We suppose Firm H captures most of the market share and

benefits from a big network effect. Firm M exists in the market with small market share and is able to market its new version of the product M which is of *higher* product quality than H. We let the net quality difference of product H compared to product M be  $q$  and positive. We also suppose firm M has costs  $m_t$  in period  $t$ , while firm H has costs  $h_t$ .

We assume each consumer will purchase up to one unit of product. All consumers are assumed to be the users of product M before firm H introduces the new M product version. Any consumer who purchases from a different firm than the one from which she purchased earlier incurs a “switching cost”,  $s > 0$ . We assume that a consumer will switch to purchase from firm M, if and only if, the net utility of choosing product M is positive. Furthermore, there exists a strong network effect where the second-period adopters (or consumers) would follow the first-period adopters if both products were priced at cost (taking into consideration the switching cost) and will pay  $r$  for a product compatible with first-period adoption.

The game proceeds as follows. In period 1, both firms price the products and period-1 adopters make the decisions. In period 2, both firms price the products again and period-2 adopters make the decisions.

It is clear that if a firm fails to win period-1 sales, it knows that it will lose in the second period. Hence, firm H will be willing to price down as far as  $h_1 - (r + s + q - h_2)$  in order to win first-period sales, while firm M is willing to price down to  $m_1 - (r - s - q - m_2)$ . Consequently, the second period efficiencies feed through into period-1 penetration pricing and which firm wins the battle depends on the difference between the switching cost and the quality difference (Elzinga and Mills 1995). In this case, the new version of the Microsoft product is not only compatible with Hancom (i.e. file portability and interface similarity), but also includes multi-languages support and better quality. This could create sufficient incentive for the first-period adopters to “switch” to product M (Katz and Shapiro 1985). This leads to period-2 adopters following the choice of the period-1 adopters and abandoning product H. Then Microsoft overtakes Hangul as the dominance player in the market.

### **4.3. Third Stage (2000-2002)**

Hangul’s response to this new market dominance by Microsoft amounted to too little, too late. They tried to bring out a newer version of their software that could be both compatible to MS Word and incorporate many of its strengths at the same time. Unfortunately, they did not have the financial resources or capital to succeed at this, and their new product was unable to integrate the two different technologies and subsequently failed to make any noticeable difference in sales, which upset Hangul’s loyal customers.

At the same time, once Microsoft was able to introduce its new product that was sufficiently advanced to Hancom, it quickly reached a level of Monopoly power similar to that achieved by Hancom before Microsoft entered the market. Without any comparable competitors, MS changed its price at a monopoly level. Even much higher than the monopoly price of Hancom. Similarly, Hancom was forced to respond the way Microsoft did in the beginning.

#### **4.3.1. The Analysis**

This model simply revisits the earlier monopoly model from stage one, with the difference that the two companies are now in opposite places. As in the first stage, Microsoft will be able to set a higher price, in this case KRW 157,200, and Hangul is not going to be able to attract customers to switch, even at a price of KRW 88,000, because the switching costs are simply too high. This will continue to be the case until Hangul is able to improve their technology to match up with Microsoft.

### 3.4 Forth Stage (2003-2004)

Hancom's response to this monopoly position of Microsoft's was to target the lower reservation priced consumers, specifically individuals and SME's. In addition, in 2004, their technology finally improved significantly to the point that they were not at such a significant disadvantage. They also signaled to Microsoft that they only intended on a limited entry into the market and had no aspirations above 30% market share. Their strategy is clearly a 'judo strategy' and can be analyzed as such.

#### 4.3.2. The Analysis

According to Gelman and Salop (1983), Judo economics describes market situations where "small firm using its rival's large size to its own advantage". In more elaborated form, the entrant (smaller firm), by choose to price low and limit the capacity. When the incumbent chooses to accommodate, makes it more feasible for the incumbent (larger firm) to prefer accommodate over prey the entrant. In such situations, the survivability of the entrant is ensured.

While the issue of capacity constraint and limitation has been widely discussed in the industry organizational literature (e.g. Edgeworth model), the Judo economics presents a distinctive view that an entrant (or smaller firm) is not always at a competitive disadvantage. Indeed, this Judo view is extended and elaborated in the business strategy context as evident in the paper by Yoffie and Kwak (2002).

For a judo strategy (Gelman and Salop 1983) we consider a market with two sellers, selling a homogenous product to a group of buyers. Since in this instance both companies are already entrants, we only consider the stage of the game where the entrant, in this case Hangul, sets price and quantity and then the next stage where the incumbent, in this case Microsoft, sets a responding price to either fight or accommodate Hangul, depending on which would be more profitable.

In this game, once Hangul sets its price and quantity, Microsoft will either fight or accommodate. They will fight if the profit from accommodating is less than the profit from fighting.

$$\begin{aligned} \Pi_{1a} &\leq \Pi_{1p}, \\ \Pi_{1a}(P_1 > P_2) &= (P_1^* - C_1)[D(P_1^*) - Q_2] \\ \Pi_{1p}(P_1 = P_2) &= D(P_2)(P_2 - C_1) \end{aligned}$$

Where,  $\Pi_{1p}$  denotes the incumbent's profit if incumbent chooses to prey;  $D(P_2)$  denotes the demand function for the product at price  $P_2$ ;  $C_1$  denotes the marginal cost of the incumbent to product one unit of item. Where  $P_1^*$  denotes the monopoly price chargeable by the incumbent;  $Q_2$  denotes the number of consumers with the highest valuation gained by the entrant.

Similarly, the entrant will choose to enter the market, if and only if, the expected profit for incumbent to accommodate exceeds the expected profit to prey.

$$E(\Pi_{1a}) \geq E(\Pi_{1p})$$

*Where the response function of incumbent (i.e.  $R_1$ ) will yield the profit of  $\Pi_{1a}$ . If the incumbent chooses to prey, the entrant will make zero profit and incur a fixed entrant loss. Since, in this game, information is perfect,  $E(\Pi_{1a}) = \Pi_{1a}$  and  $E(\Pi_{1p}) = \Pi_{1p}$ .*

In this case Microsoft has so far chosen to accommodate Hanguk. Hanguk has priced itself at KRW 151,000, which is very close to Microsoft's price of KRW 157,200. As long as Hanguk makes it clear they do not have ambitious goals in market share or target customers, and the profit picture remains the same for Microsoft, it appears there is enough room for both companies in the Korean market.

## 5. Conclusion

The competition for dominance in the software market is crucial. Unless the competing software is perfectly compatible, it is likely that a winner-takes-all situation will occur. In this study, we examine the competition for dominance in the Korean word-processing software market. While there are many prior studies examining Microsoft, this study traces the route of dominance. Several implications can be inferred from the study.

First, when Hancom dominated the market, Microsoft tried to lower its price to appeal to Hancom's customers, but failed. Similarly, when Microsoft became the dominant player in the market, Hancom adopted the same strategy. But Hancom failed to "win" back the market as well. Hence, it is clear that this form of "last struggle" price cutting will be of little impact in this network economy. Rather than engaging in almost "useless" pricing-cutting measures, a wiser move as exhibited by Microsoft in stage 2, is to improve on the product quality and software compatibility. Combining this with an appropriate pricing strategy could yield a better outcome.

Second, the fatal decision of Hancom was to under-invest. This move provided a golden opportunity for the entrant Microsoft to "catch-up" and to behave aggressively. Had Hancom taken into consideration the history of Microsoft's competitive strategies in other countries, it might have been prepared and not under-invested. This suggests that even in a market where network effect prevails, one should not assume that its position of dominance is unshakable. Instead, an increase in your rival's competitiveness could threaten your market share.

As mentioned in the introduction, this mode of analysis will be a good source of reference for practitioners contemplating to enter a market or those who are still defending their fortress. Theoretically, this study aims to bridge the gap between the pure theoretical studies by researchers to the empirical outcomes of the Korean market. While this attempt is "ambitious" to the extent that a long-term study may demand more intertwined causes that lead to the final observed outcome, it does allow us to view the software competition in a more holistic and systematic manner.

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