

Benefiting from Innovation – Playing the Appropriability Cards

Jialei Yang, University of Oulu, Oulu Business School, ORCID:
<https://orcid.org/0000-0001-6040-9535>

Pia Hurmelinna-Laukkanen, University of Oulu, Oulu Business School, ORCID:
<https://orcid.org/0000-0002-9306-6417>

Biography for each author

Jialei Yang is a doctoral researcher at University of Oulu, supervised by Professor Pia Hurmelinna. She will be a Scancor scholar at Stanford University and she was a visiting scholar at UC Berkeley sponsored by Professor Henry Chesbrough. Her research focuses on innovation management (especially innovation appropriability and open innovation), and she has 10+ publications including journal, conference, and white papers. She serves as a scientific panel member and coordinator at ISPIM, editorial board member of WOIC, and reviewer for AOM, EURAM, and Journal of Innovation Management.

Dr. Pia Hurmelinna is a Professor of Marketing, especially International Business at the Oulu Business School, University of Oulu, and an Adjunct Professor (Knowledge Management) at the LUT University. She has published about 75 refereed articles in journals such as Journal of Product Innovation Management, Industrial and Corporate Change, Industrial Marketing Management, International Business Review, R&D Management, and Technovation. Most of her research has involved innovation management and appropriability issues, including examination of different knowledge protection and value capturing mechanisms. The research covers varying contexts like internationalization and inter-organizational collaboration in ICT and healthcare sectors.

Abstract

How to benefit from innovation, or, to put it differently, how to turn appropriability – the potential to benefit from innovation, to realized appropriation? In appropriability literature, innovators with a strong appropriability regime and complementary assets are supposed to win in the competition. However, the strong appropriability premises ('cards with which innovators play') do not automatically translate into appropriation, and failures arise. In this book chapter, we propose focusing on *interactive appropriability* ('playing the cards in relevant contexts') rather than simply building appropriability ('obtaining the cards'), and outline and explicate three paths to turn appropriability into appropriation ('three ways of playing the cards'): *exclusion of others*, *leveraging the appropriability premises*, and *abandoning of protection*. Appropriability has been traditionally viewed from a property view, suggesting the proprietary use of the innovation and the related knowledge assets. We argue that besides exclusivity, leveraging and even abandoning the appropriability premises (constituted with appropriability mechanisms and complementary assets) can also be relevant ways for realizing appropriation. Placed in a networked context with collaboration and competition, innovators can co-create value with other players and capture value from the collective payoffs. Leveraging refers to treating appropriability premises as vehicles for transaction and knowledge sharing. On the other hand, appropriability premises can be deliberately abandoned, periodically or permanently, to attract contributions from outside. Within certain boundaries, a firm can also shift between the paths. We present and explicate a framework addressing the three paths and suggest how it can help innovators adjust their appropriability portfolios and align the appropriability premises with the ways in which they are utilized. This adds to appropriability theory dynamic and open elements it has lacked in the past.

Keywords

Appropriability; Appropriation; Innovation management; Intellectual property; Open innovation; Profiting from innovation; Value capture theory; Interactive appropriability

Introduction

Innovation management does not stop to the point where a new idea has emerged and gained its form. It does not stop when the innovation has been successfully offered to customers either. This is, however, the point where innovation appropriability starts to turn into appropriation – if the premises have been well managed, and if subsequent innovation management is equipped and ready to deal with hurdles related to value capture. This chapter addresses these issues.

Most innovators pursue strongly to benefit from their investments in innovation and find incentives to engage in complex and uncertain development work in the underlying potential for capturing some value in the process. This benefit does not have to be monetary, even if in many instances it comes down to making profits – at least at some point. In these situations – for capturing value – having some control over the innovation is needed, which, in turn, necessitates careful management. As most innovation is profoundly intellectual and intangible, it may be misappropriated by competitors and customers without any compensation to the innovator.

In the contemporary world, appropriability of innovation – the potential of an innovator to benefit from their innovation – realizes in complex ways. Innovation appropriability can be built, like suggested in many studies, on formal mechanisms such as patents and/or other intellectual property rights (IPRs), or on informal and strategic mechanisms such as (partial or full) secrecy and/or careful human resource management (Teece, 1986; Levin *et al.*, 1987; Liebeskind, 1996, 1997; Cohen, Nelson and Walsh, 2000; Hurmelinna-Laukkanen and Puimalainen, 2007; Olander, Vanhala and Hurmelinna-Laukkanen, 2014; Olander *et al.*, 2016; Hannah *et al.*, 2019). However, this building of appropriability needs to be aligned with the innovation and value creation processes quite early on. Succeeding in this, in turn, is dependent on contextual features. For example, while some control is generally needed, different industries and countries have different effective appropriability premises, and aspects such as networkedness of firms is relevant; an overly protective approach may make important collaborators shy away, in which case it makes sense to open up and selectively reveal ideas (Alexy *et al.*, 2018). That is, when building appropriability, understanding the contingencies and logics of value creation and matching managerial approach accordingly is needed.

Appropriation as the realizing of appropriability potential is not straightforward either. It does not follow automatically from good appropriability premises or conditions. The actual appropriation requires an understanding of the market and the dynamics within it. Having control is only the starting point, and how this control (or lack thereof) is exercised is a completely different thing. The varying appropriability mechanisms can be put in use for quite different purposes from ensuring that the innovator becomes the sole beneficiary of monopolistic profits, to making sure that other actors do not block free and wide dissemination of the innovation and its free use (Appleyard *et al.*, 2017; Jacobides *et al.*, 2006; Teece, 1986). Importantly, the mechanisms can also be utilized to support the generation of new innovation based on the initial innovation (Ahuja *et al.*, 2013; Alnuaimi *et al.*, 2016), and thereby receiving future benefits.

The challenge is, that the practices in between appropriability and appropriation are not all that clear or visible in the current theorizing or managerial writings. Existing literature tends to address the combinations of appropriability premises (the combinations of mechanisms and/or complementary assets) and the uses of individual mechanisms, such as patent strategies, separately. Current theories and frameworks lack the explaining of, for example, the emerging appropriation failures of firms that have a strong appropriability regime and sufficient complementary assets (such as IBM Watson Health) (Yang *et al.*, 2020). This chapter intends to narrow this gap with insights and a framework that elaborates the strategic and managerial premises of connecting appropriability and appropriation. We propose the concept of *interactive appropriability* – context-specific, dynamic aligning of appropriability premises (constituted with appropriability mechanisms and complementary assets) and interacting with other agents by relying on *exclusion of others*, *leveraging the appropriability premises*, and *abandoning of protection*, to benefit from innovation and appropriate value.

The rest of this chapter is structured as follows. The next section traces the theoretical origins of relevant research streams and advances profiting-from-innovation framework with value capture theory, thereby introducing the bases of our suggested framework with the emphasis on the three paths of turning appropriability into appropriation. We then explicate the realizing of the possibilities to capture value by building on conceptual consideration and illustrative examples. We conclude with the theoretical and practical contributions of this study and suggestions for future research.

Value capture theory: refining the original Profiting from innovation (PFI) framework with a cooperative game theory

David Teece's "Profiting from innovation" (PFI) framework (Teece, 1986, revisited in 2006 and 2018b; see also Gambardella *et al.*, 2021) is highly influential in the innovation and strategic management fields. Many ideas presented in the PFI framework, such as building appropriability premises with appropriability mechanisms (e.g., intellectual property rights) and complementary assets (e.g., distribution channels), are still relevant today and in the central discussion of innovation management scholars and practitioners (Table 2.1 presents typical appropriability mechanisms and complementary assets). With decades of scholars' efforts, the question "how to benefit from innovation" has been explored across varying innovations (Battisti *et al.*, 2010; e.g. Ritala *et al.*, 2009), analysis levels (e.g. Alexander, 2012), and contexts (such as industry context, country context, and more recently, digitalization context) (e.g. Faria *et al.*, 2008; Miric *et al.*, 2019; Seo *et al.*, 2017; Tech *et al.*, 2019). Among these studies, open innovation, a distributed innovation model introduced by Henry Chesbrough (2003), goes beyond the firm boundaries and opens a new research avenue in terms of purposively managing knowledge flows to benefit from innovation (Chesbrough *et al.*, 2014).

[INSERT TABLE 2.1 HERE]

Value capture theory has been recently outlined by Gans and Ryall (2017). Like the PFI framework, it addresses value appropriation and explains the heterogeneity of a firm's performance. However, in this theorizing, the object of value capturing does not necessarily have to be innovation – it can also be products that have been existing for long, for example. More importantly, the unit of analysis in the value capture theory is agent, and the focus of the theory shifts towards engaging agents in productive activities (Gans & Ryall, 2017). Being placed in the contexts of value networks composed of agents, heterogeneity of a firm's performance is explained with a cooperative game theory. For a firm, appropriating value is like a "bargaining game" between players.

In innovation appropriability literature (see James *et al.*, 2013; Sun *et al.*, 2018 for reviews), the phrase "to appropriate value" is used interchangeably with "to capture value". However, these two research streams – PFI and value capture theory, have been hardly contrasted and aligned. Yet, value capture theory's modeling of the cooperative game stage could be valuable for the PFI framework in terms of assessing how to capture value with collaboration and competition, as this kind of modeling makes it possible to analytically study the interactions in multi-player settings and the value allocated to individual players (Ross, 2018). On the other hand, the PFI framework could help value capture theory to narrow the chasm existing in the identification of issues for empirical development (Chatain *et al.*, 2017; Gans *et al.*, 2017), as factors determining value capture from innovation have been long discussed in PFI studies. As a result, value capture theory could be expanded from the predominantly conceptual and theoretical works to empirical domains.

In this section, the origins (as well as underlying assumptions) of PFI and value capture theory are presented and compared first. After converging the different streams of research, we discuss how the realizing of the possibilities to capture value could be reconsidered by looking at the paths from appropriability potential to realized appropriation. Finally, we present a framework that emphasizes the process to realize appropriability (i.e., appropriation process) as the outcome of integrating the two perspectives.

Value-based strategy versus knowledge-based view

The possibility to draw together concepts from the PFI framework and value capture theory lies in the resource-based view of the firm in the field of strategic management. Figure 2.1 illustrates the links between the PFI framework (and open innovation) and value capture theory by tracing their theoretical origins.

[INSERT FIGURE 2.1 HERE]

Both PFI and value capture theory assume that resources are scarce (that is, in finite supply) and that mobility barriers of resources exist, which accounts for profit differentials between firms (Gans *et al.*, 2017). Particularly, for the PFI framework, *knowledge* is the most important resource of the firm for creating and maintaining competitive advantage (Grant, 2015). Hence, preventing others from copying and exploiting the innovation by protecting knowledge (and innovation) with different appropriability mechanisms has dominated appropriability discussions. However, changes in the innovation and business environments have produced quite different and parallel views. Especially open innovation literature challenges the assumption that exclusivity is desirable (Huizingh, 2011), and argues the importance of allowing knowledge to flow across firm boundaries (in the way

of inside-out and outside-in open innovation). It has raised cooperation discussions upon knowledge protection and sharing, as well as aspects of knowledge acquisition and integration that are closely related to the absorptive capabilities of a firm (Bacon et al., 2020; Estrada et al., 2016; Ritala et al., 2013).

As already briefly noted above, value capture theory analyzes the tension between collaboration and competition with game theory, placed in the context of a network of players. Game theory has two distinct areas: noncooperative game theory (NGT) and cooperative game theory (CGT). While NGT focuses on *individual* strategies and is action-oriented, CGT focuses on *coalitions* and *agent added value*, and it is payoff-oriented (Gans & Ryall, 2017; Ross, 2018). Placed in a commercial setting, NGT's and CGT's modeling of a firm's value capture addresses the aspect of how much profit or utility a firm obtains from a transaction (e.g. a sale, collaboration, or investment) (Ross, 2018). CGT stage and NGT stage can be linked with a "biform game" model, where NGT is the first stage, followed by CGT (Brandenburger et al., 2007); or an inverse biform game, where NGT stage is placed *after* a CGT stage (see Nagarajan et al., 2008 for a review). Taking CGT and NGT together models cooperation (Ross, 2018).

In terms of using value capture theory to refine the PFI model at the abstract and general levels, CGT modeling of value capture seems particularly suitable. CGT can be used to understand interactions in relatively limited settings such as an acquisition or a strategic alliance, or those among a larger number of agents, such as in ecosystems, collaborative communities, and platforms (Gans & Ryall, 2017: 24; Ross, 2018). The core idea of CGT is that while a firm engages in the game and forms coalitions with other players to co-create value (or so-called "bake the cake"), it also competes to capture value from resulting collective payoffs (or so-called "divide the cake") (see Ritala & Hurmelinna-Laukkanen, 2019). The aggregate value arises from the firm's engagement (or so-called "bigger cake"), and agents can benefit from cooperation, where binding agreements determine their roles and positions (Gans & Ryall, 2017: 24; Ross, 2018).

Value capture theory's consideration of cooperation and bargaining for value appropriation is valuable for the PFI framework. PFI argues that a firm with strong appropriability premises ('the cards with which they play') will lead to profits from innovation (see Figure 2.2). However, the concrete value capture activities ('playing the cards') are missing in this discussion. This is where the value capture theory could provide the needed insight. These aspects are discussed in the following.

[INSERT FIGURE 2.2 HERE]

Appropriation processes and outcomes

Traditional views suggest that appropriation can build on the *exclusivity of the innovation and the related knowledge assets*: Innovation is treated as proprietary, and the innovator takes actions to prevent others from using the innovation and related knowledge (e.g., Ceccagnoli, 2009; Harabi, 1995; David J. Teece, 1998).

This view is changed when insights of value capture theory are brought into the discussion. Value capture theory indicates that it is possible to capture a larger share of value by engaging in coalitions constituted by agents with binding agreements. It leads to reconsidering the path from appropriability to appropriation: profiting from innovation does not necessitate exclusivity. Appropriation can also build on *leveraging the innovation and the related appropriability mechanisms*, that is, on using them in different ways according to emerging opportunities and threats. For example, Petricevic and Teece (2019, p. 1504) note that in the international markets, "the driver of individual MNEs' actions should not be the conventional 'profiting from innovation' target, but rather the insight that a rising tide will lift many boats, with IPR protection recognized as the global economic system's premier public good that logically deserves exceptional and impassioned collective action." Leveraging does not emphasize the individual, preventive use of innovation, or the proprietary nature of innovation; it rather treats appropriability mechanisms and complementary assets as bargaining chips, means of signaling capabilities, or vehicles for transactions and (intended, wanted) knowledge sharing (see Gans & Stern, 2003; Pisano, 2006). Analysis of this process can be conducted at the level of individual transactions (e.g., transaction of IP), or more broadly, at the coalition level (e.g., Apple's iOS system where agents are in a coalition to build compatible technologies).

A further insight is that *appropriability premises, especially the mechanisms, can also be purposively abandoned*, meaning that exclusive rights are not applied for or executed, and knowledge is disclosed. It is frequently the case for corporates, who do research and development and patent their inventions, that they find some patents redundant. In a cooperative environment, this kind of approach might turn out particularly challenging; on top of taking resources for no reason, it might affect the performance of firms negatively due to impeding innovation adoption and/or cooperation. Deliberate abandonment of some appropriability mechanisms may enable attracting external contribution and accessing external capabilities (Appleyard et al., 2017; Henkel et

al., 2013; Jacobides et al., 2006). Exclusive rights may remain as owned (although not executed for exclusion purposes) by the innovator, which means that others cannot limit the free and wide use of the innovation and the related knowledge. This may notably enhance the firm's value capture. However, this requires combining the traditional PFI views with insights on cooperation, coopetition, and competition, as well as open innovation.

By converging the different streams of research, we propose a refined PFI framework, where the processes for realizing value capturing, from appropriability to appropriation, are emphasized (Figure 2.3). We argue that strong appropriability premises do not automatically lead to success, but that playing the "appropriability cards" in the right way with consideration of contextual factors and other agents in the game is important. In addition, as many collaborative communities include non-profit actors (Ross, 2018), this framework separates social returns from private returns, which are more relevant to non-profit-oriented actors such as universities. In the following, we propose how *interactive appropriability* may work.

[INSERT FIGURE 2.3 HERE]

Realizing the potential for value appropriation – Leaning on interactive appropriability

The model in Figure 2.3 illustrates how benefit from innovation can accrue from the following three central paths. With this general model in mind, we consider how firms can realize value appropriation in practice. The following discussion shows, in particular, how appropriability is interactive; it is dependent on the context in which it exists and the dynamics within.

Exclusion

As noted, extant appropriability research largely focuses on exclusivity where the use of appropriability mechanisms (see Table 1), especially intellectual property rights viewed from the proprietary perspective, dominates the discussion. Although these appropriability mechanisms cannot perfectly block others (for example, it is always possible to "invent around" a patent or an idea protected with secrecy can be developed by someone else independently), these appropriability mechanisms can at least slow down excessive competition. Besides defensive motives, offensive motives to use appropriability premise emerge. These include bargaining, standard setting, and even retaliation (Granstrand, 1999; Holgersson, 2013). Sophisticated use of appropriability mechanisms can generate new revenues for a firm, such as penalty income. However, the conditions under which these outcomes are pursued, are relevant.

Size of firms affecting the exclusive approach

Empirical studies have observed that small firms find patents less valuable as a tool to secure exclusivity and thus they rely more on secrecy and other means of appropriability when they pursue proprietary benefits (e.g. Arundel, 2001). Small firms usually have fewer patents per R&D investment than large firms (Minniti, 2011), but they can still be safe from imitation if they rely on tacit knowledge, for example. Adopting such an approach is understandable, as the value of formal appropriability mechanisms depends on ability of a firm to pose a credible threat of litigation (Gans et al., 2003; Laursen et al., 2014; Sherry et al., 2004). IPRs are not self-enforcing and they come often at great expense. With IPRs, there are usually filing, issuance, and maintenance fees in addition to ongoing costs for identifying misappropriation and costs for negotiation or litigation to defend rights (James et al., 2013; Teece, 2018a).

Industry contexts

Next to firm-level conditions, industries have their specific trajectories regarding the reliance on appropriability mechanisms. Certain industries have been empirically observed to be particularly prone to show reliance on patent protection to secure exclusivity, including, for example, pharmaceuticals and biotechnology industries, drugs and medical equipment industries (Al-Laham et al., 2010; Cohen et al., 2005; Cohen et al., 2000; Hall et al., 2003). Such an approach is understandable, as pharmaceutical products may require huge efforts to discover, but are relatively easy to manufacture; and they are typically covered with clear standards for assessing and claiming patent infringement (Ivus et al., 2017; Levin, Klevorick, Nelson, & Winter, 1987). Industry context also explains why firms choose not to patent. For example, biotechnology start-up executives are concerned about technology disclosure (Graham et al., 2016). In many cases, the usefulness of the different appropriability premises depends

on whether the industry can be considered discrete or complex, and on how fast the development cycles are. Patents, for instance, may be too slow a means, and they eventually will expire.

Appropriability conditions of countries

Other aspects that may define the feasibility of exclusive uses emerge from the wider, international environment. Different countries have different legal systems and enforcement levels of legal protection. As most IPRs are country-specific and the exclusive rights are limited to issuing countries, firms having international business usually must cover multiple countries at one time, with operated and targeted countries included. However, the lawsuit results of infringement (and the exclusivity and appropriation results) can vary across countries (Santangelo et al., 2016). In countries with weak intellectual property regimes, firms struggle to execute their rights, and even if they win disputes, they may have a hard time retrieving any compensation. Furthermore, a problem might emerge, if a government decides to support local firms by putting up limitations to foreign firms – despite their IPRs (see Pao-Tsung, 2013). Therefore, companies operating across multiple countries or located in countries with weaker IPR and legal systems may find formal appropriability mechanisms to be of limited efficiency for exclusive purposes.

Nature of technologies – emerging technologies and exclusive approach

Emerging technologies and advancements illustrate the applicability of exclusive paths to appropriation. In particular, they demonstrate how appropriability is interactive in terms of connecting in various ways to the innovation and the environment in which it emerges. In recent years, Artificial Intelligence (AI) has come to the focus of the public again and attracted interest from scholars and practitioners. AI's achievements (e.g. AlphaGo's beating human chess players with a surprising move; Google AI's more precise prediction of gender through eyes than humans) excite investors and portray a promising future (Kim, 2016; Qi, 2018). However, firms with AI-related technologies find it difficult to generate significant profits from it, and the traditional way of building appropriability premises for exclusion seems to slow down the development and commercialization of AI, where numerous experiments are needed for finding the best use cases of it (Yang et al., 2020). Taking the exclusivity strategy, where innovation is treated as property, means that outsiders have limited access to the innovation and make contributions. Therefore, the tasks to explore and experiment with different use cases, as well as continuously develop the algorithms, are conducted by their own staff. For firms that attempt to apply AI in slowly digitalized industries (such as healthcare, where data is not centralized and structured), it is a challenge: They need to do all the tasks mainly by themselves, including data governance and technology development in a context that they do not necessarily know well. When the technologies are treated as property, trust concerns also arise. For example, when AI is applied to give diagnosis suggestions (used as a clinical decision support system), physicians want to know how AI produces certain conclusions. Based on the transparency of conclusion making, physicians may or may not approve AI's suggestions, which influences their future acceptance and adoption of AI. Furthermore, applying exclusivity also implies communication costs, not only for developing the technology but also for making outsiders understand the technology during commercialization. Different approaches may be then needed.

Leveraging as the focal approach

As suggested above, leveraging refers to utilizing appropriability mechanisms and complementary assets that do not emphasize exclusion, but rather controlled transfer and wider utilization of innovation and the related knowledge. It includes practices such as licensing (and property transactions), inter-organizational collaboration (e.g. team-up, alliances, and ecosystems), bargaining/negotiations, and orchestration/coordination. The focus is on allowing others to access the innovation in purposeful ways. To continue the discussion on the nature of technology as a relevant aspect, and looking at AI as an example of emerging technologies, the Watson OpenScale of IBM can be an example of leveraging for appropriating value. It is an open platform allowing IBM Watson – a cognitive computing technology that integrated different facets of artificial intelligence (Chen et al., 2016) – to be used across clouds. It enables clients to use and build AI at their choice (IBM, 2018). Nevertheless, leveraging can emerge in different forms, and is conditioned by the features of the innovation environments.

Licensing (and property transaction)

Licensing has been regarded as an important means to profit from innovation. A license is “a contract by which an IPR holder firm (licensor) transfers the right to exploit its innovation to another firm (licensee) under certain conditions and for a certain period of time” (Avagyan et al., 2014). In this regard, IPRs can be used as bargaining chips for cross-licensing agreements (Fischer et al., 2013). Such agreements facilitate accessing such assets and

resources that would otherwise be difficult to obtain and would likely be in the proprietary use of some other parties. Licensing IPRs out generates revenues, which can be significant. For example, license fees collected by IBM exceed \$1 billion a year (Bhatia et al., 2007). This kind of approach is particularly useful when the innovator does not have resources to manufacture or disseminate the innovation widely, or if the innovation involves such creations that are not in the core activity of the innovator. An innovator can also appropriate economic returns from innovation by selling its intellectual rights and assets (Chesbrough, 2003, 2006). Selling unused IP and assets will not influence much the competitive advantage or bargaining power of firms such as Ericsson and IBM who have numerous patents, but help free their cash (Holgersson et al., 2018; Stasik et al., 2020).

Inter-organizational collaboration

An innovator conducts inter-organizational collaboration for, for example, when building industry standards or dominant designs (Ahuja et al., 2008), jointly solving problems and exploiting technological opportunities (Milesi et al., 2013), and/or “borrowing” resources (e.g. expertise and assets) from others to fill its resource gap (Dattée et al., 2018). Its collaboration partners can be both private and public actors (such as universities and research institutes), even competitors (i.e. cooptation). In these activities, the benefit does not necessarily originate from the current innovation as such, but from combining it and the related knowledge with that of others for additional value, or for the generation of completely new innovation. Indeed, appropriability discussions have expanded from focal firm level to network level, thereby getting closer to the approach of value capture theory. Viewed from the network perspective, inter-organizational collaborations are dynamic, with actors entering and exiting the relationships and re-encounters happening (Hurmelinna, 2018). In the multi-innovation context, innovation ecosystem gathers private and public organizations to combine complementary resources and achieve joint innovative goals, and firms can appropriate value from the joint innovation activities (Di Minin et al., 2013; Leten et al., 2013; Ritala & Hurmelinna-Laukkanen, 2019). Digital ecosystems have emerged recently as a result of the development of interactive digital technology, Cloud, Internet of Things, Internet of services, etc (Pagani, 2013). They have provided a new basis for innovators and innovation, and firms increasingly offer platforms that enable ecosystems and make it easier for outsiders to engage in the development and commercialization of technology (Boudreau, 2010; Teece, 2018a). However, control and protective elements remain relevant. Cooperation failures happen, and this needs to be considered. Cooperative game theory provides some tools for increasing readiness: A firm’s engagement should be considered in light of the configurations of the networks constituted by agents with different portfolios (Lichtenthaler, 2015; Ross, 2018). This idea is valuable for today’s collaborative communities, where innovations are produced across disciplinary and industry boundaries. It is especially valuable for them when, for example, deciding the group size for collaboration and/or accessing the role of suppliers, buyers, or complementors who have heterogeneous complementary resources (see Ross, 2018).

Bargaining/negotiation and orchestration/coordination

Generally speaking, those with strong appropriability premises have a better bargaining position, which is also one of the reasons why innovators obtain the appropriability mechanisms (Appleyard et al., 2017; Holgersson et al., 2018). The more diversified, effective portfolio one has, the more the bargaining position can be strengthened (Bessen et al., 2009; Bos et al., 2015). The improved transferability of knowledge assets incentivizes firms to use formal appropriability mechanisms such as IPRs and contracts over informal ones. Tacitness or secrecy, might, in fact, pose challenges in this regard. However, also in bargaining situations, control has a role to play. In networks, there might be a “hub” organization that takes an orchestrator role in negotiating agreements (Bogers et al., 2011). Less central actors in the network may find it difficult to exploit information and orchestrate resources for their advantage, and they have weaker bargaining power for capturing value from collective payoffs (Dahlander et al., 2006). If these actors were able to communicate that they have relevant innovation (covered with formal mechanisms) and tacit knowledge that is valuable for the other actors, the more likely they will be able to affect their positioning.

Abandoning appropriability mechanisms for value capturing

In contemporary business environments, practical examples indicate that sometimes any control is deliberately put to the background. In most cases, this is due to the interactive nature of appropriability. The IBM example expands to this path too. IBM has been contributing to open-source communities (and utilized the abandoning approach of appropriability mechanisms), receiving social returns as well as monetary returns as AI gets more widely adopted. That is, building on the ideas in value capture theory, the appropriability mechanisms (e.g., IPRs) and complementary assets held by IBM are not used for exclusion, nor leveraged, but rather forfeited to allow for wider use and experimentation.

Promoting free access

Practices of abandoning appropriability mechanisms include open license, defensive patents, and the so-called ‘copyleft’ (e.g., Belenzon et al., 2015; Schultz et al., 2012). Through open license (sometimes called “free license”), the innovator intends to cooperatively work with other parties and instead of maintaining a monopoly (Bessen et al., 2009; Grindley et al., 1997). Open Invention Network (OIN)’s defensive patent pool is a good example for clarifying the concept of defensive patent. OIN, backed by six companies – IBM, NEC, Novell, Philips, Red Hat, and Sony, established a patent pool, but not to generate revenues by asserting those patents, but rather to defend against attacks of Linux, which is an open-source operating system, and its related technologies (Nicholson, 2012). ‘Copyleft’, for its part, describes a reverse copyright scheme, where openness is preserved, e.g., with the license called the General Public License (GPL), and individual appropriation is prevented by requiring subsequent developers to share the improved software following the original open terms (Giordani et al., 2018). Returns to innovation are mainly social returns. For firms that turn proprietary software into open source software (OSS), “non-copyleft” is suggested, as it allows converting future versions back into proprietary, exclusive ones; or they can use an OSS and a proprietary license in parallel (Henkel, 2006).

Waiving exclusive rights

Besides using the appropriability mechanisms to ensure free use of the innovation, exclusive rights can also be waived: There is a waiver paradigm where firms pledge that they will not assert exclusive rights when infringement occurs. For example, IBM, Novell, and Nokia have done this when promoting OSS (Alexy et al., 2013). Another example is found in the patent waiving pledge made by the CEO of Tesla Motors in 2014 with a blog, with the statement that “Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.” (Musk, 2014). Traditionally, Tesla Motors has had strictly protected its intellectual property, so not surprisingly, this waiving pledge for all patents attracted great interest from the public (Rimmer, 2014). In 2018, Tesla Motors also started to release some Linux source codes for the Tesla Model S and X cars. From the appropriability perspective, these Tesla’s activities of abandoning and forfeiting their rights generate significant social returns to Tesla with regard to the spilled knowledge to other firms, and the environmental contributions based on facilitating the use of electric vehicles, for example. However, Tesla also does have monetary benefits available, as the spreading of e-cars has all the potential to increase interest in and demand for Tesla’s charging stations. Disclosing innovation related knowledge without applying any protection also signifies abandoning approach.

Conclusions

This book chapter responds to a focal question in the field of innovation management: How to benefit from innovation. We add to existing knowledge by turning attention to *interactive appropriability*: we remind that appropriation does not emerge automatically from (a portfolio of) appropriability mechanisms and complementary assets, but that these connect to varying uses and to the relevant contexts in dynamic ways. We identify three specific paths where this aspect emerges: In a nutshell, *exclusion* is about protecting innovation and excluding others from accessing the innovation to prevent unwanted imitation, *leveraging* focuses on knowledge transfer and bargaining power with appropriability premises, and *abandoning* deliberately gives up control to gain social returns and future-oriented private returns.

It is worth noticing that our framework does not mean that a firm can only choose one of three approaches to realize appropriation. It does not mean either that the strategic choice of approach should be one-off: It is possible, at least to an extent, to switch between paths, even the firm is already following one alternative. The objects of value capture can also be different parts or different versions of an innovation, which allows for multiple approaches to co-exist. We highlight the importance of managing the processes strategically, utilizing exclusion, leveraging, and abandoning in an intentional manner.

Theoretical contributions and practical implications

Appropriating returns from innovation is an important motivation for firms to engage in innovation activities, including open innovation endeavors. This book chapter contributes to the current innovation study by explicating how to “play the appropriability cards” to realize appropriation.

Our study started from the distinctive, theoretical discussions of Profiting from innovation (PFI) framework and value capture theory. We suggest, that by combining insights from these two views, it is possible to understand how innovation appropriability as potential can be turned into realized value capturing. While the building blocks of appropriability and appropriation come from the PFI, value capture theory brings in the context where varying

agents interact. In particular, the cooperative game theory as a part of value capture theory analyzing the tension between collaboration and competition in networked context allows seeing how different approaches to competition and collaboration, and matching the use of appropriability mechanisms and complementary assets to these approaches, promote appropriating value from innovation in different ways. In particular, this framing has the potential to explain better the appropriability and appropriation of emerging technological innovations. Our attempt to align value capture theory with the PFI framework further gives a start to translating the mathematical language of value capture theory into a view that is applicable in strategy research and practice. Value capture theory unpacks the “bargaining ability” box, showing how appropriability mechanisms and complementary assets can be treated as bargaining chips. It allows analyzing and understanding the interactions in inter-organizational collaborations with the consideration of the added value of agents, which range from small (like an individual transaction) to large (like collaborative communities and ecosystems) (Ross, 2018). Additionally, we push the framing to cover social, and not just private return, which may be relevant when considering value capturing in relation to the grand societal and environmental challenges.

This book chapter’s proposed framework has significant implications for practice. It reminds and helps firms to reconsider and revise their appropriation strategies continuously. Nowadays, actors are increasingly networked, and open for collaboration and knowledge sharing. For example, the ongoing pandemic has prompted more discussion on collaboration and sharing of proprietary technologies and other solutions as an essential aspect in responding to global challenges (Chesbrough, 2020). It could be expected that the value of leveraging and abandoning paths could be emerging more in the future. Expanding the appropriability view from traditional exclusion towards leveraging and abandoning to turn appropriability potential to realized appropriation updates the managerial understanding of innovation appropriability and the related value capturing. Especially, the leveraging concept, enriched with cooperative game theory, offers firms ideas on how to strengthen bargaining power in the inter-organizational collaborations with the help of appropriability mechanisms and complementary assets. In such settings, building collaborative communities benefits from assessment of complementary resources owned by different agents, and from being knowledgeable of the firm’s own control over the innovation and related knowledge – overemphasis of openness is not advisable either. In governing collaborative communities, cooperative game theory (CGT) may shed light on opportunistic behavior when developing shared norms (Kolbjørnsrud, 2014; Ross, 2018), and instruct managers on the appropriate levels of exclusivity and leverage.

Future research

The paths connecting appropriability and appropriation as well as interactive appropriability with consideration of other agents and context-specificity open avenues for future innovation studies falling under resource-based view, especially value-based strategy, and knowledge-based view, to understand how to capture value from innovation in competition and networks. Correspondingly, value capture theory is in its infancy in terms of being applied to guide strategy practices.

Details of the three approaches proposed here, i.e., exclusion, leveraging, and abandoning, await examination. Empirical research on the selection of the paths and deciding when to switch paths is needed. It will be valuable not only to examine successes, but also failures of firms, who make choices on different paths. Emerging contexts warrant attention: We need studies on the emergence and building of inter-organizational collaboration platforms (e.g. IBM OpenScale), which introduce different types of dynamics of value capture. Modeling digital transactions is a relevant topic for future research. Limited research focuses on the bargaining rules and configurations of agents with different complementary resources (Piller et al., 2014; Ross, 2018). What are the optimal configurations? How to select collaborative communities with regard to a firm’s own bargaining power and appropriability level? How do bargaining failures influence innovation activities and appropriation outcomes? How does value appropriation change with a firm’s bargaining power?

Finally, we acknowledge that besides private returns, it is also valuable to study the social returns from innovation. For example, researchers can trace the process starting from a firm’s purposive abandoning of its appropriability premises, looking at what social returns come up, and ending with an examination of how these social returns eventually influence the private profiting. Contemporary global challenges, such as the COVID-19 pandemic, gathers collective and collaborative efforts to achieve technological progress and advancements (Bertello et al., 2021; Chesbrough, 2020). As a response, many firms (such as AbbVie) announced waving exclusive rights to speed up the discovering of the treatments. We hope that this study provides a starting point for work that increases understanding of the premises of abandoning path and the related returns.

Acknowledgments

We are in debt to many colleagues and co-researchers who have listened to our ideas and helped us develop them further with their questions and comments. Likewise, we thank practitioners for sharing their insight during our research activities. Funding of this research is gratefully received from Finnish Cultural Foundation, Marcus Wallenberg Foundation, Foundation for Economic Education, Tauno Tönning Foundation, Scholarship Fund of the University of Oulu, University of Oulu Graduate School, Savings Banks Research Foundation, Martti Ahtisaari International Doctoral Scholarship, HPY Research Foundation, and University of Oulu Academics.

References

- Ahuja, G., Lampert, C. M., & Novelli, E. (2013). The second face of appropriability: Generative appropriability and its determinants. *Academy of Management Review*, 38(2), 248–269. doi: 10.5465/amr.2010.0290
- Ahuja, G., Lampert, C. M., & Tandon, V. (2008). Chapter 1: Moving beyond Schumpeter: Management research on the determinants of technological innovation. *Academy of Management Annals*, 2(1), 1–98. Retrieved from <http://10.0.4.56/19416520802211446>
- Al-Laham, A., Amburgey, T. L., & Baden-Fuller, C. (2010). Who is my partner and how do we dance? Technological collaboration and patenting speed in US biotechnology. *British Journal of Management*, 21(3), 789–807. Retrieved from <http://10.0.4.87/j.1467-8551.2010.00689.x>
- Alexander, E. A. (2012). The effects of legal, normative, and cultural-cognitive institutions on innovation in technology alliances. *Management International Review*, 52(6), 791–815. doi: <http://dx.doi.org/10.1007/s11575-011-0123-y>
- Alexy, O., George, G., & Salter, A. J. (2013). Cui Bono? The selective revealing of knowledge and its implications for innovative activity. *Academy of Management Review*, 38(2), 270–291. doi: 10.5465/amr.2011.0193
- Alexy, Oliver, West, J., Klapper, H., & Reitzig, M. (2018). Surrendering control to gain advantage: Reconciling openness and the resource-based view of the firm. *Strategic Management Journal*, 39(6), 1704–1727. doi: 10.1002/smj.2706
- Alnuaimi, T., & George, G. (2016). Appropriability and the retrieval of knowledge after spillovers. *Strategic Management Journal*, 37(7), 1263–1279. doi: 10.1002/smj.2383
- Appleyard, M. M., & Chesbrough, H. W. (2017). The dynamics of open strategy: From adoption to reversion. *Long Range Planning*, 50(3), 310–321. doi: 10.1016/J.LRP.2016.07.004
- Arundel, A. (2001). The relative effectiveness of patents and secrecy for appropriation. *Research Policy*, 30(4), 611–624. doi: 10.1016/S0048-7333(00)00100-1
- Avagyan, V., Esteban-Bravo, M., & Vidal-Sanz, J. M. (2014). Licensing radical product innovations to speed up the diffusion. *European Journal of Operational Research*, 239(2), 542–555. doi: 10.1016/j.ejor.2014.05.031
- Bacon, E., Williams, M. D., & Davies, G. (2020). Coopetition in innovation ecosystems: A comparative analysis of knowledge transfer configurations. *Journal of Business Research*, 115, 307–316. doi: 10.1016/j.jbusres.2019.11.005
- Battisti, G., & Stoneman, P. (2010). How innovative are UK firms? Evidence from the fourth UK community innovation survey on synergies between technological and organizational innovations. *British Journal of Management*, 21(1), 187–206. doi: 10.1111/j.1467-8551.2009.00629.x
- Belenzon, S., & Schankerman, M. (2015). Motivation and sorting of human capital in open innovation. *Strategic Management Journal*, 36(6), 795–820. doi: 10.1002/smj.2284
- Bertello, A., Bogers, M. L., & De Bernardi, P. (2021). Open innovation in the face of the COVID-19 grand challenge: insights from the Pan-European hackathon ‘EUvsVirus’. *R&D Management*. doi: 10.1111/radm.12456
- Bessen, J., & Maskin, E. (2009). Sequential innovation, patents, and imitation. *RAND Journal of Economics*, 40(4), 611–635. doi: 10.1111/j.1756-2171.2009.00081.x
- Bhatia, V., & Carey, G. I. B. (2007). Patenting for profits. *MIT Sloan Management Review*, 48(4), 15-16.
- Bogers, M., Bekkers, R., & Granstrand, O. (2011). Intellectual property and licensing strategies in open collaborative innovation. In *Open Innovation in Firms and Public Administrations: Technologies for Value Creation* (pp. 37–58). University of Southern Denmark, Denmark: IGI Global. doi: 10.4018/978-1-61350-341-6.ch003
- Bos, B., Broekhuizen, T. L. J., & de Faria, P. (2015). A dynamic view on secrecy management. *Journal of Business Research*, 68(12), 2619–2627. doi: 10.1016/j.jbusres.2015.04.009
- Boudreau, K. (2010). Open platform strategies and innovation: Granting access vs. devolving control.

- Management Science*, 56(10), 1849–1872. doi: 10.1287/mnsc.1100.1215
- Brandenburger, A., & Stuart, H. (2007). Biform games. *Management Science*, 53(4), 537–549. doi: 10.1287/mnsc.1060.0591
- Ceccagnoli, M. (2009). Appropriability, preemption, and firm performance. *Strategic Management Journal*, 30(1), 81–98. doi: 10.1002/smj.723
- Chatain, O., & Mindruta, D. (2017). Estimating value creation from revealed preferences: Application to value-based strategies. *Strategic Management Journal*, 38(10), 1964–1985. doi: 10.1002/smj.2633
- Chen, Y., Argentinis, E., & Weber, G. (2016, April 1). IBM Watson: How cognitive computing can be applied to big data challenges in life sciences research. *Clinical Therapeutics*, 38(4), 688–701. doi: 10.1016/j.clinthera.2015.12.001
- Chesbrough, H., & Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation keywords. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), *New frontiers in open innovation* (pp. 3–28). Oxford: Oxford University Press.
- Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Boston: Harvard Business School Press.
- Chesbrough, H. W. (2006). Open business models: How to thrive in the new innovation landscape. *Harvard Business School Press Books*, 1.
- Chesbrough, H. (2020). To recover faster from Covid-19, open up: Managerial implications from an open innovation perspective. *Industrial Marketing Management*, 88, 410–413. doi: 10.1016/j.indmarman.2020.04.010
- Cohen, J. E., Rajz, G., Lylyk, P., Ben-Hur, T., Gomori, J. M., & Umansky, F. (2005). Protected stent-assisted angioplasty in radiation-induced carotid artery stenosis. *Neurological Research*, 27(SUPPL. 1), S69–S72. doi: 10.1179/016164105X25333
- Cohen, W. M., Nelson, R. R., & Walsh, J. P. (2000). *Protecting their intellectual assets: Appropriability conditions and why U.S. manufacturing firms patent (or not)* (Working Paper 7552). National Bureau of Economic Research Inc.
- Dahlander, L., & Wallin, M. W. (2006). A man on the inside: Unlocking communities as complementary assets. *Research Policy*, 35(8 SPEC. ISS.), 1243–1259. doi: 10.1016/j.respol.2006.09.011
- Dattée, B., Alexy, O., & Autio, E. (2018). Maneuvering in poor visibility: How firms play the ecosystem game when uncertainty is high. *Academy of Management Journal*, 61(2), 466–498.
- Di Minin, A., & Faems, D. (2013). Building appropriation advantage: An introduction to the special issue on intellectual property management. *California Management Review*, 55(4), 7–14. doi: 10.1525/cm.2013.55.4.7
- Estrada, I., Faems, D., & de Faria, P. (2016). Coopetition and product innovation performance: The role of internal knowledge sharing mechanisms and formal knowledge protection mechanisms. *Industrial Marketing Management*, 53, 56–65. doi: 10.1016/j.indmarman.2015.11.013
- Faria, P., & Sofka, W. (2008). Appropriability mechanisms of multinational firms – A cross country comparison. *2008 IEEE International Engineering Management Conference*, 1–5. doi: 10.1109/IEMCE.2008.4617978
- Fischer, T., & Henkel, J. (2013). Complements and substitutes in profiting from innovation – A choice experimental approach. *Research Policy*, 42(2), 326–339. doi: 10.1016/j.respol.2012.06.004
- Gambardella, A., Heaton, S., Novelli, E., & Teece, D. J. (2021). Profiting from enabling technologies?. *Strategy Science*, 6(1), 75–90. doi: 10.1287/stsc.2020.0119
- Gans, J., & Ryall, M. D. (2017). Value capture theory: A strategic management review. *Strategic Management Journal*, 38(1), 17–41. doi: 10.1002/smj.2592
- Gans, J. S., & Stern, S. (2003). The product market and the market for “ideas”: Commercialization strategies for technology entrepreneurs. *Research Policy*, 32(2 SPEC.), 333–350. doi: 10.1016/S0048-7333(02)00103-8
- Giordani, P. E., Rullani, F., & Zirulia, L. (2018). Endogenous growth of open collaborative innovation communities: A supply-side perspective. *Industrial and Corporate Change*, 27(4), 745–762. doi: 10.1093/icc/dty004
- Graham, S. J. H., & Sichelman, T. S. (2016). Intellectual property and technology startups: What entrepreneurs tell us. In *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth* (Vol. 26, pp. 163–199). Emerald Group Publishing Ltd. doi: 10.1108/S1048-473620160000026006
- Granstrand, O. (1999). *The economics and management of intellectual property*. Edward Elgar Publishing.
- Grant, R. M. (2015). Knowledge-based view. In *Wiley encyclopedia of management* (pp. 1–2). Chichester, UK: John Wiley & Sons, Ltd. doi: 10.1002/9781118785317.weom120172
- Grindley, P. C., & Teece, D. J. (1997). Managing intellectual capital: Licensing and cross-licensing in semiconductors and electronics. *California Management Review*, 39(2), 8–41.
- Hall, M., Oppenheim, C., & Sheen, M. (2003). Barriers to the use of patent information in SMEs. In R. A.

- Blackburn (Ed.), *Intellectual Property and Innovation Management in Small Firms* (pp. 144–160). London, New York: Routledge.
- Hannah, D., Parent, M., Pitt, L., & Berthon, P. (2019). Secrets and knowledge management strategy: The role of secrecy appropriation mechanisms in realizing value from firm innovations. *Journal of Knowledge Management*, 23(2), 297–312. doi: <http://dx.doi.org/10.1108/JKM-09-2017-0389>
- Harabi, N. (1995). Appropriability of technical innovations an empirical analysis. *Research Policy*, 24(6), 981–992. doi: 10.1016/0048-7333(94)00812-4
- Henkel, J. (2006). Selective revealing in open innovation processes: The case of embedded Linux. *Research Policy*, 35(7), 953–969. doi: 10.1016/j.respol.2006.04.010
- Henkel, J., Baldwin, C. Y., & Shih, W. (2013). IP modularity: Profiting from innovation by aligning product architecture with intellectual property. *California Management Review*, 55(4), 65–82. doi: 10.1525/cm.2013.55.4.65
- Holgersson, M. (2013). Patent management in entrepreneurial SMEs: A literature review and an empirical study of innovation appropriation, patent propensity, and motives. *R and D Management*, 43(1), 21–36. doi: 10.1111/j.1467-9310.2012.00700.x
- Holgersson, M., Granstrand, O., & Bogers, M. (2018). The evolution of intellectual property strategy in innovation ecosystems: Uncovering complementary and substitute appropriability regimes. *Long Range Planning*, 51(2), 303–319. doi: 10.1016/j.lrp.2017.08.007
- Huizingh, E. K. R. E. (2011). Open innovation: State of the art and future perspectives. *Technovation*, 31(1), 2–9. doi: 10.1016/j.technovation.2010.10.002
- Hurmelinna-Laukkanen, P., & Puumalainen, K. (2007). Formation of the appropriability regime: Strategic and practical considerations. *Innovation : Management, Policy & Practice*, 9(1), 2–13.
- Hurmelinna, P. (2018). Exiting and entering relationships: A framework for re-encounters in business networks. *Industrial Marketing Management*, 70(July), 113–127. doi: 10.1016/j.indmarman.2017.07.010
- IBM. (2018, October 15). *IBM introduces ai openscale to spur artificial intelligence adoption and transparency*.
- Ivus, O., Park, W. G., & Saggi, K. (2017). Patent protection and the composition of multinational activity: Evidence from US multinational firms. *Journal of International Business Studies*, 48(7), 808–836. doi: 10.1057/s41267-017-0100-1
- Jacobides, M. G., Knudsen, T., & Augier, M. (2006). Benefiting from innovation: Value creation, value appropriation and the role of industry architectures. *Research Policy*, 35(8 SPEC. ISS.), 1200–1221. doi: 10.1016/j.respol.2006.09.005
- James, S. D., Leiblein, M. J., & Lu, S. (2013). How firms capture value from their innovations. *Journal of Management*, 39(5), 1123–1155. doi: 10.1177/0149206313488211
- Kim, E. (2016, March 15). *Lee Sedol makes surprise move before final match against AlphaGo*. Business Insider.
- Kolbjørnsrud, V. (2014). *On governance in collaborative communities* [BI Norwegian Business School]. Retrieved from <https://core.ac.uk/download/pdf/52094914.pdf>
- Laursen, K., & Salter, A. J. (2014). The paradox of openness: Appropriability, external search and collaboration. *Research Policy*, 43(5), 867–878. doi: 10.1016/j.respol.2013.10.004
- Leten, B., Vanhaverbeke, W., Roijackers, N., Clerix, A., & Van Helleputte, J. (2013). IP models to orchestrate innovation ecosystems: IMEC, a public research institute in nano-electronics. *California Management Review*, 55(4), 51–64. doi: 10.1525/cm.2013.55.4.51
- Levin, R. C., Klevorick, A. K., Nelson, R. R., & Winter, S. G. (1987). Appropriating the returns from industrial research and development; Comments and discussion. *Brookings Papers on Economic Activity*, 3, 783. doi: 10.2307/2534454
- Levin, R. C., Klevorick, A. K., Nelson, R. R., Winter, S. G., Gilbert, R., & Griliches, Z. (1987). Appropriating the returns from industrial research and development. *Brookings Papers on Economic Activity*, 1987(3), 783. doi: 10.2307/2534454
- Lichtenthaler, U. (2015). A note on outbound open innovation and firm performance. *R and D Management*, 45(5), 606–608. doi: 10.1111/radm.12138
- Liebeskind, J. P. (1996). Knowledge, strategy, and the theory of the firm. *Strategic Management Journal*, 17(SUPPL. WINTER), 93–107. doi: 10.1002/smj.4250171109
- Liebeskind, J. P. (1997). Keeping organizational secrets: Protective institutional mechanisms and their costs. *Industrial and Corporate Change*, 6(3), 623–663. doi: 10.1093/icc/6.3.623
- Milesi, D., Petelski, N., & Verre, V. (2013). Innovation and appropriation mechanisms: Evidence from Argentine microdata. *Technovation*, 33(2–3), 78–87. doi: 10.1016/j.technovation.2012.12.001
- Minniti, A. (2011). Knowledge appropriability, firm size, and growth. *Journal of Macroeconomics*, 33(3), 438–454. doi: 10.1016/j.jmacro.2011.02.004
- Miric, M., Boudreau, K. J., & Jeppesen, L. B. (2019). Protecting their digital assets: The use of formal & informal

- appropriability strategies by App developers. *Research Policy*, 48(8), 103738. doi: 10.1016/j.respol.2019.01.012
- Musk, E. (2014). *All our patent are belong to you*. Retrieved from <https://www.tesla.com/blog/all-our-patent-are-belong-to-you>
- Nagarajan, M., & Sošić, G. (2008). Game-theoretic analysis of cooperation among supply chain agents: Review and extensions. *European Journal of Operational Research*, 187(3), 719–745. doi: 10.1016/j.ejor.2006.05.045
- Nicholson, D. (2012). Open invention network: A defensive patent pool for open source projects and businesses. *Technology Innovation Management Review*, 2(1), 12–17. doi: 10.22215/timreview/511
- Olander, H., Vanhala, M., & Hurmelinna-Laukkanen, P. (2014). Reasons for choosing mechanisms to protect knowledge and innovations. *Management Decision*, 52(2), 207–229. doi: 10.1108/MD-11-2012-0791
- Olander, H., Vanhala, M., Hurmelinna-Laukkanen, P., & Blomqvist, K. (2016). Preserving prerequisites for innovation: Employee-related knowledge protection and organizational trust. *Baltic Journal of Management*, 11(4), 493–515. doi: 10.1108/BJM-03-2015-0080
- Pagani, M. (2013). Digital business strategy and value creation: Framing the dynamic cycle of control points. *MIS Quarterly*, 37(2), 617–632.
- Pao-Tsung, K. (2013). *Institutional change and foreign market entry behaviour of the firm: A longitudinal study of three Swedish firms in China*. Uppsala University.
- Petricevic, O., & Teece, D. J. (2019). The structural reshaping of globalization: Implications for strategic sectors, profiting from innovation, and the multinational enterprise. *Journal of International Business Studies*, 50(9), 1487–1512. doi: 10.1057/s41267-019-00269-x
- Piller, F., & West, J. (2014). Firms, users, and innovation. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), *New frontiers in open innovation* (pp. 29–49). Oxford: Oxford University Press. doi: 10.1093/acprof:oso/9780199682461.003.0002
- Pisano, G. (2006). Profiting from innovation and the intellectual property revolution. *Research Policy*, 35(8 SPEC. ISS.), 1122–1130. doi: 10.1016/j.respol.2006.09.008
- Qi, S. R. (2018). *Google's AI can see through your eyes what doctors can't*. Retrieved from <https://medium.com/health-ai/googles-ai-can-see-through-your-eyes-what-doctors-can-t-c1031c0b3df4>
- Rimmer, M. (2014). *Tesla motors: Intellectual property, open innovation, and the carbon crisis* (Issue August). Retrieved from <http://ir.teslamotors.com/secfiling.cfm?filingID=1193125-13-96241&CIK=1318605>
- Ritala, P., & Hurmelinna-Laukkanen, P. (2009). What's in it for me? Creating and appropriating value in innovation-related co-opetition. *Technovation*, 29(12), 819–828. doi: 10.1016/j.technovation.2009.07.002
- Ritala, P., & Hurmelinna-Laukkanen, P. (2013). Incremental and radical innovation in co-opetition—the role of absorptive capacity and appropriability. *Journal of Product Innovation Management*, 30(1), 154–169. doi: 10.1111/j.1540-5885.2012.00956.x
- Ritala, P. and Hurmelinna-Laukkanen, P. (2019). Dynamics of co-opetitive value creation and appropriation. Chapter 5 In: *Routledge Companion to Co-opetition Strategy*, A-S Fernandez, P Chiambaretto, F Le Roy, W Czakon. (Eds.). Routledge, 80-89.
- Ross, D. G. (2018). Using cooperative game theory to contribute to strategy research. *Strategic Management Journal*, 39(11), 2859–2876. doi: 10.1002/smj.2936
- Santangelo, G. D., Meyer, K. E., & Jindra, B. (2016). MNE Subsidiaries' Outsourcing and InSourcing of R&D: The Role of Local Institutions. *Global Strategy Journal*, 6(4), 247–268. Retrieved from <http://10.0.3.234/gsj.1137>
- Schultz, J., & Urban, J. (2012). Protecting open innovation: The defensive patent license as a new approach to patent threats, transaction costs, and tactical disarmament. *Harvard Journal of Law & Technology*, 26. Retrieved from <https://scholarship.law.berkeley.edu/facpubs/2149>
- Seo, H., Chung, Y., & Yoon, H. D. (2017). R&D cooperation and unintended innovation performance: Role of appropriability regimes and sectoral characteristics. *Technovation*, 66–67, 28–42. doi: 10.1016/j.technovation.2017.03.002
- Sherry, E. F., & Teece, D. J. (2004). Royalties, evolving patent rights, and the value of innovation. *Research Policy*, 33(2), 179–191. doi: 10.1016/S0048-7333(03)00088-X
- Stasik, E., & Cohen, D. L. (2020). Royalty rates and licensing strategies for essential patents on 5g telecommunication standards: What to expect. *Les Nouvelles - Journal of the Licensing Executives Society*, 3. Retrieved from <https://papers.ssrn.com/abstract=3658472>
- Sun, Y., & Zhai, Y. (2018). Mapping the knowledge domain and the theme evolution of appropriability research between 1986 and 2016: A scientometric review. *Scientometrics*, 116(1), 203–230. doi: 10.1007/s11192-018-2748-0
- Tech, R. P., Kahlert, J., & Schmeiss, J. (2019). Blockchain-Enabled Open Business Models: New Means to Shared

- Value Capturing?. In: *Co-Creation*. Springer, Chambridge. 63-76.
- Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 15(6), 285–305. doi: 10.1016/0048-7333(86)90027-2
- Teece, D. J. (1998). Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets. *California Management Review*, 40(3), 55–79. doi: 10.2307/41165943
- Teece, D. J. (2006). Reflections on “profiting from innovation.” *Research Policy*, 35(8 SPEC. ISS.), 1131–1146. doi: 10.1016/j.respol.2006.09.009
- Teece, D. J. (2018a). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. *Research Policy*, 47(8), 1367–1387. doi: 10.1016/j.respol.2017.01.015
- Teece, D. J. (2018b). Reply to Nelson, Helfat and Raubitschek. *Research Policy*, 47(8), 1400–1402. doi: 10.1016/j.respol.2018.03.016
- Yang, J., Chesbrough, H., & Hurmelinna-Laukkanen, P. (2020). *The rise, fall, and resurrection of IBM Watson Health*. CA: University of California, Berkeley. Retrieved from <http://jultika.oulu.fi/Record/nbnfi-fe2020050424858>

Strategic Management Framework

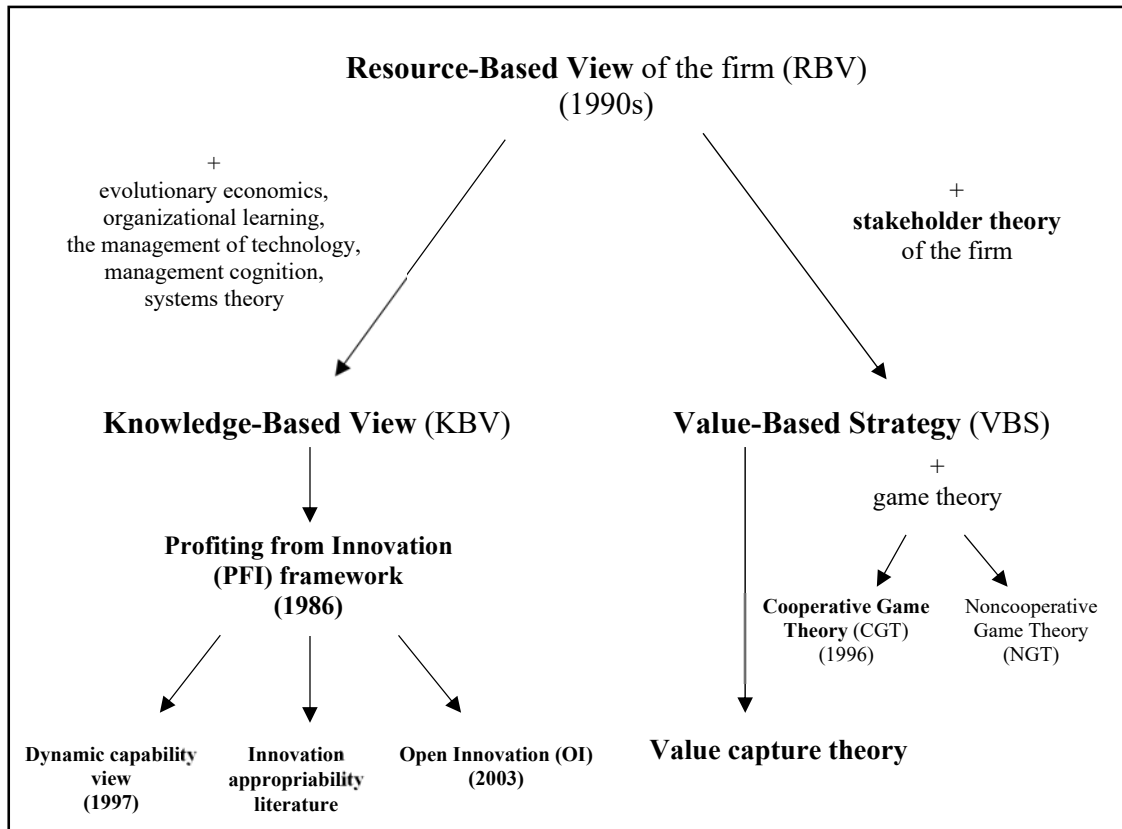


Figure 2.1 Developments of PFI and value capture theory, and their links (commonly used abbreviations in the brackets) (Teece, 1986; Teece, Pisano and Shuen, 1997; see Chesbrough, 2003; Grant, 2015; Gans and Ryall, 2017).

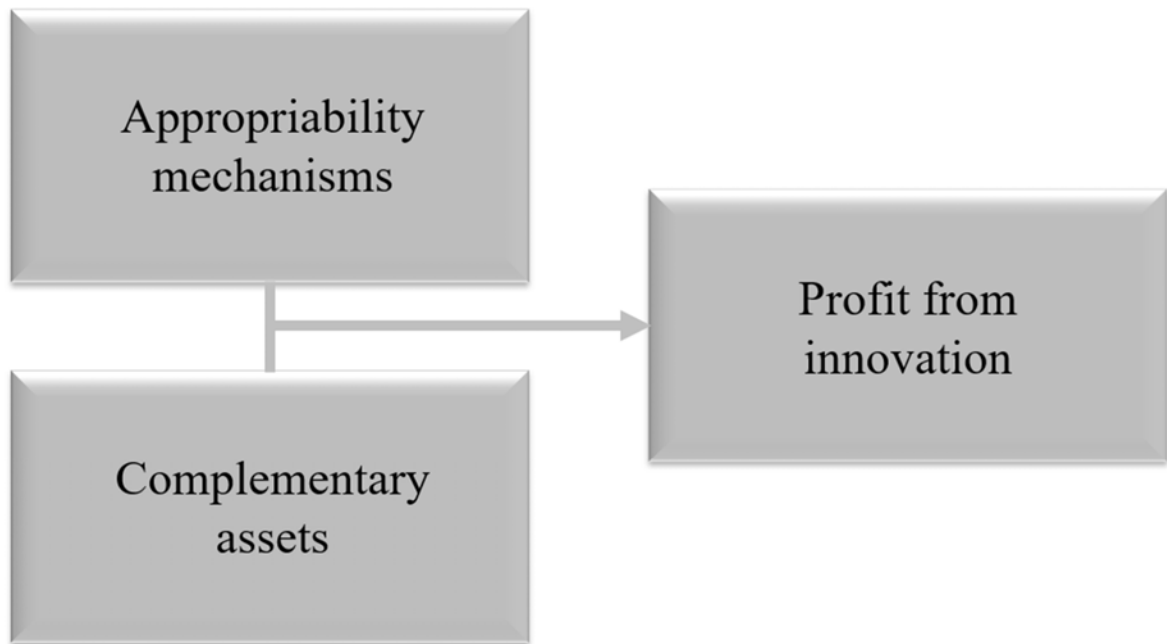


Figure 2.2 The original profit from innovation (PFI) framework.

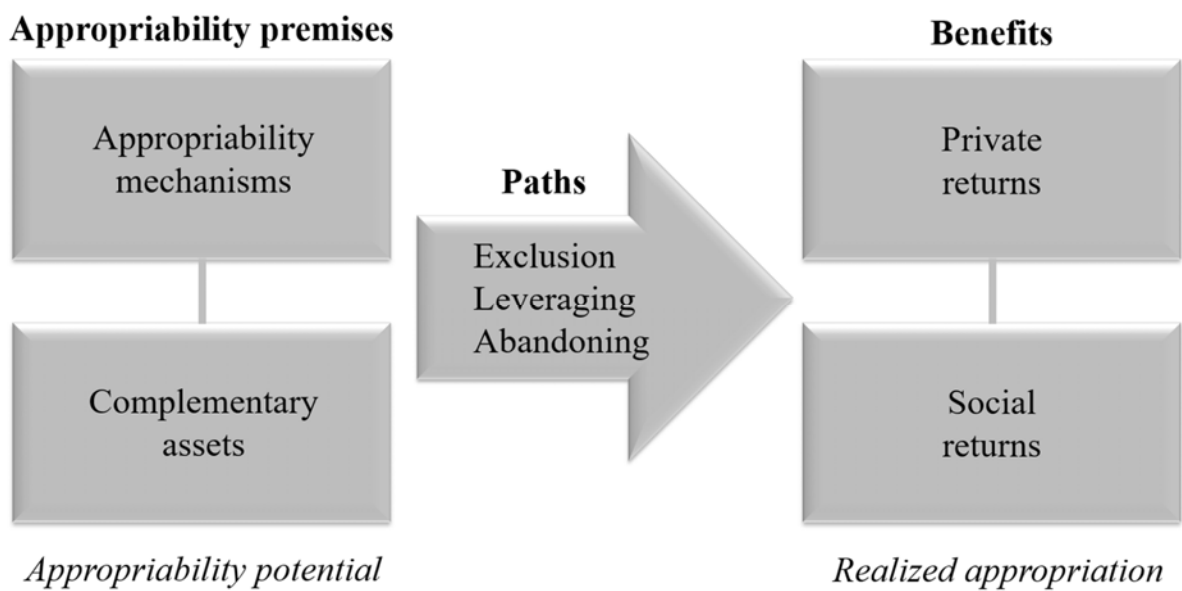


Figure 2.3 Benefit from innovation framework.

Table 2.1 Typical appropriability mechanisms and complementary assets.

Appropriability mechanisms	
<i>Formal appropriability mechanisms</i>	
Patent	} Intellectual property rights (IPRs)
Copyright	
Registered Design	
Trademark	
<i>Informal appropriability mechanisms</i>	
Secrecy (a part of IPR when considered as trade secrets defined in legislation)	
Lead time /Speed to market	
Tacitness/ Complexity (of design)	
Complementary assets	
Reputation (sometimes narrowed to brand)	
Distribution channels	
Complementary technologies/products/goods	
Marketing/Sales	
Service	
Expertise/Additional know-how	