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Innovative Advanced Technology through University-Industry Collaboration: Role of Venture Capitals, Entrepreneurs and Process Management in Japan

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Abstract The creation of academic start-up firms is an important and practical issue in the management of technology in Japan. The present study designs a model for creating academic start-up firms that fits into the social context. It focuses on the case of FIRST Program, an initiative that consists of 30 projects in innovative arenas, analyses the presence of large-scale public funding, and investigates the role of venture capitalists as support personnel in each project. As a result, the presence and significance of ‘long-term escort’ by an ‘entrepreneurial venture capitalist (EP-VCist)’ were confirmed as common features across the cases observed. EP-VCist refers to a person who can maintain and fulfil dual roles at a university and a venture capital firm, and who can take the lead throughout the venturing process as a risk taker. ‘Long-term escort’ is a form of support that reduces risks in the venturing process by supporting university researchers in the pre-entrepreneurial stage and by exerting a robust bridging role between a university and an industry.

Keywords Start-up firm, R&D management, innovation ecosystem, venture finance, university and industry collaboration, intellectual property

I. Introduction

1. Venture Capital and Entrepreneurship

Previous studies pointed out environmental and societal problems in the creation and training of venture capitalists and start-up firms (NEDO, 2016; Kimura, 2011; Feigenbaum and Brunner, 2002; Igarashi, 2005). Specifically,

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the following five points are recognized as key issues: (1) inadequate goal-setting and low aspirations by entrepreneurs, (2) immaturities in the venture capital industry and venture finance (Yamazaki, 2004.), (3) low mobility in human resources, (4) risk-averse posture of large corporations and government agencies toward entrepreneurs as customers, and (5) a Japanese system disinclined to embrace a new challenge after initial failure. By contrast, venture capital in the United States plays an important role as an initiator of venture creation and training as well as an enabler of venture finance (Feigenbaum and Brunner, 2002; Igarashi, 2005; Yamazaki, 2004).

Although venture capital in Japan is still in the process of development, recently, experienced venture capitalists have begun to appear, and the creation of and training for university-originated start-up firms have become active. Indeed, start-up firms that were founded in Japan since 2000 and that have experienced IPOs in the last five years such as LINE, Akatsuki, Coropler, Euglena, SYBERDYNE, and PeptiDream, with market capitalization exceeding JPY 100 billion, were mostly university-originated (three out of these six firms). In Japan's environment where university investment is uncommon or difficult, and where the management capability of university-originated start-up firms is relatively poor, the venture capital industry is still the main finance contributor; and managerial support by venture capitalists is extremely significant.

In light of the above, there is a growing awareness that university-originated start-up firms tend to generate significant market values in Japan, and thus, further creation is expected in the future. As such, this study focuses on how venture capitalists play a role in the process of creating university-originated start-up firms in Japan. It also explores a way to further develop the industry. Particularly, since the supply of risk capital to university-originated start-up firms is insufficient, it is necessary to explore other sources of venture finance while utilizing public funds as proactive risk-takers.

2. Large Scale-Funding Programme

The importance of university-industry collaboration is broadly acknowledged in the context of 'open innovation' (Chesbrough, 2003; Perkmann and Walsh, 2007) as public research contributes to industrial research and development (R&D) through the channel of open science (Cohen et al., 2002). There are several forms of university-industry collaborations in which research partnerships (e.g. collaborative research or university-industry research centre) and research services (e.g. contract research or consulting) are two of the main types (Perkmann and Walsh, 2007). As an example of the latter, the activities at Fraunhofer Institute in Germany represent a successful system that served as a

bridge between industrial innovation and fundamental research (Beise and Stahl, 1999). However, the forms of research activities have shifted from conventional small-group initiatives to large-scale R&D projects in recent years (Anzai et al., 2012). Subsequently, the projects subsidized by large-scale funding programmes have become the mainstream in public research activities and the forms of collaborations between public research and industry have become more complicated due to diversified organizational interactions.

Currently, Japan's science and technology policies focus on linking science and technology to industrial superiority and on solving social problems through innovation (Cabinet Office, 2017). It was in the Third Science and Technology Basic Plan (2006-10) that innovation was introduced as an important keyword of the policy package. Under this framework, in order to implement the innovation policy, large-scale public grant programs (aimed at the early industrial application of research results and the social implementation of these results) were organized and promoted such as the Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST Program, 2009-2013), the Impulsing Paradigm Change through Disruptive Technologies Program (ImPACT, commenced in 2013), the Centre of Innovation Program (or COI STREAM, commenced in 2013), and others.

The FIRST Program, led by the Council for Science, Technology and Innovation from 2009, for 5 years was an R&D program aimed at securing the world's leading position in 30 defined fields, from basic research to practical application (Cabinet Office, 2017). It is a large public funding program put in place for the purpose of opening up Japan's future in the fields of science, technology, and innovation following the market disruption after the Lehman shock. The FIRST Program committed a total of approximately JPY 110 billion to 30 selected leading-edge R&D projects led by 30 core researchers assigned to each project. As part of the innovative impact on Japan's economy and society, the creation of start-up firms that implement R&D outcomes was positioned to a factor of success for a project (Cabinet Office, 2017).

By investigating how the subsidiary projects of a large scale public R&D funding designed for innovative and practical applications as a key exit contribute to the creation and development of university-originated start-up firms, we intend to explore avenues to further promote start-up creation and training in the Japanese context (Anzai and Sengoku, 2016). With this purpose in mind, the present study examines the FIRST Program as a representative case of recent developments. The specific reasons for choosing the FIRST program are: (1) it is a large-scale public funding program deployed in Japan that was organized and promoted since the 3rd Science and Technology Basic Plan introduced the innovation policy; (2) the creation of university-originated start-up firms was centred on the objectives of the program, relevant to the

purpose of this study; and (3) data around the actions taken during the program as well as performance measures and outcomes have been published and are available for our study (Cabinet Office, 2017).

3. Research Objectives

This study develops a model for the creation of university-originated start-up firms that matches the social background of Japan by analysing the case of the FIRST Program. As a key discussion point, we look at the role and responsibility of venture capitals that are sources of complementary innovative funds and are supportive of human resources i.e., venture capitalists in the process to innovate. Specifically, three sample projects were selected from the cases of university-originated start-up firms that were founded based on technological assets derived from the program.

II. Case and Analytical Method

To explore the model for creating academic start-up firms in Japan, we adopted the theory-building approach through a case study (Eisenhardt, 1989; Eisenhardt and Graebner, 2007). Specifically, we sharpened hypothesis for the supportive human resources in the context of a large-scale funding programme.

We selected three projects (Adachi, Kataoka and Kawai) as cases to investigate where university-originated start-up firms were created during or after the FIRST Program (Kyulux, AccuRna, and Quantum Biosystems, respectively). We also selected three venture capitalists (Sakamoto, Anzai, and Honkura) that provided support to each of these projects, respectively. Each of these VCists belongs to either QB Capital Joint Venture Company ('QB Capital'), Fast Track Initiative, Inc. (FTI), or the Industrial Innovation Organization Co., Ltd. (INCJ), respectively. We conducted bibliometric analysis using SciFinder to measure the number of publications and patents applications over time. For a qualitative analysis on venture capitalists and affiliated venture capitals, we conducted a series of semi-structured interviews of these venture capitalists as well as collected publicly-available information.

III. Result

This study focused on the 30 projects of the FIRST Program as well as selected project cases that meet the study objectives. Specifically, through a screening of publicly-available information, we selected three cases where a

venture capitalist was proactively involved as a management member in the process of creating a university-originated start-up firm related to the outcomes of the project. As a result, we identified three cases of projects and university-originated start-up firms, namely, Adachi, Kataoka, and Kawai projects. We excluded the Koike project where the creation of a start-up firm was observed but the participation of a venture capitalist was not in the starting phase of the business. Therefore, we selected the above-mentioned three projects and for further investigation, included a set made up of an affiliated start-up firm, a venture capitalist, and a venture capital.

1. FIRST Program Projects

Adachi Project

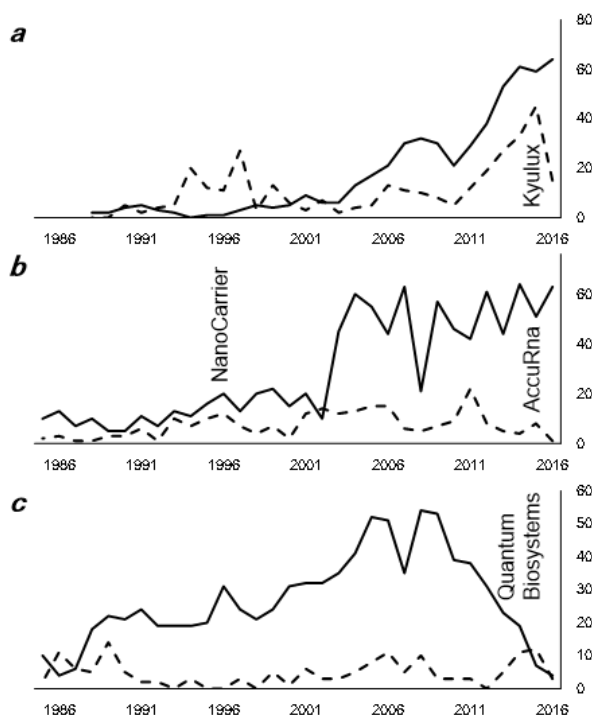
In the Adachi project, the number of publications and patent applications had both increased rapidly after the start of the FIRST Program (Figure 1a). Prior to the FIRST program, Adachi's organic EL material had a low luminous efficiency at a level that could not be put to practical use. However, R&D efforts supported by the FIRST Program dramatically improved the conversion efficiency and led to the development of the technology that went into commercialization. More specifically, the third generation of new light emission principles succeeded in realizing high luminous efficiency at a rare metal-free low cost, achieving the development of an innovative proprietary technology that overcame the weaknesses of the old generation, delivering a luminance of 3,000. Thus, it secured its durability over time (Cabinet Office, 2011).

Kataoka Project

Kataoka had consistently maintained a high track record in both publications and patent applications during the FIRST Program period (Figure 1b). R&D results of the FIRST Program included the development of technologies to overcome drug resistance to cancer and the development of nanotechnology-based anticancer drugs with a superior level of directionality to cancer tissues for refractory pancreatic cancer treatment. The project was also oriented to a global standard in industry-academia collaboration by promoting the commercial application of originated nanotechnology with anticancer drugs (Cabinet Office, Government of Japan, 2011). Specifically, R&D results during the FIRST Program led to the establishment of AccuRna, a university-originated start-up firm.

Kawai Project

The number of publications in the Kawai project peaked in 2009 and then declined sharply thereafter (Figure 1c) resulting from Kawai's retirement from the affiliated university. Kawai achieved technology development of seeds leading to the creation of a university-originated start-up firm during the FIRST sprogram period, and it took over the management of the project from Taniguchi after his retirement. The results of R&D in the FIRST program that were linked to the creation of a university-originated start-up company are as follows. The project succeeded to moderately control the speed of a single-DNA molecule in micro-fluidics with a nanometre-sized width and height by applying a voltage to the electrode. In addition, by utilising semiconductor technology to produce an electrode with one nanometre distance that corresponds to the size of a single DNA molecule, the project yielded a world record result in DNA or RNA sequencing by continuously measuring the electric resistance of a single DNA molecule as well as RNA (Cabinet Office, 2011).



Note: Solid and dotted lines represent the number of yearly publications and patent applications, respectively. a. Adachi project, b. Kataoka project and c. Kawai project.

Figure 1 Performance of each selected project

2. Related Venture Capitals

The sizes of the funds of FTI, INCJ and QB Capital in JPY were 3.1 billion, 7.1 billion, and 300.0 billion, respectively, and were variable. The leading limited partner of each of these funds was a public investor. QB Capital and FTI received JPY 750 million and JPY 3 billion from the Organization for Small & Medium Enterprises and Regional Innovation, respectively; INCJ accepted a JPY 286 billion investment from the government of Japan. The proportions of funding from public investors in these cases were 24%, 41%, and 95%, respectively.

Furthermore, we also observed the contribution of additional public programs aimed at facilitating the creation of university-originated start-up firms in accordance with the FIRST Program and venture finance. The START Program of the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) certified QB Capital and FTI. The START Program was a public grant program aimed at the commercialization of early technical seeds from universities and public research institutes. This was achieved through human resources that have expertise in private business development. It also supported the development of businesses that are high risk but have potential in the pre-entrepreneurial stage as demonstrated in their corporate strategy and intellectual property. INCJ, a semi-public venture capital supported by METI, has nurtured university-originated start-up firms as part of its corporate mission from its outset.

Conclusively, QB Capital, FTI, and INCJ were venture capitalists that promoted the creation and development of university-originated start-up firms founded by public grant programs through the utilisation of public investment for long-term support in accordance with the government's innovation policy.

3. Related Start-up Firms

We examined three start-up firms: Quantum Biosystems, AccuRna, and Kyulux, for their respective FIRST Program projects namely Adachi, Kataoka, and Kawai, respectively, and found that these firms effectively received and utilised sufficient funding from public sources via venture capitals and public program for their growth.

Quantum Biosystems, an affiliate firm of the Adachi project, procured JPY 130 million from leading venture capitals in Japan in 2013 and 2014, with total funds reaching JPY 450 million through a third-party allocation of new stocks. In 2015, the firm procured a total of JPY 2.4 billion from five venture capitals. Tokyo University Edge Capital committed to the investment as a venture capital accepting public funds to limited partners, like INCJ. Meanwhile,

Quantum Biosystems was selected under the New Energy and Industrial Technology Development Organization (NEDO) Program for Seed-stage Technology-based Start-ups (STS) in 2012. It was also selected by the Ministry of Economy, Trade, and Industry (METI) for a grant to support human resource development for new business creation in 2013.

AccuRna, an affiliate firm of the Kataoka project, held a capital alliance with NanoCarrier Co., Ltd. in March 2016 where FTI committed to the financing scheme.

Kyulux, an affiliate firm of the Kawai project, raised capital amounting to JPY 1.5 billion in February 2016 from multiple venture capitalists and non-financial investors in accordance with the New Business Creation Support Program promoted by the Japan Science and Technology Agency (JST). In April 2016, the firm procured approximately JPY 300 million and JPY 400 million from Samsung Display and LG Display, respectively. Public funds were indirectly invested via QB Capital and JST.

4. Related Advisory Professionals

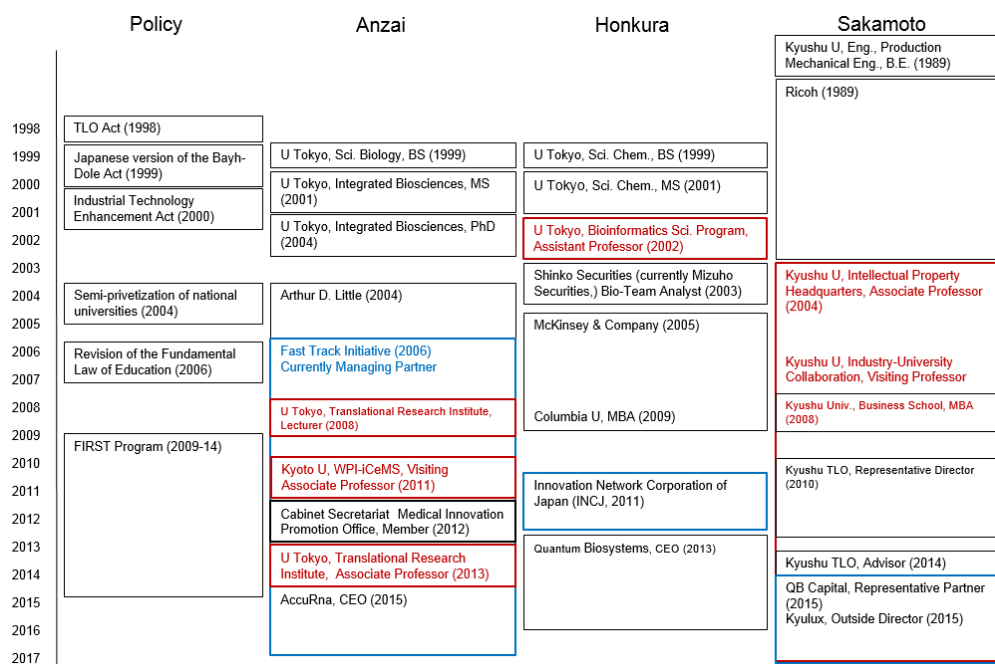
Entrepreneurs for university-originated start-up firms need to acquire skills for business strategies, capital policies, and alliances; and also develop the ability to foster relationships between the university and the industry. In the US, serial entrepreneurs have accumulated experience in the start-up process from related infrastructure in human resources (Stuart and Abetti, 1990; Colombo and Grilli, 2005). In contrast, a talent pool of skilful entrepreneurs has been scarce in Japan resulting in the entrepreneurs' lack of management capability.

In the cases of the FIRST Program, Anzai and Honkura were themselves considered top management in the start-up of AccuRna and Quantum Biosystems as demonstrated by the results of the Kataoka and Kawai project, respectively. Sakamoto participated as an outside director in the management of Kyulux, a start-up firm based on the Adachi project.

Figure 2 shows a comparison of the profiles of Sakamoto, Anzai, and Honkura. A common feature among these professionals is that they all took advantage of their university positions allowing them to generate an R&D project at the university. Both their work experience and authority (by virtue of their respective positions at the university) positively contributed to the technology sourcing and incubation at the university and the subsequent start-up process. In other words, although they were external venture capitalists, they were also internal contributors at the university from the beginning of the incubation process. Additionally, Anzai and Sakamoto had work experience at the central government through which they gained familiarity and maintained

networks with the supervisory ministries and funding agencies of the FIRST Program.

Simultaneously, these three professionals were able to understand the trends in and the progress of a particular scientific and technological field related to the program with their expertise fostered at the university. In other words, they all have acquired the skill to manage both business and technology based on their academic background. Indeed, Anzai and Honkura had work experience in management consulting firms while Sakamoto earned his MBA at a business school. As Cooper et al. (1994) and Westhead and Cowling (1995) suggested, the higher the educational level of an entrepreneur is, the greater is the growth potential of a start-up firm launched by that entrepreneur. Also, as Almus and Nerlinger (1999) and Colombo and Grilli (2005) pointed out, an entrepreneur who has an academic degree in a relevant technical field could enable greater growth for the start-up firms that he initiates. Such was the case for these three professionals.



Key innovation policies and major career events were displayed in a time course manner. Blue, red and black boxes indicate activities related to venture capital, academic and others, respectively.

Figure 2 Policy events and career background

IV. Discussion

1. Relationship between Research Leader and Advisors

From the results of the interviews and event sequence analysis we found several common elements among these three advisory professionals in terms of educational background, collaborative work experience and proximity with the representative researchers of the projects in the FIRST Program (Table 1).

Regarding academic background, Adachi and Sakamoto are both in the engineering field; Kataoka and Anzai specialize in life sciences; and Kawai and Honkura are involved in genome engineering. More specifically, Adachi and Sakamoto share identical educational background at Kyushu University; Kataoka and Anzai have similar educational backgrounds at the University of Tokyo despite their age difference; Kawai and Honkura share the same educational background at the Department of Chemistry, Graduate School of Science and the University of Tokyo.

Notably, all these advisory professionals have kept a long-term relationship with their representative researchers in the FIRST Program. Specifically, Adachi and Sakamoto shared work experience at the same company, Ricoh, and also at Kyushu University in overlapping periods; Kataoka and Anzai have been working together in the Centre of NanoBio Integration (CNBI), a previous R&D project at the University of Tokyo; Honkura has an academic background as an assistant professor in a department at the University of Tokyo identical to that of Kawai's.

A long period of time is necessary to form a relationship based on trust between an advisory professional and a representative researcher. To foster this relationship, Sakamoto and Anzai spent over ten years from their first meeting with their respective representative researchers, Adachi and Kataoka, before establishing the start-up firm. By contrast, Honkura and Kawai were acquainted for a short period of time (approximately 3 months) before launching the start-up. However, both are specialized in genome engineering and have been working at the same department, which was likely a key factor in building a trusting relationship within a short term, as Honkura commented.

Cooper and Bruno (1977) pointed out that corporate growth is higher when entrepreneurs do not do it alone but instead form a management team with several members. In addition, Zenger and Lawrence (1989) clarified that communication becomes smooth by constructing a management team with members who have worked in the same organization. In the cases covered, each of these advisory professionals succeeded in forming a substantial management team at the time of the establishment of a start-up firm based on multiple commonalities to the corresponding representative researcher in terms

of educational background, employment history, and collaborative work experience, resulting in strong, trust-based relationships.

Table 1 Common characteristics of the EP-VCists

Project	Kataoka		Kawai		Adachi	
Personnel	Representative researcher	Entrepreneurial venture capitalist (EP-VCist)	Representative researcher	Entrepreneurial venture capitalist (EP-VCist)	Representative researcher	Entrepreneurial venture capitalist (EP-VCist)
Name	Kataoka	Anzai	Kawai	Honkura	Adachi	Sakamoto
Common specialty	Life science	Life science	Genome engineering	Genome engineering	Engineering	Engineering
Common education background (degree)	U Tokyo (Engineering)	U Tokyo (Science, biology)	U Tokyo (Science, chemistry)	U Tokyo (Science, chemistry)	Kyushu U (Graduate School of Science and Engineering)	Kyushu U (Engineering)
Common academic experience (position)	U Tokyo (Professor, Graduate School of Medicine)	U Tokyo (Adjunct Associate Professor, Translational Research Institute)	U Tokyo (Postdoctoral fellowship)	U Tokyo (Assistant Professor)	Kyushu U (Professor, Applied Chemistry)	Kyushu U (Visiting Professor, Industry-University Collaboration)
Common industry experience (position)					Ricoh Co., Ltd. (Central Research Laboratory)	Ricoh Co., Ltd.

2. EP-VCist and Long-Term Escort

In this section, based on the observation and analysis above, we conceptualize such advisory professionals in the context of university-originated start-ups. Anzai, Honkura, and Sakamoto had features distinctive from the general characteristics of venture capitalists (Jungwirth and Moog, 2004). They were not typical supporting members who stand by the university and focus on the incubation of technical seeds. Rather, they were a rare class of professionals that took advantage of the dual specialised skills of academics and venture capitalists. Furthermore, they were fully dedicated to the lead-in process as risk takers. In other words, they themselves were entrepreneurs. Therefore, we hereafter define the venture capitalist having such characteristics as ‘entrepreneurial venture capitalist (EP-VCist)’.

In other words, the EP-VCist is an advisory professional capable of producing an innovative project at universities, and establishing sourcing and incubation of seed technologies aimed at launching a start-up by leveraging his/her university position and work experience. An EP-VCist can independently build a network based on his/her industrial, academic and public

connections. Furthermore, an EP-VCist can establish strong relationships with representative researchers at universities for long-term collaboration. Simultaneously, as a venture capitalist, an EP-VCist can start a firm capable of building corporate strategies, capital policy, human resource management, intellectual property strategies, among others (Ye et al., 2012), and lead the firm's management as the CEO or other relevant top management position until the firm becomes established.

One of the features seen in the cases of EP-VCists is the ability to foster relationships between the university and the industry sectors whilst taking advantage of venture capital and dual specialized skills. By supporting university researchers starting from the pre-entrepreneurial stage and consequently reducing the risk of the start-up process, this form of support (that fosters relationships between the university and the industry sectors) could be conceptualised as 'long-term escort' (Figure 3). Japan has less mobility in technology, human resources and funds than other advanced countries in the process of start-up creation resulting from a substantial gap between the university and the industry sectors. In the three projects observed, these EP-VCists were dedicated to accompanying these two groups (universities and industry sectors) over the long-term, possibly reducing the risk of the start-up process of these Japanese university-originated start-up firms, and likely enhancing the mobility of relevant resources where gaps exist.

Stated differently, EP-VCist is a human resource capable of producing a research programme at a university and conducting incubation and sourcing of technologies that would lead to the creation of a start-up firm, making full use of related university position and work experience. Additionally, an EP-VCist is capable of independently building a network based on industry, academic and governmental connections. Furthermore, an EP-VCist is able to establish strong and trusting relationships with representative researchers at the supported universities. Moreover, an EP-VCist, as a venture capitalist, is capable of creating a start-up firm based on incubation and sourcing technology. Upon creation, an EP-VCist can build business strategies, capital policy, human resources, intellectual property strategies, etc., and serve as the firm's lead management as the CEO or COO, until the firm's management is established.

Manufacturing-innovation process

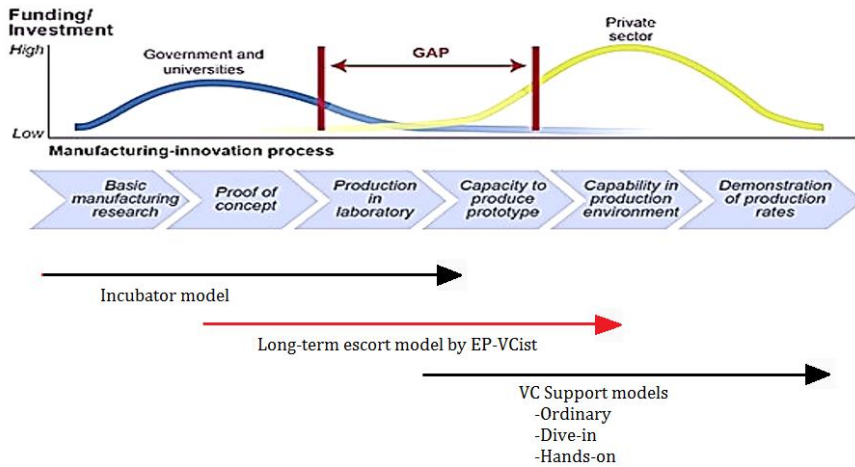


Figure 3 Significance of the long-term escort model

3. Management of Intellectual Property

The technical strengths of a start-up firm are considered core competencies until they gain sustainable manageability. In order for a start-up firm to acquire technical strength at its establishment, the firm needs to acquire an exclusive license with a sublicense right for its core technology, and its related patents can be utilised in an autonomous manner (Japan Patent Office, 2016; MEXT, Japan, 2017). However, the exclusive form of licensing for university-originated patents is limited to less than 30% of all licenses granted, with more than 70% of these licenses granted under non-exclusive conditions. This contrasts with the situation in the United States where over 90% of deals are licensed under exclusive conditions (Japan Patent Office, 2016).

One of the reasons that licenses from Japanese universities tend to be non-exclusive is that there are multiple stakeholders for a patent resulting from collaborative R&D with large enterprises and limited capability of universities to maintain the acquired patents. Consequently, majority of the patents end up being owned by both entities and subsequently licensed to university-originated start-up firms in a non-exclusive arrangement. In the case of a joint application with a large enterprise, it is possible for a university to reduce the cost for maintaining the patents, thus increasing the number of patent applications. This systemic factor hinders the strategic freedom of a university-originated start-up firm to scale up towards the sustainable management phase.

In contrast, in the cases of FIRST Program projects, these constraints were generally avoided by the presence of the EP-VCist. Table 2 shows a

comparison of licensing agreements for AccuRna, Quantum Biosystems, and Kyulux. Quantum Biosystems and Kyulux succeeded in acquiring exclusive rights with the patent license for start-up purposes. One of the key success factors was that these EP-VCists, who retain dual specialised skills at the university and the venture capital, were familiar with the management of intellectual properties and the norms and practices that are common in advanced regions.

Table 2 Profile of established start-up firms

Firm name	Year of establishment	Exclusivity of license	Sublicense	Licensor	Timing of licensing agreement
AccuRna	2015	Exclusive	With sub license	NanoCarrier	One year after the establishment
Quantum Biosystems	2013	Exclusive	With sub license	Osaka U	At the year of establishment
Kyulux	2015	Exclusive	With sub license	Kyushu U	At the year of establishment

EP-VCists frequently come and go between industry and academia in the process of nurturing a long-term relationship. This requires strict management of potential conflicts of interest. To address this issue, FTI and AccuRna, (which carried out activities in cooperation with universities, medical institutions and publicly-funded R&D projects) set up a committee overseeing potential conflicts of interest whereby a third party member has to confirm the facts related to its investment track record to improve countermeasures for the potential risk. In the case of INCJ and Quantum Biosystems, a similar practice was undertaken by INCJ that resulted in a no-go decision during the seed financing. INCJ finally participated in the second round of financing where due diligence was undertaken in a much stricter fashion than usually practiced. In the case of QB Capital and Kyulux, Sakamoto was in charge of a committee dealing with conflicts of interest when he oversaw the industry-university collaboration at Kyushu University. Reviewing these three cases, the skill in managing potential conflicts of interest is considered to be one of the key attributes of EP-VCists.

V. Conclusion

This study devised a new model for the creation of high technology-based university-originated start-up firms that matches Japanese social context and investigated the significance of large-scale public funding and the role of

venture capitalists. Focusing on the FIRST Program in Japan, we found three relevant cases, Adachi, Kataoka, and Kawai projects where university-originated start-up firms were generated. As a result of our analysis, common features across these cases were confirmed. These features include the presence of entrepreneurial venture capitalists (or EP-VCists) and the model of long-term escort. An EP-VCist is a rare professional capable of maintaining and utilising the special dual skills required in universities and venture capital firms, and a risk taker able to directly lead the early phase of the start-up. The long-term escort is a process management model where an EP-VCist reduces the risk associated with a start-up by assisting a representative researcher of the project from the seed stage and also supporting the formation of a close relationship between the university and the industry sectors. We believe that these configurations are necessary for a model to effectively create a university-originated start-up firm that is suited to Japanese-specific social and industrial contexts. We expect the outcomes of this study to serve as a basis for further studies with wider and more in-depth context.

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