Dynamics of Industry Consolidation and Sustainable Competitive Strategy: Is Birthright Irrevocable?

Bowon Kim and Kyungbae Park

We investigate how a firm’s birthright can determine its competitive advantage and its ability to survive an industry shakeout, especially when caused by non-disruptive technological innovations. Birthright is defined as the firm’s superior endowment of resources, both tangible and intangible, vis-à-vis competitors’, stemming either from its earlier entry into the market or from prior experience in a related market. Using a system dynamics simulation case analysis, we show that, consistent with the literature, birthright was indeed the determining force during the consolidation of the Korean mobile telecom industry case, and that firm’s reputation or brand was the significant factor. We then consider a deeper question, whether it is possible for newcomers without strong birthrights to survive such industry turmoil. We use the simulation model to conduct a ‘what-if’ analysis on one of the ‘victim’ firms which failed in the Korean telecoms shakeout, and conclude that targeted investment in reputation building would have enabled it to survive.

Introduction

There is a moment, after it has evolved along its own life cycle, when an industry consolidates, and in an industry-wide shakeout, some firms will survive, some collapse and some continue their existence via mergers with erstwhile competitors. In this paper, we investigate how a firm can survive and even prosper amid an industry consolidation. In such situations, the literature emphasizes the role of the firm’s birthright — its size, resource endowment, and cumulative technological capability - which incumbents have had more opportunity to develop effectively into an advantage, due to their increased time and experience in the market.
Can a latecomer lacking a strong birthright survive an industry shakeout?

Is it ever possible for a late entrant who lacks the benefits of a strong birthright to enter the market successfully? Can such a latecomer survive an industry shakeout? In the Korean mobile telecom industry, a market dominated by an incumbent, a late entrant could have adopted two possible strategies. One is a quick-fix solution, involving giving subsidies to customers. The other, to invest in building up the firm’s reputation or brand value, which is part of its birthright, is subtler and requires its long-term commitment as well as patience. Analysing the actions of the firms in our case study, we find that all the late entrants relied heavily on the ‘quick fix’ strategy, giving out generous customer subsidies to retain their position in the market. But when the market was caught up in an industry-wide consolidation, those late entrants with feeble birthrights failed, and were acquired by stronger competitors, clearly indicating that the short-term solution was unable to help the late entrants survive the shakeout, again consistent with what the literature would have predicted.

So is the late entrant doomed? In this paper, we suggest such a firm should pay more attention to cultivating its birthright by enhancing its reputation or brand value, than to giving away subsidy. Although the firm’s reputation or brand is intricately linked with its other capabilities, such as high quality of product/services and technological capability, beyond a certain level its reputation can be cultivated fairly independently. Could such a firm have survived? Our simulation analysis shows that it should have indeed been possible for a company which failed in the industry turmoil to have survived had it designed a creative strategy focussing on the reputation building, rather than simply relying on subsidy alone. The analysis also sheds light on how a latecomer should approach designing such a strategy.

For our research, we use the Korean mobile telecom industry from January 1996 to April 2003 as the case in point. The industry has unique characteristics that make it a suitable subject for our purposes. First, the Korean mobile telecom market expanded extraordinarily fast, and is currently one of the largest mobile telecom markets in the world. The industry has shown enormous dynamics - as it grew rapidly following the market’s lead, with the number of competing firms increasing from just one to five in less than 5 years. A substantial consolidation swept through the industry after the Korean currency crisis in 1997, leading to two of the five companies failing and being acquired by their competitors.

Using the Korean mobile telecom industry case, we first develop an extensive system dynamics simulation model that replicates the industry’s actual consolidation process. By analyzing the outcomes of the simulation, we explain why some firms survived and even thrived during the consolidation, while others faltered. We focus on one particular force that had a major impact on the firms’ fate during the industry shakeout, i.e., the firm’s reputation, which is a part of its birthright. Derived from this observation, we suggest a more intriguing question, ‘Is the firm’s birthright so powerful that the firm’s fate during the industry-wide consolidation is predetermined?’ Is it impossible for a company with little or no birthright to survive in the industry? We explore this research question by using the simulation model to conduct a ‘what-if’ analysis. In essence, we explore what the failed company could have done differently to survive the industry consolidation process.

Is birthright so powerful that a firm’s fate is predetermined?
The paper is structured as follows. In the next section, we discuss the theoretical constructs which underpin our research by discussing the relevant literature. Then, we describe the Korean mobile telecom industry in detail and show how we develop the system dynamics simulation model to replicate the real-world situation. Section 4 presents the simulation result and discusses its implications. Section 5 develops the ‘what-if’ analysis model and we construct a set of logical explanations. In the last section, we contemplate managerial implications of our research and propose a few conclusions and lessons for CEOs.

Theoretical Constructs and Literature Review

Dynamics of technological innovation
Technology changes dynamically. Some changes are revolutionary (or radical), while others are evolutionary (or incremental). A revolutionary technological change/innovation causes significant disruption between successive technology life cycles. Dosi notes that such revolutionary innovation leads to a new technology paradigm, defining the evolutionary course of successive technology generations. Such disruptive technological change is a competence-destroying discontinuity, tending to nullify the extant ‘rules of the game’. The accepted rules and principles of the market, which have been significant in determining firms’ competitive advantage hitherto, can suddenly become no longer valid; faced with this type of technological innovation, firms cannot assume that the competitive advantage they previously enjoyed will necessarily enable them to succeed in the resultant new market.3

In contrast, evolutionary change in technological innovation is built upon the previous developments, producing an incremental transition of technology life cycles involving only a competence-enhancing discontinuity. Thus the fundamental layout of competitive advantage in the market remains intact. The market sees improvements or enhancements to current technologies and/or products, and firms need only refine their existing competitive advantages rather than start again from scratch to develop completely new ones.4

Industry shakeouts and firm survival
An industry shakeout can be defined as the consolidation of an industry, where the smaller and weaker competitors are acquired or driven out of business. This may be due to overcapacity in the industry or firms’ desire to extend their product or market.5 Consolidation is a dynamic rather than a static process. Researchers suggest that once an industry is formed or is deregulated, it will move through four stages of consolidation, i.e., opening, scale, focus, and balance and alliance stage.6 They suggest that the first stage generally begins with a single start-up or with a monopoly emerging from a newly deregulated or privatized industry; but entrants quickly arise to shape a competitive industry. In the second stage consolidation changes the industry landscape, as major players begin to emerge, buying up competitors and forming empires. Following this fierce consolidation activity the third stage sees companies focusing on expanding their core business and continuing to compete aggressively for market share. In the final stage, companies must find new ways to grow their core business in the now-mature industry, and create a new wave of growth by spinning off new businesses into new industries in early stages of consolidation.

It is possible to integrate the two constructs and see technological innovation and industry consolidation acting together. Following a disruptive technological innovation, one or two pioneering firms create a new market and the first stage of the consolidation curve starts. The industry consolidation process continues through a series of incremental or ‘competence-enhancing’ changes until the next ‘competence-destroying’ innovation shakes the industry out.

| consolidation continues through incremental changes until the next ‘competence-destroying’ innovation shakes out the industry. |
Surviving an industry shakeout has been an important issue in the literature. Three major strands help explain the odds of survival and growth of entrants in an industry: evolutionary theories, market structure arguments, and organizational theory arguments. Evolutionary scholars explain the survival of firms in terms of evolutionary changes in the market. Agarwal and Gort showed that survival rates depend both on the stage of market development and on individual firm attributes, while Suarez and Utterback tested the hypothesis that the competitive environment of an industry, and therefore the survival of firms in it, is substantially affected by the evolution of the technology it is based on. The second strand, the market structure argument, sees firm survival as influenced by industry characteristics such as technological intensity, which determines the exploitable range of technological opportunities available to entrepreneurs. Finally, organizational theory researchers have suggested that the early year survival is dependent on the firm size, and is also impacted by timing and the evolutionary stage of the industry at the time of entry.

Consistent with these three streams of research, there are three main explanations offered to account for the demise of the late entrants. The first one is purely technological: that early entrants have developed a technological know-how that simply allows them to outperform the late entrants. Klepper and Simons suggested shakeouts are not triggered by particular technological or other events but are part of a competitive process in which the most able early entrants achieve dominant market positions through innovation. The second is a capability-based explanation. This stream of research emphasizes the role of prior knowledge in shaping firm performance and survival. Having accumulated substantial experience, early entrants benefit from capabilities and skills that are hard for latecomers to catch up with. The final alternative explanation concerns the switching cost the customers of an early entrant would incur if they decide to migrate to a different (later) product/service provider.

Although each strand of literature highlights some unique factors, there is considerable similarity across their arguments in terms of their emphasis on the dominant role of early entry in determining firm survival. The literature underscores the significance of a firm’s birthright on its chances of surviving an industry consolidation. Agarwal and Gort argue for the dominant role of initial endowments in determining survival rates. Studying the U.S. television receiver industry, Klepper and Simons conclude that firm capabilities and the evolution of the TV industry’s market structure were critically shaped by firms’ experience prior to entry, while Holbrook et al. suggest that the key differences among semiconductor companies stemmed from the firms’ technological goals and activities and their abilities to integrate R&D and manufacturing, and these differences can in turn be related to the firms’ origins and their different stages of development at the point when they entered the semiconductor industry. In a similar vein, Helfat and Lieberman found that the greater the similarity between pre-entry firm resources and the required resources in an industry, the greater the likelihood that the firm will survive and prosper.

two key factors that enable a company to be competitive are product quality and brand.

Firm’s competitive advantage
What makes a company competitive? We suggest two key factors that enable the company to be competitive, i.e., product quality and brand. A combination of well-designed, innovative products and clever brand building can help the firm gain a lasting competitive advantage. The company has to offer innovative products that customers are eager to buy and willing to pay high premiums for, but it must also have brands that make the customers believe in the value of the products, i.e., the company must have a strong reputation.

Corporate reputation has been defined as the market’s value judgment about the company’s attributes, evolving over time as a result of consistent performance, reinforced by effective communication. It enables the firm to create its competitive advantage, e.g., to enhance buyer loyalty and
market share, by mitigating uncertainties in the customers’ minds about the performance of the products.15

Figure 1 shows the dynamics of enhancing the firm’s competitive advantage. There are two primary ways to enhance the firm’s attractiveness, i.e., through an effective R&D capability that enhances the product’s quality, and through marketing and advertising that improve the brand’s reputation. In addition, operational efficiency can allow costs to be kept down, which can contribute to a certain extent to improving product and brand attractiveness. Each of these can increase the value that customers realize from the product.

Initially the firm doesn’t have a strong brand or reputation in the customers’ mind. But, as the customers perceive the product to be of high quality, the firm’s reputation is boosted and the sales increase, and this leads to an expansion of the product’s customer base. As long as the product quality is perceived as at least satisfactory, or the value of the product is seen as superior to that of competing products, and the larger the customer base, the more positive becomes the effect of word-of-mouth. Thus the reputation of product and brand increases at an accelerating rate as the sales accumulate and the customer base expands. At the same time, the firm’s resources also increase, allowing it to fund further improvement efforts such as R&D, operations, and marketing. These investments further enhance the firm’s product value and reputation, and so the virtuous cycle moves on.

An intriguing observation is that, although initially reputation must be built by product quality, once a threshold level is reached it becomes a self-reinforcing force that can drive and support the firm’s competitive advantage via appealing directly to the customers’ perception. In this way, reputation can behave independently of product superiority itself, as reputation itself begets reputation, which in turn can make the customers believe the firm’s service quality is even better than it is, and this effect can continue as long as the product quality remains satisfactorily high.

**Birthright**

A firm’s birthright can be formally defined as the firm’s superior endowment of resources (both tangible and intangible) vis-à-vis their competitors’, either due to the firm’s earlier entry into

![Figure 1. Factors to determine the Firm’s Competitive Advantage](image-url)
Is birthright really critical?
We propose that a firm’s birthright plays an important role when it faces a technology transition caused by incremental innovations, as the firm’s existing competitive advantage, (i.e. its birthright) can continue to support it as it rides on a transition comprised of multiple technology generations. In comparison, in the face of a disruptive technological innovation which makes the existing dominant designs of competition obsolete, a firm’s birthright can become irrelevant. When this happens the firm that previously enjoyed a dominant position under the old paradigm loses its competitive advantage, and it is not unusual to see dominant companies faltering when such disruptive technological innovation shakes the market. By combining the concepts of technological innovation and industry consolidation, we suggest that the firm’s birthright will play a critical role in determining the firm’s competitive advantage when the industry goes through a competence-enhancing consolidation, but not when the consolidation follows competence-destroying disruption.

Modelling the Korean Mobile Telecom Industry
Over the past two decades, the Korean telecom industry has demonstrated striking technological innovation and the mobile telecom market, in particular, has grown extraordinarily fast in the past decade. As Figure 2 shows, the total number of mobile telephone subscribers grew sixty-fold from less than half a million in 1994 to almost 33 million in less than 10 years.

The dominant position in the Korean telecom industry had long been held by Korea Telecom (KT), one of the largest government run public companies, who enjoyed a complete monopoly in the conventional telecom industry. The mobile telecom industry was created when SK Telecom (SKT) started its services in May 1984 by offering in-car phones and added hand-held mobile phones in April 1988. SKT enjoyed a near-monopoly position in mobile telecom market for several years (see Figure 3), its first serious competitor, SHT, entering the market in April 1996. Services provided by both these companies were initially based on the same analogue technology. The emergence of digital technology in early 1996 opened the PCS era in the mobile telecom industry, and by
October 1997 three PCS service providers - KTF, LGT and HST - had entered the expanding market.

The technology transition from wired to wireless telecommunications was a ‘competence-destroying’ technological innovation, and shifted the dominant market power from KT to SKT. Although KT had dominated the ‘wired telecom’ paradigm, its birthright was of little help in the face of the disruptive technological innovation represented by the ‘wireless telecom’ paradigm.

On the other hand, the transition from analogue to digital technology, (CDMA and PCS), was an incremental innovation, and SKT was able to continue its dominance of the mobile market as the technology evolved. SKT’s birthright acted to reinforce its competitive advantage, enabling the company to continue dominating the market as the incremental innovation only caused minor ‘competency-enhancing’ disruptions.

**Competition in the Korean mobile telecom industry**

The focus of our research is the period during which the Korean mobile telecom industry underwent the turmoil of a substantial industry-wide consolidation, caused by extremely intense competition amid incremental innovations. The advent of the new PCS technology helped several latecomers enter the market that had been dominated by SKT, and the resultant intensely heightened competition in the market forced the industry to consolidate.

By October 1997 there were five competitors in the industry, SKT, SHT, KTF, LGT and HST. KTF was a subsidiary of Korea Telecom, the country’s monopoly ‘conventional telephone’ company. LGT was an affiliate company of the LG Group, Korea’s third largest conglomerate (or chaebol). SKT was also an affiliate, of the SK Group, one of the top five chaebol groups, which gave it an added benefit in addition to the sizable advantage it had over its competitors because of its first mover status. During late 1997 and 1998 a shortage of foreign exchange reserves led to a severe currency crisis, crippling the Korean economy, and the mobile telecom industry suffered along with most of the country’s other industries. But it also faced a more serious problem: competition was cruelly fierce, and companies were destroying their own profitability by heavily subsidizing their customers, giving away handsets virtually free, and sacrificing their profits so as to survive in the market. Such a strategy couldn’t be sustained for long, and the two weakest players, SHT
and HST, faltered and were eventually acquired by their competitors, SHT by SKT in December 1999 and HST by KTF in June 2000. (see Figure 4).

What happened in the industry was what the literature would have predicted - the company with the strong birthright thrived. Table 1 summarizes the firms’ characteristics. SKT was the ‘early entrant’ in the mobile telecom industry. As a subsidiary of KT, KTF had extensive experience in the related industry. In addition, like SKT and KTF, LGT was part of a chaebol business group and enjoyed the support of its parent LG group. Thus SKT and KTF had birthrights vis-à-vis other competitors, and LGT was also differentiated from HST and SHT in that it had resources available from its parent should they be urgently needed.

Following the shakeout, SKT became stronger, KTF maintained its second position and LGT managed to survive, while HST and SHT failed and were acquired by their competitors. Thus the actual outcome looks consistent with the theories. We now explore dynamics underlying the shakeout, in more detail to find exactly what forces were in play to determine the firms’ fates. For instance, while it certainly appears that a firm’s birthright played a critical role, which elements of a firm’s birthright were more salient during the shakeout? We develop a system dynamics simulation model in an attempt to answer this question.

A system dynamics simulation model
The most relevant time frame for our research is from 1996, when SKT’s monopoly in the industry was broken by SHT’s entry, to 2003, by which time the first round of industry consolidation had almost settled down. The first step in developing a system dynamics simulation to replicate the industry evolution is to identify the complicated interacting relationship among crucial factors that

<table>
<thead>
<tr>
<th>Firms</th>
<th>Birthrights</th>
<th>Business group resources</th>
<th>Outcome following shakeouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKT</td>
<td>Yes</td>
<td>Available</td>
<td>Stronger</td>
</tr>
<tr>
<td>KTF</td>
<td>-</td>
<td>Available</td>
<td>Improving</td>
</tr>
<tr>
<td>LGT</td>
<td>-</td>
<td>Available</td>
<td>Surviving</td>
</tr>
<tr>
<td>HST</td>
<td>-</td>
<td>-</td>
<td>Acquired</td>
</tr>
<tr>
<td>SHT</td>
<td>-</td>
<td>-</td>
<td>Acquired</td>
</tr>
</tbody>
</table>

Table 1. Firms’ birthrights

Figure 4. Time line of the Korean telecom industry and the Consolidation Curve
shaped the industry’s competitive dynamics: Figure 5 shows the cause-and-effect diagram, which was directly used to develop the system dynamics simulation model. The key components of the simulation model are outlined below, and more details of the simulation formulation are in Appendix.

**Firm attractiveness.** How is a firm’s market share determined? An individual firm’s market share is determined by the relative attractiveness of the firm’s product to competitors’.20 In the mobile telecom industry, a firm’s attractiveness is in turn determined by four factors, i.e., reputation, service quality, network externality and handset subsidy. Since reputation is the significant factor in our study, it is dealt with separately in the following section. For the other factors, the firm’s service quality improves as it invests more in its R&D, physical facility and infrastructure such as transmitters, base stations, cellular gateway switches, and other switching and network systems. As the number of subscribers increases, the firm’s network externality grows quickly, enabling it to reap more benefit from its expanding subscriber base. In addition to these more concrete attractiveness factors, the Korean mobile telecom operators (implicitly encouraged by the government) were offering customers handsome incentives in the form of substantial subsidies on handset costs. In many cases handsets were provided free as part of network service contracts, and such agreements were one of the most powerful forces behind the market’s explosive growth.

**Reputation.** The remaining significant component of attractiveness is the firm’s reputation, which is also related to the power of the firm’s brand image as perceived by the customers.21 Sometimes it can be difficult to completely isolate reputation from other factors, but in this instance we believe it played a critical role, which is clearly separable from other industry factors.22 Our focus is on the period of dramatic industry growth and subsequent consolidation between 1996 and 2003, and in the early years the only mobile telecom company that had a visible level of reputation was SKT. No other company had been able to establish sufficient brand loyalty in the market (with the possible exception of KTF, which had been established by the ‘conventional’ service provider KT, and could be seen as benefiting to some extent from its parent company’s reputation). The factors of incentive

![Figure 5. Interaction dynamics of key factors in the Korean mobile telecom industry](image-url)
(via handset subsidy) and investment in service quality (which followed customer base growth) only began to affect comparative firm attractiveness after the PCS companies joined the market, precipitating rapid expansion and intensified competition. We can therefore postulate that it was reputation which played the substantial role in firm attractiveness at the start of our period.

**reputation played the substantial role in firm attractiveness**

**Firm resources.** Quality improvement and customer incentives require resources. These combine with the other attractiveness factors to feed market growth, and as sales and profit increase, so do the firm’s resources. Increased resources in turn are available to fund the firm’s quality improvement and subsidy distribution.

**Industry competition.** The simulation model includes all of the five mobile telecom companies, each trying to improve its own attractiveness vis-à-vis its competitors’. The overall attractiveness of the companies determines the attractiveness of the industry as a whole, which in turn determines the market size and the diffusion speed. Each company’s market share is proportional to its attractiveness relative to that of the whole industry.

**Relationship with the theoretical constructs**

Our simulation model is consistent with the literature. In particular, the attractiveness factors are closely related with the theoretical constructs noted in the literature review section, where we suggested three alternative explanations about why latecomers have difficulty in surviving. The purely technological explanation focuses on the early entrant’s technological know-how and innovation capability; the capability-based explanation emphasises prior knowledge and experience, and switching cost-based theory rests on network externality. **Figure 6** depicts the relationship between the three explanations and the model’s determinants of the firm’s attractiveness. The early entrant’s technological know-how and the prior knowledge and experience in related industries are key birthrights, which determine the firm’s quality level and eventually its reputation in the market. The switching cost-based theory can be separated into two effects, network externality and brand loyalty. The effect of network externality is embodied by the firm’s installed base, while brand loyalty is affected by the firm’s reputation level. Among the determinants of the firm’s attractiveness, quality will enhance the

![Figure 6. Birthrights and determinants of firm’s attractiveness](image-url)
firm’s reputation, while quality and reputation will increase the firm’s sales and therefore enlarge the installed base. By spending more on customer incentives, the firm can also increase its sales and therefore eventually strengthen the installed base. Thus our system dynamics simulation model contains the key factors suggested by the literature, and we have also included subsidizing prices as an operational or short-term leverage the firm can use to enhance its current sales.

(Further technical details about the simulation model can be found in the Appendix. Section A shows how the firm’s attractiveness is operationalized in the simulation; Section B introduces the concept of calibration used to verify the correctness of our simulation model; Section C presents a detailed simulation procedure; while Section D covers robustness checks and Section E describes refining the estimates of reputation.)

Simulation Model Results

Tables 2 and 3 summarize the simulation result. Table 2 shows the initial resource levels of the companies with figures from 1998, the first year when all the companies reported a full year’s financial result. It clearly shows SKT as having the largest resource endowment, and HST and LGT the least. The table also shows initial reputation values, estimated from consumer satisfaction reports, which were used to provide a starting point for the simulation, with values from 1 (low) to 4 (high). Following model calibration, we were able to obtain calibrated reputation values, which reflected actual reputation levels.

Table 3 presents the key simulation outcome, i.e., the relative importance of the factors that determine the firm’s attractiveness (see Appendix Table 7 for absolute measures of attractiveness). Consistent with what actually happened in the market, SKT, the leading company in the industry, turned out to be the most attractive, and HST the least. The attractiveness measures were normalized by setting HST’s attractiveness as 1.

Observation 1. The simulation outcome clearly describes what happened in the industry, confirming what the literature would have predicted. That is, firms’ birthrights were indeed determining forces. In particular, SKT, the company that enjoyed the strongest birthright as the earliest entrant into the industry, emerged stronger from the shakeout. KTF, leveraging its prior experience in the conventional telecom market, was also able to weather the turmoil.

Observation 2. However, there exists a critical difference between these two companies that started with solid birthrights. There was a marked tendency for all latecomer firms to adopt the same strategic focus to succeeding in the market place, even if they had some strength of birthright and/or resources available at the business group level. While reputation played the most significant role in determining SKT’s attractiveness, all four latecomer firms opted to use subsidy as their primary strategy in the face of the dominant incumbent. Handset subsidy was the key factor in their attractiveness, accounting for some 70-80% of the attractiveness of SHT, HST and LGT. In the case of KTF (the second strongest player in the market) reputation played a certain role, but subsidy was the still largest single factor. Even SKT was drawn into what clearly became a market norm, with subsidy only slightly behind reputation as a component of their attractiveness. The general lesson, however, is clear — there is an evident relationship between high levels of reputation as part of attractiveness (in the case of SKT, and, to an extent, KTF) and the ability of survive a market shakeout.

The relationship between high reputation levels and the ability to survive a market shakeout is clear.

From this observation, we can conclude that there was one major birthright element, i.e., firm reputation, which determined firm attractiveness in the Korean mobile telecom industry. The other factors were not significant differentiators among the competitors. This conclusion is striking, since
the literature usually highlights other forces of birthright, such as technological know-how, capability, and quality. One possible explanation is that when the industry shakeout is caused by incremental technological innovations, a firm’s intangible assets such as brand value and reputation can have increased relevance and be more vibrant forces in determining its attractiveness, and thus its competitiveness.

The network externality effect was completely absorbed into the reputation effect. It is not surprising since one of the forces driving reputation is the word of mouth, which equates to network externality. Another possibility is that, in the simulation model, the reputation effect actually represents the combined effect of both reputation and network externality at the same time.

The ‘What-if’ Analysis of the Birthright and its Implications

In this section, our primary research question is ‘Is the firm’s birthright so powerful that the firm’s fate during the industry-wide consolidation is predetermined?’ More specifically, is it possible for a company with little reputation and small initial resource endowment to survive in the industry? If it is possible, what would be the conditions under which such a firm could endure?

Investment in reputation

During the industry’s consolidation process, SHT and HST, the two companies with little reputation, faltered and were acquired by their competitors. As Table 3 shows, reputation was a minor element of firm attractiveness for all except SKT. Our initial simulation showed that the reputation value remained constant; in fact, companies made little investment in enhancing their reputation since 1996. But, in the ‘what-if’ analysis, the simulation model allows us to vary the value of reputation as if the company had succeeded in improving it, to test out the assumption that had a company that eventually failed made a genuine and systematic effort to improve its reputation, it would have been able to survive and even prosper through the industry consolidation. In order to incorporate this new assumption into the simulation, we needed to define the reputation so it could be affected by the firm’s conscious resource allocation (see Appendix G). First, it is important to find out whether there might exist a minimum level of effectiveness of the firm’s effort to enhance its reputation in order to make sure that the company would have survived: we use $\alpha$ to denote such

### Table 2. Initial Resources and Reputation Values

<table>
<thead>
<tr>
<th>Firm</th>
<th>SKT</th>
<th>SHT</th>
<th>KTF</th>
<th>HST</th>
<th>LGT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales ($ million)</td>
<td>3041.86</td>
<td>1101.79</td>
<td>1228.52</td>
<td>915.42</td>
<td>937.05</td>
</tr>
<tr>
<td>Profit ($ million)</td>
<td>129.82</td>
<td>6.86</td>
<td>-121.15</td>
<td>-97.21</td>
<td>-132.99</td>
</tr>
<tr>
<td>Reputation</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Calibrated (Actual) Level</td>
<td>3.9644</td>
<td>2.6818</td>
<td>3.1923</td>
<td>0.00115</td>
<td>2.4225</td>
</tr>
</tbody>
</table>

### Table 3. Relative Importance of Influencing Factors

<table>
<thead>
<tr>
<th>Each factor’s share of total attractiveness</th>
<th>SKT</th>
<th>SHT</th>
<th>KTF</th>
<th>HST</th>
<th>LGT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>14.03%</td>
<td>17.97%</td>
<td>14.37%</td>
<td>18.29%</td>
<td>18.42%</td>
</tr>
<tr>
<td>Network externality</td>
<td>0.00%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
<td>0.01%</td>
</tr>
<tr>
<td>Reputation</td>
<td>43.75%</td>
<td>8.24%</td>
<td>19.22%</td>
<td>0.00%</td>
<td>3.98%</td>
</tr>
<tr>
<td>Subsidy</td>
<td>42.21%</td>
<td>73.78%</td>
<td>66.40%</td>
<td>81.70%</td>
<td>77.59%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Total attractiveness in relative scale</td>
<td>2.75</td>
<td>1.11</td>
<td>1.50</td>
<td>1.00</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Important numbers (i.e., intriguing results) are shaded.
Threshold level of the effectiveness of investing in reputation

Using various scenarios with trial-and-errors (see Appendix), we found out that it would have been possible for HST to survive the industry shakeout. But, whichever strategy was employed, for HST to survive by investing in improving its reputation, there was a threshold level for the effectiveness of the investment. It turned out that the threshold level of effectiveness had to be $\alpha \geq 0.12$: i.e. if the cumulative investment in reputation is doubled, the reputation increases by 0.12 (see Figure 7). Table 2 shows that with no conscious effort to improve it, HST’s reputation value is 0.001, against SKT’s 3.964. With $\alpha \leq 0.12$, the company could not have survived whatever strategy it tried.

Balanced versus penetration strategy

The first, ‘balanced’, strategy allocates a certain percentage of the company’s sales revenues to be invested in improving its reputation. The second, ‘penetration’, strategy, sees the company investing more aggressively earlier in the period so that the enhanced reputation can have a longer-term effect on the firm’s competitiveness. (For details see Appendix H). We use $\alpha = 0.12$ in the following discussion.

Balanced strategy. The simulation model indicates that the optimal decision for a company choosing the balanced strategy would be to invest about 6% of sales in reputation (Figure 8). An interesting
observation is that when the effectiveness coefficient is above a certain level, the optimal investment level decreases: this is because when effectiveness is sufficiently high, the firm doesn’t have to spend too much on reputation, which can be significantly improved by only a small investment level.

Employing the balanced strategy, HST’s reputation value would increase from almost nil to over 3, comparable with KTF’s figure. (A consistent outcome can be observed in Table 7 in Appendix I).

So how much should HST have invested in building its reputation? Table 4 presents the investments and profits for the company on a cumulative basis. The analysis estimates that in order to survive the shakeout the firm should have invested about $600 million in its reputation over the 7 years from 1997 to 2003. If we look at the numbers in 2000, the difference in total investments between the actual case and the balanced strategy case is not that great, implying that allocating resources wisely could have been more important than how much was spent. Investing according to the balanced strategy would have seen the company’s cumulative profit turn positive in 2004.

**Penetration strategy.** Under the penetration strategy, the firm would borrow from outside as long as its debt ratio stays below the industry average of 136%; the cost of capital was assumed to be 12% per year. The simulation model shows that, by adopting the penetration strategy, HST would also have survived. In fact the two strategies would have produced qualitatively similar outcomes, although in quantitative terms the penetration strategy would have generated larger reputation and total attractiveness values.

Figure 9 highlights the differences between the two strategies. Each strategy shows both pros and cons at the same time. From the effectiveness perspective, the penetration strategy seems better,

<table>
<thead>
<tr>
<th>Cumulative investment in</th>
<th>Actual case in 2000</th>
<th>Balanced strategy to invest in reputation in 2000</th>
<th>2003</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>$1.32*</td>
<td>$1.32</td>
<td>$1.37</td>
<td>$1.37</td>
</tr>
<tr>
<td>Subsidy</td>
<td>$0.822</td>
<td>$0.955</td>
<td>$0.955</td>
<td>$0.955</td>
</tr>
<tr>
<td>Reputation</td>
<td>NM*</td>
<td>$0.143</td>
<td>$0.545</td>
<td>$0.926</td>
</tr>
<tr>
<td>Total investment</td>
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<td><strong>$2.42</strong></td>
<td>$2.87</td>
<td>$3.25</td>
</tr>
<tr>
<td>Cumulative profit</td>
<td>-$2.62</td>
<td>-$2.71</td>
<td>-$1.06</td>
<td>$1.04</td>
</tr>
<tr>
<td>Yearly profit</td>
<td>-$0.132</td>
<td>-$0.048</td>
<td>$0.780</td>
<td>$0.888</td>
</tr>
</tbody>
</table>

*Amounts in billion dollars; NM – not meaningful. Total investment figures are highlighted (shaded) for comparison.
since the company becomes more competitive early on. However, to invest in enhancing reputation early, the company would have had to take the risk of overspending, and might not have had enough resources, if its sales revenues had not had time to accumulate. To invest more than its internal resources the company would have had to borrow from outside lenders, involving the company in interest expenses and the danger that its cash position could drop below the ‘safety’ level, leading to the possibility of bankruptcy. The importance of initial resource endowment is clearly underlined.

While the results illustrated in Figure 9 appear to be quite similar, in fact the difference in the strategies is significant. The cumulative profit of the penetration strategy at $t = 250$ is about $95 million, as against $75 million for the balanced strategy, in other words the penetration strategy generates about 25% more profit than the balanced strategy. Adopting the penetration strategy in pursuit of an extra 25% profit will depend on the decision maker’s attitude towards risk, as they must assess the firm’s particular situation and weigh its current resource availability against the danger of borrowing too much. (See also Table 8 in the Appendix for comparison between the two strategies’ effects on reputation and total attractiveness).

Managerial Implications and Learning Points

The primary motivation of this research was to investigate the dynamics of industry shakeout via a study of the Korean mobile telecom industry. In order to answer our research question, we first developed a system dynamics simulation model to accurately replicate the consolidation process between 1996-2003. We then employed a calibration process to validate the model, and used the

HST could have survived the turmoil if, rather giving away subsidy to the customers, it had pursued a strategy of systematically nurturing its birthright.

The what-if analysis clearly shows that HST could have survived the turmoil if, rather than mimicking other latecomers’ policy of giving away subsidy to the customers, it had invested in building its reputation from the very beginning, using either strategy. Table 7 in Appendix I indicates that HST would have become as competitive as KTF, had it have pursued the strategy of nurturing its birthright systematically.
refined model to conduct a ‘what-if’ analysis to see whether and if so how a failed firm could have survived the shakeout.

**Simulation result and its implications**

The simulation result was very consistent with the literature’s theoretical explanations. SKT, the industry leader, had retained the strongest position by capitalizing on its robust birthright, which dated from the original deregulation of the industry. The company continued to pursue a strategy that enabled it to get most out of its birthright, and paying less attention to customer incentives. On the contrary, all of the latecomers had chosen a handicapped strategy in order to ‘jumpstart’ into the newly opened market, focusing on giving away subsidy to the customer without paying sufficient attention to overcoming the disadvantage in their birthright, i.e., their lack of reputation in comparison with the incumbent market leader.

The fact that the simulation underscored the significance of reputation as the critical constituent element of birthright offers a new perspective in the literature, which usually highlights other birthright forces such as technological know-how, capability and quality. We propose that, when an industry shakeout is caused by incremental technological innovations, firm’s intangible assets such as brand value and reputation are more influential in determining the firm’s competitiveness.

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**the consistency of attributes such as quality, price and delivery is the key to building reputation**

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**Implications from the what-if analysis**

A firm’s birthright is a strong and reliable force in determining its competitive advantage vis-à-vis its competitors. But, though a daunting task for the weak player, it wouldn’t be absolutely impossible for a firm with a feeble birthright to survive, and even to prosper, amid a massive industry consolidation. The critical condition for such a scenario to become possible is that there must exist a threshold level for the effectiveness of a method to boost the firm’s reputation. Given that the method is effective beyond this level, two alternative strategies, the balanced and the penetration strategy, are suggested.

Although the literature doesn’t shed much light on the specific methods a firm can utilize to improve its reputation, there are a few guiding principles. Herbig and Milewicz suggest that the consistency of attributes such as quality, price and delivery offered by a firm is the key to building its reputation. Yoon et al. suggest there are two primary sources of reputation, experience and information. That is, the firm’s reputation would increase as customers ‘experience’ the superior performance of its product. Performance is perceived as superior when the company offers a high quality product, presents satisfactory guarantees or warranties and responds to the customer complaints quickly and acceptably. In addition, there are two major ways for the customers to get information about the company’s product: via the company’s own marketing effort, and through word-of-mouth or network externality among customers already using the product. Effective strategies to enhance reputation in the telecom industry might include giving customers more opportunities to experience the firm’s services, offering extended warranties and so forth. (It is known that a carmaker can enhance its reputation in a relatively short period of time by offering a very attractive ‘extended warranty package’ to its customers).

**Our advice would have been simple: reduce the handset subsidy and invest the saving in building the company’s reputation**
What advice should we have given the CEO of HST in 1997 to help his company survive the coming industry shakeout? Based on the what-if analysis, our advice would have been very simple: reduce the handset subsidy and invest the saving in building the company’s reputation from the very beginning! Finding an effective method to increase reputation would have been a minor issue in this particular case: the amount of money that could have been saved by limiting handset subsidy was so enormous that HST would have had enough resources to investigate any number of effective methods to enhance its reputation.

**Generalizable learning points**

Are the lessons generalizable - what advice we could offer CEOs in other industries? Our research sheds light on designing a practical strategy to overcome the disadvantage of lack of firm birthright. The implication can be significant, especially to the firm that is not yet fully established in the industry and/or trying to enter a new market dominated by strong incumbents, or facing a technological change. In such a situation, the CEO must first ask whether the industry is facing a competence-destroying or competence-enhancing technological change. If it is a competence-destroying one, the CEO probably doesn’t have to worry about birthright, since such a disruptive technological change makes such pre-existing advantages irrelevant. But if it is a competence-enhancing innovation, and there is a leading incumbent with a strong birthright in the market, the CEO must pay close attention on how to overcome his company’s disadvantage by identifying the incumbent’s strongest birthright and seeking effective ways to overcome it. Our analysis also indicates that, during an industry shakeout caused by competence-enhancing incremental innovations, intangible birthrights such as reputation and brand value can be more critical than more tangible resources, technological know-how, capability, and the like. The ‘What–If’ analysis suggests that targeted investment in reputation building is well worth considering, with the choice between the two illustrated strategies depending on the firm and market situation. Some simple advice on this choice might be: ‘if money is tight, go balanced, if speed is of the essence, go penetrative.’

**During industry shakeouts caused by incremental innovations,**

*intangible birthrights such as reputation and brand value can be more critical than tangible resources*

If multiple newcomers enter the market together, the CEO should design a strategy to differentiate their company’s approach. In our case, with all the late entrants adopting the subsidy strategy, the more creative or innovative way would have been to invest in strengthening the firm’s birthright.

Finally, what advice can we give to the incumbent’s CEO? Design a strategy to defend your strongest birthright from the invasion of smart newcomers. Don’t let them have enough time and resources to overtake your leadership position in the market, but leverage your birthright fully to further build up your competitive advantage before the newcomers gain their own strengths. In the light of this research, persuading your competitors to indulge in a mutually-ruinous incentive/subsidy war might also seem to be good advice to incumbent CEOs: in contrast, cultivating a vision beyond such short-term competitive strategies must be sound advice for late entrants.

**Incumbent CEOs should design a strategy to defend their strongest birthright from the invasion of smart newcomers.**
A methodological contribution our research makes to the literature is related with the way we developed a system dynamics simulation model to accurately replicate the competitive dynamics of an important industry. Calibrating the simulation model against the real-world data allowed us to carry out a what-if analysis to see how a firm without a strong birthright might survive the turmoil of an industry shakeout. This research process is novel in the literature and, we believe, can be a very useful methodology in conducting this line of research.

The fact that our simulation model was developed for a specific industry might appear to limit the generalizability of our research. But as the model can be readily modified to replicate the dynamics of any other industry, we do not feel this difficulty is insurmountable. We are more concerned about how to find an implementation strategy to enable the weak firm to enhance its reputation sufficiently to survive the crisis. Does such a method exist in the real world, and if it does, how can a beleaguered CEO find it out? These questions are excellent candidates for future research.

Appendix

System Dynamics Simulation Formulations and Assumptions

A How the firm’s attractiveness is determined

Firm $i$’s attractiveness is defined: $A_i = b_0 + X_1^{b_1} + X_2^{b_2} + X_3^{b_3} + X_4^{b_4}$ where

$A_i$: Firm $i$’s attractiveness

$X_1$: Service quality represented by the cumulative investment in facility/capacity

$X_2$: Firm $i$’s reputation

$X_3$: Firm $i$’s cumulative handset subsidy

$X_4$: The number of subscribers of firm $i$

$b_0$: Constant

$b_j$: Elasticity coefficient of service quality ($j = 1$), reputation ($j = 2$), subsidy ($j = 3$), and the number of subscribers ($j = 4$).

B. Calibration of a system dynamics simulation model

In order to confirm the validity of a simulation model, a methodology called ‘calibration’ is used in system dynamics simulation. The following explanation of calibration is from the site of Vensim® ([http://www.vensim.com/optimize.html](http://www.vensim.com/optimize.html)) software, which is used in this paper.

Validation of the integrity of a model rests in part on comparing model behaviour to time series data collected in the ‘real world.’ When a model is structurally complete and simulates properly, calibration of the model can proceed to fit the model to this observed data. Dynamic models are often very sensitive to the values of constant parameters. If you want to calibrate your parameters so the model behaviour matches observed data, you may need to experiment with thousands of combinations of different parameter values. Calibration makes this procedure automatic. You specify which data series you want to fit and which parameters you want to adjust, then Vensim automatically adjust parameters to get the best match between model behaviour and the data.

C. The simulation procedure

The first step of our system dynamics simulation was to develop a model by defining the dynamic relationships among key factors and variables as in Figure 5. In order to check the validity of the model, we needed to calibrate the model against the actual data in the Korean mobile telecom industry from January 1996 to April 2003. We calibrated our simulation model using the actual number of subscribers in the industry as the criterion. But there was a slight problem. Most of data
points and parameter values necessary to calibrate the model were available from financial and other secondary sources of the companies. The most difficult part was how to decide the initial values of firm reputation (Figure 10). For the purpose of preliminary calibration, we decided to use constant reputation values, which were derived from the KMAC Customer Satisfaction Index Report, a market survey conducted to measure each firm’s brand power. With these ‘guessed’ reputation values, we ran the preliminary calibration. The first calibration’s $R^2$ was 0.99888, indicating that the fit was very good.

At the end of the calibration, the model generates new values of reputation as plug variables. These reputation values are representing the true, i.e., more accurate, values of reputation for the companies in the industry. Once we obtained the reputation values from the initial calibration, we used them to rerun the calibration. The result of the second calibration gave a figure of $R^2$ as 0.99894, showing that the two calibrations pretty much coincide, implying that the guessed reputation values were not far off the true ones.

D. To check the validity of the simulation model
During the calibration process, we fitted our simulation model with 6 different sets of data, one for the total number of mobile telecom subscribers in the industry as a whole and five, each for the number of subscribers for each of the five companies: the system dynamics simulation model appeared to fit the actual data well. It can also be objectively verified by the statistics in Table 5. The $R^2$’s are very high, indicating that the model depicts the reality quite accurately, not only for the industry as a whole, but also for individual companies.

<table>
<thead>
<tr>
<th></th>
<th>Industry</th>
<th>SKT</th>
<th>SHT</th>
<th>KTF</th>
<th>HST</th>
<th>LGT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$</td>
<td>0.99894</td>
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<td>0.99790</td>
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<td>0.09328</td>
</tr>
</tbody>
</table>

Note: $n$ (total number of data points — monthly data) = 88; MAPE = Mean Absolute Percent Error.
E. To get refined reputation measures

In Figure 10, we described our simulation procedure and discussed how to obtain the reputation values. As mentioned before, we used an educated guess-work based on the market survey information and rather subjectively assigned values to the companies’ reputation measures, i.e., 4 to SKT’s reputation, 3 to KTF’s, 2 to LGT’s, and 1 to SHT’s and HST’s. Using these values, we conducted a calibration and revised the reputation values as in Table 1. It shows that our initial educated guess was not much different from the calibrated, i.e., more systematic, estimate. Nevertheless, we note that our initial guesses at SHT’s reputation and HST’s were off the mark: we underestimated SHT’s reputation value while overestimated HST’s. We then calibrated our simulation model again using the reputation values obtained from the preliminary calibration.

F. How to decide the relative contribution of each factor to the firm’s attractiveness

The total attractiveness in Table 6 is at $t = 186$ just before the government banned the handset subsidy in June 2000. For instance, at $t = 186$, SKT’s total attractiveness was 20,316 and its reputation contributed to almost 44% of the firm’s attractiveness. As in Appendix A, we used an additive formula to calculate the firm’s attractiveness, which changed over time as the simulation proceeded. We chose the firms’ attractiveness values at $t=186$ because the attractiveness at $t=186$ shows the dynamics involving all of the relevant factors simultaneously.

<table>
<thead>
<tr>
<th>Each factor’s share of total attractiveness</th>
<th>SKT</th>
<th>SHT</th>
<th>KTF</th>
<th>HST</th>
<th>LGT</th>
<th>SUM</th>
</tr>
</thead>
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<tr>
<td>Quality</td>
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<td>1591.234</td>
<td>1349.317</td>
<td>1591.234</td>
<td>8850.643</td>
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<tr>
<td>(14.03%)</td>
<td>(17.97%)</td>
<td>(14.37%)</td>
<td>(18.29%)</td>
<td>(18.42%)</td>
<td>(15.93%)</td>
<td></td>
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<tr>
<td>Network externality</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>(0.00%)</td>
<td>(0.01%)</td>
<td>(0.01%)</td>
<td>(0.01%)</td>
<td>(0.01%)</td>
<td>(0.01%)</td>
<td>(0.01%)</td>
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<tr>
<td>Reputation</td>
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<td>2127.331</td>
<td>0</td>
<td>344.0897</td>
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<td>(43.75%)</td>
<td>(8.24%)</td>
<td>(19.22%)</td>
<td>(0.00%)</td>
<td>(3.98%)</td>
<td>(21.65%)</td>
<td></td>
</tr>
<tr>
<td>Subsidy</td>
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<td>7351.512</td>
<td>6027.645</td>
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<td>(42.21%)</td>
<td>(73.78%)</td>
<td>(66.40%)</td>
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<td>(77.59%)</td>
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<td>8640.6067</td>
<td>55575.468</td>
</tr>
<tr>
<td>(100.00%)</td>
<td>(100.00%)</td>
<td>(100.00%)</td>
<td>(100.00%)</td>
<td>(100.00%)</td>
<td>(100.00%)</td>
<td></td>
</tr>
</tbody>
</table>

Important numbers (i.e., intriguing results) are shaded.

G. Defining ‘reputation’ as a function of firm’s strategic effort

$$IR(\tau) = \alpha \ln[E(\tau)]$$

$$R(t) = R(t_0) + IR(t)$$

$$E(\tau) = \int_{t_0}^{\tau} e(s) ds : \text{Firm’s cumulative effort/investment at } \tau \text{ to enhance the reputation}$$

$$e(s) : \text{Firm’s effort or investment at } t=s \text{ in dollars to enhance the reputation}$$

$$\alpha : \text{Effectiveness coefficient of the firm’s cumulative investment in reputation}$$

$$R(t_0) : \text{Firm’s reputation level at } t$$

$$t_0 : \text{Initial time.}$$
H. Strategies of investment in reputation

(i) Balanced strategy

If the firm adopts this strategy, throughout the entire decision horizon it invests a constant % of its revenues in increasing its reputation.
That is, \( e(t) = \gamma S(t) , 0 \leq t \leq T \) where

- \( e(t) \): Firm’s effort or investment at \( t \) to enhance the reputation
- \( S(t) \): Firm’s sales revenue at \( t \)
- \( \gamma \): Investment constant, \( 0 \leq \gamma \leq 1 \)
- \( T \): The end point of decision horizon.

(ii) Penetration strategy

Under this strategy, the firm can invest more heavily in the early periods, when the market reserve rate is higher.
That is, \( e(t) = \delta(t) S(t) , 0 \leq t \leq T \), where

- \( \delta(t) = \beta_0 + \beta_1 MR(t) \)
- \( \beta_0, \beta_1 \) Coefficient constants to be estimated
- \( MR(t) = \# \text{ of potential users/Total market size} \): Market reserve rate, which represents the proportion of the market that is not yet satisfied/penetrated.

We calibrated the simulation model to calculate the optimum values of the coefficient constants so as to maximize the firm’s cumulative profit at \( T \). We allowed the firm using the penetration strategy to borrow money from banks as long as its debt ratio is below the industry average, i.e., Debt/Asset = 0.566.

I. Relative contribution of each factor to firm’s attractiveness in the what-if analysis

<table>
<thead>
<tr>
<th>Each factor’s share of total attractiveness</th>
<th>SKT</th>
<th>SHT</th>
<th>KTF</th>
<th>HST</th>
<th>LGT</th>
<th>SUM</th>
</tr>
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<tbody>
<tr>
<td>Quality</td>
<td>2850.815</td>
<td>1468.059</td>
<td>1591.239</td>
<td>1349.322</td>
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<tr>
<td>(14.03%)</td>
<td>(17.97%)</td>
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<td>(14.77%)</td>
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<td>(18.42%)</td>
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<td>(0.01%)</td>
<td>(0.01%)</td>
<td>(0.01%)</td>
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<td>Reputation</td>
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<td>(3.98%)</td>
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</tr>
</tbody>
</table>

Important numbers (i.e., intriguing results) are shaded for comparison.

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