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Innovative business models for high-tech entrepreneurial ventures: the organizational design challenges

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1. INTRODUCTION

New customers' preferences, deregulation, and technological changes are currently facilitating the emergence of new business models and *business model innovation* (BMI) is increasingly attracting the attention of scholars and practitioners (Casadesus-Masanell & Zhu, 2013; Zott et al., 2011; Massa & Tucci, 2013). BMI refers to "the search for new logics of the firm and new ways to create and capture value for its stakeholders; it focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers, and partners" (Casadesus-Masanell & Zhu, 2013). In this chapter, we concentrate on BMI in the context of high-tech entrepreneurial ventures and study how BMI challenges the organizational design of these firms. We adopt a broad definition of BMI as deviation from the traditional ways in which "an organization orchestrates its system of activities for value creation" (Massa & Tucci, 2013: 9). Hence, the terms "*Business model innovation*" and "*innovative business models*" (which we use interchangeably in this chapter) refer to mentioned deviations from the traditional ways.

Academic literature on BMI has devoted attention to high-tech entrepreneurial ventures (e.g. Amit & Zott, 2001; Zott & Amit, 2007) showing that BMI creates entrepreneurial opportunities (Markides, 2008) and affects venture performance (Zott and Amit 2007, 2008). However, so far the literature has been silent on how BMI shapes the organizational design of high-tech entrepreneurial ventures. We contend that such an aspect is of paramount importance for these firms. High-tech entrepreneurial ventures operate in high velocity and uncertain environment where rapid changes require decision makers to process a large amount of information (Galbraith, 1974). A proper organizational design is thus fundamental for the effectiveness of high-tech entrepreneurial ventures' decision processes and ultimately for their performance. This holds even truer as the organizational design of a venture in its early years has an enduring effects on the organizational design that the firm adopts in subsequent phases of its lifecycle (Baron et al., 1999).

The lack of research on the relation between BMI and high-tech entrepreneurial ventures' organizational design is part of a more general gap in the organizational design literature. Indeed,

scholars in this field have not devoted much attention to the organizational design of entrepreneurial ventures (Colombo and Rossi-Lamastra, 2013). Conventional wisdom suggests that entrepreneurial ventures are different from established firms in several aspects. They have limited financial, technological and human resources (Becker and Gordon, 1966), lack sophisticated governance structures (Ambos and Birkinshaw, 2010) and legitimacy (Stinchcombe, 1965). Hence, knowledge on organizational design of established firms is not generalizable to entrepreneurial ventures.

In this chapter, we contribute to fill this gap by discussing the challenges posed to the organizational design of high-tech entrepreneurial ventures[1] by two innovative business models that these firms are increasingly adopting. Namely, we consider the business model based on collaboration with communities of users and developers (hereafter: *community collaboration BM*) and the business model based on market for ideas (hereafter: *market for ideas BM)*. Traditionally high-tech entrepreneurial ventures rely on internal research and development (R&D) and commercialize their innovations by moving along the value chain and internalizing downstream complementary assets such as production facilities, marketing channels, and so on. Prominent examples of entrepreneurial ventures adopting this traditional business model are Dell and Hewlett-Packard in their early years. Many firms are now innovating this traditional approach across its two main dimensions: the *organization of R&D* and the *control of downstream complementary assets*. In the former case, high-tech entrepreneurial ventures in-source external knowledge generated by communities of users and developers to cope with the surge in development costs and competition. In so doing, these firms move the locus of innovation outside their boundaries by engaging in an increasingly salient type of open innovation (Chesbrough, 2003)[2]. Collaboration between high-tech

[1] The discussion here is highly relevant for newly established ventures, which are adopting one of these models and build their organizational design accordingly. We do not claim that there are similar issues for established firms, which want to innovate their business model. Indeed, established firms already have an organizational structure and transition from one BM to another BM is different from newly established ventures. For arguments about challenges of BMI for established firm see for example Santos et al, (2014) in chapter 5 of this book.

[2] The two BM presented here also echo mainstream notions in open innovation, namely *inbound* (community collaboration BM) and *outbound* (market for ide BM) open innovation. Inbound open innovation refers to internalizing

entrepreneurial ventures operating in the software industry and the community developing Open Source software (hereafter: *OSS entrepreneurial ventures*) is a case in point (Bonaccorsi et al., 2006).

In the case of market for ideas BM, high-tech entrepreneurial ventures generate value by commercializing their ideas instead of their products. These firms focus on developing technologies, whilst other firms that possessed the required complementary assets commercialize products based on these technologies (Arora et al., 2001a). High-tech entrepreneurial ventures with a market for ideas BM capture value from a variety of technological exchanges like licensing, cross-licensing, R&D joint ventures, technological partnerships, and so on (Arora et al, 2001a; Gambardella and McGahan, 2010; Grindley and Teece, 1997).

Figure 1 summarizes the above discussion. The situation in which firms conduct R&D internally and revenues result from the commercialization of technology-based products corresponds to the *traditional BM* of high-tech entrepreneurial ventures. Conversely, the situation in which a venture focuses in developing technological knowledge instead of products and the control of downstream complementary assets is external configures the *market for ideas BM*. The situation in which a high-tech entrepreneurial venture opens up its R&D processes and relies more on external ideas developed by communities of users and developers configures the *community collaboration BM*. Finally, a *mixed model* is possible which is characterized by external R&D and external control of downstream complementary assets.

We do not claim that these business models are discrete alternatives. They can indeed co-exist in the same firm, being suitable for different transactions with different customers[3]. However,

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of external knowledge, while outbound open innovation refers to the transfer of a firm's technology to other actors (Chesbrough & Crowther, 2006).

[3] It is worth noting that besides being based on the leveraging of innovative technological knowledge, the market for ideas BM and the community collaboration BM differ regarding their approach toward IP protection. While in the former business model, IP protection is essential in order facilitate transactions in market for ideas, in the latter loose IP protection is necessary to foster knowledge exchange and sharing with communities of users and developers. High-tech entrepreneurial ventures are more likely to adopt a market for ideas BM when the appropriability regime of the industry in which they operate is *tight*.

for the sake of simplicity, in this chapter, we analyze the market for ideas BM and the community collaboration BM separately and set aside the mixed model. As regards to the organizational design dimensions considered in this paper, we root in mainstream research (Galbraith, 1974; Colombo et al., 2008) and focus on the *organizational structure* (i.e., hierarchy and task specialization) and *delegation of decision authority*.

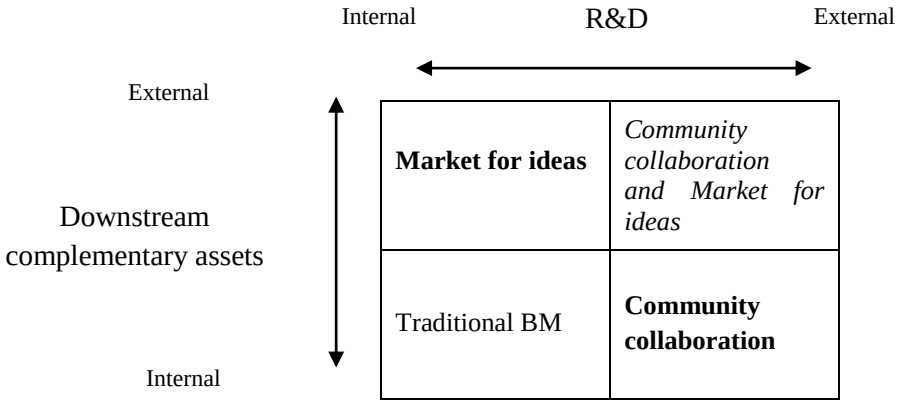

Figure 1- BMI in high tech entrepreneurial ventures.

The chapter is organized as following. Section 2 illustrates the two innovative business models we are focusing on in this chapter. Section 3 discusses the challenges that these business models pose to the organizational design of high-tech entrepreneurial and offers possible solutions to them. Finally, section 4 concludes and summarizes possible promising avenues for future research.

2. BMI FOR HIGH-TECH ENTREPRENEURIAL VENTURES

The business model (BM) of a firm reflects the "management hypotheses about what customers want, how they want it, and how an enterprise can best meet those needs and get paid for doing so" (Teece, 2010, pp 172). Hence, the BM of a firm sketches the business logic of how to

manage resources and exploit knowledge, how to create and capture value for stakeholders and define the landscape that venture operates (Amit and Zott, 2001; Trimi and Berbegal-Mirabent, 2012; Casadesus-Masanell and Ricart, 2010). The BM depicts the design of *transaction content*, *structure*, and *governance* to create value through the exploitation of business opportunities. Governance refers to who is responsible for activities and controls resources and to incentives. Structure defines how transactions are linked and determines their "*flexibility*", "*adaptability*" and "*scalability*". Content refers to what is exchanged and what resources are required for the exchange (Amit and Zott, 2001). Referring to this BM definition, any change in conventional business models namely changes in content, structure or governance of transactions turns out to be a BMI.

Chesbrough (2006) argues that the rise in development cost and the shorter product life cycle force firms to modify their BM regarding where to get the ideas and how to commercialize the ideas. The new BM, which is different from traditional BMs where firm discover, develop and commercialize technologies internally, creates new opportunities for entrepreneurial ventures to create and capture value despite their limited financial resources, scant specialized employees and lack of downstream complementary assets (van de Vrande et al, 2009). In a typology of BMI developed by Santos et al., (2014) in chapter 5 of this book, this change is categorized in repartition, i.e., "altering the boundaries of the focal firm by moving an activity unit across firm boundaries. The organizational location of an activity unit moves from outside to inside the firm or from outside to inside the firm." As figure 1 shows, in community collaboration BM the research development expands outside boundaries of firm and in market for idea BM the downstream complementary assets, which are necessary for commercialization, are controlled by external actors. In this section, we discuss these two BMs, which are deviations from traditional business model adopted by high-tech entrepreneurial ventures.

2.1. The market for ideas BM

While Lamoreaux and Sokoloff (1996, 1999) have documented the existence of a lively market for patented technologies in 19th century, in the last 30 years there has been a surge in markets for ideas with a variety of technological exchanges through R&D joint ventures, partnerships, licensing, cross-licensing and so on (Arora et al, 2001a). Empirical studies point out the increasing role of licensing in high-tech industries around globe since 1990s (Grindley and Teece, 1997; Dengan, 1998; Sheehan et al, 2004; Zuinga & Guellec, 2008; Arora et al, 2001b) driven mainly by Information and Communication Technology (ICT) and by the Bio-Pharmaceutical industry.

According to Arora et al. (2001a), markets for technologies are highly beneficial for high-tech entrepreneurial ventures, which suffer from liability of newness and smallness despite having competitive advantage in technology development. These firms indeed produce high-quality technology[4], but usually lack the resources and complementary assets needed to manufacture and commercialize technology-based products. Also, there is the risk that life span of these downstream activities might be longer than the lifecycle of the technology[5], generating underutilized assets, which lead to pressures for developing new technologies. When markets for ideas are well-developed, high tech entrepreneurial ventures lacking resources and complementary assets have the option of focusing on developing technology and transferring it to third parties (usually larger firms), which possess resources and downstream assets (Grindley and Teece, 1997). Gambardella and McGahan (2010) provide a comprehensive list of entrepreneurial ventures in different industries, which primarily focus on markets for ideas. These firms are for instance common in biotech industry. While in the 1980s, the ideal path for a biotech was to become a drug manufacture, in recent years biotech entrepreneurial ventures mainly focus on the development of a

[4] Technology can take form of technological services, intellectual property, software code, design or product (Arora et al, 2001a) on so on.
[5] This frequently happens in the pharmaceutical industry, where the life of a molecule is limited to patent life and the development of a new molecule is very uncertain and often depends on serendipity.

molecule of drug to be licensed to large pharmaceutical firms (Arora and Gambardella, 1995; Gambardella and McGahan, 2010). Other examples are specialized engineering firms in chemical processing industries, firms designing chips in semiconductor and software firms (Arora and Gambardella, 2010, 1998; Hall and Ziedonis, 2001; Cockburn and MacGarvie, 2011).

The main concern for high-tech entrepreneurial ventures adopting a market for ideas BM consists in not appropriating the full value from their technology (Caves et al., 1983). These firms are indeed largely dependent on downstream manufacturers and providers of complementary assets and thus are plagued by inefficiency of contracts and lack of bargaining power (Arora et al., 2001a).

In particular, value appropriation by high-tech entrepreneurial ventures with a market for ideas BM is easier in the short term than in the long term as licensing a technology causes its diffusion and increases the risk of imitation. A high-tech entrepreneurial venture usually protects itself from the risk of imitation by innovating and producing new technologies. However, this is hard to achieve due to the toughness of innovation race and to the heterogeneous value of technologies (Arora and Gambardella, 2010). Alternatively, a high-tech entrepreneurial venture can provide complementary services associated to its technologies such as modifications and improvements of other technologies. However, also this strategy is not straightforward and requires significant investments. Saying that, the difficulty of long run success for high-tech entrepreneurial ventures adopting a market for ideas BM makes them a potential acquisition targets for large firms, being acquisition the natural outcome of this model.

Moreover, high tech entrepreneurial ventures adopting a market for ideas BM may have an advantage in focusing on *general purpose technologies* (Arora and Gambardella, 2010). Indeed, developing general purpose technologies allows to license technologies within a wider range of markets and industries, thus obtaining revenues from numerous customers (Thoma, 2009). A large number of customers also create positive network externalities, which favour the attraction of further customers. Moreover, general purpose technologies are not dependent on limited specialized downstream assets. This makes high-tech entrepreneurial ventures less vulnerable in negotiation

and less dependent on the success of a single downstream manufacturer (Gambardella and McGahan, 2010). Examples of general purpose technology suppliers are common in software industry (Giarratana, 2004).

However, the development of general purpose technologies pose two major challenges. The wide range of potential applications is also associated with higher competition. Furthermore, capturing the full potential of general purpose technologies requires marketing insights in addition to technological skills (Gambardella and McGahan, 2010). As it is difficult to predict in which industries and markets these technologies will be applicable, it might be of great help to create a community of users that fosters exchange of information about further possible uses. Pollock and Williams (2009) explained how a firm that developed a general purpose ERP system for companies was able to successfully modify the business version of its software in a version ideal for universities by creating a community of users in universities who provided feedback.

To conclude, from the discussion above it emerges that the main challenges of market for ideas BM is to render entrepreneurial ventures adopting this BM less dependent from third parties and less exposed to imitation. Moreover, this BM also requires searching actively for wider applications and users of the technology. This in turn requires frequent interactions with current and potential customers to get deeper insights and access to knowledge possessed by them. As extensively discussed in section 3, proper organizational design can be of great help in overcoming the challenges posed by the market for ideas BM.

2.2. The community collaboration Business Model

As a reaction to the increase in development costs and competition, high-tech entrepreneurial ventures are opening up their innovation processes and increasingly using external knowledge produced by communities of users and developers. A prominent example of this trend is collaboration with the community producing OSS by entrepreneurial ventures operating in the

software industry (Chesbrough and Appleyard, 2007). Despite its initiation as an ideological movement (Stallman, 1984), OSS has gained significant commercial importance in the software industry (Fitzgerald, 2006), shifting from a pure community model to a commercial milieu (Harison and Koski, 2010). The success of OSS products such as Linux, Apache web server, Sendmail and Firefox has made OSS as a market trend in the software industry (von Hippel & von Krogh, 2006). In 2013, more than 3.4 million developers contribute to 324,000 OSS projects hosted on Sourceforge.net[6]. A survey taken on 740 software industry executives in 2012 forecasts that in 2016 OSS-based solutions will dominate the majority of software markets[7]. Currently, many software entrepreneurial ventures have entered the market to profit from OSS (Gruber & Henkel, 2006), thus adopting a community collaboration BM based on the collaboration with the OSS community. The attractiveness of this BM has been fuelled by the success of VA Linux and RedHat in their initial public offering (IPO), which lead to flow of capital to OSS entrepreneurial ventures (Moody, 2001; Weber, 2004; Aslett, 2009).

Several studies have investigated why firms participate in the OSS and how they derive revenues from it (see e.g., Behlendorf, 1999; Bonaccorsi et al., 2006; Dahlander and Magnusson, 2005, 2008; Perr et al, 2012 among the many others). A community collaboration BM has two main distinctive features: *collaboration with the OSS community* beyond firm boundaries and *a loose regime of intellectual property* (IP) protection, which fosters instead of forbidding the access to information. OSS entrepreneurial ventures do not control the OSS community resources, which reside in the OSS community (Dahlander and Magnusson, 2008). This poses challenges, which OSS entrepreneurial ventures must address to achieve success. First, the OSS community is *open*: heterogeneous people with different skills and motives can join OSS projects (Von Krogh et al, 2012). Such heterogeneity is not (fully) observable from outside the community and influences the quality of produced codes (Colombo et al., 2013). Second, since there are no contractual ties and

[6] http://sourceforge.net/about.

[7] http://northbridge.com/2012-open-source-survey.

enforceable agreements between OSS entrepreneurial ventures and OSS developers, it is hard to control the OSS development process and its outcome. This is a major drawback for OSS entrepreneurial ventures, which must commit to clear road map of high-quality software releases to make profits and attract external capital (O'Mahony and Bechky, 2008). Third, due to leadership structure of OSS projects (O'Mahony and Ferrero, 2007; Dahlander and O'Mahony, 2011), relevant information about software development may be possessed by individuals who are not the leaders of the project and who OSS entrepreneurial ventures can hardly identify from the outside. Fourth, to proficiently collaborate with OSS developers who often have a strong ideological orientation (Raymond, 2001); OSS entrepreneurial ventures must comply with the written and unwritten norms ruling the OSS community (Agerfalk and Fitzgerald, 2008). The ignorance of these norms creates conflicts with OSS developers, which hinder knowledge transfer (Dahlander and Magnusson, 2005).

In this framework, two different approaches for accessing and using the resources of the OSS community are possible. First, OSS entrepreneurial ventures can just use the OSS code freely available on the Web and modify it according to their customers' needs without any significant contribution to the OSS community. Despite being simple, this approach may cause negative image and create conflicts with OSS developers, who may perceive the venture as a free rider (Dahlander and Magnusson, 2005). Alternatively, OSS entrepreneurial ventures can play an active role in the OSS community by directly contributing to the development of OSS projects either by launching new OSS projects or by supporting existing projects (O'Mahony and west, 2008; Henkel, 2009). In this case, OSS entrepreneurial ventures pay their employees to write OSS code and documentation or to answer technical questions by OSS users (Lakhani and Von Hippel, 2003). This pro-active approach provides visibility and direct access to the development process and allows OSS entrepreneurial ventures to exert an influence on the project (O'Mahony and Bechky, 2008). OSS entrepreneurial ventures with a proactive approach learn to identify high quality pieces of OSS code to be integrated with their own solutions, gain specific knowledge about potential applications of

the OSS code to their business and can identify the most talented developers in the community to collaborate with (Dahlander and Wallin, 2006; Dahlander, 2007; Eilhard, 2008).

The loose IP protection makes revenue generation out of the OSS rather complicated, as OSS firms cannot directly sell OSS code. The literature on OSS has identified several models that OSS entrepreneurial ventures adopt to generate revenue from OSS (Perr et al, 2010; Alexy and George, 2013). Perr et al. (2010) categorized OSS revenue generation models in the major groups of *dual licensing models* (Goldman and Gabriel, 2005), *proprietary extensions to OSS (hybrid models*, Bonaccorsi et al, 2006; Casadesus-Masanell and Llanes, 2008) and *sales of complementary services or products*, such as professional services and consulting, support, subscription and hardware devices (Gruber and Henkel, 2006).

In the dual licensing, OSS entrepreneurial ventures license two different versions of their software under different licenses (*public licence* and *commercial licence*) to different customer groups (e.g., individual users vs. firms). Examples of OSS entrepreneurial ventures with this revenue generation model are MySQL and Sleepycat (Perr et al, 2010; Goldman and Gabriel, 2005). In hybrid models, OSS entrepreneurial ventures monetize by sale of proprietary extensions for OSS core or alternatively allow OSS extensions to their proprietary code (Casadesus-Masanell and Llanes, 2008). The prominent examples of OSS entrepreneurial ventures with hybrid models are SugarCRM, Codeweavers, Zend and Black Duck Software (Perr et al, 2010). Finally, OSS entrepreneurial ventures can generate revenue by offering complementary services such as consulting, implementation and training for customers that choose OSS solutions (Alexy and George, 2013). Among ventures offering complementary services we can mention Red Hat, Compiere, JBoss, SpikeSource and Mazu Networks (Perr et al, 2010). Alternatively, OSS entrepreneurial ventures use OSS software in hardware products, which constitute their main sources of revenues. For example, OSS entrepreneurial ventures tailor the Linux operating system for devices such as mobile phones, game consoles and machine controls (Gruber and Henkel, 2006). These revenue generation models are not mutually exclusive: OSS entrepreneurial ventures

usually adopt more than one of them[8]. The success of each model requires careful attention to the design and management of collaborations with the OSS community and of IPRs and along with an in deep understanding the target market (Perr et al, 2010). Again, we contend that entrepreneurial ventures' organizational design is crucial to this purpose.

3. BMI AND THE ORGANIZATIONAL DESIGN OF HIGH-TECH ENTREPRENEURIAL VENTURES

3.1. The organizational design of high-tech entrepreneurial ventures

Building on Colombo and Rossi-Lamastra (2013), in this section, we illustrate the peculiarities of the organizational design of high-tech entrepreneurial ventures by focusing on two prominent dimensions: *structure* and *decision system*. In the next section, we explore the organizational design challenges posed by the adoption of the market for ideas BM and the community collaboration BM.

Structure is defined as the "*sum of total of the ways in which a firm divides its labor into distinct tasks and then achieves coordination among them*" (Mintzberg, 1979, p.2). In general, entrepreneurial ventures have a very simple structure (Stinchcomb, 1965). Hierarchy is flat and includes two layers: the top management team (TMT) and the non-executive employees (Baron et al., 1999). As firms grow, the two layer-hierarchies may evolve into a three layer-hierarchy through the creation of a middle management layer (Colombo and Grilli, 2013).

Decision system determines who has the authority in the decision making process. It specifies the members of organization who are responsible for decisions and the modes for taking these decisions (Keidel, 1995). Entrepreneurial ventures usually have a simple decision system (Colombo et al., 2012), with decision authority mainly concentrated in the hands on the members of the TMT.

The organizational design of high-tech entrepreneurial ventures is shaped by the exposure to high-velocity environments in which these firms operate (Bourgeois and Eisenhardt, 1988) and by

[8] In addition, Bonaccorsi et al. (2006) have shown that OSS entrepreneurial ventures tend to mix both OSS and proprietary business models.

the crucial role of high skilled human capital in value creation (Unger et al, 2010). High-velocity environments require that organizational structure and decision system be designed to achieve both *flexibility* and *efficiency* (Davis et al., 2009). Flexibility enhances the ability of capturing new and unpredictable opportunities[9] (Weick, 1993), while efficiency favours the quick and proficient exploitation these opportunities (Adler et al., 1999). As regards to structure, formalization of roles and specialization of tasks are mandatory as they increase the speed and accuracy of decisions and execution through learning-by-doing (Foss et al, 2013). Moreover, specialization allows organizational members to use their highly specific knowledge in decision-making (Sine et al. 2006). As regards to decision system, selective decentralization of decisions is of crucial importance (Sine et al., 2006). Specifically, TMT members must delegate operative decisions while retaining authority on high-level strategic decisions (Bourgeois and Eisenhardt, 1988). Selective delegation positively affects the organizational efficiency as it allows TMT members to concentrate their time and effort on high-level strategic decisions (Colombo and Rossi-Lamastra, 2013).

Task specialization and selective decentralization of decisions have a close relationship with the depth of corporate hierarchy. By hiring a middle manager, thus creating a three layer-hierarchy, TMT members can delegate operative decisions to the middle manager and focus on strategic decisions. Colombo and Grilli (2013) show that the hiring a middle manager is related to strength of competition and the uncertainty of business environment in which high-tech entrepreneurial ventures operate. This is in line with Galbraith (1974) argument: task specialization and organizational depth increase firms' capacity to process information.

Besides assuring both flexibility and efficiency, the organizational design of high-tech entrepreneurial ventures should serve the purpose to leverage individual knowledge and transform it in organizational knowledge (Foss et al., 2010). TMT members and key employees who master sophisticated technological knowledge play a vital role for sustaining high-tech entrepreneurial ventures' competitive advantage through innovation (McMuller and Shepard, 2006). For instance,

[9] Developing a new product or service, entering new market, etc.

as high-tech entrepreneurial ventures usually lack resources to offer talented individuals an attractive salary, they can organize to offer employees autonomy and challenging task to leverage their intrinsic motivations (Kemelgor and Meek, 2008).

3.2. The organizational design challenges of the market for ideas BM

It is reasonable to expect that the organizational design challenges faced by high-tech entrepreneurial ventures adopting a market for ideas BM differ from those of their peers that operate in the market for products. First, high-tech entrepreneurial ventures adopting a market for ideas BM are actually R&D labs. Despite the tight appropriability regime of the industries in which usually these firms operate, defending technologies from imitation is a major concern. In this regards, the granting of the *first patent* is a crucial, although difficult to achieve, milestone. The limited resources of high-tech entrepreneurial ventures prevent these firms from obtaining and then effectively using patent protection (Acs and Audretsch, 1990). Thus, high-tech entrepreneurial ventures usually take time to get their first patent (if they ever succeed in obtaining it). Patenting involves indeed significant application costs (e.g., the filing and examination fees); while high-tech entrepreneurial ventures normally lack the resources to commit credibly to defend their patents in courts (Aroundel, 2001).[10] Accordingly, in most cases, secrecy is the best protection mechanism for high-tech entrepreneurial ventures in the market for ideas. Therefore, in their pre-patenting phase, these firms must cope with significant *appropriability hazards*. To cope with these appropriability hazards, it is reasonable to expect that high-tech entrepreneurial ventures which adopt a market for ideas BM and rely mainly on secrecy prefer to avoid adding new functional competences to their TMT or hiring a middle manager so as to reduce the risks of technological linkages. When the need for new competences becomes compelling, these firms likely prefer to enlarge the TMT by taking

[10] Resource scarcity also prevents high-tech entrepreneurial ventures from resorting to strategic appropriability mechanisms that are widely used by large incumbent firms, such as quickly climbing the learning curve or reducing time to market (Levin et al., 1987). Obviously, the receipt of VC funding relaxes the financial constraints plaguing high-tech entrepreneurial ventures, and thus significantly changes the scenario described above.

on board another owner-manager instead of appointing a salaried top executive. Indeed, the financial investment that the new owner-manager makes in the high-tech entrepreneurial venture serves as an *hostage* that makes her commitment of un-disclosing corporate secrets more credible (Williamson, 1983). Such a hostage is lacking in the case of the appointment of a salaried manager, who invests only its human capital in the entrepreneurial venture without providing financial resources. Accordingly, the appointment of a salaried manger engenders the risk of opportunistic behaviours, which pave the way to detrimental technological leakages if the salaried executive leaves the firms because a competitor hires her or she founds her own entrepreneurial venture. In a similar vein, we posit that in the pre-patenting phase, high-tech entrepreneurial ventures would prefer to adopt more centralized decision systems. Indeed, centralization reduces the need for information exchanges among firm's personnel, thus reducing the risk of detrimental technological leakages by firm's executives and line works that know relevant information.

Furthermore, we argue that high-tech entrepreneurial ventures in the market for ideas have a narrower set of decisions in comparison with firms that operate in the market for products. In most of the cases, owner-managers have just to take few crucial decisions about technology and its licensing, thus being less likely to suffer from information overload. Consequently, we expect that high-tech entrepreneurial ventures adopting a market for ideas BM tend to centralize these few crucial decisions and are less compelled to increase the depth of their corporate hierarchy (see Colombo and Grilli, 2013 for a similar argument). Conversely, when high-tech entrepreneurial ventures operate in the market for products, complementary assets are fundamental for successfully developing the business (Teece, 1986; Gans and Stern, 2003). High-tech entrepreneurial ventures do not normally possess these complementary assets nor own the resources and competences to develop them. Thus, collaborations with external third parties possessing these assets are pivotal and urge high-tech entrepreneurial ventures to adopt a suitable organizational design. Indeed, numerous collaborations may cause information overload for TMT members (Simsek, 2009), while relevant knowledge may be dispersed across multiple sources. Adding new functional competences

to the TMT, specializing TMT roles or increasing the vertical depth of the organization may help in coping with information overload and dispersion. For instance, high-tech entrepreneurial ventures might want to hire an alliance manager to whom delegate decisions regarding external collaborations with other firms or universities.

Third, since the core activity of entrepreneurial ventures adopting a market for ideas BM is focused on idea generation and technology development, the main assets of these firms are undoubtedly their high-skilled employees, who require an *ad hoc* design of incentives[11]. Innovative projects are associated with high uncertainty and task complexity, which make their outcome unpredictable, hard to quantify, and non-immediately observable. Therefore, it is very difficult to link rewards to effort or performance. Having a flat organization may be of help as shorter organizational distance between TMT and researchers favours the monitoring of employees (Zenger, 1994). More importantly, delegation of decision authority over technology-related domains to high-skilled employees may serve two main purposes. In line with the Hayekian principle of collocation of knowledge and decision rights, delegation allows high-skilled employees to better direct and conduct their knowledge intensive work with a positive effect on performance[12]. Moreover, delegation boosts employees' intrinsic motivations (see e.g., Bartling, et al., 2013), thus serving as an effective incentive along with salary (Gambardella et al., 2013).

3.3. The organizational design challenges of the community collaboration BM

As discussed in section 2.2, OSS entrepreneurial ventures face severe challenges in insourcing valuable knowledge from the OSS community. Dealing with these challenges requires an appropriate organizational design.

[11] Baylin (1985) has shown that monetary incentives are not the most important factor in increasing motivation of knowledge-workers.

[12] Delegation implies the risk of *loss of control* (Aghion and Tirole, 1997). Accordingly, Gambardella et al. (2013) have shown that firms are more likely to delegate authority to knowledge workers in projects that do not deal with a firm's core of business.

Colombo et al. (2013) have argued that the organizational practice of allowing firm programmers to contribute autonomously to OSS projects in which OSS entrepreneurial ventures do not contribute on their own behalf is highly beneficial. First, as aforementioned, high-skilled employees especially appreciate autonomy in job environment (Finegold and Frenkel, 2006). Thus, granting autonomy to firm programmers boosts their intrinsic motivations with a positive impact on job satisfaction and productivity (Foss et al., 2010). Second, the practice increases reputation and visibility of OSS entrepreneurial ventures in the OSS community by showing respect and compliance with the OSS norms of reciprocation and knowledge sharing. Such a good reputation makes OSS developers keener on collaborating with OSS entrepreneurial ventures (Osterloh and Rota, 2007). Finally, autonomous contribution by firm programmers to OSS projects help OSS entrepreneurial ventures to identify valuable OSS knowledge and to use it internally proficiently (Colombo et al., 2013). Indeed, firm programmers usually have an information advantage over their corporate superiors as regards to collaboration with the OSS community. Indeed, they often play an insider role within OSS projects (Dahlander and Wallin, 2006), because participation in the OSS software development is part of their daily work or they contribute to OSS in their spare time. Thus, they possess specific knowledge of the OSS community. OSS entrepreneurial ventures can leverage this specific knowledge by granting their programmers autonomy and letting them to act as gatekeepers between the firm and the OSS community (Chan and Husted, 2010).

Granting autonomy may also have a dark side. Firm programmers may behave opportunistically and choose to contribute to OSS projects that give them private benefits (e.g., OSS projects through which they can signal their ability on the job market, Lerner and Tirole, 2002; Von Krogh et al., 2012). Reasonably enough, employees adopting opportunistic behaviours run the risk of losing their autonomy or even their job (Baker et al, 1999). This of course limits them in following personal objectives, which are not aligned with those of their venture. Anyway, opportunistic behaviours from firm programmers likely diminish the return from adopting the aforementioned practise. High-powered incentives – e.g., linking programmers' salary to

performance (Gambardella et al., 2009) – prevent these behaviours. However, the adoption of these incentives is possible only when managers can closely monitor their employees. This happens for instance in small firms where employees can be directly observed by their superiors and mutual control among employees exist (Knez and Simester, 2001). In general, having a flat hierarchy favours monitoring and makes it is easier to align firms' and employees' objectives (Alonso and Matouschek, 2008). Accordingly, OSS entrepreneurial ventures intending to adopt the practise of allowing their programmers to contribute to OSS projects autonomously should carefully evaluate the benefits of having a flat hierarchy. Finally, the information advantage of firm programmers likely leads to task specialization, which, in turn, engenders learning-by-doing and gains from knowledge-related economies of scale (Argote and Epple, 1990). In other words, some employees specialize in in-sourcing knowledge from the OSS community

More generally, the organizational design challenges faced by OSS entrepreneurial ventures depend on two major dimensions: the *scale and scope* of entrepreneurial ventures' OSS operations and firms' experience with the OSS community. Once a piece of software code is in-sourced from the OSS community, the firm must combine it with internally developed code to create ready-to-use software solutions. The gains from such knowledge integration activity crucially depend on the scale and scope of the OSS operations. Community collaboration BMs are heterogeneous as regard to the importance of OSS for entrepreneurial ventures' system of activity and revenue generation model. While collaboration with the OSS community is pivotal for some OSS entrepreneurial ventures, other ventures relegate OSS to a modest role. The larger are the scale and scope of a firm's OSS operations, the larger is the value to the firm of the knowledge that is in-sourced from the OSS community. Accordingly, we expect that choosing the appropriate organization design is more important the larger and the broader the OSS operations of an entrepreneurial venture. For instance, the benefits and the drawback of adopting the aforementioned practise of granting autonomy to firms' programmers will be larger for firms that widely leverage the OSS community than for firms that have a more limited focus in OSS. In accordance with this argument, Colombo et

al. (2013) find that firms with higher OSS sales and a wider portfolio of OSS-based activities are more likely to authorize their programmers to contribute autonomously to OSS projects in which the firm does not contribute on its own behalf during working hours.

Finally, experience with the OSS community does matter. A firm that is a novice in collaborating with the OSS community must rely on the (few) employees who allegedly possess individual knowledge of the OSS community (see Matusik & Heeley, 2005). Accordingly, task specialization is mandatory for novice firms as the (few) employees who are experienced in interactions with the OSS community should specialize in the gatekeeping task. It is also reasonable to expect that decision authority over interactions with the OSS community be delegated to these gatekeepers. As OSS entrepreneurial ventures gain experience in collaborating with the OSS community, more and more firm's programmers get in contact with OSS users and developers in their daily working activities and so become knowledgeable of the OSS community. This results in a wider diffusion among firm's employees of the ability to detect, screen, and in-source good quality knowledge from the OSS community. The information advantage of employees experienced in OSS over their corporate superiors and peers tends to vanish. Granting autonomy to employees experienced in OSS becomes thus progressively less beneficial.

The table 1 summarize the organizational design of the discussed business models

	Community Collaboration BM	Market for Idea BM
Organizational structure (Hierarchy)	✓ Flat organization	✓ Flat organization
Organizational structure (Task specialization)	✓ Specialization in gatekeeping tasks by employees experienced in OSS	✓ Pre- patent: non-specialized TMT (founder managers) ✓ After patent: Specialized TMT
Decision System	✓ Delegation of authority in both issues related to interaction with the OSS community	✓ Centralized in management domain ✓ Delegation of authority in technology domain

Table 1- BMI and Organizational Design

4. CONCLUDING REMARKS

This chapter focuses on the organizational design challenges of BMI exploring them by considering two prominent innovative business models increasingly adopted by high-tech entrepreneurial ventures: market for ideas BM and community collaboration BM. From the discussion above, it emerges that entrepreneurial ventures should carefully design their structure and decision systems so as to master the complex system of activities and revenue generation model typically of these BMs and, in general, of BMI.

The chapter highlights interesting avenues for future research. First, research on the organizational design challenges of BMI is still in its infancy. Accordingly, this field of study would benefit a lot from further studies, which offer insights to managers and entrepreneurs on how to organize internally their firms to unleash the full potential of BMI. Many aspects need attention. For instance, does BMI requires firms to have a lower span of control as employees need a tight monitoring due to the complexity of their system of activities? Does BMI require always a flat hierarchy or a more mechanistic structure helps to master the complexity of the revenue generation model? Which are the suitable managerial practices that firms adopting BMI must use for attracting and retaining the talented employees who are the basis of the success of these firms? Second, research on the organizational design challenges of BMI has largely adopted a descriptive and

qualitative approach (see e.g., Colombo et al., 2013 for an exception) and consequently it would benefit a lot from large-scale quantitative studies testing propositions and arguments derived from the literature. Third, the chapter considers OSS as a prominent example of community collaboration BM. However, new communities of users and developers are now emerging, which may pose different challenges to entrepreneurial ventures intending to leverage their knowledge. Social networks, developers and firms producing Apps, customers' groups active on the Internet, crowdfunding platforms are relevant examples of communities whose knowledge can be leveraged by entrepreneurial ventures to build BMI. Finally, one may wonder how the BMI examined in this chapter interact. What are the organizational design challenges faced by entrepreneurial ventures that develop and commercialize ideas that they generate by relying on the knowledge produced by communities users and developers? Do the problems engendered by these two BMs cumulate or positive externalities exist from one model to the other? For instance, if a firm does business by developing and commercialize a technology by leveraging community knowledge it cannot count on a tight appropriability regime to protect its technology. The risks of technological leakages are thus more severe, but the firm can benefit from the wide diffusion of the community knowledge, which may in turn fuel the diffusion of its technology.

5. REFERENCES

ACS, Z.J. and AUDRETSCH, D.B., 1990. *Innovation And Small Firms.* Cambridge, MA: MIT Press.

ADLER, P.S., GOLDOFTAS, B. and LEVINE, D.I., 1999. Flexibility Versus Efficiency? A Case Study Of Model Changeovers In The Toyota Production System. *Organization Science,* 10(1), pp. 43-68.

AGERFALK, P.J. and FITZGERALD, B., 2008. Outsourcing To An Unknown Workforce: Exploring Open Sourcing As A Global Sourcing Strategy. *Mis Quarterly,* 32(2), pp. 385-409.

ALDRICH, H.E. and FIOL, C.M., 1994. Fools Rush in - the Institutional Context of Industry Creation. *Academy of Management Review,* 19(4), pp. 645-670.

ALEXY, O. and GEORGE, G., 2013. Category Divergence, Straddling, and Currency: Open Innovation and the Legitimation of Illegitimate Categories. *Journal of Management Studies*, 50(2), pp. 173-203.

ALONSO, R. and MATOUSCHEK, N., 2008. Optimal Delegation. *Review of Economic Studies,* 75(1), pp. 259-293.

AMBOS, T.C. and BIRKINSHAW, J., 2010. How Do New Ventures Evolve? An Inductive Study of Archetype Changes in Science-Based Ventures. *Organization Science,* 21(6), pp. 1125-1140.

AMIT, R. and ZOTT, C., 2001. Value Creation In E-Business. *Strategic Management Journal*, 22(6-7), pp. 493-520.

ARGOTE, L. and EPPLE, D., 1990. Learning-Curves in Manufacturing. *Science,* 247(4945), pp. 920-924.

ARUNDEL, A., 2001. The Relative Effectiveness Of Patents And Secrecy For Appropriation. *Research Policy*, 30(4), pp. 611-624.

ARORA, A., FOSFURI, A. and GAMBARDELLA, A., 2001a. Markets for Technology and their Implications for Corporate Strategy. *Industrial and Corporate Change,* 10(1), pp. 419-451.

ARORA, A., FOSFURI, A. and GAMBARDELLA, A., 2001b. *Markets for Technology.* Cambridge, MA: MIT Press.

ARORA, A. and GAMBARDELLA, A., 1998. Evolution of Industry structure in the Chemical Industry. In: A. ARORA, R. LANDAU and N. ROSENBERG, Eds, *Chemicals and Long Term Economic Growth.* New York: John Willey.

ARORA, A. and GAMBARDELLA, A., 1995. The Division of Innovative Labor in Biotechnology. In: N. ROSENBERG, A.C. GELIJNS and H. DAWKINS, Eds, *Sources of Medical Technology Universities and Industry.* Washington, DC: The National Academies Press, pp. 188-206.

ARORA, A. and GAMBARDELLA, A., 2010. Ideas For Rent: An Overview Of Markets For Technology. *Industrial and Corporate Change,* 19(3), pp. 775-803.

ASLETT, M., 2009. *Open to Investment :Venture Funding for Open Source 1997-2008.* New York: THE 451 GROUP.

AUDRETSCH, D., 1995. *Innovation And Industry Evolution,* Cambridge" MA.: MIT Press.

BAKER, G., GIBBONS, R. and MURPHY, K.J., 1999. Informal Authority In Organizations. *Journal of Law Economics & Organization,* 15(1), pp. 56-73.

BARON, J.N., HANNAN, M.T. and BURTON, M.D., 1999. Building The Iron Cage: Determinants Of Managerial Intensity In The Early Years Of Organizations. *American Sociological Review,* 64(4), pp. 527-547.

BARON, R.A., 2010. Job Design And Entrepreneurship: Why Closer Connections = Mutual Gains. *Journal of Organizational Behavior,* 31(2-3), pp. 370-378.

BAILYN, L., 1985. Autonomy in the Industrial R-And-D Lab. *Human resource management,* 24(2), pp. 129-146.

BARTLING, B., FEHR, E. and HERZ, H., 2013. *The Intrinsic Value Of Decision Rights.* CESifo Working Paper Series No. 4252. May 31.

BECKER, S.W. and GORDON, G., 1966. An Entrepreneurial Theory of Formal Organizations Part I: Patterns of Formal Organizations. *Administrative Science Quarterly,* 11(3), pp. 315-344.

BEHLENDORF, B., 199. Open Source As a Business Strategy. In: C. DIBONA, S. OCKMAN and M. STONE, eds, *Open-sources: Voices from the Open Source Revolution,* O'Reilly, pp. 149-170.

BONACCORSI, A., GIANNANGELI, S. and ROSSI, C., 2006. Entry Strategies Under Competing Standards: Hybrid Business Models In The Open Source Software Industry. *Management Science,* 52(7), pp. 1085-1098.

BOURGEOIS, L.J. and EISENHARDT, K.M., 1988. Strategic Decision-Processes in High-Velocity Environments - 4 Cases in the Microcomputer Industry. *Management Science,* 34(7), pp. 816-835.

BRYANT, P.C. and ALLEN, D.G., 2009. Emerging Organizations' Characteristics As Predictors Of Human Capital Employment Mode: A Theoretical Perspective. *Human Resource Management Review,* 19(4), pp. 347-355.

CASADESUS-MASANELL, R. and ENRIC RICART, J., 2010. From Strategy to Business Models and onto Tactics. *Long range planning,* 43(2-3), pp. 195-215.

CASADESUS-MASANELL, R. and LLANES, G., 2011. Mixed Source. *Management Science,* 57(7), pp. 1212-1230.

CASADESUS-MASANELL, R. and ZHU, F., 2013. Business Model Innovation And Competitive Imitation: The Case Of Sponsor-Based Business Models. *Strategic Management Journal,* 34(4), pp. 464-482.

CAVES, R.E., CROOKELL, H. and KILLING, J.P., 1983. The Imperfect Market For Technology Licenses. *Oxford Bulletin of Economics and Statistics,* 45(3), pp. 249-267.

CHAN, J. and HUSTED, K., 2010. Dual Allegiance and Knowledge Sharing in Open Source Software Firms. *Creativity and Innovation Management,* 19(3), pp. 314-326.

CHESBROUGH, H.W., 2006. *Open Business Models : How To Thrive In The New Innovation Landscape.* Boston: Harvard Business School Press.

CHESBROUGH, H.W. and APPLEYARD, M.M., 2007. Open Innovation And Strategy. *California management review,* 50(1), pp. 57-76.

CHESBROUGH, H. and CROWTHER, A.K., 2006. Beyond High Tech: Early Adopters Of Open Innovation In Other Industries. *R & D Management,* 36(3), pp. 229-236.

COCKBURN, I.M. and MACGARVIE, M.J., 2011. Entry and Patenting in the Software Industry. *Management Science,* 57(5), pp. 915-933.

COLOMBO, M.G., FOSS, N. and ROSSI-LAMASTRA, C., 2012. *Organizational Designs For Absorptive Capacity: The Role Of Task Specialization, Delegation Of Decision Authority, And Knowledge Sharing Practices.*Working paper. Available at:

http://druid8.sit.aau.dk/acc_papers/curfgqe9ldxs30e70fqjjs3npq0u.pdf.

COLOMBO, M.G. and GRILLI, L., 2013. The Creation of A Middle-Management Level by Entrepreneurial Ventures: Testing Economic Theories of Organizational Design. *Journal of Economics & Management Strategy*, 22(2), pp. 390-422.

COLOMBO, M.G., PIVA, E. and ROSSI-LAMASTRA, C., 2013. Authorising Employees to Collaborate with Communities During Working Hours: When is it Valuable for Firms? *Long range planning*, 46(3), pp. 236-257.

COLOMBO, M. and ROSSI-LAMASTRA, C., 2013. *The Organizational Design Of High-Tech Start-Ups: State Of The Art And Directions For Future Research*. In: A. GRANDORI, ed, *The Handbook of Economic Organization. Integrating Economic and Organization Theory.* Northampton: MA: Edward Elgar, pp. 400.

DAHLANDER, L. and MAGNUSSON, M.G., 2005. Relationships Between Open Source Software Companies And Communities: Observations From Nordic Firms. *Research Policy*, 34(4), pp. 481-493.

DAHLANDER, L. and MAGNUSSON, M., 2008. How Do Firms Make Use Of Open Source Communities? *Long range planning*, 41(6), pp. 629-649.

DAHLANDER, L. and O'MAHONY, S., 2011. Progressing to the Center: Coordinating Project Work. *Organization Science*, 22(4), pp. 961-979.

DAHLANDER, L. and WALLIN, M.W., 2006. A Man On The Inside: Unlocking Communities As Complementary Assets. *Research Policy*, 35(8), pp. 1243-1259.

DAVID, R.J. and HAN, S.K., 2004. A Systematic Assessment Of The Empirical Support For Transaction Cost Economics. *Strategic Management Journal*, 25(1), pp. 39-58.

DAVIS, J.P., EISENHARDT, K.M. and BINGHAM, C.B., 2009. Optimal Structure, Market Dynamism, and the Strategy of Simple Rules. *Administrative Science Quarterly*, 54(3), pp. 413-452.

DENGAN, S.A., 1998. The Licensing Payoff from US R&D. *Journal of licensing executive society international*, 3(4), pp. 1-8.

EILHARD, J., 2008. *Firms on SourceForge.* MPRA Paper No. 78092008 edn.

FINEGOLD, D. and FRENKEL, S., 2006. Managing People Where People Really Matter: The Management Of Human Resources In Biotech Companies. *International Journal of Human Resource Management*, 17(1), pp. 1-24.

FITZGERALD, B., 2006. The Transformation Of Open Source Software. *Mis Quarterly*, 30(3), pp. 587-598.

FOSS, N.J., HUSTED, K. and MICHAILOVA, S., 2010. Governing Knowledge Sharing in Organizations: Levels of Analysis, Governance Mechanisms, and Research Directions. *Journal of Management Studies*, 47(3), pp. 455-482.

FOSS, N.J., MINBAEVA, D.B., PEDERSEN, T. and REINHOLT, M., 2009. Encouraging Knowledge Sharing among Employees: how Job Design Matters. *Human resource management,* 48(6), pp. 871-893.

GALBRAITH, J., 1974. Organization Design: An Information Processing View. 4(3) 28-36. *Interfaces,* 4(3), pp. 28-36.

GAMBARDELLA, A., GIARRATANA, M.S. and PANICO, C., 2010. How And When Should Companies Retain Their Human Capital? Contracts, Incentives And Human Resource Implications. *Industrial and Corporate Change,* 19(1), pp. 1-24.

GAMBARDELLA, A. and MCGAHAN, A.M., 2010. Business-Model Innovation: General Purpose Technologies and their Implications for Industry Structure. *Long range planning,* 43(2-3), pp. 262-271.

GAMBARDELLA, A., PANICO, C. and VALENTINI, G., Forthcoming. Strategic Incentives To Human Capital. *Strategic Management Journal*.

GANS, J.S. and STERN, S., 2003. The Product Market And The Market For "Ideas": Commercialization Strategies For Technology Entrepreneurs. *Research Policy,* 32(2), pp. 333-350.

GIARRATANA, M.S., 2004. The Birth Of A New Industry: Entry By Start-Ups And The Drivers Of Firm Growth - The Case Of Encryption Software. *Research Policy,* 33(5), pp. 787-806.

GOKTAN, A.B. and MILES, G., 2011. Innovation Speed And Radicalness: Are They Inversely Related? *Management Decision,* 49(3-4), pp. 533-547.

GOLDMAN, R. and GABRIEL, R.P., 2005. Chapter 2 - Innovation Happens Elsewhere. *Innovation Happens Elsewhere.* San Francisco: Morgan Kaufmann, pp. 15-28.

GREENWOOD, R. and HININGS, C.R., 1993. Understanding Strategic Change - the Contribution of Archetypes. *Academy of Management Journal,* 36(5), pp. 1052-1081.

GRINDLEY, P.C. and TEECE, D.J., 1997. Managing intellectual capital: Licensing and cross-licensing in semiconductors and electronics. *California management review,* 39(2), pp. 8-&.

GRUBER, M. and HENKEL, J., 2006. New Ventures Based On Open Innovation - An Empirical Analysis Of Start-Up Firms In Embedded Linux. *International Journal of Technology Management,* 33(4), pp. 356-372.

HAGE, J. and AIKEN, M., 1967. Program Change And Organizational Properties. A Comparative Analysis, *American Journal of Sociology*, 72(5), pp. 503-19.

HALL, B.H. and ZIEDONIS, R.H., 2001. The Patent Paradox Revisited: An Empirical Study Of Patenting In The US Semiconductor Industry, 1979-1995. *Rand Journal of Economics,* 32(1), pp. 101-128.

HARISON, E. and KOSKI, H., 2010. Applying Open Innovation In Business Strategies: Evidence From Finnish Software Firms. *Research Policy,* 39(3), pp. 351-359.

HARS, A. and OU, S.S., 2002. Working For Free? Motivations For Participating In Open-Source Projects. *International Journal of Electronic Commerce,* 6(3), pp. 25-39.

HENKEL, J., 2009. Champions Of Revealing- The Role Of Open Source Developers In Commercial Firms. *Industrial and Corporate Change,* 18(3), pp. 435-471.

KEIDEL, R.W., 1995. *Seeing Organizational Patterns: A New Theory And Language Of Organizational Design* . San Francisco, CA.: Berrett-Koelher Publisher.

KEMELGOR, B.H. and MEEK, W.R., 2008. Employee Retention in Growth-Oriented Entrepreneuerial Firms: An Exploratory Study. *Journal of Small Business Strategy,* 19(1), pp. 74-86.

KNEZ, M. and SIMESTER, D., 2001. Firm-Wide Incentives And Mutual Monitoring At Continental Airlines. *Journal of Labor Economics*, 19(4), pp. 743-772.

LAKHANI, K.R. and VON HIPPEL, E., 2003. How Open Source Software Works: "Free" User-To-User Assistance. *Research Policy*, 32(6), pp. 923-943.

LAKHANI, K.R. and VON HIPPEL, E., 2003. How Open Source Software Works: "Free" User-To-User Assistance. *Research Policy*, 32(6), pp. 923-943.

LAMOREAUX, N.R. and SOKOLOFF, K.L., 1999. *Inventors, Firms, And The Market For Technology In The Late Nineteenth And Early Twentieth Centuries*, NBER Historical Working Paper No. 98.

LAMOREAUX, N.R. and SOKOLOFF, K.L., 1996. Long-Term Change In The Organization of Inventive Activity. *Journal of Economic History*, 56(2), pp. 494-495.

LEPAK, D.P. and SNELL, S.A., 1999. The Human Resource Architecture: Toward A Theory Of Human Capital Allocation And Development. *Academy of Management Review*, 24(1), pp. 31-48.

LERNER, J. and TIROLE, J., 2002. Some Simple Economics Of Open Source. *Journal of Industrial Economics*, 50(2), pp. 197-234.

LEVIN, R.C., KLEVORICK, A.K., NELSON, R.R. and WINTER, S.G., 1987. Appropriating the Returns from Industrial-Research and Development. *Brookings Papers on Economic Activity*, (3), pp. 783-831.

MANN, J.R., 2006. Commercializing Open Source Software: Do Property Rights Still Matter? . *Harvard Journal of Law & Technology*, 20(1), pp. 1.

MARKIDES, C., 2008. *Game-Changing Strategies: How To Create New Market Space In Established Industries By Breaking The Rules.* New York: Jossey-Bass.

MASSA, L. and TUCCI, C.L., 2013. Business Model Innovation. In: D.G.M. DODGSON and N. PHILLIPS , eds, *Oxford Handbook of Innovation Management.* Oxford: Oxford University Press.

MCMULLEN, J.S. and SHEPHERD, D.A., 2006. Entrepreneurial Action And The Role Of Uncertainty In The Theory Of The Entrepreneur. *Academy of Management Review*, 31(1), pp. 132-152.

MINTZBERG, H., 1979. *The Structuring Of Organizations: A Synthesis of The Research.* Prentice-Hall.

MOODY, G., 2001. *Rebel Code – Inside Linux and the Open Source Revolution* . Cambridge, MA: Perseus Publishing.

O'MAHONY, S. and BECHKY, B.A., 2008. Boundary Organizations: Enabling Collaboration among Unexpected Allies. *Administrative Science Quarterly,* 53(3), pp. 422-459.

O'MAHONY, S. and FERRARO, F., 2007. The Emergence Of Governance In An Open Source Community. *Academy of Management Journal,* 50(5), pp. 1079-1106.

O'MAHONY, S. and FERRARO, F., 2007. The Emergence Of Governance In An Open Source Community. *Academy of Management Journal,* 50(5), pp. 1079-1106.

OSTERLOH, M. and ROTA, S., 2007. Open Source Software Development- Just Another Case Of Collective Invention? *Research Policy,* 36(2), pp. 157-171.

PERR, J., APPLEYARD, M.M. and SULLIVAN, P., 2010. Open For Business: Emerging Business Models In Open Source Software. *International Journal of Technology Management,* 52(3-4), pp. 432-456.

N. POLLOCK AND R. WILLIAMS, 2009. *Software and Organisations: The Biography of the Enterprise-Wide System or How SAP Conquered the World*, Routledge, London and New York.

RAYMOND, E.S., 2001. A Brief Story Of Hackerdrom. In: E.S. RAYMOND, ed, *The cathedral and the bazaar: musings on Linux and Open Source by an accidental revolutionary.* Sebastopol, CA.: O'Reilly & Associates, .

SHEEHAN, J., MARTINEZ, C. and GUELLEC, D., 2004. *Understanding Business Patenting And Licensing: Results Of A Survey.*

SIMSEK, Z., 2009. Organizational Ambidexterity: Towards a Multilevel Understanding. *Journal of Management Studies,* 46(4), pp. 597-624.

SINE, W.D., MITSUHASHI, H. and KIRSCH, D.A., 2006. Revisiting Burns And Stalker: Formal Structure And New Venture Performance In Emerging Economic Sectors. *Academy of Management Journal,* 49(1), pp. 121-132.

STALLMAN, R., 1984-last update, The GNU Manifesto. Available: http://www.gnu.org/gnu/manifesto.html2013].

STINCHCOMBE, A.L., 1965. Social Structure and Organizations . In: J.G. MARCH, ed, *Handbook of Organizations.* New York, NY: Rand McNally, pp. 142-193.

TEECE, D.J., 1986. Profiting from Technological Innovation - Implications for Integration, Collaboration, Licensing and Public-Policy. *Research Policy,* 15(6), pp. 285-305.

TEECE, D.J., 2010. Business Models, Business Strategy and Innovation. *Long range planning,* 43(2-3), pp. 172-194.

THOMA, G., 2009. Striving For A Large Market: Evidence From A General Purpose Technology In Action. *Industrial and Corporate Change,* 18(1), pp. 107-138.

TRIMI, S. and BERBEGAL-MIRABENT, J., 2012. Business Model Innovation In Entrepreneurship. *International Entrepreneurship and Management Journal,* 8(4), pp. 449-465.

UNGER, J.M., RAUCH, A., FRESE, M. and ROSENBUSCH, N., 2011. Human Capital And Entrepreneurial Success: A Meta-Analytical Review. *Journal of Business Venturing,* 26(3), pp. 341-358.

VAN DE VRANDE, V., DE JONG, J.P.J., VANHAVERBEKE, W. and DE ROCHEMONT, M., 2009. Open Innovation In Smes: Trends, Motives And Management Challenges. *Technovation,* 29(6-7), pp. 423-437.

VOLBERDA, H.W., FOSS, N.J. and LYLES, M.A., 2010. Absorbing the Concept of Absorptive Capacity: How to Realize Its Potential in the Organization Field. *Organization Science,* 21(4), pp. 931-951.

VON HIPPEL, E. and VON KROGH, G., 2006. Free Revealing And The Private-Collective Model For Innovation Incentives. *R & D Management,* 36(3), pp. 295-306.

WEBER, S., 2004. *The Success of Open Source,* Cambridge, MA: Harvard University Press.

WEICK, K.E., 1993. The Collapse of Sensemaking in Organizations - the Mann Gulch Disaster. *Administrative Science Quarterly,* 38(4), pp. 628-652.

WEST, J., 2007. Value Capture and Value Networksin Open Source Vendor Strategies, *Proceedings of the Hawai'i InternationalConference on System Sciences*, January 3-7 2007, IEEE.

WEST, J. and O'MAHONY, S., 2008. The Role of Participation Architecture in Growing Sponsored Open Source Communities. *Industry and Innovation,* 15(2), pp. 145-168.

WEST, J. and O'MAHONY, S., 2008. The Role of Participation Architecture in Growing Sponsored Open Source Communities. *Industry and Innovation,* 15(2), pp. 145-168.

WILLIAMSON, O.E., 1983. Credible Commitments: Using Hostages to Support Exchange. *The American Economic Review,* 73(4), pp. 519-540.

ZENGER, T.R., 1994. Explaining Organizational Diseconomies of Scale in Research-And-Development - Agency Problems and the Allocation of Engineering Talent, Ideas, and Effort by Firm Size. *Management Science,* 40(6), pp. 708-729.

ZOTT, C. and AMIT, R., 2008. The Fit Between Product Market Strategy And Business Model: Implications For Firm Performance. *Strategic Management Journal,* 29(1), pp. 1-26.

ZOTT, C. and AMIT, R., 2007. Business Model Design And The Performance Of Entrepreneurial Firms. *Organization Science,* 18(2), pp. 181-199.

ZOTT, C., AMIT, R. and MASSA, L., 2011. The Business Model: Recent Developments and Future Research. *Journal of Management,* 37(4), pp. 1019-1042.

ZUNIGA, M.P. and GUELLEC, D., 2008. *Survey On Patent Licensing: Initial Results From Europe And Japan.* Paris.: OECD.