

Inter-Organizational Collaboration and Start-Up Innovation

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INTER-ORGANIZATIONAL COLLABORATION AND START-UP INNOVATION

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Abstract. This chapter presents an overview of the literature on collaborative relationships between start-ups and incumbent firms, focusing on the implications of these relationships for start-up innovation and performance. Value creation in such relationships occurs when assets are exchanged by the parties involved: collaboration allows for passive knowledge flows and active knowledge creation; in addition, collaboration provides start-ups with access to the complementary assets of the incumbent. At the same time, value creation presents opportunities for value capture by either party, where value capture by the start-up is determined by their knowledge appropriation regime and social capital. The form in which the start-up appropriates value has implications for the assets that enable value creation. The framework for value creation and capture in bilateral start-up-incumbent collaborations extends to start-up-incumbent collaborations in a platform and ecosystem context, where there are fruitful future research opportunities.

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INTRODUCTION

Innovative start-ups need access to external knowledge assets to innovate, as well as external complementary assets to commercialize their innovations in product markets. Established incumbent firms control key components of these assets. Creating or acquiring these external assets is costly for start-ups, as they typically operate in highly resource-constrained environments. Thus, startups collaborate with incumbent firms to jointly create value by leveraging the innovation of the startup in conjunction with the assets owned by the incumbent firm, and in so doing functionally extend the asset base of the startup beyond its boundaries. However, the relationship between a start-up and incumbent firm creates challenging conditions for value capture by the start-up, which faces the possibility of misappropriation of value by the incumbent firm.

In this chapter we review the literature that examines how start-up firms use external collaborative relationships with larger industry incumbents, focusing both on how firms can jointly create value from innovation, as well as on how the start-up's value capture considerations affect the types of assets that can create value in the relationship. Our emphasis is on settings where value creation is driven by technological innovation, such as in the biotechnology, semiconductor, and software industries. Because value creation and value capture are both precursors to successful start-up innovation, we focus on the conditions that allow start-ups to create and capture value in collaborative relationships. We consider assets of two types: knowledge assets and complementary assets. Together, these assets constitute the raw material that serves to promote both innovation and commercialization. A start-up's ability to gain access these types of assets is thus essential to ongoing innovation and successful product market outcomes.

The external channels through which start-ups assemble knowledge and complementary assets encompass a variety of contractual relationships with incumbent organizations. We concentrate primarily on formal contract-based bilateral relationships between start-ups and incumbents. Corporations and universities are desirable incumbent partners that possess large asset bases that start-ups can draw on within the context of a formal relationship. We consider a broad set of formal collaboration forms, including equity and non-equity strategic alliances, as well as corporate venture capital investments. In a concluding section we outline a set of future research directions for understanding start-up and incumbent cooperation within a platform and ecosystem context.

In the context of bilateral collaboration, we consider both strategic alliances and corporate venture capital. A strategic alliance is a contractual agreement between two organizations to share assets in pursuit of common goals while at same time remaining independent. In our case these goals generally include product commercialization or the execution of research and development activities. Alliance structures can range from short-term licensing agreements to long-term equity ownership agreements. Joint ventures (JVs) are also included in the definition of strategic alliances in many cases; while we do not explicitly exclude joint ventures, such structures are less prevalent in the forms of collaboration we focus on, as there is likely to implicitly be some level of parity among partners (which is generally not the case in our setting). We also consider corporate venture capital (CVC) as a form of bilateral collaboration, because in the context of our discussion CVC is often indistinguishable from an (equity) strategic alliance, except insofar as the incumbent places a greater importance on financial returns from the equity investment in the start-up. We limit our consideration to these sets of formal bilateral collaboration forms. Alternatives to these forms of collaboration comprise informal collaborations grounded in trust-based relational contracting, spot

contracts in the open market, an outright acquisition and integration of the start-up by the incumbent.

A longstanding body of literature suggests that collaborative relationships between start-ups and incumbents can provide competitive advantages to the start-up. This research shows that external relationships not only constitute a necessary precondition for start-up innovation (Shan, Walker and Kogut, 1994), but that they also promote start-up performance even when the internal capabilities of the focal start-up are taken into consideration (Lee, Lee and Pennings, 2001). The optimal external partnership for a start-up may change over time. Exploration alliances aimed at activities such as product development in a firm's early periods make way for exploitation alliances aimed at product commercialization as the start-up matures (Rothaermel and Deeds, 2004). An entrepreneur who consistently partakes in successful incumbent collaborations can leverage this dynamic capability to purposefully adopt her own resource base as the environment rapidly changes (Teece, 2007). As such, alliance arrangements offer the firm an opportunity to actively learn and upgrade existing skills (Branzei and Vertinsky, 2006).

Collaborative relationships comprise the building blocks of an entrepreneurial firm's external network (Hitt, Ireland, Camp, and Sexton, 2001), enabling a start-up in a new industry to overcome uncertainty, contend with intense competition, and more generally navigate uncertain times (Eisenhardt and Schoonhoven, 1996; Li and Atuahene-Gima, 2002; De Carolis, Yang, Deeds, and Nelling, 2009). The broader network of relationships within which an entrepreneurial firm is positioned promotes focal firm innovation and mobilizes the varied resources required for new venture growth (Stuart and Sorenson, 2007). For entrepreneurial firms, external networks offer an alternative to vertical integration as an organizational form (Larson, 1992) by facilitating opportunistic access to external resources (Aldrich and Zimmer, 1986). Several distinct strategic

considerations arise when shifting the level of analysis from individual dyadic relationships in isolation to a broader portfolio of collaborative activity (Aggarwal and Hsu, 2009; Ozcan and Eisenhardt, 2009).

We first explore ways in which collaboration between start-ups and incumbents creates value through innovation, specifically through the exchange and utilization of the incumbent's knowledge assets and complementary assets. We then discuss ways in which the start-up can capture value generated from these relationships, considering both the general appropriation regime and the start-up's social capital. In a concluding section we then discuss avenues for future research on collaboration and start-up innovation. We focus this discussion on the emerging area of work involving platforms and ecosystems. In contrast with bilateral relationships between start-ups and incumbent firms, which constitute the bulk of our review in this chapter, work that takes the perspective of the start-up innovator in a platform setting is relatively nascent (in contrast with work addressing strategic considerations of the incumbent platform owner, which has been extensively explored over the last few decades). We examine the ways in which our framework of value creation and value capture, which emerges from the literature on bilateral collaboration, might provide insight on issues that arise when shifting the focus from bilateral relationships to an ecosystem of relationships within a platform.

VALUE CREATION: START-UP ACCESS TO INCUMBENT ASSETS

Value can be created in collaborations between start-ups and incumbents by combining the knowledge and innovations of the start-up with the knowledge assets and complementary assets of the incumbent firm. The following discussion reviews the conceptual basis of each type of incumbent asset that can create value in the such relationships.

Knowledge Assets

Start-ups collaborating with incumbent firms can create value from innovations that result from passive knowledge flows among parties, as well as active knowledge creation jointly occurring among two parties. Innovation occurs when the incumbent and start-up bring together knowledge that is recombined in novel ways. The value of these knowledge flows and the resulting level of knowledge creation is, however, moderated by the relatedness of the start-up and incumbent.

Passive Knowledge Flows. Over the course of a collaboration, there can be passive knowledge flows between the startup and incumbent that facilitate innovation, beyond the scope of what is and can in practice be contracted for. The collaborating organizations know more than they can explicitly communicate and codify (Polanyi, 1966), and the tacit knowledge composed of the routines and know-how that underlie innovation is organizationally embedded (Kogut, 1988). Alliances form a conduit of knowledge exchange between partners, allowing both explicit and tacit knowledge to flow to where it creates the most value. Thus, relationships between start-ups and incumbents can be mutually beneficial through general knowledge transfers among partners (Mowery, Oxley and Silverman, 1996). Passive knowledge flows can take place regardless of whether the collaboration is intended to facilitate knowledge flows in the first place (Gomes-Casseres, Hagedoorn, and Jaffe, 2006).

The knowledge flows, whether intentional or unintentional, support the innovative capacity of the collaborating start-up. As the smaller firm, start-ups are better positioned to seek out and identify new opportunities. Moreover, because start-up firms possess relatively limited stocks of knowledge and limited market power, collaboration in which knowledge and experience-based resources are shared with larger partners can enable start-ups to remain creative and flexible (Ketchen, Ireland and Snow, 2007). The benefits of these knowledge flows may end up being one-

sided in favor of the entrepreneur: under some conditions, an entrepreneur may gain from the spillover of knowledge at the expense of knowledge creation for the incumbent firm, depending on the stage of the market life cycle (Parker, 2010).

The contractual structure of the relationship itself determines the level of knowledge flows that occur. Given the difficulty of contracting for tacit knowledge, which by definition cannot be codified, equity alliances and equity-based joint ventures offer a greater volume and variety of opportunities for such knowledge transfer as compared to more arms-length relationships such as licensing, because under equity ownership the parties are able to share the value created by tacit knowledge flows (Kogut, 1988). Moreover, the geographic proximity and the broader regime of information disclosure within which partners operate can shape the degree of knowledge transfer that occurs in a relationship (Owen-Smith and Powell, 2004).

Collaborator characteristics determine whether knowledge flows are effective for innovation. The degree of knowledge flow depends on the relative and absolute absorptive capacity, R&D intensity, and the size of the start-up and incumbent (Mowery, Oxley and Silverman, 1996). Firms can also improve over time in their ability to utilize knowledge flows. By building on experiences developed through prior relationships, start-ups can develop routines that lead to performance improvements in future alliances (Hoang and Rothaermel, 2005).

Active Knowledge Creation. In addition to more passive knowledge spillovers, start-ups can actively facilitate knowledge creation beyond their existing knowledge base and that of their incumbent partners by intentionally cultivating relationships for this purpose. Boundary-spanning relationships can generate novel knowledge recombinations across a wide range of settings (Rosenkopf and Nerkar, 2001). In an academic context, formal collaborations between start-ups and universities can promote innovation (Liebeskind, Oliver, Zucker and Brewer, 1996), with such

collaborations aimed at optimizing the synergies that can emerge from joint knowledge creation capabilities (Mindruta, 2013). In corporate settings, collaborations with foreign partners can increase the propensity of developing breakthrough innovations (Dunlap-Hinkler, Kotabe and Mudambi, 2010).

Furthermore, start-ups can cultivate the broader *network* of relationships in which they are embedded to promote innovation. Phelps, Heidl and Wadhwa (2012), for example, review the large and growing body of work on “knowledge networks.” A full treatment of the knowledge networks literature is beyond the scope of the present chapter, as that literature covers a much larger scope than just collaborations between start-ups and incumbents. However, a key point to bear in mind regarding the knowledge creation effects of collaborative relationships is that the “locus” of production of innovative output is not necessarily within any given relationship. Rather, it is within the broader network of relationships that surround the start-up (Powell, Koput and Smith-Doerr, 1996). Access to knowledge arises not just from dyadic relationships, but also from the extensive collection of relationships within an industry. Factors characterizing the patterning of firm networks, such as “clustering” and “reach” thus shape the degree to which new knowledge can be created from firm networks (Schilling and Phelps, 2007).

Relatedness as a Moderator. The degree to which start-ups gain value from knowledge flows and from the knowledge created through collaborations is a function of the degree of relatedness (overlap) between the start-up and incumbent in the knowledge space. Innovation performance can be a curvilinear function of knowledge relatedness (Sampson, 2007; Keil, Maula, Schildt and Zahra, 2008). Lower levels of overlap impede the absorption of knowledge from the partner (Cohen and Levinthal, 1990). On the other hand, elevated levels produce an oversaturation of similar knowledge and minimal consequent gains because innovation arises from new

combinations of diverse knowledge (Schumpeter, 1934). More generally, higher levels of technological relatedness alter the balance between the incentives for value creation and those for value appropriation (Diestre and Rajagopalan, 2012).

Beyond the implications for knowledge transfer, partner overlap (or the lack thereof) affects the stability of an alliance by influencing the propensity of alliance termination. Within a portfolio of alliances, for example, similarity in the technological space can shape alliance value (Vassolo, Anand and Folta, 2004). Relatedness should more generally be considered in a portfolio context: the greatest benefits accrue to alliance start-ups when their portfolios minimize the “costs of redundancy, conflict, and complexity” (Baum, Calabrese and Silverman, 2000). Resource redundancy also appears in CVC-alliance interactions (Dushnitsky and Lavie, 2010). In addition to redundancy, coordination costs, which may arise as a function of dissimilarity, also can a role in influencing alliance effects (Kotha, George and Srikanth, 2013).

Complementary Assets

In the traditional view of collaboration between a start-up and incumbent, the parties engage in a value-creation effort focused on utilizing the complementary assets of the incumbent. In such a situation, the start-up provides value at the early idea stage, while the incumbent supplies the (generally more capital-intensive) resources necessary to commercialize the innovation. In a sense, the start-up transfers its innovative knowledge to the incumbent firm, which in turn leverages the knowledge in conjunction with its complementary assets. Complementary assets consist of generic assets, which are general purposes assets that do not need to be tailored to the innovation in question, as well as specialized and co-specialized assets, which have a unilateral or bilateral dependence between the complementary asset and the innovation (Teece, 1986).

Generic Assets. As one type of generic asset, the reputation of incumbent firms can benefit the start-ups with which they are affiliated. Given their size and long-term track record, incumbent firms accumulate a stock of reputation that engenders trust and confidence among other partners, such as investors, customers and other alliance partners. By comparison, the start-up does not have such an established reputation. Thus, the start-up, lacking in reputation, benefits greatly from the reputation of the incumbent, which may accrue to the start-up as a consequence of the collaboration. Collaborations in the form of alliances can act as endorsements, increasing the level of confidence third parties have in the quality of the start-up (Stuart, 2000) and promoting higher levels of start-up performance (Stuart, Hoang and Hybels, 1999). Such relationships can have one-sided effects on reputation. In many cases, the small firm in the relationship enjoys the reputational benefits. At the same time, however, multiple positive signals of quality can produce diminishing returns for the start-up. For example, while the prominence of both a venture capital firm and an alliance partner can have positive signaling effects for the affiliated start-up, these two types of partners may substitute for one another: the greatest value from a particularly prominent affiliation is achieved when the alternative affiliation is absent (Ozmel, Reuer and Gulati, 2013).

Specialized and Cospecialized Assets. Incumbents accrue specialized and cospecialized assets that specifically serve to commercialize innovations. In the pharmaceutical and biotechnology context, for example, these assets can take the form of distribution channels, brand name, and regulatory approval know-how, all of which are necessary to commercialize a therapeutic treatment, well after the development of the start-ups initial innovation, which is generally protected by formal intellectual property (i.e., a patent). An extensive literature, mostly set in the context of the biotechnology industry, documents the role that (co)specialized

complementary assets accessed through alliances play in commercializing start-up innovation (Rothaermel, 2001).

When start-ups can fully protect the innovation they generate, and incumbent firms hold the complementary assets to commercialize that innovation, this can result in an active market for technology where start-up and incumbent collaboration becomes the dominant commercialization strategy (Gans and Stern, 2003). Later in this chapter, we discuss the implications of the knowledge appropriability regime for this type of collaboration.

VALUE CAPTURE IN START-UP-INCUMBENT COLLABORATIONS

Although collaborations between start-ups and industry incumbents are a source of value creation, several factors influence the degree to which this jointly created value can be captured by the start-up as opposed to by the incumbent. In general, a relationship between a start-up and incumbent firm creates the conditions under which appropriation concerns can become quite salient. Such concerns are often higher for the smaller firm (Alvarez and Barney, 2001).

Among other factors, the relative value accruing to the start-up is largely a function of the external knowledge appropriation regime and the start-up's social capital. These factors affect the form through which knowledge assets and complementary assets are leveraged in the relationship, and determine whether the relationship both emerges and remains stable over time.

Knowledge Appropriation Regime

Start-ups have several tactical and legal mechanisms through which they can appropriate and protect the knowledge and innovation they create. The start-ups intellectual property is exposed to misappropriation risk when it collaborates with an incumbent and the incumbent learns about the

start-up firm's technology. Some technologies, such as software, lend themselves naturally to appropriation by the start-up: once the code base for a complex software language (such as C++) has been compiled, the underlying knowledge embedded in the code itself cannot be easily imitated and appropriated by another party (Gans and Stern, 2003). This knowledge protection is a form of trade secrecy. Formal intellectual property, in the form of patents, copyrights and trademarks, as enforced and regulated by the government, is one of the most widely studied mechanisms through which start-ups appropriate value from their knowledge. Greater knowledge appropriability, derived from a superior defense of trade secrets and formal intellectual property, is a key tool in offsetting misappropriation risk by an incumbent (Katila, Rosenberger and Eisenhardt, 2008). On the other hand, when innovations are imitable, the value created may accrue to owners of the complementary assets instead of the innovator (Teece, 1986).

Appropriation and Active Knowledge Creation. A strong knowledge appropriation regime facilitates active knowledge creation partnerships. Active knowledge creation that occurs jointly between the start-up and incumbent can flourish when the start-ups trusts that it can protect its existing and future knowledge. These considerations can influence the mode of collaboration in which a start-up engages—e.g., an equity-based arrangement or a more arms-length licensing agreement. Aggarwal and Hsu (2009) observe that deal-level IP considerations made in isolation can have spillover effects when considered in the context of the start-up's broader portfolio of relationships. These spillover effects, derived from mechanisms such as crossover patent protection, then operate to create an overall firm-level "appropriation environment." This firm-level characteristic, together with the firm's governance capabilities—the collection of knowledge, routines, and structure associated with a particular collaboration form—together influence a start-up's choice of mode in its relationships with industry incumbents.

On the other hand, a strong IP regime may be unfavorable to passive knowledge flows between the start-up and incumbent. Corporate venture capital investments, which align the incentives of the startup and incumbent through incumbent ownership of the startup, are less likely under conditions of strong IP protection (Dushnitsky and Lenox, 2005; Dushnitsky and Shaver, 2009). These incentive-aligned relationships are favorable to the occurrence of incidental knowledge flows, which are now less likely to occur because either party has more control over their own knowledge and the knowledge they create.

Appropriation and (Co)specialized Complementary Assets. Under the view that start-up and incumbent collaboration is about leveraging the (co)specialized complementary assets of the incumbent, a strong knowledge appropriation regime has a significantly positive effect on whether the start-up firm accrues benefits from its collaboration with an incumbent, which in turn determines whether an active market for technology can emerge. A large body of work shows that start-ups are more likely to engage in cooperative relationships with industry incumbents in situations where there are stronger IP rights (Gans, Hsu and Stern, 2002). This pattern stems from the start-up's need to avoid appropriation of knowledge and technological know-how by the incumbent partner.

The inherent tension around value appropriation is reflected in the greater value start-up firms capture from relationships that are exploitation-related, because exploration-related relationships open up the smaller firm to risks of knowledge appropriation, while exploration-related relationships benefit the most from (co)specialized assets of the established partner, such as financial capital and manufacturing facilities. Given this risk at the exploration stage, early in the life of the startup and the collaboration, when exploration by the start-up is most important for

performance in the relationship, control rights are optimally allocated to the innovating entrepreneurial firm (Lerner and Merges, 1998).

Conversely, because incumbents view relationships with start-ups as a source of knowledge acquisition to complement their (co)specialized assets, long-term collaborative relationships may be less likely to materialize under such circumstances, because spot market transactions (e.g., IP sales or licensing) in a “market for ideas” or a “market for technology” would be an effective alternative (Gans and Stern, 2003). As markets for technology grow more common than in the past, entrepreneurs must focus more proactively on managing their intellectual property, and incumbent firms with complementary assets to leverage must direct greater attention to external monitoring of emerging technologies, which together imply the need for inter-organizational collaborative forms (Arora, Fosfuri, and Gambardella, 2001). Aggressive pursuit of intellectual property protection is even more important for entrepreneurs in technology spaces where ownership rights are widely distributed, which causes fragmentation in the market for technology (Ziedonis, 2004). However, in some contexts, stronger IP regimes may reduce the liquidity of the market for ideas by discouraging participant of incumbents who buy the ideas of the entrepreneurs (Luo, 2014).

Social Capital

The start-up’s social capital, consisting of its direct relationships and a network of indirect relationships within which the start-up is embedded, also enables value capture by the start-up by fending off misappropriation by the incumbent. In general, collaborations are successful when incentives for value creation are greater than those for value appropriation—for example, when

there exist rivals to the incumbent in the product-market to whom proprietary know-how can be sold (Pisano, 1990).

Social Capital and Passive Knowledge Flows. Start-ups can allow for more passive knowledge flows when they have a third-party defense. Passive knowledge flows, where tacit information is a large component, are difficult to formally contract on and cannot necessarily be protected by formal intellectual property. To further mitigate the dangers of “corporate sharks,” ties with prominent partners such as VCs (Hsu, 2006) and other third parties can help shield the start-up from appropriation. Centrally-positioned third party partners to the start-up are a powerful defense against incumbent misappropriation, particularly when the knowledge appropriation regime discussed above is unfavorable (Hallen, Katila and Rosenberger, 2014). Thus, an external third-party defense can protect the start-up, so that the start-up can let knowledge flow to the incumbent. Furthermore, ties facilitate the ongoing set of interactions among collaborating partners set the conditions from which tacit knowledge flows can occur and through which the start-up can absorb knowledge (Lane and Lubatkin, 1998; Stuart, 2000).

Social Capital and Generic Complementary Assets. Social capital also facilitates the bargaining position of start-ups versus incumbents for generic complementary assets. Consider the dilemma faced by a start-up partnering with a highly generically-resourced incumbent. While the new firm can benefit from the resources of this relationship, these resources also bestow greater power on the incumbent because the start-up has fewer substitute partners available. Thus, the start-up faces greater costs associated with maintaining the alliance, which can be mitigated by embedding these relationships with other powerful partners in common third-party ties (Bae and Gargiulo, 2004). More generally, because relationships exist within a portfolio context, factors such as the relative standing of a firm in a partner’s portfolio can shape the degree to which

relationships confer benefits (Ozmel and Guler, 2015; Aggarwal, 2017). Social capital confers relatively less bargaining benefits for (co)specialized assets. Since these assets are tailored for the innovation at hand, there are fewer outside partner options for the entrepreneur to work with, favoring value capture by the incumbent by engendering a hold-up problem.

The framework for value creation and value capture in start-up and incumbent collaborations that emerges from this review is presented in **Figure 1**.

FUTURE RESEARCH DIRECTIONS

Thus far we have focused predominantly on formal modes of bilateral inter-organizational collaboration between start-ups and incumbents. The literature in this area has both thrived and matured over the past several decades, giving us a deep understanding of how entrepreneurial start-ups can use collaborative relationships as a tool in the innovation process. However, there is a related and continually emerging field of research on platforms and ecosystems, within which the role of collaboration has been under-explored when considering the start-up as the focal actor. In this section, we briefly outline some future research directions that consider how the idea of value creation through complementary assets and knowledge spillovers, as well as value capture as influenced by the extant appropriation regime and social capital, might alter the ways in which start-ups generate innovation-related value when the nature of collaboration shifts from a purely bilateral context to one in which the start-up operates in a platform context.

There are numerous examples of platform and ecosystem-based contexts in which start-ups can (and often, must) use collaboration as a tool for innovation. These include, but are not limited to, business incubators, open scientific communities, patents pools, and open collaborative communities. Business incubators can serve as an open-system intermediary for firms to

collaborate in and exchange knowledge (Dutt, Hawn, Vidal, Chatterji, McGahan and Mitchell, 2016). Participation in open scientific communities generates patentable knowledge (Gittelman, 2007). Patent pools facilitate complementary technologies as well as industry standards that reduce search, negotiation, and licensing costs by mitigating uncertainty and appropriation hazards, thereby fostering a collective sense of trust, and raising the reputation of the participants (Vakili, 2016). Open collaboration communities, such as online forums, mailing lists, open-source, software-sharing platforms, and online encyclopedias, create goods of economic value by opening access that encourages members to contribute and consume knowledge in a loosely coordinated environment (Levine and Prietula, 2014). We focus our discussion here on open platforms as opposed to closed ones, as chosen by the incumbent platform sponsor.

With respect to innovation-related value creation, shifting the locus of collaboration to the context of a platform with an ecosystem of entrepreneurial complementors has implications for the ways in which innovation-related value is created through their combined knowledge assets and complementary assets. In the case of bilateral incumbent-entrepreneur collaboration, participants jointly engage in activities that are targeted toward the production of innovation. When shifting the focus to the ecosystem, however, the locus of value creation expands beyond just the focal incumbent platform owner and an entrepreneurial complementor to include all the entrepreneurial complementors in the ecosystem. This then increases both the returns from and the necessity of engaging in a set of collaborative activities that span a larger set of players (Gawer and Henderson, 2007). However, the platform must incur substantive coordination costs to manage the architecture of the system to facilitate collaboration (Katz and Shapiro, 1994)

An ecosystem perspective also influences the nature of passive knowledge flows. Whereas in a bilateral context such flows occur as an outcome of ongoing engagement in arms-length

relationships, platforms create incentives for a broader sharing of knowledge among stakeholders, as the stakeholders, which include the incumbent platform owner and the entrepreneurial complements, all gain when the ecosystem improves as a collective good (Grover and Kohli, 2012). On the other hand, knowledge sharing by stakeholders may increase the potential for competition, either between the platform sponsor and the complementors, or among the complementors themselves. As the value of the ecosystem increases, further entrepreneurial entry by complementors becomes more likely, as does the risk of more aggressive value capture by the incumbent platform owner. Fostering a collective identity among entrepreneurs can counteract this effect by increase the focus on the net public good of the platform as opposed to individual returns (Ibarra, Kilduff and Tsai 2005), facilitating beneficial knowledge flows among participants. The net outcome of these opposing effects may either promote or inhibit innovation and is likely to be influenced by the value capture effects as we discuss below.

The ways in which complementary assets operate in a platform context are also likely to differ as compared to purely bilateral relationships. As discussed earlier in this chapter, (co)specialized complementary assets are particularly helpful for promoting innovation in the context of markets for technology. They allow for entrepreneurial specialization in knowledge production, with the market itself operating as the coordinating device to ensure that upstream entrepreneurial activities and downstream incumbent activities are integrated with one another. In a platform context, the integration device shifts away from the market and toward the platform itself as the means of coordination. For example, the incumbent platform owner can provide specialized business support services to foster entrepreneurial development on the platform, which increases explorative behavior (Wareham, Fox, and Cano Giner 2014). This then allows for a greater range of specialized entrepreneurs who focus on developing upstream contributions. In this

sense, the role of the platform as an integrator can be both to increase the breadth of innovation within the overall ecosystem, while at the same time increasing the level of specialization of any particular player within the ecosystem.

Generalized complementary assets, likewise, are also likely to have different effects when shifting from a purely bilateral focus to a situation of platform-driven relationships. Reputation still matters, though it may turn out to be relatively less important as a strategic consideration to the degree that relationships with the dominant player (e.g., with the platform provider) become less unique and more standardized, particularly in the case of open platforms. In other words, the reputational benefit of affiliations is likely to be less in a platform-related context. On the other hand, the platform does serve as an arbiter of quality, where variance in the quality of complementors can lead to agency costs that the incumbent bears, and in this sense can thus (by excluding certain complementors) play the usual endorsement role, even in a platform context (Wolter and Veloso, 2008).

While the shift in the locus of collaboration from bilateral to platform-driven collaboration relationships changes the nature of innovation-related value creation by start-up firms, it can also influence the mechanisms through which value capture occurs by these firms. The external knowledge appropriation environment within which a firm is embedded still has implications for value capture by the entrepreneurial complementors: Ceccagnoli, Forman, Huang, and Wu (2012), for example, find that small independent software vendors benefit most from joining a major platform when they have greater intellectual property rights. However, the platform itself has control over the governance of knowledge as well. This platform-based governance has the effect of further shifting power away from the entrepreneur and toward the incumbent that controls the platform. For example, the platform sponsor may control a proprietary technology standard at the

core of the platform that they can choose to share (or not) with complementors (Kogut, Walker and Kim 1995). However, the incumbent is generally incentivized to balance value capture from the entrepreneurial complementors with the value created by the ecosystem (Rochet and Tirole, 2003). At the same time, ties (through social capital and otherwise) may continue to serve as an effective defense mechanism through which the start-up can mitigate incumbent value capture concerns in a platform context. In addition, relationships (whether formal or more informal) with other complementors can take on greater salience in a platform setting, as they can forestall the attractiveness of the incumbent to enter the market of the start-up.

Together, these considerations with respect to innovation-related value creation and value capture in a platform context highlight the many possible directions scholars may explore in the future when considering the ways in which collaboration with incumbent firms shapes start-up innovation. While bilateral contracting between an incumbent and start-up will continue to have importance in the context of a number of industry settings (e.g., biotechnology), the growing prevalence of platform ecosystems of complementary entrepreneurial firms in other industry (e.g., information technology) suggests that exploring how collaborative strategy shapes start-up innovation in a platform-driven context is a fruitful issue that can spawn a wide-ranging set of research questions that scholars might consider in the coming years.

CONCLUSION

In this chapter, we review the extant work addressing the ways in which collaborations with industry incumbents can influence the extent of a start-up firm's innovation-related value. We confine our attention on the start-up itself as the focal actor and examine both value creation and value capture considerations. For the former, we propose that the extant arguments for innovation-

related value creation can be organized into value created via either knowledge-related assets and spillovers, and more general complementary assets used in the broader process of innovation. We propose that value capture considerations stem from the appropriation regime in which the start-up operates and the extent of social capital it possesses with respect to its collaboration partners. While the focus of our review is generally on these issues in a bilateral collaboration context, we discuss in a concluding section how these considerations might be affected by the move in many technology-based industries toward platform and ecosystem-related contexts for collaboration. Such settings provide fertile opportunities for future research examining the ways in which inter-organizational collaborations influence start-up innovation.

		Form of Entrepreneur Value Capture	
		Appropriation Regime	Social Capital
Shared Asset for Value Creation	Knowledge Assets	Active Knowledge Creation	Passive Knowledge Flows
	Complementary Assets	(Co)specialized Complementary Assets	Generic Complementary Assets

Figure 1 Shared Assets for Value Creation and Form of Entrepreneur Value Capture. This figure presents the implication of the form of entrepreneur value capture for the mechanism of value creation form share assets. In particular, the form of value capture alters the balance of the role of active knowledge creation and passive knowledge flows, and the balance of the role of (co)specialized complementary assets and generic complementary assets.

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