

Fund Management for Carve-Out Start-Ups: A Scheme to Lead Innovations Outside the Business Scope of Large Corporations

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Abstract-- Amidst the revolutionary change of today's business environment due to progress of semiconductor technologies and the Internet, existing corporations as well as their R&D groups find it increasingly challenging to realize technology-based innovations; these innovations require disruptive business models with substantial risk. It seems particularly true in new fields, such as social innovations, where traditional businesses lack the necessary skills and vision for success.

The authors successfully raised the Technology Carve-out Fund to offer opportunities to "carve out" technologies and key personnel from traditional corporations or research institutes, and enable pursuit of innovative business models in start-ups, outside the existing business scope of large organizations. The concept was reported at PICMET 2005, and the ongoing efforts at PICMET 2014. Since the fund duration ended on December 31, 2015, the authors would like to summarize their work and highlight lessons for future "carve-out" efforts as follows:

1. Strong and sustained commitment of the parent organization is essential.

In addition to unwavering commitment from the parent corporation, the open discussion of challenges and risks associated with new business models and how they would affect the strategy of the parent organization is important. A set of fair and agreeable terms for the "carve out" balanced between all stakeholders is an urgent need.

2. Overcoming the time constraint for early stage start-ups needed to achieve positive ROI.

The start-ups founded were mostly at an early stage, and the typical fund duration of ten years has been found to be too short. Solutions to overcome this constraint are necessary.

3. Bolstering the limited business management skills of "carved-out" personnel.

Although the key personnel carved-out are experts in their respective fields, their skills are not broad enough to manage a company, even for very small entities. The management team needs additional bench strength.

4. Flexible fund terms to enable a variety of deals with unpredictable new challenges.

Each "carve-out" has unique circumstances, conditions, and challenges. The fund must not be overly constrained, or else it cannot create investment deals for the wide variety of "carve-out" cases that are otherwise good opportunities.

I. INTRODUCTION

The Internet, together with progress in semiconductors, is driving many changes in our business environment. These changes are generating enormous business opportunities, while threatening existing businesses. The transformation can be viewed as a reshuffling of the added value distribution throughout industries, eliminating poorly performing players despite their established value chains. However, change is

welcomed by challengers, as well as by people in society who enjoy the resulting benefits. Change, ideally, should allow for sustainable value sharing among industrial players and society at large.

When rapid change is adopted, it is meeting unmet social needs. The authors believe there are compelling opportunities that can only be successfully pursued by players who boldly offer new solutions exploiting emerging technologies. Large corporations face serious challenges when unable to take the risks associated with emerging technologies and so-called "disruptive innovation", even when they see decreasing profitability in their existing business units. Success in the past constrains the ability to change, as described by the term "Innovator's Dilemma" [1]. So, although large established entities wish to transform themselves through their own internal efforts, they are unlikely to succeed. Taking advantage of reduced barriers for communication, thanks to the Internet, the "Open Innovation" concept [2] has been employed by many large corporations, making the outsourcing of both product development and manufacturing quite popular.

In addition, many innovations from R&D groups require completely new business models, which threaten incumbent models currently in use [3]. So, the question is whether corporations dependent on outsourced resources have the flexibility to truly transform themselves when changing to a new business model is necessary. The authors believe that business model transformation itself cannot be outsourced. It logically results that the hidden role of R&D groups is to seed transformation of business thinking in the corporation, in addition to seeding commercialization of new products and services. So, a key question is how this can be done effectively in spite of management pushback and those protecting the current balance of power in the organization.

It was studied how breakthroughs have been achieved through organizational and managerial structures. It was discovered that the successful companies separate their new, exploratory units from their traditional, exploitative ones, allowing for different processes, structures, and cultures; at the same time, maintaining tight links across units at the senior executive level [4]. In this context, the carve-out should be a powerful scheme.

Society, upon which all corporations are based, is also changing rapidly with an aging population, threats to environmental sustainability, and globalization of the economy. Thanks to the Internet, knowledge is spreading rapidly to the whole world. In an interconnected world, the advanced countries can no longer neglect the needs of newly developing countries. There are growing expectations from

society of industry, to not only protect their profit margins but also to meet the needs of the population, which expects to improve their standard of living. So, it would be a logical consequence that companies innovating ways to solve societal problems will succeed financially as well [42].

Start-ups can make agile decisions and adopt new business models that seem very risky to established players. As a consequence, quite a few start-ups have found successful growth paths and become substantial players in the world. However, only a few develop and sustain their momentum to the point where they become powerful enough to maintain industry leader status.

The authors have worked to establish a series of process steps for “carve-outs” consisting of fund raising, start-up founding, and incubation and exit, as described in the following sections.

II. CONCEPTION AND THE HISTORY AT SONY

A. Conception

S. Watanabe, leading author, delivered a plenary talk on the “carve-out” concept at PICMET 2005, where he reviewed the development of the concept [6] and the authors contributed a paper to PICMET 2014 [7].

The authors define “carve-out” as a scheme to extract technology and key personnel from established companies or research institutes for the purpose of developing new businesses strategically important to the parent organization and to society. “Carve-outs” have been expected to be particularly effective in Japan, where the impact of start-ups has been limited [8] in spite of intensive R&D efforts in industry. The “carve-out” scheme can take advantage of two approaches, spin-outs and corporate venturing. First, a large growth opportunity is identified (typically one whose success can be characterized by quick decision making and flexible business models), and second, appropriate resources are identified and committed to reduce execution risk (see Fig.

1).

B. The Successful History at Sony

S. Watanabe, lead author, was on the executive board of Sony when the electronic game business was “carved-out” and moved to Sony Music Entertainment (SME); it was later acquired back by Sony. He was also directly responsible for founding STLCD, a joint venture with Toyota Industries, that later evolved into Japan Display, Inc.

The Play Station game business, conceived of by K. Kutaragi at the Research Center of Sony, was by no means welcome at Sony because of its content-centric business model; Play Station management placed only secondary supportive functions on the video game console, whereas Sony had placed its main emphasis on the advanced electronics within the product itself [9], [10]. Moreover, it was a platform business to offer benefits to players such as content creators and gamers at a huge investment of the platformer in advance, quite different from electronic product manufacturing. So, the executive management transferred the group to Sony Music Entertainment (SME), where content management was the key focus [11], [12]. The business was developed within a completely different culture, blossomed, and later earned more profit than Sony Electronics. After a few years, Sony acquired it back by way of equivalent stock exchange [13]. Stockholders of SME enjoyed a huge capital gain. The consolidation was done with an expectation that the business would open a major new gateway to the future for Sony.

As President of the Semiconductor Business Unit, S. Watanabe was directly involved with the business incubation of STLCD, a joint venture (JV) between Sony and Toyota Industries Corporation, “carving-out” part of the business from Sony. STLCD was founded in 1997 [14]. Toyota Industries is the original company of the Toyota Group, which manufactured traditional loom machines as well as fork lift trucks [15]. The JV strategy was a way to explore new display technology without threatening the dominant,

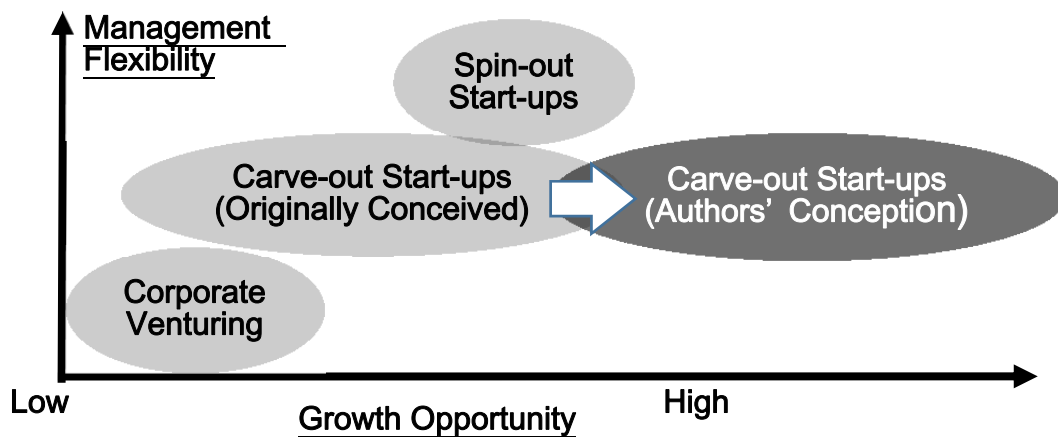


Fig.1 Positioning Of Carve-Out Start-Ups Vs. Corporate Venturing And Spin-Out Start-Ups

(Modified figure from the article of Nikkei Sangyo Shimbun with addition of carve-out start-ups in authors' conception [12].)

profit-making Trinitron tubes business of Sony at the time. A hidden expectation of the author was to introduce Toyota's

Lean Production concepts into the production model of LCDs and semiconductors, where a huge scale of investment was required, but could potentially be reduced with new practices.

In 2011, STLCD, Sony, Toshiba, Hitachi and Panasonic agreed to form Japan Display, Inc., a joint venture (JV) with 200 billion yen or approximately 2 billion U.S. dollars funding from the Innovation Network Corporation of Japan (INCJ) managed fund [16]. Japan Display was listed for Initial Public Offering in March 2014 [17]. The offering's total value was 318.5 billion yen (\$3.08 billion USD) [18]. So, this is an example of a “carve-out” that became a major independent manufacturer. STLCD supplied Sony with high-resolution displays.

C. Challenges of Abandoned Platforms at Sony: FeliCa Card and LIBRIe

Sony FeliCa card [19], is better known as “Octopus Card” in Hong Kong, “Oyster Card” in London (good for transportation), and “Suica” or “PASMO” in Japan (good for transportation as well as for credit card shopping) [20]. The proposal of the team of Susumu Kusakabe, the originator and promoter of the FeliCa card, to establish a worldwide platform did not win management support at Sony [21]. The business was limited to card manufacturing and licensing, and as a result Kusakabe left Sony. The challenge to make the card into a universally applicable platform was realized by Akio Shiihashi of Japan Railway (JR), and now all transportation and associated shops in proximity are equipped to use this card: 80 million cards have been issued [22]. JR courageously embraced risk and invested a few hundred oku-yen, or equivalently a few hundred million U.S. dollars [23]. FeliCa offers a dominant platform outside of Sony. It is understandable that Sony management rejected Kusakabe’s proposal, for it required the company to embrace too much risk. It was just as the economist J. Schumpeter predicted, that large corporations would surely lose to entrepreneurship because of internal bureaucracy and aversion to risk [24].

Yoshitaka Ukita, one of the eccentric champions who brought the great success of the Diskman to Sony, launched LIBRIe, Sony’s electronic book in 2004, three years prior to Amazon [25]. Although he made a huge effort to bring Japanese publishers to the platform, the business did not take off as had been expected, and he left Sony in regret. His successor, Noguchi, expanded the service to many countries and was confident about the quality of the product, But, Amazon dedicated enormous resources to promote their platform by offering many incentives, compelling Sony to drop out [25]. It looks as though the same traditional mindset pushed Sony towards choosing the deadly competition of smartphones. They were not yet ready for this platform business despite the PlayStation success.

III. PLATFORM BUSINESS OPPORTUNITIES AND “CARVE-OUTS”

Now the authors would like to discuss the challenge of generalizing the advantage of the platform business; specifically, fund management of “carve-out” start-ups may benefit those taking risk in creating new platform businesses.

A. From Product Manufacturing to Service Driven Business

During the previous century, there was strong market pull for an abundance of tangible products, and thus many products were manufactured and supplied to customers with significant infrastructure investments, such as in supply chains, logistics and networks. However, today, thanks to the progress in semiconductors and the Internet, together with other efficiency improvements, the same manufacturing output is possible with much less capital investment. Many prevailing services have emerged from what started as product-centric businesses, such as the iTunes store from Apple.

As Kenichi Ohmae, developer of the 3C’s Model (Customer, Competitors, Corporation) and noted management consultant from McKinsey & Company, teaches, a company’s strategy should be focused on creating value for customers rather than beating competitors. Indeed, this principle has endured for decades [26]. As more and more consumers buy certain products, the products become commoditized. There is often a reshuffling of the added value distribution in the industries that see such commoditization. We therefore see the emergence of new value creators and the disappearance of ineffective players in light of the changing environment. The traditional value chain based on infrastructure investment is shifting to capital efficient service-centric platforms, taking advantage of broadband networks and the availability of commoditized hardware [27]. The services model opens up the possibility of flexible utilization at much lower cost. Sooner or later, the change will spread over to many other capital intensive industries. The rules of competition are also changing [28]. Players used to offer similar products or services in a segmented field of the industry, where the cost and performance were closely scrutinized by customers. Now, in platform competition, superiority comes from innovation in the business model and the capability to attract and retain an audience [29]. Yet, there are also risks associated with platform technology investment, and many of these new businesses have also disappeared.

B. Economic Rationale of Platform Businesses and their Impact

The major impact of platform businesses may be characterized as reshuffling of added value distribution, from supply chains to content and user engagement. For example, Netflix offers streaming services for content with a lower fee than incumbent services such as those of CATVs. Netflix has even announced content creation and delivery services of super high definition 4K media [30]. Such a content business used to be exclusively run by traditional broadcasters and movie companies. However, each of these traditional entities is restricted by past investment in obsolete infrastructure and cannot afford to invest in new technology.

Also, their service territory has limited geographic coverage and lacks the scale to justify significant investment. In order for artists and content creators to come up with significant productions, they must be properly incentivized. The content should be delivered to a larger customer base at as low a cost as possible, thus requiring the best usage of the Internet and semiconductor technologies. New business models also change the way artists are rewarded, providing them with better compensation for their work. Although this kind of reshuffling is driving the industry to change on one hand, it is offering many opportunities for new challengers, including social innovators.

C. Platform Structure in the Semiconductor Industry

In the semiconductor industry, vertically integrated manufacturers used to have in-house CAD teams as well as manufacturing facilities called fabs. Today, vertical integration is less common. For example, CAD tools are offered by Cadence, and logic synthesis as well as logic level design assets (IP) are provided by Synopsys. However, the microprocessor market is dominated by Intel for PCs and ARM Corporation for mobile applications. Qualcomm, a fabless company, is the major supplier of LSI chips for smartphones [31]. The LSI (large scale integrated circuits) manufacturing has become dominated by foundries, such as TSMC [32], and Global Foundries [33], which enable design companies to be fabless. Fabless companies can focus on design and quickly implement sophisticated LSIs, enhancing creation of many new IT (information technology) and communication businesses. Semiconductor companies, including Sony, used to have their own CAD groups to control specificity of their product. However, the platform offered by Cadence reflected requests of many companies and made rapid evolution. The offerings from Cadence and Synopsis have thus enabled a platform structure that drives transformation of all associated industries with continual progress in performance and reduction of power and cost.

D. How and Why Platform Businesses Thrive in Start-Ups

It should be noted that start-ups, either spin-outs or what the authors call “carve-outs”, played an important role in the creation of companies that now dominate their respective industries, although many of the original entities have merged or disappeared. TSMC came out of ITRI (Industrial Technology Research Institute of Taiwan) [34]; Intel started as a spin-out from Fairchild [35]; ARM came from the joint venture between Acorn Computers, Apple Computer and VLSI Technology [36]; Joe Costello’s Cadence was the result of a merger between SDA Systems and ECAD [37], Synopsys was launched by Dr. de Geus and a team of engineers from GE’s Microelectronics Center [38], and Qualcomm was co-founded by a professor from the University of California, San Diego named Irwin M. Jacobs [31].

Many such business models were not successful from the beginning, and today’s successes come after numerous challenges, risks, and failures in the past. The key to

successfully developing innovative business models is working iteratively through a process that starts with a small scale business with clear targets and the freedom to meet customer needs, and progresses through successive challenges along the way. This is particularly true in the transition to a platform business structure. In large corporations, on the other hand, the required sales volume in the mid to long term is substantially large, and risks are weighed extensively against the probability of long term success, even if it is almost impossible to make a reasonable assessment at the start. Large corporations do not have the luxury of quickly iterating on a business model to fine tune it.

E. Extension of “Carve-Out” Advantages to Platform Businesses

It would be recommended, as Kenichi Ohmae states, that if one has an idea for a platform, it pays to be first to build a critical mass of customers before competitors arrive [39]. Naturally, agility is the first necessity, but resources are required. It should be pointed out that if there is a power to the “carve-out” scheme, it is overcoming the resource challenge many spin-outs fall into by having sustained committed capital.

Thus the “carve-out” scheme is expected to provide an advantage for platform businesses, where many large entities have not been able to succeed. The culture for encouraging spin-outs, spin-offs including carve-outs and corporate venturing should be adopted for long term sustainability of large corporations.

IV. CHALLENGES AND EXPECTED IMPACT

The rise of digital technology and networks has enabled the platform business model with its distinct economic advantages. These include the efficiencies of large scale, distributed, service-centric structures instead of the traditional product-centric model, where each company must develop the whole vertically integrated set of business components on its own (even if some are out-sourced) [40]. The platform approach may totally change the way industrial players execute business, rebalancing a dependence on internal resources versus the utilization of external, globally available technologies and assets [41]. The question is how industries as a whole will transform into economically justifiable structures in the new economy. Preceding examples suggest that bringing out motivated specialists and technology as independent start-ups, whether in the “carve-out” model or some other way, can quite effectively encourage bold risk taking behavior. The freedom to innovate, coupled with the financial support of the parent organization or other related corporations, is a powerful combination [7], [42], [43].

Implementation of the new scheme could be viewed as challenging research work in itself [7]. It starts with fundraising, then carving out the technologies and personnel, together with appropriate execution of contracts. Creating a management structure, hands-on incubation, and lastly and most importantly, achieving exit to gain a return on

investment, are all critical steps. The important challenges are as follows:

Challenge 1. Create “Carve-Out” Businesses with Impact on Industry and Society:

The original purpose of this work was to realize businesses with substantial impact on industry and society, including the creation of platform businesses. “Carve-outs” allow large companies to overcome the “innovator’s dilemma” by enabling small start-up teams to grow into major industrial players.

Challenge 2. Realize Technology Based Commercialization with Innovative Business Models:

Create new business models, including platform management. Examples include furthering the Internet, progress and proliferation of semiconductors, and other new technologies with social potential. The scheme enables ambitious and talented employees to go through the challenge of creating a new and impactful business model.

Challenge 3. Meet Growing Expectations of Society:

Create a way to meet rapidly growing societal needs that often put pressure on the environment. The needs are intensified by an aging population and globalization of the economy. This kind of business is usually outside the scope of established businesses, and the “carve-out” scheme was expected to be enabling.

V. SUMMARY OF “CARVE-OUT” INVESTMENT AND EXIT

A. Formation of Technology Carve-Out Limited Liability Partnership

TechGate Investment, Inc. (TGI) was organized by the authors together with T. Doi and a few other members in order to raise and manage a fund, “Technology Carve-Out Limited Liability Investment Partnership” (TCO). TCO was composed of limited liability partners (LPs), including major banks and insurance companies, as well as a government agency, SMRJ (Organization for Small & Medium Enterprises and Regional Innovation Japan), and was formed with TGI as General Partner (GP). The commitment was slightly more than ¥4 billion, or \$40 million (USD) at the then-current exchange rate.

B. Situations That Required the Carve-Out Scheme

Ten start-ups were founded, and the situations that each start-up faced can be classified into three categories as follows:

a) Service innovation associated with products from traditional manufacturing corporations.

Although service oriented research is conducted widely in manufacturing companies, to fully benefit from their

products, the service-centric business model is often quite different from the product-centric mindset; thus, the researchers face serious barriers internally. Six out of ten carve-out start-ups can be categorized into this group.

b) Pursuit of alternative technologies to mitigate risk in the future.

In the case of semiconductors and displays, which require significant investment, the parent company cannot afford to invest in multiple competing technologies at the same time. Although management selects one technology for the primary path, they would like to have an alternative as a back-up plan. In such a case, relying on investment from other sources for the back-up plan, such as venture capital, is reasonable. For researchers, it is an opportunity to work on the technology they believe in. Two “carve-outs” were in this category.

c) Research institutes where researchers seek to commercialize their inventions.

Research institutes, such as government-funded laboratories, have strong technological capability. Yet, they usually lack the means to commercialize themselves. In cases where the technology and associated business model are new, it can be difficult for such a group to gain the interest of outside companies. Two “carve-outs” fall into this group.

C. Summary of Carve-Out Portfolio and Exit Scenarios

The table below shows the business categories in the portfolio.

D. A few Start-ups and Additional Explanation

A few start-ups that need additional explanation are as follows:

- Cool-Revo: Content delivery through broadband networks for communities such as foreign residents. This platform competes in scale. The services are offered to many communities whose members are spread all over the country. So, the value proposition is better communication among like-minded people who are geographically separated by long distances. The service is expected to have broader impacts on other social innovations.
- Zeta Bridge: The second screen service based on the company’s advertisement database seems to offer very interesting business models for handy terminal manufacturers and TV broadcasters. Zeta Bridge is expected to bring back the traditional TV screen to the center of family conversation. It could also lead to social innovations to bring together digitally divided people.
- Carrier Integration: Silicon carrier tools to bridge existing 8 inch and 300mm semiconductor platforms with the new generation 450mm (or other custom sizes). They may allow smooth and cost-effective transition to new generations in the semiconductor industry.

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TABLE 1. LIST OF “CARVE-OUT” START-UPS FUNDED BY TECHNOLOGY CARVE-OUT FUND

NAME	BUSINESS CATEGORY	PRODUCTS/SERVICES	SOCIAL INNOVATION IMPCT	EXIT AND CAPITAL GAIN OR LOSS
Inventure	High speed interface IP design service	High speed IP [LSI (large scale integration) macro-design, custom made to specific processes]	Indirect impact through IT and communication products utilizing broadband LSIs	Acquired by Synopsys in February 2012 [44][45]. Gain.
Venus Technologies [46]	Thin client server service	Center server service by unique and cost-effective thin-client software	Cost effective cloud service for local entities.	Closed in December 2013, primarily due to effects of the Tsunami disaster in 2011. Loss.
Cool-Revo [47]	IPTV content delivery service over network	Content delivery through broad band networks for communities such as foreign residents.	Contents delivery to geographically spread community members to strengthen social ties.	Invested stocks acquired by a secondary fund, aiming for IPO. Loss.
Zeta Bridge [48]	Picture & voice processing service over network	Picture & voice processing service for smart phones and cell-phones, including TV advertisement meta-data based identification [49]	Secondary screen information service by smart-phones or tablets to multiply value of TV	Acquired back by So-net, a division of Sony. Loss.
Koozyt [50]	WiFi based place engine and virtual reality services	Location service within airports, buildings and shopping malls where GPS is not working.	Adding convenience to public and semipublic facilities through location services.	Acquired back by Sony together with additional of stocks by ISID, an IT service company under Dentsul. Loss
Field Emission Techno-Logies [51]	Field Emission display and X-ray imaging device	Develop, manufacture, and sell field emission display panels and high sensitivity X-ray imaging devices	Realizing much lower radiation exposure in CT scans	Display business given up. X-ray imaging device business sold to medical investment company. Loss.
Dempeki (Smart Bricks) [52]	Intelligent construction tile manufacturing	Electronically addressable wall tiles for internal and external wall displays for buildings	Adding messaging capability to building walls for adding value of public information services.	Although employed at major hotels in the U.S., sales have not yet been realized and invested stocks sold to the management. Loss.
AE Tech [53]	Solid GaN LED substrate manufacturing	High quality GaN single crystal substrate for LEDs; Manufacturing and technology licensing	High quality LEDs for much better energy efficiency and energy saving.	Each technological component has been sold to players in the field. Loss.
Carrier Integration [54]	Silicon wafer holder for small and rectangular wafers	Silicon-wafer-based carriers for SiC, GaN and MEMS fabrication as well as development of 450mm technology and beyond.	Effective utilization of equipment with multiple wafer size adaptability, saving investment.	Stocks acquired by one of the founders and an owner of Matsunaga Giken Inc. Loss.
Wafer Integration [55]	Nano-scale probing machine	LSI prober directly probing and measuring transistors, key technology for improvement reliability and yields of LSIs.	Improvement of reliability of LSIs required for use in safety critical applications as automobiles.	Stocks acquired by founders to continue development. Loss.

- Wafer Integration: LSI prober directly probing and measuring transistors by use of the Atomic Force Microscope (AFM), offering key technology for improvement in reliability and yields of LSIs in the coming generations.

E. Bringing “Carve-Outs” to Exit

In response to the aftermath of the Lehman Shock in 2008, the exit paths of start-ups were redirected to a merger and acquisition (M&A) strategy. The impact on the business environment for start-ups was substantial, as most financial institutions and large corporations were compelled to adopt a very conservative attitude. Two of the portfolio companies have been closed and the rest of them have found ways to further their development and growth. Although the authors have fully utilized their business network and their knowledge for successful exits as M&A or IPO, the overall return on investment has not turned positive, suggesting the necessity for further improvement of the management of the scheme.

F. Opportunities for the Carve-Out Scheme to Address Social Innovations

The scheme looks attractive for technologies developed with a scope for social innovation, since traditional corporate business units lack the skills and vision for this kind of work. The scheme should be effective for such challenges, although among our start-ups, only one could be categorized this way. This is a challenge that is left to the future.

VI. REVIEW OF THE CHALLENGES

The authors have spent ten years “carving-out” start-up teams, incubating and bringing them to exit. A review of the challenges are as follows:

Do “Carved-Out” Start-ups Have Substantial Impact on Industry and Society? (Challenge 1)

Although “carve-out” start-ups were initially expected to have a major impact, most of them have not become major players. Insight into the reason for this regrettable result is useful for future efforts towards “carve-outs”.

Have the Start-Ups Adopted Remarkable Business Models? (Challenge 2)

All the “carve-outs” have employed business models that would not have been possible at their respective parent organizations. However, none of them have been able to fully demonstrate business model driven successes in the timeframe of the fund. The result suggests that an innovative business model may not be sufficient for rapid growth. Other ingredients are important for success.

Will “Carved-Out” Start-Ups Meet Growing Expectations from Society? (Challenge 3)

The content delivery service to distributed communities offered by Cool-Revo is expected to meet the demands of society for strengthening ties among like-minded community members. They have made a mid-term plan to go for an IPO, and the stock has been acquired by another fund to let them continue on that path. However, other than this case, it would be fair to say that the challenges faced by fund management have not enabled the expected social innovations in spite of the apparent advantages of the “carve-out” scheme. Further exploration into how the scheme can be optimized for social innovation would be beneficial.

VII. LESSONS FOR FUTURE CHALLENGES

A. Lessons Learned

Although the authors believe in the advantages of the “carve-out” scheme, many lessons have been identified from the perspective of fund management. The lessons can be summarized as follows:

a) Sustained long-term commitment of the parent organization is indispensable.

Strong commitment of the parent organization is indispensable, together with sharing views on the challenges and risks associated with new business models. It is also necessary to fully agree on how decisions affect the strategy of the parent organization. In this respect, in-depth discussion and agreement with the top management, prior to the act of “carving out”, should have been prioritized. Our experience tells us that the urgency of transformation was not fully recognized by top management and the corporate staff members of large corporations. The “carve-out” scheme was new to them as well. A set of fair and agreeable conditions for “carve out” that balances the needs of all stakeholders is an urgent need for the future, and this would be a good subject for research on management of engineering and technology.

b) Overcoming time constraints for early stage start-ups is essential.

The start-ups founded were mostly at an early stage. If not, the parent organization would not have needed help

with external funding. The exception was Inventure, which received investment at a later stage. Since the typical fund duration of ten years has been found to be too short for the early stage challenges, arrangements to overcome this time constraint are needed. For example, it would help to pre-negotiate with a number of corporations and research institutes prior to fund raising, and to be ready to invest at the earliest phase of the fund.

c) Augmentation of “carved-out” skill sets is needed.

Although the specialists carved-out were expert in their respective fields, their skills were not sufficient for managing a whole company, even if very small. The fund needed to augment the management teams. The education and training of such skills for scientists and engineers who would like to be involved in commercialization of their innovation is a keen need, and it would be a useful offering for a society on management of engineering and technology.

d) Flexibility is needed by fund management to create the best deals for new “carve-outs”.

In retrospect, the variety and complexity of “carve-out” opportunities requires that the limited partner agreements outlining investment conditions need to be flexible. The GP needs to be able to work effectively with a wide variety of specific conditions associated with each individual case. Our fund was over-constrained in terms of conditions on investment. Because this scheme was new to all the participating financial institutions (LPs), they asked for a contract that very strictly limited the autonomy of the GP. As a consequence, the fund documents were revised quite a few times in order to adjust conditions to meet specific requirements of certain deals. This process was unusual, very time consuming and inefficient. As an example, the original conditions stipulated majority ownership of the stock. However, there were quite a few cases where the minority share would have been sufficient for implementing the core concept of the scheme. Consequently, the fund documents were revised as late as at the middle of the fund duration.

B. Evaluation of the Scheme with Respect to the Changing Environment and Social Needs

Another aspect of evaluation should be how well the “carve-out” scheme can benefit technology management for social innovations. Social innovation addresses the rapid changes in the world, such as environmental sustainability, aging populations, and globalization of the economy.

Although the authors have to admit that they have not been able to fully demonstrate this advantage of the scheme, they hope that the lessons will be helpful for the next generation of business challengers and fund managers. Many corporations understand the serious challenges they face and are trying to transform themselves by searching for opportunities through open innovation, while restructuring traditional businesses. The “carve-out” scheme could be a

path to exit non-core businesses and to de-risk new businesses until they are ready for acquisition.

VIII. SUMMARY

Technology “carve-out” has been established as a scheme to:

- 1) Extract technology seeds with key personnel from established corporations and research institutes,
- 2) Create promising technology driven start-ups,
- 3) Take advantage of both corporate venturing and spin-outs.

After ten years, the performance of this fund would not be judged as successful. Although the overall return on investment is negative, the authors still believe in the advantage of the “carve-out” scheme. With the lessons learned, the authors encourage engineers and scientists as well as fund managers to pursue business opportunities with this approach.

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