

Title	Open innovation : based on the perspectives of the Silicon Valley high-tech startups
Sub Title	
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Publisher	慶應義塾大学大学院経営管理研究科
Publication year	2014
Jtitle	
JaLC DOI	
Abstract	
Notes	修士学位論文. 2014年度経営学 第2964号
Genre	Thesis or Dissertation
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO40003001-00002014-2964

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慶應義塾大学大学院経営管理研究科修士課程

学位論文（ 2014 年度）

論文題名

Open Innovation
- Based on the Perspectives of the Silicon Valley High-tech Startups -

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論文要旨

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Open Innovation – Based on the Perspectives of the Silicon Valley High-tech Startups –					
(内容の要旨)					
<p>The primary objective of this study is to explore on an emerging research topic within the open innovation paradigm. It attempts to shed light on open innovation specific to a high-tech startup environment. By conducting interviews with the leading entrepreneurs and professionals residing in Silicon Valley USA, this study delves into the unique motives and the challenges that originate from the salient features of a startup: smallness in size, focus and speed. Furthermore, it securely complements the preceding studies by revealing the thought processes and the tacit knowledge relevant to practicing open innovation in a startup surrounding. This study concludes by presenting an overall analysis on the said topic, suggesting that “open mindset” and “strategic integrity” are the key factors for successfully adopting open innovation within a startup environment.</p>					

Open Innovation

– *Based on the Perspectives of the Silicon Valley High-tech Startups* –

February 2015

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0. Abstract

The primary objective of this study is to explore on an emerging research topic within the open innovation paradigm. It attempts to shed light on open innovation specific to a high-tech startup environment. By conducting interviews with the leading entrepreneurs and professionals residing in Silicon Valley USA, this study delves into the unique motives and the challenges that originate from the salient features of a startup: smallness in size, focus and speed. Furthermore, it securely complements the preceding studies by revealing the thought processes and the tacit knowledge relevant to practicing open innovation in a startup surrounding. This study concludes by presenting an overall analysis on the said topic, suggesting that “open mindset” and “strategic integrity” are the key factors for successfully adopting open innovation within a startup environment.

1. Keywords

Open Innovation; High-tech Startups ; Silicon Valley ; Ecosystem ; Dynamic Capability

2. Introduction

Over the last decade, open innovation has evolved to become a prominent innovation paradigm examined from different perspectives by both the scholars and practitioners alike. From the perspective of the large firms engaged in open innovation practices, startups are typically treated as one of the constituents to its innovation. This study inverts the traditional viewpoint, by casting the high-tech startups as the leading character of open innovation.

The first and obvious keyword within the scope of this study is open innovation. As illustrated in the latest edition of Chesbrough`s literature, “New Frontiers in Open Innovation”(2014), open innovation is currently being researched at various levels – from individuals, firms in various sizes, domestic and international firms. By contrast, history shows that most of the preceding studies pertained to open innovation focuses on the large & established firms with extant capabilities. It is within the recent years that some scholars have started to research the nature of

open innovation adopted in small and midsized firms (Van de Vrande, 2009). Consequently, it is still an emerging topic with many fields still left open to be explored.

The second relevant keyword within this study is High-tech Startups. Startups are organizations, which are typically associated with its smallness, focus and speed. They have a tendency to be more flexible, faster in decision making, and quicker to react to market conditions (Vossen, 1988). The relevance between firm size and innovation process is another favorite research area that has been explored at various levels. Prior research suggests that innovation processes and models in smaller firms differ significantly compared to larger firms (Edwards et al, 2005). However, when it comes to examining the differences of small firms to large firms specific to open innovation, this again is an area yet to be explored.

Thus, the confluence of the two keywords —Open Innovation and High-tech Startups— makes it a fascinating yet challenging research topic to explore upon.

3. Literature review and preceding studies

This study starts with the literature review of Henry Chesbrough's original edition of open innovation literature "Open Innovation: The New Imperative for Creating and Profiting from Technology" (2003) and its derivative researches. This original research was significant in that, (a) advocated the importance of utilizing "external knowledge" as well as "internal knowledge" to innovate something new (b) indicated the paradigm shift from closed to an open innovation by closely observing the large and established firms such as Xerox PARC, IBM, and Lucent/Bell Labs (Figure 1.). This was unique in a sense that most conventional management theories and business practices prior to open innovation have pursued a different path; explaining that the firm's superior performance results from knowledge inside a "block box", in other words knowledge kept within firm's organizational boundaries (Nonaka, Chesbrough 2014). Additionally, open innovation could also be understood as the antithesis to the traditional vertical integration approach where internal R&D activity lead to internally developed products that are then distributed by the firm (Chesbrough, 2006).

- Insert figure 1. here-

Over the years, the definition of open innovation has evolved, adding key elements to its original definition along the way. It is therefore important to apprehend the key essences of this terminology, before delving into the details. Below represents the key definitions of open innovation in historical order.

1st Edition: The New Imperative for Creating and Profiting from Technology (2003)

“A phenomenon of companies making greater use of external ideas and technologies in their own business, and letting unused internal ideas and technologies go outside for others to use in their businesses”.

2nd Edition: Researching the New Paradigm (2006)

“Open Innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively”

Latest edition: New Frontiers in Open Innovation (2014)

“We define open innovation as a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization’s business model. These flows of knowledge may involve knowledge inflows to the focal organization (leveraging external knowledge sources through internal processes), knowledge outflows from a focal organization (leveraging internal knowledge through external commercialization processes) or both (coupling external knowledge sources and commercialization activities), as we further discuss below.

Upon comparing the three definitions, the latest definition is obviously the most elaborative. However, it can be said that the following are the key ingredients of open innovation.

- Open innovation is a distributed innovation process involving both internal and external ideas and/or knowledge-flows, which are purposively managed.

- Open Innovation not only applies to ideas and technologies, but could also apply to business models and services which appear later in the value chain.
- Open Innovation involves multiple directions. Inbound (outside in) and Outbound (inside out), and Coupled (Bi Directional), which is a new concept introduced in the latest edition.

As previously stated, open innovation provides a basic framework in which the scholars and practitioners can expand upon. This is perhaps one of the reasons why open innovation is widely accepted as such a popular research topic. For instance, open innovation can be analyzed and discussed from various perspectives in management such as strategic positioning, value chain, business model, core competence, knowledge creation and management (Nonaka, Chesbrough, 2014). Furthermore, the variation on the type of firms as a research subject has also expanded beyond large and established firms as well. The types of firms covered along these line include, Open Innovation in Small and Medium size Enterprises (Brunswick, Van de Vrande, 2014), Open Innovation in Multinational Corporations (Asakawa, Song, Kim, 2014) and Social firms (Chesbrough, DiMin, 2014). Other scholars have chosen to deep dive on the means of open innovation processes, such as Corporate VC (Vanhaverbeke, Van de Vrande, 2008) and the direction of openness (Lichtenthaler, 2009), contributing to the diversity of this research topic.

Despite the fact that open innovation has evolved along the years, there is still a notable trend in that most of the preceding research is based on the perspectives and data gathered from the large and established firms. Even the scholars who are involved in studying open innovation in SMEs admit that this is still the case (Van de Vrande, 2009; Lee et al., 2010). Another important point to mention is that Chesbrough's initial arguments were focused more on the technical R&D (invention) aspect of the innovation, whereas innovation involves multiple stages including commercialization (Afuah, 1996). Needless to say, to acquire a comprehensive view of the open innovation approach, it is important to pay attention not only to the firm size but also to the multiple stages of innovation.

4. Focus area and Research questions

Based on literature review, it is evident that there still exists a gap in the preceding studies. Figure 2 depicts the comparison between the existing research areas and the main areas covered within this study.

- Insert figure 2. here-

To further explore upon the main areas of this study, the following research questions were initially designed.

RQ1. How startups perceive innovation in general (not limited to open innovation)

RQ2. What are the motives of implementing open innovation in a startup environment?

RQ3. What are the challenges and inhibitors in implementing open innovation?

RQ4. What is the decision process involved in choosing open and/or closed?

RQ5. Does the firm of the size matter?

RQ6. How does open innovation influence the performance of the firm?

In addition, the following assumptions or hypothesis were created in advance, with the purpose of later testing against the collected primary data.

H1. The entrepreneurs/startups at Silicon Valley have an intrinsic motivation to open up and innovate.

H2. The startups face unique challenges in implementing OI compared to a large firm. There are some scenarios that will require taking more of a closed or a hybrid approach.

H3. There are unique open innovation mechanisms specific to a startup.

H4. External environment as well as internal environment influences the implementation of OI in a startup.

5. *Research and Data Gathering Methodology*

In an attempt to test the research questions and said hypothesis, this study took mostly an exploratory, inductive and qualitative approach.

As aforementioned, there are certain challenges involved in observing the startups, especially when trying to come up with a common finding or a pattern. There are primarily two reasons involved. First, since the startups do not have the obligation to disclose information to the public, it leads to the scarcity of public and/or secondary data required for analysis. It also is not a common practice for the startups to codify and share their management practices, as they are typically treated as tacit knowledge. Second, the emergent nature and speed of the startups adds to the complexity when studying their behaviors. For example, it is a rarity that an initial business plan of a startup at its inception will stay the same when it is converted into an actual product or solution. Although there are literatures such as the “The four steps to the Epiphany” (Blank, 2013) that have attempted to elucidate the startup process, the challenge of observing the startups still remains.

Thus, it was natural to take the exploratory and inductive approach when observing the phenomena of startups. The heart of this study is built upon collecting and analyzing primary data gathered from entrepreneurs and professionals residing in Silicon Valley, USA. The methodology used for gathering data was based on a semi-structured interview, as it became an inevitable task to gather the precious insights and perspectives directly from the startups. Silicon Valley was selected as the primary location, since it is to date the leading high-tech cluster and home to many of the leading startups. The industry sector selected was ICT, with a concentration in areas of communications, networking, server/storage and cloud related technologies. With regard to interviewee types, target candidates were carefully selected from the following two main groups.

- The startups and entrepreneurs: This group includes active serial entrepreneurs, leaders (CEOs, VPs) and founders at startup organizations. It also includes corporate executives who have transferred to large firms as a

result of startup M&A. It is noteworthy that most of the interviewees had excellent track records in leading both large firms and in founding multiple startups.

- Venture capitalists and analysts: This group includes the Venture Capitalists, which support and exploit innovation to ultimately earn business and/or capital gains. This group also includes industry researchers and analysts whom constantly follow the trends of startups innovation.

Figure 3 illustrates an overall picture of how the interviewees were involved in innovation. Upon analyzing the responses, the interviewees were classified as explorers and exploiters of innovation. Analysis showed that the majority of the interviewees were involved as exploiters of innovation, with a lean towards the commercial side of innovation, reflecting their professional background.

- Insert figure 3 here-

The actual data gathering process started in May 2014, and was intensively conducted within a week (last week of May 2014) at Silicon Valley, USA. More than 20 entrepreneurs and professionals from 15 different firms participated in the interview. The interviews were conducted in a face-to-face and semi-structured manner, with the typical interview lasting for an hour. The initial data gathered turned out to be a reasonable amount of data, since upon completion of about 10 interviews, certain signs of certain patterns and data saturation started to appear. The interviewees, especially the entrepreneurs, were asked to speak based on their own experiences, in an attempt to secure uniqueness of data. The VCs and the analysts were also asked to speak based on their experiences, both at a micro and macro level, which contributed in securing the diversity and validity of data.

6. Additional keywords

In addition to open innovation, there are certain keywords that require close attention in connection with this study: Innovation, High-tech startups, and Ecosystem.

6.1 Innovation

Innovation itself is a widely adopted terminology used within various management contexts and researches. It is therefore a meaningful gesture to understand how the startups perceive innovation, prior to stepping into the specifics of open innovation. The definition of innovation was pioneered by Joseph Schumpeter back in the 1930`s. In the later years, Freeman defined innovation as “invention and commercialization”, emphasizing that the commercial and business aspect of innovation are equally as important as the R&D and invention aspect (Freeman, 1988). Porter indicated that process of innovation has a strong tie with the firm`s strategic and competitive context.(Porter, 1990) In the most recent open innovation literature, “New Frontiers in Open Innovation”, the definition of innovation is described as “any idea, practice, or object that is perceived as new” (Rogers, 1995)

When the interviewees were asked about how they perceive innovation based on their professional experiences, each came up with unique responses. Select examples of responses are as follows:

“Challenging the status quo”

“Out of the box thinking”

“Coming up with new ideas - Creation of something new that is useful or for people to consume”

“Taking a new approach or an angle to a problem set”

“The process of identifying a deficiency or a gap within a product or a domain, and providing a solution”

“Identifying a gap within the existing business ecosystem”

“Providing a unique solution to a unique problem”

“Different types of innovation. Fundamental innovations and Modest or Incremental innovations”

“Technology centric innovation– applying new technology to an existing market, applying established technology to a new market”

Regardless of the different languages used which resulted in slightly different nuances, notable commonalities were observed. First, the responses were in line with the definitions of the scholars from a viewpoint that they were well aware that

there are multiple stages and aspects to innovation. Second, when asked about the mindset relevant to innovation, many pointed out “challenging the status quo” and “out of the box thinking” as the key factor. Third, due to their professional background many associated innovation with technology, more specifically pointing to product and service innovation, but at the same time were also aware of the fact that innovation could apply to low-tech or in non-tech fields as well.

6.2 High-tech startups

Since this study is based on observing the perspectives of high-tech startups, it is important to outline what this terminology implies within the scope of this study. High-tech, in definition means technology at the cutting edge, or the most advanced technology and is not limited to a certain industry. However, due to the scope of this study and the characteristics of the interviewees, the term high-tech in this study will point to technology in the ICT related field. It is also important to note that when the term “startup” is referred within this paper, it will encompass both the firm itself and the entrepreneurs/innovators whom make up the firms, unless otherwise noted.

In terms of terminology, others comparable to high-tech startups include Technology new ventures (Kazanjian, 1988) and New Technology Based Firm also abbreviated as NTBFs (Almus et.al. 1999). Additionally, the common terminology used in the “New Frontiers in Innovation” is SME (Small and Medium Size Enterprise), which is regularly associated with high-tech startups, small firms and entrepreneurial firms. From a practitioner point of view, a leading venture capitalist residing in Silicon Valley came up with a compelling definition, which underlines the key essences of a startup.

“ Startups are like missile defense systems. Once you see a missile coming in, you fire at the missile, and use all your energy trying to hit the missile. In other words, startups are very small organisms that have a single mission in mind, and they put all their energy into that one mission. Either they get the market right and end up becoming very successful... or... they kind of miss it and flameout...”

6.3 Ecosystem

Within the scope of this study, the term ecosystem will be referred both at a macro level e.g., ecosystem formed at the cluster level (Silicon Valley) and more at a micro level e.g., ecosystem formed at the business level.

6.3.1 Silicon Valley – the recursive ecosystem –

When conducting the interview with the startups, many pointed out the influence of pursuing innovation in a unique environment like Silicon Valley. Figure 4, was originally handwritten by a renowned entrepreneur residing in Silicon Valley. It represents a diagram of the major constituents within an ecosystem. At the center of the ecosystem, the innovative projects reside, which are initiated by the entrepreneurs and innovators. Surrounding the innovative projects are the key players such as: Venture Capitalists whom play an important role in providing capital that understands innovative risk and lawyers that are experienced in dealing with startup specific issues. Innovative workforces and innovative customers that are willing to take innovative risk are essential in accelerating the innovative projects. The entrepreneur accents the significance of the “ recursive nature” of the ecosystem, which makes Silicon Valley long lasting and unique. He also emphasizes the importance of the unique mindset deeply rooted in Silicon Valley, which was expressed as “Open culture without prejudice” and “No stigma for failure”, both being a prerequisite for cultivating and preserving an innovative culture in the area.

-Insert Figure 4 here-

6.3.2 Networking and Business level Ecosystem

From an open innovation perspective, it is also noteworthy to pay close attention to the nature of the workforce residing in the Silicon Valley. Silicon Valley sources its talent from over 100 locations all over the world (including other areas within the US). The abundance of mobile and skilled work forces causes formal and informal networking, which becomes the basis for open innovation (Chesbrough, 2003).

Silicon Valley nests leading high-tech startups and renowned large high-tech

firms alike. The density and proximity of both the small and large firms makes Silicon Valley an ideal platform for forming a business level ecosystem within the cluster. The format of a business ecosystem could include dyadic partnerships and multi actor alliances, which all are methods for the startups to get access to critical resources, extend their technical competencies, and help them to build legitimacy and reputation (Baum et al., 2000).

7. Cases

7.1 Motives of implementing Open Innovation in a startup environment

The interview revealed that there are certain motives and internal/external factors that induce the implementation of open innovation in a startup.

- *Extra innovating opportunities:* Whether in a format of formal and/or informal networking, startups are aware that absorbing external knowledge via open innovation will lead to additional innovating opportunities. Collaborating with the customers, academia, and sometimes larger firms in different formats of open innovation will lead to such positive effects as reinforcing their technical capabilities, and being receptive to the changes in market. For this reason, overcoming the limitations resulting from smallness in size becomes one of the key motives for the startups to adopt open innovation.
- *Efficiency:* Due to its smallness in size, efficiency becomes a crucial factor when operating a startup. When engaged in open innovation, the startups see a smaller risk of “reinventing the wheel”, meaning the act of trying to invent or innovate something that already exists in the market. This will lead to positive effects in terms of efficiency, such as saving time and equity dollars, which in turn will enable the startups to focus on solving a need or a problem.
- *Progress in IT technology:* Startups named the progress in IT, especially the cloud, as a key motive to taking the open innovation approach. For example, cloud services such as AWS (Amazon Web Services) provides a mean for collaborative R&D platform without the need of owning their own infrastructure. The increase of technical building blocks in the market, have

motivated the startups to open up. Consequently, these factors turn out to be positives for the startups, as it again enables them to direct their resources on solving a need or a problem.

- *Leadership*: The interviewees acknowledged that leadership, especially the founders of startup organizations, play an essential role in shaping the innovative culture of a startup. These include the personality and the background of the leaders. Founders whom have had positive experience in the past with the open approach tend to take the same approach when starting a new venture. The founders, whom had negative experiences in terms of the open and/or closed approach, endeavor to overcome the past challenges in the new venture. This tendency coincides with preceding studies, as it suggest that the level of education of the CEO and nature of the top management team affect the openness of SMEs (Classen et al., 2012).
- *Venture Capitalists*: Chesbrough indicated the influence of the venture capitalists as a major eroding factor, which leads the firms to take the open innovation approach (Chesbrough, 2003). The interviews with both the entrepreneurs and the VCs confirmed that this was the case. In terms of supporting the startups, the VCs not only play an important role of providing risk capital but also play the role of monitoring and advising the startups. They sometimes try to be the “devil`s advocate”, so to make sure that the entrepreneurs have thought through the ramification of the decisions that they are going to make. VCs tend to keep an eye on the innovation strategies within a startup, since it could become ultimately become a board decision due to its financial impact of the startup.

7.2 The challenges of implementing Open Innovation in a startup environment

Due to its characteristics, the startups face unique challenges when implementing open innovation as their core innovation strategy. Based on the interview responses, the following are the potential challenges or inhibitors that startups may face when adopting open innovation.

- **Ecosystem:** Building an ecosystem can be an effective method to identify and acquire externally generated knowledge that is critical to its operations (Zahra, George, 2002). However, some startups associate business ecosystem with the downsides, more specifically as a potential overhead to their innovative activities. There are multiple reasons involved. First, since the startups are typically the smallest player and thought to be the “new kid on the block”, it becomes a challenge to manage the multiple open constituents within the ecosystem, especially if there a larger firm is involved. Second, participating in an ecosystem in an effort to create a reciprocal relationship require startups to adjust with other firms in various forms of collaboration. This could lead to visible and invisible transaction costs. Therefore, if not implemented properly at the right time, an ecosystem for a startup could lead to side effects, such as: slowing down and losing control of the innovation process. This is a challenge that is unique to a startup, as larger firms do not face the same challenges in forming and managing an ecosystem. Large firms have the luxury of being able to allocate dedicated resources to engage in collaborative activities. They can also take advantage of their “attractiveness” to grasp external innovation, whereas a startup will typically need to take a more of a “foraging” approach (Doz, Wilson, 2012).
- **Target lock:** Target lock is a negative phenomenon observed in some startups, where the entrepreneur will fall into a myopic state typically accompanied by a complacent mindset. As repeatedly discussed, startups have very few resources and very little time, and are focused on doing something special. On the positive side, it is this extreme focus that will lead to the initiation of innovative projects that large firms neglect to identify. To the contrary, the extreme focus in some cases becomes a double-edged sword. When the startups fall into the pitfall of a target lock, they may miss an important market opportunity or lack responsiveness such as refusing to modify the product or a solution to other receptive markets. More importantly, target lock may impede the startup from taking the open innovation approach when necessary. Target lock could potentially occur in larger firms as well, but with a lower chance, since the larger firms tend to have multiple focuses and agendas.

- ***NIH (Not Invented Here)***: NIH syndrome in definition is a state where firms regard knowledge not generated in its own organization as inferior (Nonaka, 2014). NIH syndrome typically occurs when an organization overly prioritizes and rewards “original” output, so the incentive to reuse or share knowledge disappears (Doz, Wilson, 2012). NIH is known to be an inhibitor for the large firms to engage in open innovation (Chesbrough, 2003), but apparently, this could apply to a startup as well. Because of the extreme focus and pride towards an internally developed technology, NIH could potentially take place at multiple levels within a startup organization, starting from the engineers and up to the top management. In fact, some startups blame NIH as a major reason for breaking up in the early stages.
- ***Protecting IP***: Startups raised concerns on protecting their IP when engaging in open innovation activities. This is in line with preceding studies, as it suggests that ineffective IP protection mechanisms prevent firms from being open (Drechsler & Natter, 2012). Therefore, startups need to consider the balance of endangering IP versus gaining innovative opportunities when engaging in open innovation activities.

Although, there are no established practices for overcoming these challenges, the interviewees commonly pointed out the importance of learning from past experiences, especially, learning from the years of mistakes and failure. As to the challenges related to mindset issues, the startups claim that being focused and being open can coexist, by keeping the focus on the execution side of the business. Additionally, for the challenges caused by the characteristics of the startup, there are certain thought processes that a startup can exercise, which will be examined in the following sections.

7.3. Open and Closed – a strategic decision process –

The interview with the startups revealed that the decision making process pertinent to open and closed innovation is closely tied to other strategic agendas: technical competence, marketing, and resource management etc. Many startups agree that they need to be open by nature, yet the question is not so simple when

it comes to selecting the actual open and/or innovation strategy. It requires close attention to the details and analysis conducted at multiple dimensions. The following suggests a simple but thought provoking set of questions that startups need to undergo when examining the open and/or the closed approach.

- *What problem am I solving*
- *What is the core to what you are doing*
- *How much resources do I have to solve the problem*
- *How much time do I have to solve the problem and what is the market window*
- *What are the things around the product that you don't need to (re) invent or innovate*

- **What problem am I solving?**

It is important to understand the characteristic of the problem when considering the open and/or closed approach. Startups view open innovation as more of a suitable approach for general-purpose solutions. When the problem is bigger and general, it is easier to create a business ecosystem with common interests and goals. On the contrary, when it comes to special purpose solutions, it becomes more challenging since the constituents inside a business ecosystem may have competing agendas and may be running on a different timetable.

- **What is the core to what you are doing?**

Whether in a large firm or in a startup environment, it is crucial to identify the core of what you are doing. The rule of thumb is that the closer you are to the core, you would want to gain more control - gain control in terms of technology, how it is being built, and when it is being built. However, since there are certain trade offs in engaging in open innovation such as losing control, startups should be selective and careful of when to adopt the open innovation approach. On another note, identifying the core is also crucial for making the build vs buy decision, which will be examined in the later sections.

- ***How much resource do I have to solve the problem?***

Innovation processes need to be considered in concert with resource management. Open innovation becomes a viable option for reinforcing the limited resources by collaborating with external resources. On the other hand, the involvement of additional resources and knowledge may cause the state of “having too many cooks in the kitchen”, holding the risk of diluting the innovating process. Indeed, prior research suggests that limited resources can become an advantage in that young firms come up with new ways of creating value that transcend existing conceptions of the market (Baker, Wilson, 2005). The interview responses coincide with the said theory, as startups named “working in small and smart teams” as an essential criteria for preserving an innovative environment. For this reason, startups need to be careful of the effects of the additional resources brought about by open innovation, so it does not dilute the innovational process.

- ***How much time do I have to solve the problem and what is the market window?***

Startups need to determine how much time is allowed to solve the problem. This may vary on such factors as the characteristic of the problem, market demand and the competitive nature of the problem. An accurate estimation of the time to market becomes essential, as the collaborative processes of open innovation introduces certain tradeoffs in terms of consuming more time. Similarly, it becomes imperative to understand what is called the “market window”, which is the ideal timing to introduce a product or a solution to the market. For example, if a startup is too early to enter the market, the risk of not being able to survive increases, because they will have to find other means to survive until the market is there. Vice versa, if they are too late to enter the market, the risk of larger firms catching up will increase. The startups always need to pay close attention to the trends of the larger firms, since the customers will tend to purchase from the larger firms if they can provide an equivalent solution to a startup. In other words, a startup cannot survive by merely coming up with a “me too product”. Translated into more of an open and closed innovation context, if a startup chooses to be open but is too late to enter the market, there is a possibility that you could “die on the

vine". On the other hand, if a startup selects the closed approach for more control and eat up its capital money along the way, that itself becomes a critical problem influencing the survival of a startup. In consequence, the startups need to conduct sensitivity analysis based on the market window and the most efficient way to reach the market in time by always asking the question, is it a smart move to innovate on your own (closed innovation) or better to innovate with others (open innovation).

- ***What are the things around the product that you don't need to (re) invent or innovate?***

When the decision process becomes closer to an operational level, the open and closed discussion will eventually turn into a build vs buy discussion; is it preferable to build it with your own resources, or is it preferable to buy an existing product or licensed knowledge in the market. Making the right sets of build vs buy decisions will obviously increase the efficiency and productivity within a startup, as it will decrease the risk of reinventing the wheel. As with open and closed, build vs buy decisions typically boils down to two dimensions: cost/economics and the time to market. It is also vital that the startups revisit the core value of what they are trying to provide when making this decision. As an example, even though if there seems to be abundant knowledge and/or off the shelf technology that is possible to acquire from the market, it sometimes become a worthwhile act to think about doing it on your own, if it will definitely help enhance the core value of a startup.

7.4. Case Studies

As examined in the previous sections, startups sometimes need to be eclectic in taking the open innovation approach. Presented below are cases in point to exemplify the importance of selecting a cohesive innovation strategy and how it influences the outcome of a startup.

- ***Case #1. Procket Networks***

Procket was a networking and telecommunication device startup founded in 1999. They started with the ambition of creating the next generation router, a high-performance networking device, which would compete head to head

against the networking giant, Cisco. Upon its inception, Procket seemed to possess all the correct formula for a successful exit: abundant venture capital funding exceeding \$300 million, a dream team comprised of talents such as Tony Li from Cisco and Steve Lynch from Sun Micro Systems and an innovative technology which would promise them a core differentiator in the router market. All these factors multiplied together lead to high expectations, as the valuation of Procket at its peak was estimated at \$1.5 Billion. Their innovation approach was somewhat unique for a high-tech startup, as they deliberately selected the closed innovation or the “black box” approach. In pursuit of differentiation, their strategic decision was to develop and manufacture all the components within their organizational boundaries; including software, silicon chips and associated hardware alike. This approach resulted in an extremely high burn rate, meaning that they were consuming too much equity dollars in prior to building a solid pipeline of customers. Added with the unfortunate economic climate at that time, especially the telecommunication expenditure downturn, they failed to identify new customers in time and eventually ran out of cash to run the company. The final outcome for Procket was disappointing; they lacked to acquire additional capital for their own survival and had no alternative but to sell their core assets to Cisco for a bargain price of \$89 Million.

Although multiple factors including market conditions influenced the outcome of Procket, it is evident that the innovation strategy was one of the key influencers. Procket’s undesirable outcome can be attributed to their adherence to the closed innovation approach. Moreover, there is also a possibility that Procket was in the state of severe target lock, as they lacked to modify their product and technology to other receptive markets when they had the chance to do. If they had thought about the option of taking the open innovation path, and had constantly debated about the build vs buy decision as a strategic agenda, the possibilities are that they could of saved more time and money potentially resulting in a different outcome.

- **Case # 2. Juniper Networks**

Juniper is a major networking manufacturing company, currently operating at a size of \$5.6 Billion in term of sales (FY2013). Pradeep Shindhu, a research

scientist at Xerox PARC started Juniper with an initial funding of \$200k in 1996. Shindhu identified the need for a high speed routing device to support the emerging Internet trends, and came up with revolutionary silicon that would carry packets at wire speeds. Juniper's innovation strategy was a mixture of open and closed innovation. As a startup, Juniper quickly identified what was core to their innovation and what was needed to solve the customer problems. For example, Juniper had the option to take an open approach to develop the router software, meaning that they could have relied on Cisco IOS technology or other available routing software in the market. Instead, they decided to take the software development into their own hands, and as a result developed a scalable and modular routing platform called the JUNOS, which would later become one of the key differentiators of the product. These efforts paid off, as the M40, Juniper's first shipping product became a huge hit which helped Juniper gain roughly 30% market share in the service provider market. Juniper later decided to implement the same innovation approach, when entering the enterprise market with an Ethernet switching product in 2008. This approach, however, did not turn out to be the same as when they first introduced the M40 back in the late 1990's. The Ethernet switching market was already established and saturated market, hence factors such as cost and time to market became important differentiators. As the market was favoring cost over features, the decision to develop its own software became somewhat of an overhead. This is the reason why some still argue that Juniper should have taken a more aggressive open innovation approach, such as relying on external licensing to develop software, when entering the said market.

The success and challenges of Juniper provide important implications on how to adopt open innovation within a startup environment. As a startup, Juniper had good understanding of their core capabilities, core values and also was conscious of what knowledge needs to be shared and what need not to be shared. They were also keen on making the right build vs buy decisions. Meanwhile, the challenges they faced when entering the Ethernet switching market imply that replicating successful innovation strategies from the past does not secure success in the current markets. Innovation strategy needs to be periodically revisited and modified accordingly, based on factors

such as availability of current resources, market conditions and product lifecycle. Within the open and closed innovation context, the level of openness and the method of acquiring external knowledge also need to be reevaluated from time to time.

- **Case # 3. Seamicro***(now a subsidiary of AMD)*

Founded in 2007 by industry veterans Andrew Feldman, Gary Lauterback and Anil Rao, Seamicro is a startup well known for pioneering a new category in the server market. At its inception, Seamicro decided to challenge the status quo by taking on the competitive server market, which at that time was dominated by large incumbents such as HP, Dell and IBM. By scrutinizing the pain point of innovative customers, Seamicro identified a unique problem within a datacenter, and came up with a solution that would dramatically save energy and space. The core of the solution was based on creating a new category of server product — an ultra dense server — which incorporated the technologies from supercomputing, networking, switching, and storage. Just like a small but skilled “sumo wrestler”, Seamicro used its smallness to its advantage. Once they identified the unique set of problem and solution, they were agile in building the product ahead of its potential competitors. In terms of innovation strategy, Seamicro took advantage of the open innovation approach, to build on their unique technical competencies. Open innovation for Seamicro was practiced at multiple levels. For example, formal and informal networking with potential customers and partners were regularly held, in an effort to fine-tune their solutions. Wherever applicable, external IP and off the shelf hardware were adopted in the R&D process to save money and time. They also were eager in forming business ecosystems with software vendors such as Red Hat to make their solution more appealing. As a result of their innovative activities, the first shipping product from Seamicro, the SM10000, was released in 2010. This was the perfect timing in terms of hitting the market window, as the initial product and the follow on products were extremely well accepted by the market, being deployed at multiple high caliber customer sites. This all lead to a successful outcome for Seamicro, which resulted in an acquisition by AMD for \$334Million in 2012. Larger incumbents such as HP, Dell and Intel followed the footsteps of Seamicro by later attempting to release an

equivalent solution, which again verified that Seamicro as a startup had the wisdom to see into the future.

A mixture of strong and committed leadership, an entrepreneurial mind set and unique technical capabilities coupled with the right set of innovation strategies all contributed to the success at Seamicro. A closer examination at Seamicro`s innovation strategy displays that they were perceptive to the advantages and disadvantages of open innovation. They embraced the extra innovational opportunities induced by open innovation, but at the same time were watchful on minimizing the negatives of this approach. The series of right decisions were made, as they were always focused on elevating their core differentiating values and made their strategic decisions based on reaching their strategic goal, that is “providing a unique set of solution to the right set of customers, at the right timing, ahead of the fellow competitors”. At an operational level, the correct set of build vs buy decisions lead to the agility and frugality of their operations. They were extremely focused, but the founders took extra precautions so that the firm will not fall into the pitfall of “target lock” and/or “NIH”. All in all, the Seamicro case is exemplary in a sense that it shows how the right set of innovation strategies could contribute to a successful outcome of a startup.

8. Analyses and Findings

This section presents an overall analysis and findings attained from the primary data.

8.1. The entrepreneurs/startups at Silicon Valley have an intrinsic motivation to open up and innovate.

The interview revealed that the entrepreneurs/startups see a positive relationship between the environment at where they innovate and with their preference of innovational approaches. It is true that the entrepreneurs do have an intrinsic motivation to open up and innovate which stems from their unique characteristic and cultural background, but it is also as a result of the influence of the environment at where they innovate. As examined in the previous sections, Silicon Valley embraces an open culture with an open mindset; hence it is natural

for the startups to be open by nature. In fact, all of the respondents named “open mindset” as an imperative for pursuing innovative activities. Moreover, the abundance of innovative talent and resources concentrated in Silicon Valley enables the startups to network at various levels; which is another prerequisite for engaging in open innovation.

8.2. The startups face unique challenges in implementing OI compared to a large firm.

The analysis indicate that there is a certain tradeoff associated with adopting open innovation in a startup surrounding, which is illustrated in Figure 5. By opening up, the startups gain more capabilities that lead to extra innovating opportunities but it comes with the pain of potentially losing control and efficiency.

- Insert figure 5. here-

By examining in more details, the analysis also indicates that the motives and challenges associated with startup open innovation have strong ties with the characteristics of a startup, i.e. smallness, focus and speed. The chart below represents a basic pros/cons analysis, mapped to the characteristics of a startup.

- ***Smallness (incl. Limited resources/capabilities, lack of initial credibility)***
 - + Access to external knowledge and resources
 - + Additional innovation opportunities (reinforcing technical competencies)
 - + Gain more legitimacy and credibility
 - + Increasing receptivity to the market
 - Challenge in managing the open constituents (as the smallest player)
 - Losing initiative or control (as the smaller player)

- ***Focus***
 - Diluting the innovation process
 - Deviate from perfection
 - Too many market options
 - Generally not suitable for innovating special purpose solutions

- **Speed/Efficiency**
 - + Lesser risk of reinventing the wheel (save time and money)
 - Additional transaction costs
 - Slowing down the innovation process

By examining the advantages and disadvantages, it is safe to assume that open innovation is a viable innovation strategy for mostly addressing the challenges associated with the smallness of a startup, but at the same time could negatively impact its focus and speed. Therefore, when the startups engage in open innovation, they need to be at least be aware of the potential downsides, more preferably, come up with measures to alleviate the negative impacts.

Since there are no clear-cut formulas in reaching answers to these questions, the startups have to go through a thought process to come up with the initial decisions. With regard to methods on mitigating the side effects of startup open innovation, startups also need to go through a trial and error process, since there are no established practices. The following suggests some thoughts on mitigating the negative impacts.

- **Controlling the level openness:** As preceding studies have suggested, an effective way to control the level of openness is by selecting the types of open innovation practices to be involved in, and also by selecting to whom to open up to (Cosh & Zhang, 2011). For example, a startup could intentionally decide not to get involved in formal type business ecosystem in the early stages, so to avoid the extra cost and slowness associated with participating in an ecosystem. Additionally, a startup could choose to open up to the parties only necessary, so to mitigate the risk of diluting the innovative process.
- **Opening up along the value chain:** A potential strategy for the startups could be to open up along the value chain. For example, a startup could take more of a closed approach when they are closer to the invention phase of innovation.(e.g., in the process of defining their core competencies). They

could open along as the startups enter the phase of testing their hypothesis with the customers, and ready to enter the commercial phase of innovation. By taking this approach, the startups could mitigate the risk of losing control in the earlier stages and later take advantage of the merits such as reinforcing their limited capabilities.

- ***Bulid vs Buy:*** Conducting Build vs Buy at the operational level proves to be an effective method to compensate for the negative aspects of startup open innovation. For example, a startup could make up for loosing speed and efficiency, buy acquiring the right sets of IP and components from the partners and/or the market.

In sum, the challenge for the startups is not to draw the line between “Open” or “Closed” approach. Rather, the real challenge resides in determining the level of openness, what to open and what to close, how to open, and when to open. This is the reason why, the startups preferred to use such expressions as “Open but Closed” and “Open and Closed – more of a hybrid approach” to demonstrate their preference in engaging in open innovation activities.

8.3. There are unique open innovation mechanisms specific to a startup.

As illustrated in figure 6., startups engage in open innovation by controlling the organizational boundaries. By controlling the boundaries, the startups are in a sense exercising a strategic framework known as dynamic capability; where dynamic capability is defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, 1997). Paraphrased from more of a startup perspective, startups intentionally control the boundaries, for the purpose of becoming receptive to the market, and as a method to reinforce their limitations resulting from smallness in size.

- Insert figure 6. here-

In comparison with the larger firms, there are notable differences in how the startups control their openness. First, due to their size and limited capabilities it is easier for the startups to identify their core capabilities, therefore easier to identify

the initial organizational boundaries. By contrast, a larger firm with multiple capabilities and agendas may find it difficult and more time consuming to draw the line. Second, the quicker decision process of a startup allows faster maneuver of the boundaries compared to larger firms. These two factors imply that the startups have the ability to adapt and modify faster to the open innovation process, than the large firms.

8.4. External factors as well as internal factors influence the implementation of open innovation in a startup.

Open innovation in a startup is influenced by multiple factors: environment, strategy and operational issues. Figure 7 outlines the influences in a hierarchical (reverse pyramid) manner. At an environmental level, factors such as location and market conditions could influence the openness of a startup. With regard to market conditions, when a startup is involved in a stable market, it is less challenging to engage in open innovation, since predictability and control becomes a lower priority. Whereas, if a startup is involved in more of a rapidly changing/volatile market, engagement in open innovation could become more challenging, as control and predictability becomes a higher priority. When it comes to the strategic level, it requires being in line with other strategies such as technical competence, marketing and resource management. Finally, at an operational level the build vs buy discussions need to be conducted.

-Insert figure 7 here-

The insights from the startups imply that open innovation cannot be treated as a standalone agenda. For open innovation to become a viable and practicable innovation strategy, it requires integration with the surrounding environment, other strategies and operational issues involved. More importantly, open innovation needs to be practiced in a cohesive manner that will ultimately lead to the value creation process of a startup.

Since the startups encounter countless uncertainties, choosing the right innovation strategy itself will not guarantee them success. However, it does become a vital factor for their growth and survival of a startup. The cases and findings imply that startups that have implemented open innovation with “strategic

integrity” succeed, whereas startups that lack integrity face serious situations and eventually flameout.

9. Limitations

This study has its potential limitations as the analyses are drawn from a single data collection point, single industry, with limited quantity of data. Nevertheless, it is safe to assume that the significance and universality of this study will not be lost for the following reasons. First, with regard to location, Silicon Valley is thought to be the leading high-tech cluster, and is the model of the other high-tech clusters in the world. Hence, it is possible to assume that certain commonalities exist with the other clusters of the world. Second, although this study limits itself to the ICT sector within the high-tech industry, preceding studies indicate that open innovation practices are applicable beyond high-tech, also adaptable to other industries as well. (Chesbrough, Crowther 2006) Third, to make up for the quantity of data, measures were taken to improve on the quality of data. These efforts include conducting interviews with high caliber entrepreneurs and professionals with diverse backgrounds, interviewing the VCs and analysts for extra validity, and asking the same interview question from multiple angles to increase reliability.

10. Contributions and Suggestions for Future research

This exploratory study complements the preceding open innovation studies, by providing practical and useful insights related to adopting open innovation in a high-tech startup surrounding. Since this study is based on the perspectives of the active entrepreneurs, prospective entrepreneurs could potentially benefit by examining the actual thought process and know how presented in this study. For the professionals whom are involved in supporting the startups, the cases and findings could also become useful, in such scenarios as conducting due diligence. and advising the startups.

To further embellish on this study, the following topics are provided as suggestions for additional future research.

- ***The influence of Venture Capitalists:*** Within this study, so called “classic VCs” were highlighted as influencers to startup open innovation. On the other hand, there are now other variations of firms that support the entrepreneurs, the seed accelerator being an example. Seed accelerators typically invest in smaller amounts compared to the classic VCs and provide fixed (short) term mentoring programs to the entrepreneurs. It would be a compelling topic to explore on how the mentoring program influence the startups in terms of innovation strategy. Another notable format for supporting the entrepreneurs is the EIR(Enterprise in Residence) program provided today by high-tech firms such as Cisco and Dell. EIR is an incubation program, where the host of the program supports the entrepreneur by providing initial funding and access to its own corporate resources(e.g. marketing and engineering). From the perspective of the firm hosting EIR, it is another way of engaging in an open innovation activity. From the entrepreneurs` point of view, the firm hosting the EIR could become a key influencer in shaping the startups` innovation strategy.
- ***Startup stages:*** Within this study, the stage of the startup was defined somewhat loosely, typically alluding to the pre IPO growth stage(early to mid stage) of a startup, but excluding the medium size firms with slower growth and 10+ years in operations. Startups within the growth stage can be dissected into smaller stages, accordingly to: number of years in operation, employee size, financing rounds and pre FCS(First customer shipment)/post FCS etc. Although it was not examined in details within this study, a more rigid study can be conducted by observing the differences resulting from different stages.
- ***Other Clusters/Ecosystems:*** This study examined the influence of Silicon Valley in relation to the startup innovation strategy. Since this study was conducted primarily at a single cluster, it could be a worthwhile effort to gather data from other clusters inside the US, and clusters outside of the US for comparison. It would be a compelling topic to compare the differences in terms of location, culture and industry and how it associates to startup innovation. It would also be an interesting topic to examine both the intra-cluster and inter-cluster activities and analyze how it effects startup

innovation.

- ***The direction of openness:*** The direction of openness (inbound, outbound, or bidirectional) was part of the agenda during the interview, however was not discussed in details. The interview responses revealed that most of the startups associated open innovation with inbound activities, which coincide with the preceding studies, as it suggests that inbound open innovation practices are far more diffused than outbound open innovation practices (van de Vrande et al, 2009). Given the importance of this topic within the open innovation research, it would a worthwhile effort to pay closer attention to the direction of openness, especially on the outbound and bidirectional open innovation activities.

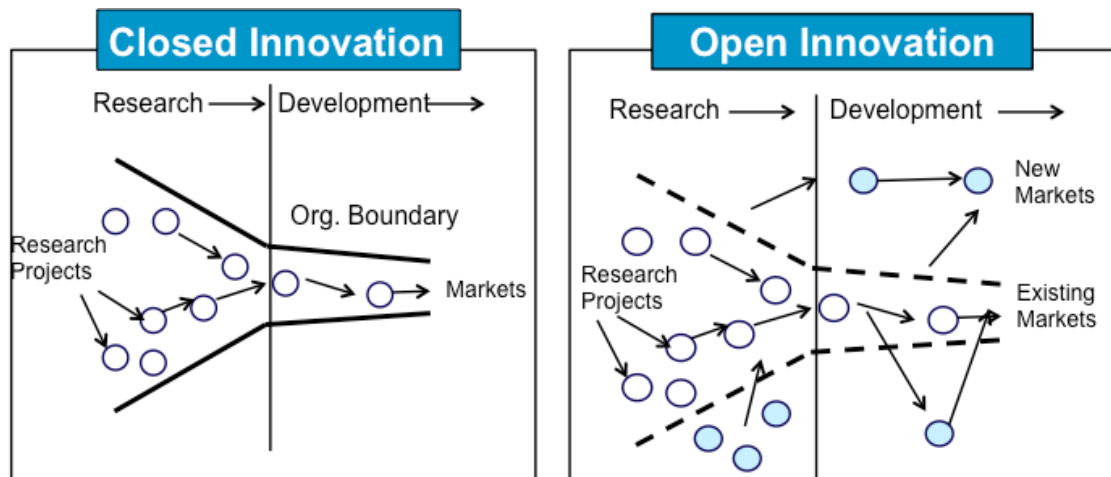
12. Acknowledgements

I would like to acknowledge and thank all the friends residing in Silicon Valley for devoting their precious time to share their perspectives on this topic; they were all essential in completing this paper

Appendices:

Appendix A: Figures and Diagrams

Figure 1. Paradigm shift from Closed to Open Innovation



(reference: Chesbrough, 2003)

Figure 2. Main focus of this study

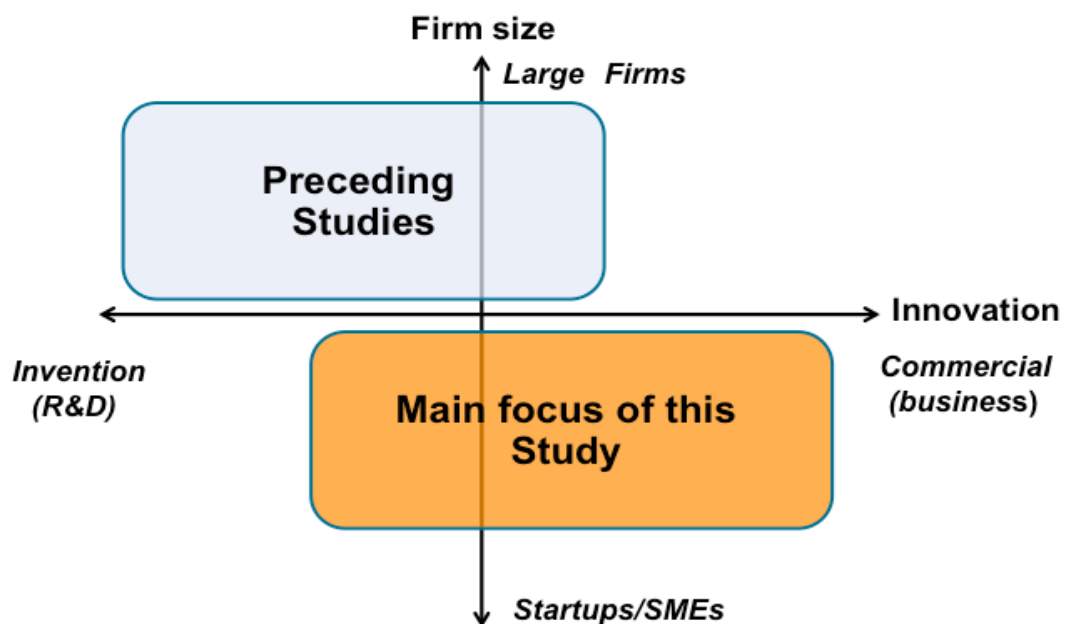


Figure 3. Interviewee types

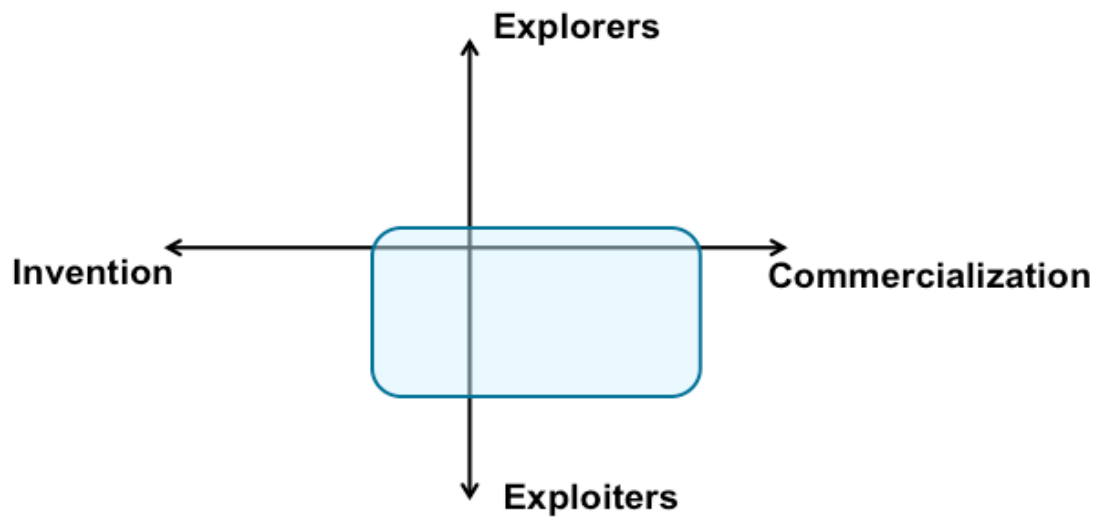


Figure 4. Silicon Valley - a recursive ecosystem

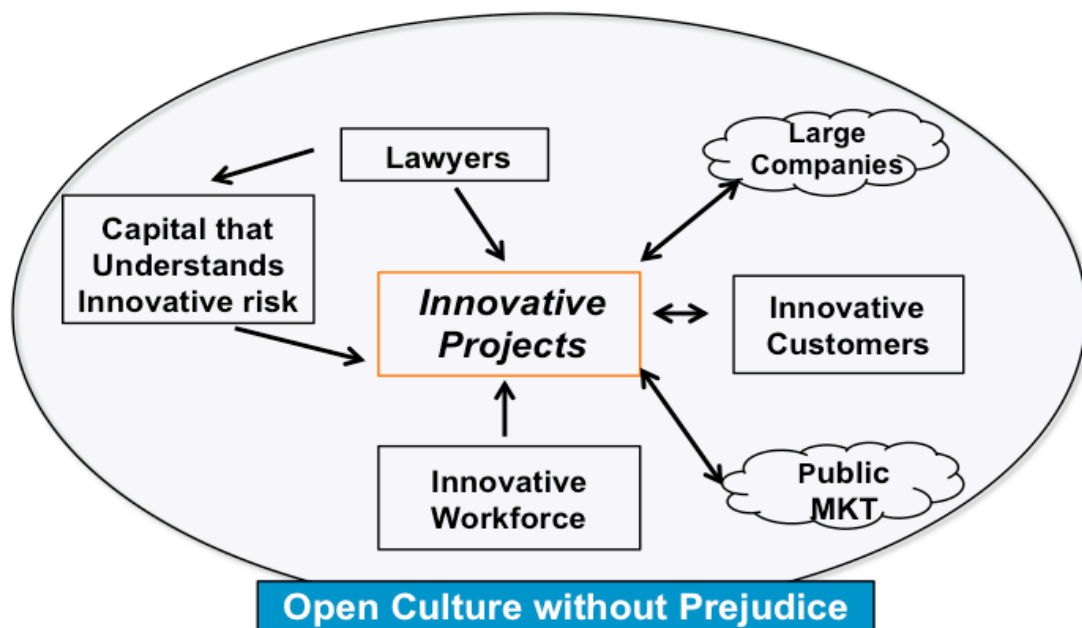
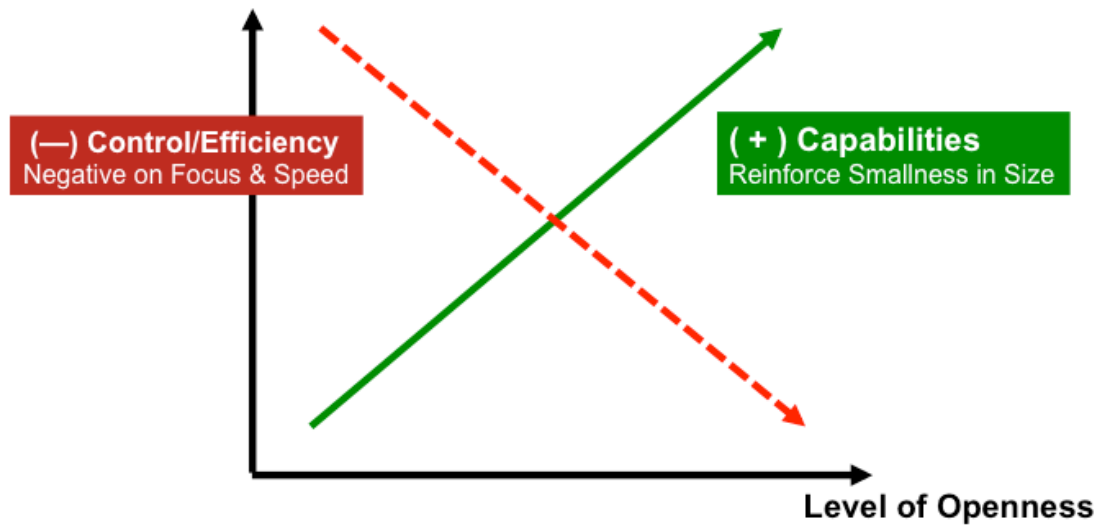


Figure 5. The tradeoff



Note: Diagram based on interview responses. Theoretically, the level of openness could have an opposite effect as depicted above.

Figure 6. Startup open innovation model

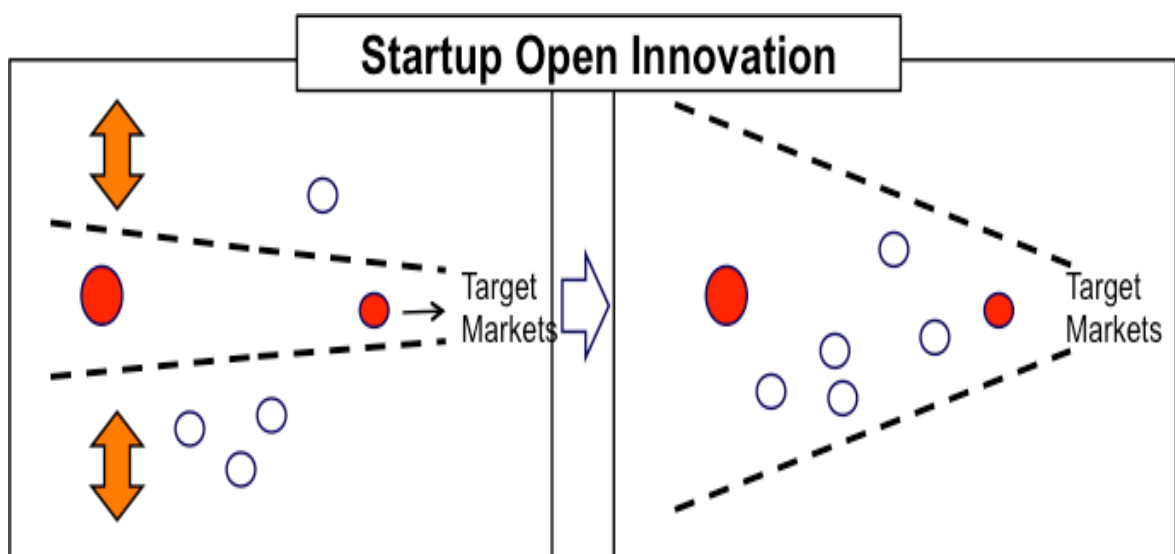
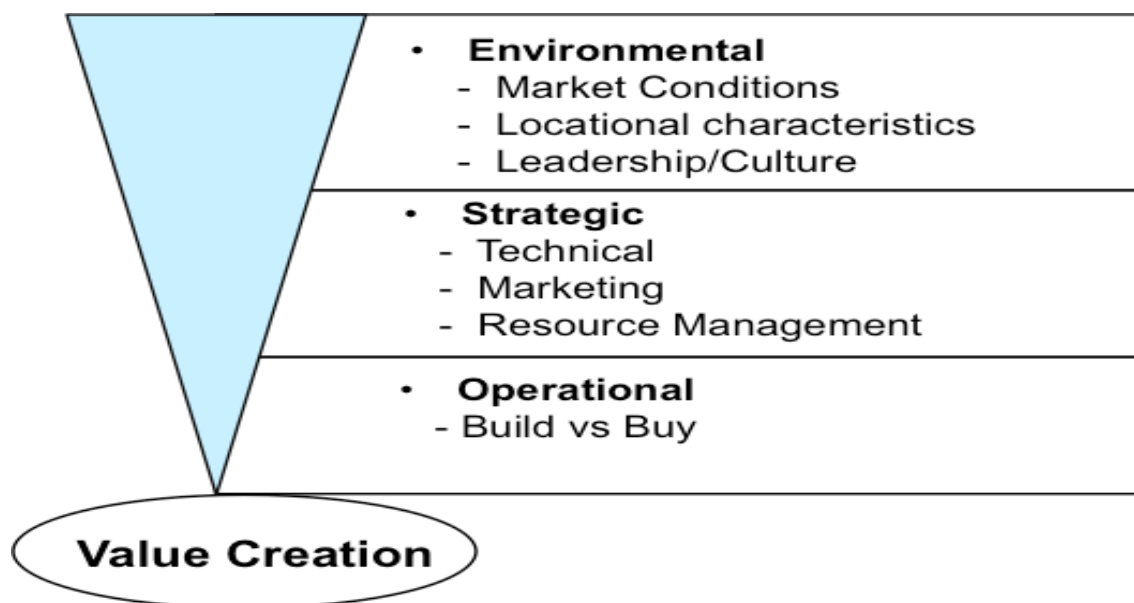


Figure 7. Influential factors



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