How to succeed in the presence of financial and technological gaps : From the perspective of governance innovation

Hannah Jun[1]
Wonseok Woo[2]
Hyoung-goo Kang[3]

저자연락처	
사무실	주저자 : +82-70-8114-2790
	제 1 공동저자 : +82-2-3277-4455
	제 2 공동저자 : +82-2-2220-2883
개인전화	주저자 : +82-10-3606-5090
	제 1 공동저자 : +82-10-9271-7367
	제 2 공동저자 : +82-10-4607-1816
e-mail address	주저자 : jun.hannah@gmail.com
	제 1 공동저자 : wwoo@ewha.ac.kr
	제 2 공동저자 : hyoungkang@hanyang.ac.kr

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[1] Ph.D. candidate, Ewha Womans University, Graduate School of International Studies
[2] Associate Professor, Ewha Womans University, Scranton College, Division of International Studies
[3] Assistant Professor, Hanyang University Business School

Abstract

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Hannah Jun
Ewha Womans University, Graduate School of International Studies
11-1 Daehyun-Dong, Seodaemun-Gu, Seoul, Korea 120-750
e-mail: jun.hannah@gmail.com

Wonseok Woo
Ewha Womans University, Scranton College, Division of International Studies
11-1 Daehyun-Dong, Seodaemun-Gu, Seoul, Korea 120-750
e-mail: wwoo@ewha.ac.kr

Hyoung-goo Kang
Hanyang University Business School
17 Haengdang-Dong, Seongdong-Gu, Seoul, Korea 133-791
e-mail: hyoungkang@hanyang.ac.kr

Abstract: Conventional wisdom would predict firms with little financial and technological capabilities to fail. This is even more so the case for such firms in the high-tech sector during periods of industry downturn. In this paper, we ask how firms experiencing financial and technological gaps can succeed by transforming current challenges into opportunities via governance innovation. We select Hynix and the semiconductor industry to investigate our research question. Against financial, technological and nonmarket challenges such as public and expert opinion, Hynix emerged from near bankruptcy and a weak productivity base to become the number two player in the global semiconductor memory market following the industry downturn of 2001. We find that Hynix's case requires extending prevailing theory, such as management innovation and dynamic capabilities, upon further focus on governance and control. We pinpoint specific factors that contributed to Hynix's success specifically from the perspective of governance innovation for the theoretical extension. In doing so, we suggest several practical implications. First, we can guide managers to replicate the success of Hynix, especially when faced with financial and technological gaps versus competitors. Second, investors in capital markets can find long-term investment opportunities in firms with potential for governance innovation, but are currently underpriced due to financial and technological challenges. Third, market leaders can prepare for possible challenges from currently-depressed competitors who have the potential for governance innovation.

Methodology and Implication: We apply Burton et al's *Organizational Design: A Step-by-Step Approach* (2006) in order to develop prior constructs for our case study. We use Eisenhardt (1989)'s framework in order to conduct this case study and extend existing theories. Qualitative data regarding firm history and strategy was collected through interviews with industry experts, Hynix management, and relevant news sources. Quantitative data used to measure levels of success, funding, and productivity was collected through industry databases such as Gartner Dataquest, IDC, Worldwide Semiconductor Trade Statistics (WSTS), as well as company data.

Keywords: Governance innovation, management innovation, dynamic capabilities, control, high-tech sector, Hynix

1. Introduction of Research Questions

The question of how firms can achieve long-term success continues to spur academic thinking and debate. Particularly with regard to relatively new firms or ventures in the high-tech sector, previous studies have explored this question with special focus on founding teams, top management performance, strategy, technological edge, and competitive landscape (e.g., Cooper & Bruno, 1977; Eisenhardt & Schoonhoven, 1990; Feeser & Willard, 1989; Haleblian & Finkelstein, 1993; Roberts, 1992; Roure & Keeley, 1990). Findings have been helpful in suggesting several specific factors or qualities of a firm which can collectively increase the firm's likelihood of success. But while this area of research is useful in highlighting potential predictors of success for relatively new firms or ventures, it has weaker prescriptive power in addressing how established "have-not" firms – especially for those in volatile industries such as the high-tech sector – can make the leap from failure to success. For example, findings on the role of founding teams in contributing to success may have greater value for companies in the start-up phase, but may prove less significant for firms that are already in operation and have no means to change founding conditions.

In response, there have been a growing number of studies on innovation and increasing the innovative capabilities of a firm in driving firm success. As summarized by Birkinshaw et al (2008), major areas of research include technological innovation, process innovation, service innovation, strategic innovation, and management innovation. In seeking to answer our question of how established firms with limited capabilities make the transition from failure to success, we examined Birkinshaw et al (2008)'s definition of management innovation, namely, "the invention and implementation of a management practice, process, structure, or technique that is new to the state of the art and is intended to further organizational goals." Upon a detailed analysis of Hynix Semiconductor Inc. (hereafter referred to as "Hynix") and the semiconductor memory industry, we propose an extension of existing theory by examining more closely the innovation process as it relates to control structures of a firm and strategic decision-making, or what we term governance innovation.

Through our analysis, we explore what conditions allowed for innovation to take place and, in the process, create a tangible framework as an extension to existing theory. We argue that governance innovation was central to Hynix's success as it created the system whereby agents of change had free reign to direct strategy, mobilize labor, and improve efficiency. Furthermore, we believe the role of governance innovation was even more important as the firm lacked typically "ideal" capabilities.

We also propose several practical implications through our study. First, our prescriptive framework can be used by firms looking to replicate Hynix's success, particularly if they experience financial and technological gaps vis-à-vis peers. Second, investors in capital markets can find long-term investment opportunities in firms with potential for governance innovation, but are currently underpriced due to financial and technological challenges. Third, market leaders can prepare for possible challenges from currently-depressed competitors who have the potential for governance innovation. For our study, we broadly follow Eisenhardt (1989)'s framework in building theories from case study research.

2. Case Selection

For our investigation, we chose Hynix and the semiconductor memory industry between 1999 and 2007. In considering our target industry, availability and measurability of data were key factors. Given the dynamic nature of the memory industry, a firm's success can be gauged simply by tracking whether it remained in business over the course of a specific period of time. Additionally, available quantitative measures of success include market share and profit margin trends, as well as qualitative measures such as employee morale and external perception (e.g., media).

Within the memory industry, we selected Hynix for our in-depth analysis. Compared to the amount of media attention highlighting Hynix's success, as well as its reputation in the domestic market and investment community, there is a surprising lack of academic research on the firm and factors that contributed to its success. This is even more so the case as it emerged from near bankruptcy and a weak productivity base to become the current number two player in the global semiconductor memory market. Taken together with access to timely quantitative and

qualitative data, Hynix was the ideal choice for our investigation.

In rationalizing why we selected Hynix for our study, we further offer reasons why Hynix was our only choice. For one, as noted by Pettigrew (1988), it makes sense to choose cases such as extreme situations (in this case, Hynix) in which the process of interest is "transparently observable." We view Hynix to be the most extreme success case in recent years given its unique and dynamic history, which include: struggling to realize synergies and amassing a huge debt burden after Hyundai Electronics and LG Semicon merged in 1999, coming close to bankruptcy and being bailed out by the government, evading a takeover attempt by rival Micron Technology in 2002, and successfully turning its business around to become one of the industry's top players. And as our study relates to control structures and management initiatives, the processes were also transparently observable via company data as well as media reports. Additionally, given the firm's colorful history, an in-depth study solely on Hynix also made practical sense considering the sheer amount of data available. But while Hynix remains the core example used for the theoretical extension, we juxtapose the firm's history and characteristics with brief analyses of relevant industry players as well.

3. Crafting Instruments and Protocols

Semi-structured interviews with senior management and industry experts formed the primary source of qualitative data for our study. Subjects were active in the firm or industry over the period of our analysis (i.e., 1999 to 2007) and had close working relationships or first-hand experience with key members of the firm and/or government. For firm employees, we interviewed the current CEO, whose previous capacities included strategy, planning, and investor relations. Questions prepared for interviews were standardized, while some flexibility in questions was allowed for clarification and supplemental purposes.

Quantitative data used to enhance our findings include company financial data and industry data sources including Bloomberg, Gartner Dataquest, iSuppli, and Worldwide Semiconductor Trade Statistics (WSTS). Quantitative data were used to track share price performance, market share as well as profit margin trends.

4. Data Collection

During the course of our research, we were able to produce a narrative of key phases in Hynix's recent history (1999 – 2007). This narrative, which synthesizes qualitative and quantitative data collected, forms the base of our study. Data include findings from interviews and questionnaires, company promotional materials, company financial data, media reports, and industry data. We provide an in-depth look at each period below.

As a prologue to our investigation, we provide a brief background of the semiconductor memory industry as well as the firm's founding.

Industry Background

Within the semiconductor industry, semiconductor memory (DRAM and NAND flash only) accounted for around 16%, or approximately $37 billion, of the global semiconductor market of $226 billion, based on 2009 data provided by the Worldwide Semiconductor Trade Statistics (WSTS). Under the subset of semiconductor memory, there are two major camps which are divided according to the way in which they operate: (1) RAM (random access memory); and (2) ROM (read only memory). As its name suggests, a RAM is used to read and write data in any order as required, with data stored and read many times to and from this type of memory. Within RAM, DRAM (dynamic random access memory) is a major sub-group and is often used in personal computers (PCs) and workstations where it forms the main RAM for the computer. Given its core applications, DRAM industry dynamics are strongly correlated with the global PC market.

For ROM, data is written once and then not changed, and thus is widely used for storing programs and data that must survive when a computer or processor is powered down. Flash memory, including NAND flash, can be seen as an extension of ROM technology (specifically of EEPROM, or electrically erasable programmable read only memory) and is used in applications such as memory cards for digital cameras, mobile handsets, and more recently as computer memory in the form of SSDs (solid state drives). Although the size of the NAND flash market is considerably smaller than that of DRAM, NAND flash demand has grown rapidly

since the early 2000s due to the popularity of consumer electronics devices such as mp3 players and digital cameras, and is expected to grow going forward given the growing number of applications using NAND flash chips. Based on 2009 WSTS data, global NAND flash revenue reached $14.8 billion (up 21% year-over-year), while DRAM totaled $22.4 billion (down 7% year-over-year).

Excluding special forms of DRAM used in mobile, server, and graphic applications (i.e., specialty DRAM), DRAM used in PCs are commodity products produced by DRAM manufacturers globally. Thus the game among DRAM players is how to consistently maintain a superior cost structure relative to other competitors. In order to reduce costs, the general rule has been to reduce cost per wafer by either producing more chips per wafer through the use of more advanced technology or by increasing wafer capacity. In semiconductor manufacturing, semiconductor chips are produced from silicon wafers that have been prepared through the wafer process. During this process, various semiconductor devices are created on the wafer and interconnected to form desired electrical circuits. In creating circuit designs, micron line width measures the degree of miniaturization. By designing and executing smaller micron sizes in the manufacturing process, semiconductor manufacturers can fit more circuits into a smaller area, thereby producing more chips per wafer. While this is an important measure of technological innovation, it generally takes time for manufacturers to achieve mature yields at finer technology nodes. Thus, we note that a time lag exists from between the time more advanced technology is developed and the time at which semiconductor manufacturers actually realize cost reduction as a result of the technology's successful execution.

Company Background

Hyundai Electronics Industries Co., Ltd., the predecessor to Hynix Semiconductor Inc., was founded in 1983 under Hyundai Group during a time when the conglomerate was continuing to diversify its business portfolio. Early investments made by Hyundai Electronics include its semiconductor fab in Icheon, Korea, which was completed in 1986. Thus when the US-Japan semiconductor trade conflict of 1986 culminated in 100% tariffs on $300 million worth of Japanese imports in April 1987, the resulting DRAM price increase accelerated the entry of Korean semiconductor firms, including Hyundai Electronics (Irwin, 1996).

On the heels of the unexpected industry upturn, Hyundai Electronics undertook large-scale investment going into 1990. Thanks to its investments and favorable market conditions, Hyundai Electronics ranked among the top ten DRAM manufacturers globally by the 1990s.

i. M&A (1999)

Following the financial crisis that plagued most of the Asian region, including Korea, in the late 1990s, then-president Kim Dae-Jung and his administration began to focus on financial and corporate restructuring as part of an effort to bring about economic recovery. Within corporate structure reform, the Kim administration's goal was to restructure the conglomerates (or *chaebols*) so as to increase efficiency and competitiveness while also providing greater opportunities for small- to medium-sized enterprises (SMEs). One approach used in bringing about restructuring was the use of business swaps, or "Big Deals" (Bridges, 2001). Big Deals were essentially a series of swaps and mergers in key industries between the five largest conglomerates. For the semiconductor industry, this meant that the three players existing before the Big Deal era (i.e., Samsung Electronics, Hyundai Electronics, and LG Semicon) would be reduced to two, namely, Samsung Electronics and a union between numbers two and three.

On the one hand, the process leading up the merger between Hyundai Electronics and LG Semicon in 1999 was a rocky one. LG initially refused to accept the evaluation that Hyundai would be better equipped to manage the new company, and offered to give up other core businesses in exchange for continuing operations of its affiliate (Bridges, 2001). LG eventually conceded to the merger following pressure from creditor banks as well as threats of financial sanctions (Bridges, 2001). But additional criticisms of the merger include the difficulty in realizing synergies for the semiconductor memory division given different technology and process designs. And while this was a merger between two semiconductor firms, the scope of businesses for the combined group ranged from semiconductor memory, non-memory, telecom, LCD, and monitors. This meant that despite the merger, there was a need

for further streamlining as well as downsizing.

But while there were apparent strategic difficulties to deal with as a result of the merger, the financial burden that would ultimately weigh on the new firm proved to be one factor that would lead to the company's near-collapse.

ii. Crisis: A Perfect Storm (2000-2001)

Following the merger between Hyundai Electronics and LG Semicon, total debt reached 15.8 trillion won in October 1999, compared to total annual revenue of less than 10 trillion won. Interest expenses alone reached 1.4 trillion won in 2000, and concentrated debt maturity (or maturing debt for the year) totaled 6.4 trillion won in 2001. And while the firm began rescheduling its debt and restructuring its operations, it faced an unprecedented DRAM industry downturn in 2001 as the weakening global economy and IT market recession led to global PC shipments declining for the first time in history. The decline in PC shipments ultimately resulted in a collapse in the DRAM market.

With the firm's huge debt burden and the DRAM market downturn, it was even more difficult for the company to secure funding – funding that was needed to repay debt, as well as to invest in technology upgrades and research and development. And although the firm may have had a funding cushion to fall back on had it remained within Hyundai Group, the company had already spun-off in August 2001 and was thus unable to benefit from the Group's credit umbrella.

This combination of legacy liabilities, industry downturn, and inability to secure funding created the "perfect storm," as coined by the company, and led the firm close to collapse. It was around this time that the firm was placed under the Corporate Restructuring Promotion Act (October 2001) and underwent a second phase of comprehensive debt restructuring in November that included a 3.0 trillion won debt-to-convertible bond swap, 1.4 trillion won in debt write-downs, and 3.2 trillion won of extensions of mature debt and refinancing.

In the midst of the firm's struggles, Hynix's creditor banks also entertained an acquisition proposal by industry rival Micron Technology, Inc. (hereafter referred to as "Micron"). While Micron's bid of $3.4 billion in cash and stock found support from the company's creditors as well as the government, Hynix's board of directors rejected the proposal in April 2002 as they felt it did not fully appreciate the value of the company. For one, while the bid was evaluated to have reflected the cost of just one new semiconductor fabrication plant (commonly referred to as a fab), Micron would have acquired six Hynix fabs. In addition, the proposal was thought to have reflected lower-than-expected cash generation potential as memory revenue for the firm alone reached $6 billion in 2000. Regarding credit risk, the proposal offered no guarantee from Micron's parent company while loans were also secured on domestic memory assets. And lastly, the sale of Hynix may have resulted in a deterioration of domestic semiconductor infrastructure as DRAM know-how and talent would flow out of Korea, resulting in a contraction of domestic semiconductor-related industries such as the raw materials and equipment industries.

Following the rejection of Micron's proposal, Hynix began to pursue a standalone plan. But aside from the need to continue business and debt restructuring, Hynix also faced allegations that it received government subsidies. Regarding the latter, the United States, European Union, and Japan began to petition for countervailing duties on Hynix's DRAM exports from between 2002 and 2004. But despite these hurdles, Hynix was able to turn its operations around from 2002 through a combination of internal restructuring, which included debt reduction, streamlining of businesses, technological and productivity enhancement, and strategic partnerships, while benefiting from external factors such as an industry upturn and the NAND flash market boom.

iii. Turnaround (2002 – 2007)

At its core, Hynix's turnaround efforts were the result of extensive internal restructuring spurred by a crisis mentality following the firm's near-bankruptcy and takeover rejection. Post-merger integration issues such as culture clash were replaced by the larger goal of surviving as a standalone firm, and management began to effectively address improving its financial status, technology and productivity, and industry positioning.

Regarding its financial position, Hynix underwent a third phase of debt restructuring in December 2002. This included a 1.8 trillion won debt-to-equity swap with creditor banks, a

rescheduling of remaining debt maturity, and a reduction in interest payments. In addition, the firm continued to dispose of its non-core businesses and assets, which included the sale of its LCD business in 2002, non-memory semiconductor business in 2004, and monitors business in 2005. Combined with the sale of its telecom business in 2001, Hynix was reborn as a pure semiconductor memory firm and raised a total 3.9 trillion won to repay debt.

In addition, given the limitations of the domestic market, the firm also pioneered greater access to global capital markets in procuring funds. For example, Hynix began issuing GDRs in 2001 and also sold shares abroad. This allowed for greater foreign investment and less dependence solely on domestic creditor banks. Between 2002 and 2007, we note that the shareholding stake held by creditor banks decreased from around 61% to around 30%. But while the firm's debt structure began to improve and it had greater access to more sources of funds, it did not have the liberty to invest liberally for capacity or technological upgrades – particularly as the company was still under the workout plan. Thus, management had to develop initiatives to improve the company's technology and productivity amid strict financial controls, which would in turn heighten its investment appeal to foreign investors. To this end, the firm successfully developed cost-efficient process technology and formed strategic partnerships.

Known as its "bluechip technology," management embarked on a plan to increase capital expenditure (capex) efficiency versus peers. Hynix engineers were able to develop a cost-efficient, scalable proprietary technology platform that enabled the firm to migrate to next-generation technology using minimal capex. This included maximizing utilization of existing equipment and minimizing equipment changes when migrating to next-generation technology. Management also spurred cost reduction efforts such as wage control and encouraged frugality when using company resources, such as office supplies.

In addition to implementing internal mechanisms aimed at reducing costs, the firm also actively sought out strategic, external partnerships to improve its competitiveness while spending as minimally as possible. Because the company had a strong footing in the DRAM market, Hynix was looking to diversify its business portfolio within semiconductor memory by penetrating the growing NAND flash market. In April 2003, Hynix formed a strategic alliance with Europe-based STMicroelectronics for the joint development of NAND flash. The alliance combined Hynix's low-cost process technology and STMicroelectronics' strength in applications and strong customer base. The alliance resulted in a joint venture based in Wuxi, China, with investment totaling $2 billion – of which $750 million was in equity and $1,250 million was in debt. Through the joint venture, Hynix could: (1) maintain a dominant market position in the fast-growing China market; (2) capitalize on a low cost manufacturing environment; (3) leverage favorable local financing; (4) seek a fundamental solution for trade issues regarding countervailing duties on exports; and (5) expand business cooperation with STMicroelectronics. As a result, Hynix's NAND flash market share jumped from close to 0% in 2004 to nearly 20% by the end of 2006.

Separate to Hynix's strategic efforts and innovations, the firm clearly benefited from a market recovery for both DRAM and NAND flash. DRAM shipment value increased 36% year-over-year in 2002 to $15 billion thanks to a macroeconomic recovery and a rebound in PC demand. This followed the sharp 61% year-over-year decline the previous year. With Hynix's NAND flash supply capacity heightened through its alliance with STMicroelectronics, the firm benefited from the average 26% year-over-year growth in NAND flash shipment value between 2004 and 2007. In early 2004, the firm's DRAM and NAND market share were 16% and 0%, respectively. By end-2006, Hynix had global market shares of around 20% for both DRAM and NAND flash, and ranked number two and number three in the respective markets.

In addition to external industry factors, we also note that a weaker Korean won relative to other major currencies between 2004 and 2007 also helped improve the competitiveness of semiconductor memory products produced in Korea.

Data Analysis

On the one hand, we acknowledge that many important influences on Hynix's recent history were uncontrollable, environmental factors which undoubtedly contributed to the firm's survival. Of these, we highlight favorable

industry dynamics and foreign exchange as key elements. In addition, many industry watchers have specifically pointed to the string of government initiatives and bailout schemes as the key to Hynix's turnaround. But while we acknowledge that these factors created a more favorable environment versus that which was present during Hynix's crisis years, we believe they are insufficient in explaining the level of success the firm achieved so soon after its near-collapse. For one, even during the industry upturn, we saw clear profit differentiation between Hynix and other memory manufacturers, notably Micron. This is clearer when comparing share prices trends over the period of our study. As such, this explanation is insufficient in showing that favorable industry dynamics alone contributed to Hynix's outperformance. Also, while the government bailout may have been a necessary condition for the firm's immediate survival, we view that the bailout itself is insufficient in explaining the level of success seen by the company specifically because the bailout was separate to the generation and execution of key strategic and technological initiatives were taken by the firm. In fact, we note that the government and creditor banks initially opposed some strategic alliances proposed by management – alliances which ultimately proved successful. Thus in the analysis of our data, we focus on the internal changes that took place at the firm, specifically regarding changes in control and governance mechanisms, which drove the company's turnaround.

In our analysis, we: (1) examine what innovations in control and governance took place during the major phases in Hynix's recent history; and (2) highlight how such innovations permitted agents within the organization to drive initiatives aimed at improving performance. To this end, we first define dependent and independent variables as follows.

i. Dependent Variables

Dependent variables in our study are quantitative measures of firm performance as gathered over the course of our investigation. We chose market share, operating profit margins, and share price performance. Market share is based on revenue, with data collected from Gartner Dataquest, iSuppli, and company data. Operating profit margins refer to margins for the overall memory business, as margins for DRAM and NAND flash are typically not revealed separately. Margin data is based on company data. Share price performance is based on raw data collected from Bloomberg. Market share, margins, and share price performance are analyzed for each of the three phases in Hynix's recent history: (1) M&A; (2) crisis; and (3) turnaround. In addition to comparing absolute measures of performance for the firm itself, we provide a relative comparison using respective data for key competitors as well as industry data (where available) to get a sense of Hynix's performance versus peers. Our goals in doing so specifically include: (1) highlighting Hynix's outperformance; and (2) isolating factors for its outperformance separate to environmental aspects, which arguably affected all industry players.

For each phase, we gauge Hynix's performance relative to its peers and consequently label the firm an underperformer, market performer, or outperformer. Based on a summary of our findings in Figure 1, we conclude the following for each of the three phases:

i. M&A phase: underperformer
ii. Crisis phase: underperformer
iii. Turnaround phase: outperformer

Over the M&A phase, Hynix's DRAM market share fell from 19% at the beginning of the period to 17%, with its ranking falling from number two to number three. During the crisis phase, although the firm maintained its global ranking, market share continued to slip from 17% to 13% by end-2001. For both phases, we concluded that Hynix underperformed the industry based on most of our measures.

Going into the turnaround phase, we see a distinct improvement in market share, ranking, as well as operating margins. DRAM market share for the firm rose 8%ppts from 13% to 21%, while its ranking rose from number three to number two. NAND market share also jumped from close to 0% to 19% over the same period, with its number four rank improving one notch. Although DRAM operating profit margins improved for both the industry and the firm, operating margins for the industry rose 25%ppts over the period while Hynix's increased by 51%ppts. Even if we assume that NAND flash generated higher margins than those for DRAM, we believe the level of

improvement differentiates Hynix's performance versus that of its peers. Thus for this period, we evaluate Hynix to have been an outperformer.

ii. Independent Variable

We measure the level of governance innovation in the firm qualitatively. For the purposes of our study, we define governance innovation as a new structure that generates and cultivates innovation in the organization's control mechanisms with the goal of fostering innovative processes. We note that innovation of control mechanisms can include co-opetition (Brandenburger & Nalebuff, 1997), as seen in our case study, while innovative processes can include strategic initiatives, technological innovations, and innovations in productivity and efficiency improvement.

In measuring levels of governance innovation, interviews with management, industry experts, and company materials are used to form the base of our analysis. For each phase, we label the level of governance innovation as "high" or "low." High levels of governance innovation are first characterized by the presence of innovation of control mechanisms within the firm as well as the development and execution of new innovative processes, while low levels are characterized by the opposite.

As a prior construct to our analysis, we also categorize the control systems of the firm for each phase based on Burton et al's (2006) classifications. Depending on the degree of formalization and centralization, firms fall within five major designs: (1) family (low formalization, low decentralization); (2) machine (high formalization, high centralization); (3) market (low formalization, high decentralization); (4) clan (high formalization, high decentralization); and (5) mosaic (high formalization, high decentralization) (Figure 2). The clan model tends toward somewhat greater formalization and less decentralization, while the mosaic model tends toward somewhat less formalization and greater decentralization versus the clan model (Burton et al, 2006). Under this construct, formalization refers to the degree to which the firm specifies a set of rules or codes to govern how work is done, and centralization refers to the degree to which coordination and control are managed by a core person or level in the organization.

In classifying each period according to the type of control model and the level of governance innovation, we summarize our findings in Figure 3 and conclude the following:

i. M&A phase: market/low
ii. Crisis phase: market/low
iii. Turnaround phase: machine/high

For the M&A and crisis phases, evidence supported the observation that formalization at the firm was low. Variations in control and coordination which typify low formalization were due to initial difficulties following the merger and delays in streamlining businesses, with both factors contributing to inconsistency in control and coordination. We also note that management mentioned a "lack of transparency" as a key company-specific issue.

At the same time, decentralization of control was high during both phases. Given the disorder following the merger and the industry downturn that soon followed, it was difficult to know who was in charge. During that short time, many players had exercised tremendous power: the government first initiated the merger; former Hyundai employees were given initial reign over the newly-merged firm; creditor banks became involved as part of the government bailout scheme; and government and creditor banks supported the Micron takeover bid while the BOD and employees did not. Unsurprisingly, management cited that these years were marked by "poor internal controls."

Given low formalization and high decentralization, we categorize both phases as exhibiting a market-style control design. While the market design may be viewed as providing a firm flexibility and more easily allowing for innovation, we believe internal and external crises during this period may have further inhibited the company from taking strategic and necessary action. Our analysis leads us to conclude that the M&A and crisis periods exhibited low levels of governance innovation.

The unsuitability of the market design along with the failure of the takeover bid by Micron contributed to an upheaval in the control mechanisms of the firm. Now firmly under the Hynix banner, we saw the emergence of a strong set of accepted rules or codes of conduct. The streamlining of businesses created less variation in control and coordination, and cost

consciousness and efficiency maximization became key tenets for both the manufacturing process and employee behavior.

Also during this time, strategic decision-making became centralized under a core management team, which included the CEO and the heads of strategy and technology. Although creditor banks were the major shareholders, the core management team headed actual operations within the firm while initiating internal innovations and external alliances.

With the transition to a machine design of high formalization and low decentralization, we saw the generation and execution of many important innovations that led to the firm's success and outperformance. These include: (1) cultural innovation; (2) financial innovation; (3) management team innovation; and (4) technology and process innovation.

iii. Analysis Summary

In isolating the level of governance innovation at Hynix and the generation of innovative processes as a result, we argue that higher governance innovation at the beginning of the firm's turnaround phase was the trigger to its outperformance. This is because the resulting control mechanism enabled the firm to successfully streamline its business, focus on improving technology and reducing costs, enter growing markets within the semiconductor memory industry, and effectively mobilize labor. Combined with an effective strategy, we believe the firm was able to turn its business around despite having faced financial and technological gaps.

6. Shaping Hypotheses

While acknowledging favorable external conditions such as an industry upturn and a weaker Korean won, our analysis suggests that governance innovation at the early stage of Hynix's turnaround served as the catalyst for the firm's outperformance through to 2007. Thus based on our findings, we offer several propositions.

First, when analyzing the three phases of Hynix's recent history, both the M&A and crisis periods were marked by clear underperformance relative to peers, with performance worsening as the company transitioned from the M&A period into the crisis years. Control structures were characterized by low formalization and high decentralization, with little to no generation or cultivation of innovation in control mechanisms.

Conversely, the turnaround phase began with dramatic changes in control structures, with mechanisms characterized by a high degree of formalization and low decentralization. Through successful governance innovation, a culture was created whereby the generation and execution of many innovative initiatives were encouraged – initiatives which in turn led to the firm's outperformance versus peers. Thus given this observation, we propose the following:

Proposition 1: The higher the governance innovation, the more successful a firm can become.

Particularly when producing commodity goods, maintaining a favorable cost structure vis-à-vis peers becomes crucial to surviving and staying ahead. For companies that do not have an abundance of financial resources, the ability to maximize efficiency of capital through financial and technological innovation becomes even more important. Our case study suggests that governance innovation was necessary in unlocking other forms of innovation to take place. As such, we propose:

Proposition 2: The lower the financial resources a firm has, the more important the role of governance innovation in making the firm successful.

Lastly, in addition to the importance of governance innovation for firms lacking financial resources, we believe this is applicable to firms experiencing technological gaps. In our study, although Hynix arguably had a strong foothold in DRAM technology prior to its turnaround, it was a latecomer to NAND flash and was hindered by a lack of financial resources in pursuing the business aggressively by itself. Management transformed these difficulties into opportunities by seeking new ways of approaching the market via overseas technological alliances. We believe governance innovation allowed for and encouraged such innovation to take place. As a result, we propose the following:

Proposition 3: The lower the technological resources a firm possesses, the more important

the role of governance innovation in making the firm successful.

7. Enfolding Literature

The concept of governance innovation was developed as an extension to the broader idea of management innovation. In Birkinshaw et al (2008)'s research, management innovation refers to the invention and implementation of a management practice, process, structure, or technique that is new to the state of the art and is intended to further organizational goals. In illustrating how management innovation comes about, analysis is focused on key change agents inside and outside the organization in driving and shaping four processes — motivation, invention, implementation, and theorization and labeling. Of these processes, our research focused on the innovation process as it relates to decision-making. While this process refers to the phase in which a hypothetical new practice is first tried out in an experimental way, our findings led us to suggest a broadening of "new practices" to encompass control systems by which decisions are made in the firm (i.e., governance innovation). We highlight governance innovation as an extension of management innovation within a list of key examples provided by Brikinshaw et al (2008) in Figure 4.

In conceptualizing governance innovation, we do not ignore the role of strategic innovation, technological innovation, and other important initiatives that contributed to the firm's success. Rather, we view that high innovative capabilities regarding control and governance mechanisms enabled agents within the firm to implement other forms of innovation more effectively. In this sense, we found that governance innovation served as a type of dynamic capability that in turn contributed to the firm's outperformance. Research on dynamic capabilities by Teece (1994) explain how competitive advantage is gained and held by firms, and argue that winners have demonstrated timely responsiveness and rapid and flexible product innovation, along with the management capability to effectively coordinate and redeploy internal and external competences. Subsequent research by Teece et al (1997) and by Eisenhardt and Martin (2000) also characterize dynamic capabilities as having emerged from path-dependent histories of individual firms. But through our investigation, we view that governance innovation was low or nonexistent during the M&A and crisis phases of Hynix's history and question the direct applicability of this general characterization for our analysis. We believe that strategic and technological innovations that took place at the firm were more sudden phenomena which resulted from a higher degree of governance innovation at the early stages of its turnaround. But rather than discrediting the generally path-dependent nature of the development of dynamic capabilities, we take the view that governance innovation was a form of latent dynamic capability triggered in large part due to a crisis mentality following the firm's near-collapse.

As follows, our study encouraged us to examine the question of how firms can initiate or increase the level of governance innovation for the purpose of enhancing performance. For one, academic literature points to the possible role of poor performance in a firm leading to organizational change because good performance may lead to inertia (Boeker, 1997; Nelson & Winter, 1982; Hannan and Freeman, 1984; Oster, 1982). Following our data collection and analysis, we believe this view is consistent with Hynix following its crisis years as poor performance and an ensuing crisis mentality served as catalysts to innovation. And while our study may prove more useful to firms facing financial and technological gaps versus peers, we note that existing literature, and to some extent our investigation, is less explicit on initiatives that can be taken by firms that are facing relatively fewer external or internal difficulties in order to enhance performance.

8. Conclusion and Avenues for Future Research

While acknowledging the role of uncontrollable external factors such as an industry upturn and favorable foreign exchange in contributing to Hynix's turnaround, we believe these reasons are insufficient explanations in and of themselves. This is because while they can explain Hynix's survival, they have less explanatory power regarding the firm's outperformance versus peers – specifically as the firm faced financial and technological gaps. Thus in our investigation, we pinpointed governance innovation as the key internal catalyst that led to Hynix's turnaround as it opened the door for other forms of innovation to

take place.

In measuring the degree (or existence) of governance innovation in firms, we used qualitative evidence, particularly from interviews, in our investigation. But while this can provide a relative comparison between distinct time periods within a particular firm, future research may focus on developing a set of criteria that can better objectively and quantitatively measure the level of governance innovation at any firm. This would be particularly useful in comparative analyses.

Additional avenues for future research include in-depth comparative studies between Hynix and relevant players in the memory industry. While our study provided a first blush, deeper intra-industry analysis of respective firms' control systems and management strategy may enhance the findings of this paper.

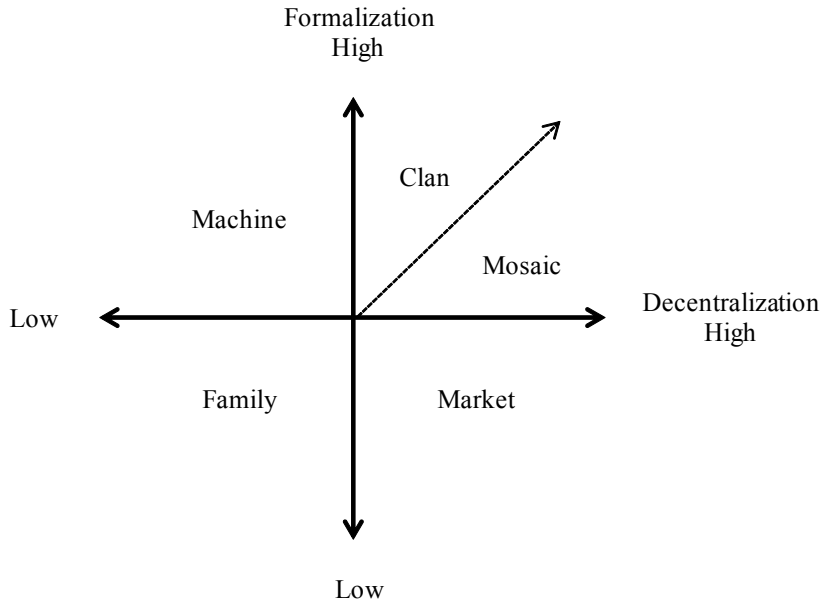
As one of our key research goals includes providing a practical framework for other firms to replicate Hynix's success, further research can be undertaken to test the framework's applicability to industries other than the high-tech industry.

<Figure 1: Performance of Hynix Semiconductor for phases in recent history>

Description		M&A (1999)			Crisis (2000-2001)			Turnaround (2002-2007)		
		Beginning	End	Δ	Beginning	End	Δ	Beginning	End	Δ
DRAM	Market share	19%	17%	-2p%	17%	13%	-4p%	13%	21%	+8%p
	Rank	2	3	-1	3	3	--	3	2	+1
	OP Margin - Hynix[1]	nm	nm	nm	nm	-47%	nm	-24%	27%	+51%
	OP Margin - Industry Average[2]	nm	nm	nm	nm	-20%	nm	-8%	17%	+25%
NAND	Market share[3]	nm	nm	nm	nm	nm	nm	0%	19%	+19%p
	Rank	nm	nm	nm	nm	nm	nm	4	3	+1
	OP Margin - Hynix	nm	nm	nm	nm	nm	nm	-24%	27%	+51%
	OP Margin - Industry Average[4]	nm	nm	nm	nm	nm	nm	nm	nm	nm
Share Price Performance[5]	Hynix	100			100			100		
	Industry Average	100			100			100		
Evaluation		**Underperformer**			**Underperformer**			**Outperformer**		

Source: Company data, Gartner Dataquest, iSuppli
Note:
1: Operating profit margins for the company refer to margins for the semiconductor business and are not divided between DRAM and NAND.
2: Industry average data refers to the averages of Samsung Electronics (semiconductor business), Hynix Semiconductor (semiconductor business), Micron Technology, and Qimonda (operating margins before 2006 are based on margins for Infineon Technologies).
3: We could not locate meaningful industry data for NAND prior to 2002.
4: Almost all main players in NAND do not disclose margins specific to the NAND business (i.e., Samsung Electronics, Toshiba Corporation, Hynix Semiconductor).
5. Share price performance is set at base = 100 at the beginning of the period.

<Figure 2: Coordination and Control Space>



Source: Burton et al (2006)

<Figure 3: Control Structures and Governance Innovation at Hynix>

Description	**M&A (1999)**	**Crisis (2000-2001)**	**Turnaround (2002-2007)**
Formalization	Low	Low	High
examples	variations in control and coordination: initial difficulties realizing merger synergies and delays in streamlining businesses contributing to inconsistency; management pointed to a "lack of transparency" as a key company-specific issue		strong set of accepted rules or codes of conduct: following its near-collapse and takeover, streamlining of businesses created less variation in control and coordination, with cost consciousness and maximizing efficiency becoming key concepts not only in the manufacturing process, but also in employee behavior
Decentralization	High	High	Low
examples	difficult to know who was in charge: government initiated the merger, former Hyundai employees given initial reign over the newly-merged firm, creditor banks entered the picture in light of the government bailout scheme, government and creditor banks supported the Micron takeover bid while the BOD and employees did not; management cited "poor internal controls" during these years		core management team: CEO, strategy, and technology heads formed the core decision-making body; although creditor banks were the major shareholders, the core management team headed actual operations within the firm while initiating internal innovations and external alliances
Control structure	**Market**	**Market**	**Machine**
Change in control structure	No	No	Yes
Innovation generation	No	No	Yes
examples			**cultural innovation:** mixture of mainstream Hyundai culture (cooperative) and select new employees, including from Samsung (competitive) in creating a co-opetitive culture **financial innovation:** pioneering access to overseas capital markets in raising funds; creating strategic alliances with STMicro in NAND to bridge financial/ technological gap **management team innovation:** following the collapse of the Micron bid, once competitive stakeholders (e.g., creditors, employees, top management team, government, communities) became co-opetitive **technological/process innovation:** development of bluechip technology to maximize capex efficiency; improving productivity by increasing theoretical capacity at facilities
Governance Innovation	**Low**	**Low**	**High**

Source: Company data

<Figure 4: Examples of Management Innovation>

Example	How if fits the definition of management innovation
Modern research lab	A new structure to manage the technological innovation process; intended to improve technological and product innovations
Divisional (M-)form	A new organizational structure for dealing with complex, multiple-product, and multiple-market firms
Toyota production system	A new set of practices and processes aimed at improving production efficiency and reducing waste
Total quality management	A new set of practices and processes aimed at reducing quality defects and improving customer satisfaction
Discounted cash flow	A new technique intended to improve investment and budgeting decisions by adding a temporal dimension
Spaghetti organization	A new organizational structure with the objective of increasing employee initiatives and overcoming problems of hierarchy
Cellular manufacturing	A new process for managing tasks inside a production unit aimed at improving employee satisfaction and production output
NASA new organization	A new structure and practice for teams to perform complex modeling and analysis without colocation
Activity-based costing	A new practice and technique for assigning costs aimed at providing more realistic cost assessments
Modern assembly line	A new set of practices and processes with the goal of improving production efficiency and lowering costs
Balanced scorecard	A new technique and practice for integrating various types of information with the aim of making more informed decisions
Quality of work life	A new set of practices and processes around the job design of employees with the goal of improving their happiness at work
Governance innovation*	A new structure that generates and cultivates innovation in the organization's control mechanisms with the goal of fostering innovative processes

Source: Birkinshaw et al (2008)
Note: * denotes this paper's contribution to the existing research.

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