Kuhn (1962, p. 103) writes, “[Paradigms] are the source of the methods, problem-field, and standards of solution accepted by any mature scientific community at any given time.”

Organizational innovation management is experiencing a paradigm shift. In this chapter, the technological drivers for the open paradigm are discussed followed by key concepts of innovation management including innovation funnel, radical and incremental innovation, exploration and exploitation, and organizational change. We then contrast closed and open innovation and highlight some selected forms, approaches, and practices of open innovation. We review major and promising theoretical models and present questions for further research. Open source will be reviewed as part of open community models.

Innovation means creating and implementing new ideas, services, technologies, business models, applications, or processes (Gupta et al. 2007). Only when an idea or invention is successfully applied to practice does innovation take place (Schumpeter 1942). Innovation can take place in just about any
human activity. Innovation is particularly critical when an organization faces one or more of the following: technological discontinuities, global competition, new markets, new competitors, collapsing product and service life cycles, or new customer value systems.

Traditionally, a firm’s research and development (R&D) and product development departments generated and managed innovations. Sometimes, this centralized approach would then delegate responsibility to business units organized by products and markets or both. Innovation in services was haphazard at best. Now, there is a greater recognition that innovation affects everything the organization or company does including but not limited to logistics and human resource management, marketing and customer management, production management, information systems, financing and capital management, and public relations. Nearly any job opening highlights innovation management as a core skill set. Never has innovation been as valuable as it is now.

Information and communication technology (ICT) plays a major role in the innovation revolution because it converges multiple technologies enabling access to vast amounts of data. ICT complements business and work processes and innovative management techniques that make innovations possible. ICT has fundamentally transformed innovation from an internal activity into an open and network-based business process (Brynjolfsson and Saunders 2010). ICT makes it possible to innovate across geographic and organizational boundaries and reach out to millions of people for their ideas and their assessments. ICT has led to large-scale, fast-cycle experimentation. Real-time data capture, storage, mining, visualization, simulation, and rapid prototyping allow companies to dramatically reduce development cycles and test novel combinations faster than ever before (Dodgson et al. 2006).

Technological changes have opened the innovation activities from inside the firm toward external networks. Shell’s GameChanger process brings together ideas from inside and outside the company, including academic researchers, to collaborate on new technologies and business ideas. A number of initiatives have emerged that use virtual worlds and digital games (Schultze et al. 2008). For example, the Institute for the Future uses massively multiparty online war game as a way to collectively address major problems together with the U.S. Office of Naval Research. Much innovation now takes place under an open paradigm: open innovation (Chesbrough 2003), open source (O’Mahony 2003), user innovation (von Hippel 2010), open communities (Faraj et al. 2011), social production (Benkler 2006), and sponsored co-creation (West and O’Mahony 2008). Large-scale unifying communications networks create a global community for producing, distributing, and consuming innovative ideas, products, and processes.

The open paradigm to innovation lowers the barriers to entry and enables small and large companies to participate in the innovation revolution. Global companies such as Procter & Gamble traditionally relied on their internal brick and mortar R&D functions to produce innovations. The company was very insular in terms of the ideas it developed and launched. However, by early 2000, the company adopted a new radical strategy of open innovation. Their “Connect and Develop” model focuses on identifying promising ideas anywhere in the world and bringing them to the company to enhance and capitalize on internal capabilities. The company also launched an Internet-based innovation intermediary (NineSigma). This new model of innovation allows the firm to innovate more with less and shorten its development cycles (Sakkab 2002). In some cases, R&D costs were cut 60% (Huston and Sakkab 2006).

Another company leveraging the paradigm shift in innovation is Threadless, a small Chicago-based company with less than 20 employees. Threadless operates t-shirt design competitions through its website. Globally, over one million people, many of whom were professional designers, submit designs (Howe 2006; Brabham 2010). The designs are then posted and voted on each week. Using all this information, the firm selects the final prints for the t-shirts that it produces.

Open innovation is best thought of as a paradigm shift in innovation management (Huizingh 2011). Openness has been long valued as bringing important diversity in the early phases of innovation, but more recently in other phases of the innovation as well (Granstrand et al. 1997). Openness takes varied forms in different phases (Dahlander and Gann 2010). Open innovation can involve integrating external ideas with internal organizational capabilities and resources, as well as effectively using intellectual property (IP) for appropriating value from innovations (Chesbrough 2003; Lichtenthaler 2011).
Open innovation can also mean exploiting open communities without legal constraints (von Hippel 2010). As problems grow more complex, Internet-based innovation communities make it possible for an almost infinite number of firms and individuals (who may not even know of each other’s existence) to work independently yet contribute to the overall innovation (Faraj et al. 2011).

Open innovation in its varied forms and approaches has gained popularity globally and across industries. Early research and writing began in North America and Europe (e.g., Chesbrough and Teece 1996; Granstrand et al. 1997). There is a growing body of open innovation literature in Asia (Asakawa et al. 2010; Lee et al. 2010) and Latin America (Gomes and Kruglianskas 2009). Governmental bodies, eager to improve their economic competitiveness, are very interested in open innovation (de Jong et al. 2008; Almirall and Wareham 2011; Jarvenpaa and Wernick 2011). Leveraging innovation in open networks is not limited to high-technology sectors (e.g., Intel, Apple, and Google) but is increasingly exploited in mature industries and service businesses (Chesbrough 2010; Chiaroni et al. 2010) and in small- and medium-sized firms (van de Vrande et al. 2009). Open innovation is also leveraged in nonprofits (Holmes and Smart 2009; Lakhani et al. 2012). As research continues and is disseminated and as technology continues to converge, more individuals, companies, and governments embrace the open innovation paradigm and reap its benefits.

### 68.2 Key Concepts in Innovation Management

The field of innovation management is rich with many concepts, frameworks, and models. It bridges many disciplines including organization theory, economics, information systems, communications, sociology, psychology, geography, and history. Successfully connecting these various disciplines requires a holistic management approach. Interested readers are referred to many handbooks that take a holistic view on innovation (e.g., Nooteboom 2000; Burgelman et al. 2004; Fagerberg et al. 2005). With an understanding of the interconnectedness inherent in innovation management, we next review some key concepts that are particularly valuable in understanding open innovation.

#### 68.2.1 Innovation Funnel

The “innovation funnel” (see Figure 68.1), also called stage-gate model, was developed in the 1980s as a way to understand how a firm decides which innovations to pursue and how to pursue them (Cooper 1988). Innovations go through four to five stages such as idea generation, concept development, testing, and commercialization. Each stage typically involves more resources than the previous one, resulting in increased commitments. At the beginning, in the idea generation stage, the firm engages in technology and market assessments that generate a sizable number of ideas and possible opportunities.
These may include customer or market need, new product concept, scientific breakthrough, competitive advantage, and so on. At the first gate, the ideas and opportunities are evaluated, and a determination is made whether to proceed into the next stage. A broad set of factors may be considered including the current technology strategy, product/market strategy, competitor analysis, political risks, etc. If the idea passes the first gate then it progresses to the second gate: concept development, if successful there then to the third gate, testing, and if passes that gate on to commercialization (Gronlund et al. 2010).

Many have criticized the funnel as anti-innovative because it creates a linear and rigid process (Nichols 2007). If the innovation fails any of the gates, the innovation is put on the shelf. The gates can involve heavy evaluation processes to the point that more resources are allocated to evaluating and eliminating innovations rather than improving the innovations. The innovation funnel engenders “false negatives.” These are ideas that are weeded out by internal groups and remain unused and underutilized by the firm. However, many such ideas might be valued by others outside the firm. The funnel only considers internal paths to market. The funnel does not encourage ideas from outside except in the first stage. There are often strong norms against innovations that are not internally developed, so-called not-invented-here syndrome. The funnel emphasizes alignment between the innovation and the firm’s strategy (Gronlund et al. 2010).

### 68.2.2 Radical versus Incremental Innovation

Different types of innovations (product, process, business models, architectural), as well as innovation processes, are commonly discussed in terms of a continuum from incremental to radical. This continuum reflects the relative newness and uniqueness of the innovation from preexisting alternatives and knowledge bases (Dewar and Dutton 1986) and has a major impact on future developments (Dahlin and Behrens 2005). “An innovation is radical when innovators need to acquire extensively unique and novel technological and process-related know-what, know-why, and know-how” (Carlo et al. 2012). Radical innovations are considered as frame breaking and transformative yet highly risky and uncertain. Radical innovations or radical innovation processes are based on different and unconventional technologies or scientific principles, fundamentally change the cost/benefit ratios, require new cognitive frames, open new use contexts and applications, and lead to new markets (Henderson and Clark 1990).

By contrast, incremental innovation “introduces relatively minor changes to the existing product and exploits the potential of the established design” (Henderson and Clark 1990, p. 9). Incremental innovations are competence enhancing, whereas radical innovations are competence destroying (Henderson and Clark 1990). Radical innovations are new-to-the-world, whereas incremental innovations are new-to-the-firm (Henderson and Clark 1990).

Radical and incremental innovations have different economic and organizational consequences. It is well accepted in innovation management literature that firms that enter the market early and introduce offerings with a high level of originality derive more commercial value (Utterback 1994; Christensen 1997). This is the case not only in product-based industries but also in services (Love et al. 2011; Therrien et al. 2011). All this requires ever-greater diversity, mobility, and scale in innovation, as well as “creative destruction” (Schumpeter 1942) and “creative abrasion” (Leonard-Barton and Swap 1999).

Yet, pursuing radical innovation is not always a preferred strategy. At times, rushing to embrace the unique and novel can be detrimental to the firm’s viability (Charitou and Markides 2003). Radical innovations can pose high knowledge requirements for their adopting units (Carlo et al. 2012). Radical innovation is much more difficult and risky to implement (Damanpour 1988). A multitude of factors must be considered and each individual situation must be thoroughly assessed to determine the feasibility of pursuing either radical or incremental innovations.

### 68.2.3 Exploration and Exploitation

Exploration and exploitation represent two other core concepts in innovation management. Exploration involves the generation of an idea or invention; exploitation involves the conversion of the idea or
innovation into a solution, business, or application that can be used to generate a profit. All innovative activity involves exploration and exploitation as their main activities (March 1991). Exploration involves “search, variation, risk taking, experimentation, play, flexibility, discovery, and innovation” (March 1991, p. 71). Exploration is about value creation: new learning and knowledge, tasks, functions, and activities that maximize opportunities. Exploration is associated with uncertainty over value appropriation as the future markets, customers, application areas are still unknown. Traditionally, to manage this uncertainty, firms limit their exploration activities to a limited number of parties to maintain control yet leverage informal relationships for the transfer of tacit knowledge.

Exploitation refers to “refinement, choice, production, efficiency, selection, implementation, and execution” (March 1991, p. 71). Exploitation is about efficient use of existing knowledge and assets, routines, standard operating procedures, and formal relationships. Exploitation is about maximizing income from innovation or gaining the maximal utility or use value from innovation. In exploitation, markets are known and focus is on maximizing transaction efficiency.

The organization’s ability to achieve a balance between exploration and exploitation is referred to as organizational ambidexterity (Tushman and O’Reilly 1996; Gibson and Birkinshaw 2004). Organizational ambidexterity is challenging as the requirements for leadership, structures, and processes regarding exploration and exploitation are very different even paradoxical (Dougherty 2006; Lavie et al. 2010). Yet, successful innovation requires management of exploration and exploitation at a high level in a complementary fashion (Katila and Ahuja 2002). Organizational ambidexterity requires a holistic view of innovation (e.g., Linder et al. 2003). The innovation value chain (Hansen and Birkinshaw 2007) provides such a view through (1) idea generation, (2) conversion, and (3) diffusion. The innovation value chain interlinks knowledge generation and sourcing by transforming this knowledge into new services and commercialization of these new services to grow business.

### 68.2.4 Organizational Change

The more radical the innovation, the more challenging the organizational change. Radical innovation means undergoing discontinuous change processes including a cultural change not just in the firm but often also in the broader networks of customers and suppliers. In the vocabulary of radical change theorists, discontinuous change requires deep structural changes where basic values, business practices, culture, and organizations change (Tushman et al. 1986). Without a deep structural change, behaviors migrate back toward the old ways of operating, reinforced by the existing processes, structures, incentives, and cognitive frames (see Figure 68.2). The weakest link in the network can undermine accomplishments elsewhere. Some level of identity crisis, disorder, and ambiguity usually precedes a deep structural change that sticks. Therefore, a long-time horizon and high level of organizational, architectural, managerial, and legal competencies are required for successfully implementing a radical innovation. Done in this manner, new incentives and mind frames are adopted and accepted and successfully replace the old behaviors.

For example, Procter & Gamble found that it took 5 years of investments, sourcing ideas externally, and developing online knowledge exchange sites before the firm began to see returns from the transformation of its innovation process from an internal model to an open innovation model (Hansen and Birkinshaw 2007). The transition from closed to open innovation meant radical change for Procter & Gamble. Open innovation required many technological and organizational investments such as partner networks, open innovation business units, platforms to transfer knowledge externally and internally, and IP protection systems (Gassman and Enkel 2004; Huston and Sakkab 2006; Chioroni et al. 2010; du Chatenier et al. 2010). Procter & Gamble's long-time horizon and high-level organizational, technological, managerial, and legal competencies enabled a successful radical change to open innovation.

Without the correct structures in place, failures are common. A global firm with a large customer base was unable to transfer and leverage even a single external unsolicited R&D even though “it participated in many forms of external innovation such as open source software development, patent donations, and open
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In the 1990s, increased investments in R&D in the automotive, energy, pharmaceutical, and other industries produced declining rates of innovation (e.g., Barrell et al. 2000). Open innovation addressed this issue and became a way to boost a firm’s innovative capacity, grow, and increase market share (van de Vrande et al. 2009; Drechsler and Natter 2012). Open innovation augments internal capabilities with complementary capabilities, network externalities, and access to new relationships (Chesbrough and Crowther 2006). If implemented correctly, open innovation can enable growth and increase market share.

68.3.1 Henry Chesbrough on Open Innovation

In the book entitled, Open Innovation: The New Imperative for Creating and Profiting from Technology, Henry Chesbrough (2003) popularized the notion of “open innovation.” This book has proven to be highly influential. It had more than 5740 citations as of August 2012. There were 1800 citations in July 2010 (Huizingh 2011), just 7 years after the book was published. Chesbrough (2012, p. 20) wrote

When I wrote Open Innovation in 2003, I did a Google search on the term “open innovation,” and I got about 200 links that said “company X opened its innovation office at location Y.” The two words together really had no meaning. When I conducted a search on that same term last week, I found 483 million links, most of which were about this new model of innovation.

Chesbrough (2003) contrasted open innovation to “closed innovation.” Closed innovation refers to a vertically integrated innovation model. The company largely relies on its own innovation investments, processes, and structures for exploration and exploitation (March 1991). In terms of the innovation
funnel, the closed innovation process is a linear path from ideas to launch. Once fully developed, innovations are channeled to markets or used internally. The firm that creates the innovation is assumed to be in the best position to create value out of it (Kogut and Zander 1992; Wyld 2010).

For Chesbrough (2006), open innovation is about both decoupling and integrating the different phases of the innovation value chain and in so doing seeking radical innovation through business models. Open innovation is a paradigm shift “that assumes that firms can use external ideas as well as internal ideas, and internal and external paths to market” (Chesbrough 2003).

Figure 68.3 illustrates the innovation funnel adapted to open innovation (Gronlund et al. 2010). Ideas, opportunities, and technologies can come from internal or external sources and enter and leave the open innovation funnel at any stage. If the innovation fails one of the gates, it can take a different path and a different business model. Innovations do not just make their way through the firm’s sales and marketing channels but as a spin-off, as out-licensing, as a design freedom, as an industry standard. There is a continuous assessment of external technologies, markets, and other developments. There is a continuous assessment of exportation and importation of know-how and technology. The gates are not just cost and risk evaluations but opportunity assessments (Gronlund et al. 2010).

Chesbrough (2012) identified three conditions that must be met to take advantage of the open innovation: workforce mobility, internal R&D, and basic rules on IP. The conditions are important because no significant innovation progresses without people moving; creative abrasion requires the integration of external and internal innovation; and IP protection rules are needed for investors to be willing to invest beyond the nascent stage of an innovation.

A key contribution of Chesbrough’s (2006) work has been to bring greater focus on the role of business models in innovation management. A business model is “a structural template of how a focal firm transacts with customers, partners, and vendors” (Zott and Amit 2008). A business model focuses on how the firm commercializes the innovations of others and commercializes innovations through others (Chesbrough 2006). Business models are a way to generate different pathways through the open innovation funnel (Chesbrough 2012). Rather than turning an innovation into a product or service
that the firm sells, the firm can think of a different business model. Open innovation often means getting more aggressive about IP-based business models that involve leveraging technology from outside (e.g., in-licensing) or getting others to leverage the firm’s technology (e.g., out-licensing).

Chesbrough (2006) argues that the most valuable open business model involves a platform. Platform refers to a system and architecture where a complex system is partitioned into stable core components (“platform”), variable peripheral components (“complement”), and standard interfaces (Baldwin and Woodard 2009; Gawer 2009). Complements provide variability and dynamicity through morphing and mutation. An example of such a platform in mobile technologies is the Android based platform by Open Handset Alliance (Han et al. 2012). In a platform-based model, the company’s business model is interconnected with the business models of its key suppliers and customers. Not just the firm but all partners can innovate and share technical and financial risks and rewards. The IP is managed as a strategic asset.

### 68.3.2 Beyond Chesbrough on Open Innovation

Chesbrough’s views have been highly influential but do not represent the only views regarding open innovation. During a paradigm shift, heated debates are expected. The definition and conceptualization of open innovation are still under much discussion (see recent commentaries by Linstone 2010; von Hippel 2010; Lichtenthaler 2011; Chesbrough 2012). We highlight some of these views as follows:

**User innovation:** To von Hippel (2005), the open paradigm shift is about changing functional relationship between innovator and innovation. In the past, producers were assumed to be the innovators who sold their innovations to users. Now, users innovate by improving and reinterpreting products and services through “sticky information” from repeated use. For example, users renegotiated the Wii gaming platform as an in-house exercise platform (Verganti 2009). In some areas as in sports equipment and software design, user innovation does not just complement but competes with producer innovation.

**Private-collective innovation:** von Hippel and von Krogh (2003) advanced the private-collective innovation model based on their research on open source. The model relies on a group of individuals and organizations collaborating and sharing their private ideas and knowledge and openly revealing innovations: yet gaining higher profits than free riders (von Hippel and von Krogh 2003). The private-collective model of open innovation relies on private investments, open revealing, and tacit learning to iteratively co-create and disseminate the innovation. As some tacit learning remains private, the innovators profit economically from their innovations.

**Process transformation:** Gassmann and Enkel (2004) promote transformation of three core processes in open innovation: (1) the outside-in process (wide and deep external search and integration), (2) the inside-out process (multiple channels for externalizing innovation including third party commercialization of innovation), and (3) the coupled process (combining outside-in and inside-out by collaborating in strategic networks with other companies). The coupled process requires strategic choices to participate in networks and share IP with other organizations and capabilities and resources to engage in intensive interactions to transfer learning across organizational boundaries.

**Organizational permeability:** For Dahlander and Gann (2010), openness is about “the permeability of firms’ boundaries where ideas, resources, and individuals flow in and out of an organization” (p. 699). Open innovation is about openness in the inbound and outbound processes. The outside-in process of acquiring and inside-out process of selling involve monetary transactions. The outside-in process of sourcing and inside-out process of revealing are non-pecuniary.

**Modularity:** Baldwin and Clark (2006) and Henkel et al. (2012) emphasize modularity and architectural design decisions to enhance open innovation generation and appropriability (i.e., profit making). Modularity in design refers to the designers being able to design parts independently but working together to support the whole (Baldwin and Clark 2006). Modularity facilitates collaborating with diverse partners with different and even conflicting motives. Modularity can help a group of companies such as a consortia...
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or alliance to jointly develop the concepts for the innovation but then compete to privately appropriate the value (Ritala and Hurmelinna-Laukkonen 2009; Almirall and Casadesus-Masanell 2010; Han et al. 2012).

Disruptive change: A disruptive innovation creates new markets and business models and disrupts and eventually displaces existing technologies, processes, prevailing power and control structures, and institutionalized routines (Christensen 1997). Christensen et al. (2005) view open innovation as a disruptive change. Many unknown and unknowable factors face organizations embracing open innovation. They quote Paivitt (1999) to illustrate the type of uncertainties and ambiguities present, “In many areas, it is not clear before the event who is in the innovation race, where the starting and finishing lines are, and what the race is about.”

IP management practices: Pisano and Teece (2007) argue that open innovation makes it much more challenging for firms to capture value (profit) from innovation. Open innovation requires much greater attention and skillful use of IP mechanisms such as patents, copyright, and secrecy in innovation management (Pisano and Teece 2007). At times, IP management is overly emphasized to the point that IP becomes a bottleneck for open innovation (Alexy et al. 2009).

Networks: Open innovation is about network-based innovation. Organizations increase their capacity for open innovation by participating in networks and improving their ability to learn from their partners (Fey and Birkinshaw 2005). However, without continual change in such networks, networks can become as much an obstacle as an enabler of innovation—“the ties that bind may become the ties that blind” (Birkinshaw et al. 2007, p. 68). Building new networks requires right attitudes and resources. It requires engaging in finding, forming, and performing in a wide range of networks. Such networks may include idea networks, funding networks, user innovation networks, cross-industry consortia, etc. (Birkinshaw et al. 2007). Companies have to be highly agile in building networks as there is much uncertainty and ambiguity in new ties.

To recap, we take an inclusive view into the open paradigm in innovation management. The views of Chesbrough and the aforementioned authors are presented and discussed to show that open innovation is multifaceted and complex.

68.3.3 Openness in the Open Innovation Paradigm

Openness is a common theme in the views of open innovation. However, what this openness is and represents is still much under debate. Many have pointed out that the antithesis of open innovation and closed innovation is largely a myth. Throughout history, firms have tapped external sources for innovation including Edison’s laboratory in nineteenth century (Mowery 2009). Allen (1983) described the history of the nineteenth century iron and steel industry as collective. Process industries such as chemicals and oil and gas have a long history in relying on external sources of knowledge and technology (Lamoreaux and Sokoloff 1998).

In studying platforms, West (2003) was one of the first to raise the question of “How Open is Open Enough?” He found that in many industries, the industry pioneers initially developed proprietary and vertically integrated platforms to capture profits and protect against imitation (e.g., IBM’s 360). Major technical and economic reasons moved the companies to offer more partly open platforms to seek interoperability and attract complementary business. In the partly open platforms, the commodity layers were open and those parts that offered differentiation were retained as proprietary. In a later work, West and O’Mahony (2008) defined “openness” via three indicators: (1) transparency (external parties able to contribute to the innovation), (2) accessibility (external parties able to influence the direction of the innovation), and (3) joint appropriation (external parties have use/development rights). They found that company-sponsored open source communities were more likely to offer transparency than accessibility. Transparency allowed external partners, or complementors, to participate on the platform but limited accessibility and maintained company control over key decisions. In a study of mobile computing platforms, Boudreau (2010) found that granting platform access to independent complementors was preferred over giving up formal company control of the platform itself.
Examine the outside-in process and specifically external search in innovative activities, Laursen and Salter (2006) defined openness in terms of breadth and depth of sources. Breadth of external search was defined as the number of different external sources or search channels. The depth was defined in terms of the extensiveness to which firms deeply engage the external sources or search channels. Laursen and Salter (2006) found that those firms that searched both wide and deep were more innovative but only to a point where openness became subject to decreasing returns.

Again focusing on the outside-in process, Drechsler and Natter (2012) built on the Laursen and Salter’s (2006) study by examining the underlying drivers of breadth and depth of external search in innovative activities. They found that different factors impact the initial opening of the outside-in process from those that lead the firm to further increasing the openness in the external search. Closed firms that did not engage in external search lacked internal capabilities particularly in the area of market and technology know-how and IP protection. They also faced much rivalry and imitation. The firms that increased openness in the external search were exposed to financial funding opportunities. They also developed effective IP protection mechanisms. This study underscores the internal company competence development both in terms of moving from closed to open and increasing openness.

Dahlander and Gann (2010) conducted a broad review of the open innovation literature to identify a typology of types of openness. They introduced a framework of openness that distinguished activities by their non-pecuniary and pecuniary character and the phase of innovation (outside-in process and inside-out process). Sourcing is the use of external information but without direct monetary payment. Acquisition (i.e., outsourcing) refers to purchasing resources from the market. Revealing is disclosing information without immediate financial rewards whereas selling (e.g., out-licensing) involves monetary exchange. Dahlander and Gann’s (2010) review suggests that most studies so far have only examined one or at most two types of openness. Dahlander and Gann called for more research.

Openness also varies by innovation life cycle. In a study of open alliances, Han et al. (2012) speculated that openness is likely to be highest at the early stages and once ideas develop into products and services, with more certainty of markets and customers, openness will be adjusted to minimize spillovers, particularly to rivals. They also propose the possibility that as the products and services become mature, openness might be increased to gather improvements that further extend the life of the offering.

In summary, the discussion of openness has moved beyond a dichotomy to discussing openness by degree, type, and life cycle of the innovation. While no models exist in terms of optimal openness, research is beginning to define some boundaries for openness.

### 68.4 Open Innovation Forms and Approaches

Openness is impacted by the forms and approaches taken in a particular initiative. According to Huizingh (2011, p. 3), “open innovation [has] become the umbrella that encompasses, connects, and integrates a range of already existing activities.” Baldwin and von Hippel (2011) also highlight how open innovation is based on combinations of existing techniques. Next, we highlight some popular forms and approaches. These are mapped to the innovation value chain (Figure 68.4).

#### 68.4.1 Outsourcing of Innovation

Outsourcing of innovation represents limited openness. Companies procure, acquire, and in-license innovation from outside using contractual transactions. Outsourcing of innovation often represents something that the firm may have innovated internally in the past but now is left to another company or entity to innovate and the firm buys or acquires the innovation for a fee. Outsourcing of innovation includes sponsored research, strategic procurement, and development partnerships. While sponsored research addresses the idea generation phase of the innovation value chain, strategic procurement represents the diffusion phase of the innovation. The innovation is well developed with known characteristics.
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Many industries including the pharmaceutical industry have long turned to various forms of outsourcing of innovation to support their activities.

In 1996, Chesbrough and Teece (1996) asked “When is virtual virtuous?” that is, should firms outsource, namely procure and acquire innovation from outside partners just as they have outsourced production? At this point, the authors cautioned against outsourcing innovation when innovation relates to the firm’s core competencies and involves architectural innovation such as platforms.

Linder et al. (2003) conducted a study in 2002 and examined the increasing portion of innovation that is externally sourced. They found that the share of innovative ideas from external sources was accounting for an average of 45% of ideas and the executives expected this percentage to grow. Retail companies reported as high as 90% of innovation from external sources. Shared risk, reduction in costs, and increased growth drove companies toward outside sources of innovation. Linder et al. (2003) found that many firms failed to realize the benefits from outsourcing activities because of a fragmented and project-based approach that lacked a coherent and holistic organizational strategy.

68.4.2 Consortia, Alliances, Networks, Clusters, Districts

Compared to outsourcing of innovation that involves bilateral contractual relationships, firms band together to save costs, share risks, and form larger multilateral relationships such as consortia (Pisano 2006). These are still contract based, but the membership can vary from stable (e.g., significant penalties for premature termination of contracts) to highly dynamic (e.g., open innovation alliances). This is a popular approach to innovation in the oil and petroleum industries, as well as automotive and chemical firms. The life science industry is well known for its clusters (Powell et al. 1996; Bunker-Wittington et al. 2009). Regional and national policy makers incentivize consortia as a way to revitalize or grow new, emerging industry sectors such as clean energy (Jaegersberg and Ure 2011).
Just as in outsourcing of innovation, there is a high level of variance within and across these multilateral relationships. Consortia that represent a “perfect community” with a strong shared identity that openly shares data, knowledge, and results can fail to transfer and commercialize innovations (Gibson and Rogers 1994; Cassier and Foray 2002). When competitors are part of the consortia, the work is divided and structured with clear roles and responsibilities by domains and technologies. Sharing is limited to predetermined areas with little accumulation of knowledge pools. Ownership rights are handled separately by different participants. There is minimal contact by personnel from rival companies. At times, work does not go beyond defining the future research areas as was the case with a breast cancer research consortium (Cassier and Foray 2002).

Open alliances (e.g., Android) represent groups with competing entities with dynamic membership. Open alliances “seek to enlarge the ‘economic pie’ through value co-creation, rather than fighting with competitors over a ‘fixed pie’” (Han et al. 2012). Han et al. (2012) reported that participating firms realized significant positive returns particularly when the alliance engaged in radical innovation. However, rival firms who did not participate in the alliance gained even greater benefits through free riding.

### 68.4.3 Crowdsourcing and Sponsored Co-Creation

Crowdsourcing involves a job or activity that would have been traditionally performed by an employee or outsourced but now performed by a large group of people, or crowd, in the form of an open call (Howe 2006). Crowds are expected to provide unbiased information (“wisdom of the crowds”). The Internet and collaboration technologies have created opportunities to expand the crowd and use it to perform innovative tasks (Albors et al. 2008; Afuah and Tucci 2012). Sponsored co-creation shares many similarities with crowdsourcing but is often less time paced and less structured (Nambisan and Baron 2010). Crowdsourcing and sponsored co-creation are in widespread use across industries (Bogers et al. 2010). Openness is limited. While anyone can propose an innovative solution, the sponsor proposes a problem and claims ownership rights to the solution.

The Threadless example mentioned at the beginning of this chapter is an example of crowdsourcing. Threadless’ design contests allow customers to submit new t-shirt ideas for a chance at prize money. Goldcorp of Canada used the crowd to locate the position of gold on its properties. Dell’s IdeaStorm is a firm-sponsored crowdsourcing community. In 2007, the firm launched the site as a way to counter negative feedback toward its business model. The site was introduced with the statement that IdeaStorm was a place “where your ideas reign” (di Gangi et al. 2010, p. 215). Users can post improvement ideas for Dell’s products and services and other users can promote or demote the ideas. Users are not given a financial incentive but top users are honored on the Top Idea Makers List.

Tournaments are a common form of crowdsourcing: “each agent from the crowd self-selects to work on its own solution to the problem, and the best solution is chosen as the winning solution” (Afuah and Tucci 2012, p. 355). Netflix used a tournament-based form of crowdsourcing to improve its movie recommendation system. Darpa Grand Challenge and Google Lunar X Prize are other well-known examples. Procter & Gamble, as part of their “Connect and Develop” model, launched NineSigma, a crowdsourcing intermediary that runs tournament-based crowdsourcing (Jeppesen and Lakhani 2010). Procter & Gamble initially set up Innocentive to address internal R&D problems and then turned it into a separate business. Innocentive and other intermediaries attract companies as they can reduce costs of finding solvers, reduce costs of specifying what is needed, and facilitate enforcing rules and agreements. Jeppesen and Lakhani (2010) found that people in fields outside of the problem domain often become successful solvers in tournaments; the distance between the solver’s field of technical expertise and the field of the problem owner increased the likelihood of winning; female solvers performed significantly better than men in developing successful science solutions. There are also platforms that facilitate contests inside large and distributed global firms, for example, Innocentive@work.

Crowdsourcing is also used for big social problems. Founded in 2010, the OpenIDEO platform was launched by a global design firm, IDEO. The platform invites anyone in the world to enjoy solving
problems associated with social issues. The platform has hosted 16 challenges and 35,000 participants had participated by August 2012. A key incentive is to do social good while staying on your sofa. The OpenIDEO platform does not award prizes. The platform uses IDEO’s unique approach to problem solving (Lakhani et al. 2012).

Motivational represents the biggest challenge. The heterogeneous motives and backgrounds make it challenging to motivate and support the participants (Antikainen et al. 2010). Füller (2010) listed a variety of motives including extrinsic reward-oriented, need-driven, curiosity-driven, and intrinsically interested. It is this heterogeneity that makes it challenging to activate and sustain an active community over time (Leimeister et al. 2009; di Gangi et al. 2010; Zheng et al. 2011). Many companies find that they face a major battle trying to sustain co-creation (Jarvenpaa and Tuunainen 2012). The use of awards might crowd out contributors. On sponsored co-creation sites, the frequent contributors may be explicitly identified from less frequent contributors. Even this type of recognition can crowd out participants (Gu and Jarvenpaa 2003). Besides explicit recognition, there are often no immediate benefits except the crowdsourcing or co-creation experience (Nambisan 2002; Nambisan and Baron 2010).

Another challenge is to find the problems that actually can be solved with crowdsourcing. Afuah and Tucci (2012) identify several requirements: Problems need to be easily delineated and modular. Solutions need to require knowledge that is far from what the problem owner currently has available. The crowdsourcing needs to reach a motivated crowd that has problem-solving skills. If the crowd is expected to vote, then the solution has to be appraisable by multiple people.

### 68.4.4 Crowd Funding

An extension of crowdsourcing is crowd funding. Crowd funding is a collective effort of users or consumers to pool their money together and invest and support an initiative (Ordanini et al. 2011). New funding platforms such as GrowVC collectively fund innovation by opening the opportunity to invest small amounts of capital or effort (“sweat equity”) to start-ups around the world. Besides providing funds, they can signal the initiative’s market potential and expect their feedback to be heard as the ideas are refined and improved. Voting with money is expected to lead to more thoughtful and credible input and an improvement over traditional crowdsourcing. Crowd funding initiatives can reduce costs of initial development, create visibility, and encourage word of mouth marketing, and even drive initial sales for a new initiative or project idea (Burtch et al. 2012). However, here again, heterogeneous motives make management of the process difficult. Sometimes a crowd can be uninformed, driven by herd behavior, or not understand the initial idea. This then leads to a noisy signal problem in the ideation marketplace. The use of crowd funding is in its infancy and failures are still very common (Burtch et al. 2012).

### 68.4.5 Lead User

In the lead user approach, it is the user that identifies the problem to be solved and creates the solution (von Hippel 1977). The lead user approach is premised on the idea that users have the most accurate assessment of their needs and hence are ideally suited to be the innovators (von Hippel 1986). Compared to traditional ways, the lead user method has been identified as a much faster and cheaper way of identifying new product concepts (Herstatt and von Hippel 1992). Lüthje et al. (2005) found that users with membership in multiple communities were able to combine previously disparate information; the lead users of mountain bikes were medical doctors who wanted to make bikes safer (Lüthje et al. 2005). IP issues are deemphasized with the lead user approach. The lead users are not usually interested or concerned about protecting their innovations (Shah 2000).

The lead user innovator approach is most applicable in the context of complex products and services involving complex systems that require high levels of customization, iterative design, and adjustment after purchase to meet heterogeneous customer demands. The challenge for the firm is to locate the lead
users that operate at the world-class level and identify innovations that have commercial value in the marketplace (Bogers et al. 2010). The firm may provide toolkits to encourage this type of innovation (Franke and von Hippel 2003; Jeppesen and Frederiksen 2006). Toolkits for user innovation allow customers to discover their needs in a structured fashion that enable users to develop new innovations (von Hippel and Katz 2002). The toolkits are specific to a certain design area such as software design (Franke and von Hippel 2003).

**68.4.6 Open Community Innovation**

Just like the lead user model relies on a non-pecuniary relationship, so do open communities for innovation. There are no legal transactions involved. Whereas the lead user model is driven by the user's private benefit, the open community innovation is driven by generalized reciprocity and community norms (Wasko and Faraj 2000; Roberts et al. 2006). The model relies on open reveling: instead of claiming proprietary rights over the proprietary knowledge that they have, community participants allow others to freely use their knowledge in the community (von Hippel and von Krogh 2006). Open revealing is associated with superior learning opportunities that still allow private benefits such as learning, enjoyment, and reputational gains (Henkel 2006).

There are a multitude of open source communities. Technology open source communities include Linux, GNOME, Apache, and Mozilla. Wikipedia (O'Mahony 2003; Niederman et al. 2006) is another open source community. There are various sporting communities such as kayaking, snowboarding, windsurfing, skateboarding (Franke and Shah 2003), and there are even music remix communities (Jarvenpaa and Lang 2011). The communities are usually characterized as low in rivalry although Franke and Shah (2003) found that even when there is rivalry, assistance is still given and innovations are revealed although not “just not as often as in the less competitive communities” (p. 172). Although the open community can represent radical innovation in its own right such as Wikipedia, particular innovative outputs are often a result of independent entities (firms or individuals) providing incremental contributions.

Challenges relate to finding new contributors and maintaining dynamicity (Faraj et al. 2011). Continuous changing membership, ambiguous identities, rotated leadership, and various technology affordances among other things can maintain necessary dynamics in innovative activities (Faraj et al. 2011). Challenges also relate to building sufficient actionable transparency (Baldwin and von Hippel 2011). Modular architectures and collaborative spaces facilitate such transparency and allow thousands of independent contributors to work independently and in parallel. Others’ activities can be transparent without any direct communication taking place between the contributors.

**68.4.7 Living Labs**

Living labs are hybrid communities of lead user and open community innovation that have become popular in Europe and are particularly encouraged by public sector funders (Almirall and Wareham 2011). Living labs involve an intermediary that brings together the users to engage in exploration (i.e., research), as well as others that are part of the technology implementation, to test out various exploitation options. Almirall and Wareham (2011) analyzed six living labs as part of the European Network of Living Labs. These cases involved media and health, as well as an industrial consortium in the automobile sector. Living labs were found to be valuable in arbitrating incremental innovation by bringing together disparate actors, creating user demand, and testing different business models. The challenges focused on connecting all the dots and coordinating the activities of heterogeneous actors in the innovation value chain.

**68.4.8 Out-Licensing**

An approach that encourages other companies’ use of the firm’s innovations includes out-licensing. Out-licensing generates new sources of revenue. Out-licensing can also promote learning of customer and other
firms’ environments as licensing agreements do not just require legal transactions but also tacit knowledge exchange. Large companies such as IBM and Texas Instruments have had active out-licensing programs since the 1980s. Small companies also have adopted licensing as a key strategy. For example, Rovio has licensed its trademark Angry Birds to over 15,000 different products around the world. But for many companies, out-licensing strategies and activities are still in their infancy (Lichtenthaler 2011). Successful out-licensing programs require a strong involvement from senior management, a dedicated structure to house specialized knowledge and skills (e.g., licensing office, dedicated teams), as well as support and participation of the firm’s employees (Lichtenthaler and Ernst 2007; Bianchi et al. 2011a,b). Firms often rely on outside intermediary services (e.g., law firms); however, they are best considered as complementing not substituting internal capabilities (Lichtenthaler and Ernst 2007).

68.5 Theoretical Perspectives to Open Innovation

Open innovation is fundamentally about the boundaries inside and outside the firm, management of knowledge and learning, social relationships, power, identity, and legitimacy. The existing research follows theoretical perspectives commonly used to study inter-organizational relationships (see Parmigiani and Rivera-Santos 2011).

The most common theoretical perspectives relates to the boundaries of the firm from an organizational economics perspective. Open innovation can reduce production costs, bring benefits in the form of complementary assets, and achieve greater incentive alignment through modular platform architectures. Organizational economics perspectives include theories of transaction cost economics (TCE), agency theory, network externalities, and the resource-based view (RBV).

TCE is used to understand when open innovation is a more efficient alternative than governing activities and transactions internally. According to Williamson (1991), the optimal organization of transactions should minimize the production, communication, and opportunity costs, and strive for scale and scope economies. Transactions should be handled internally when probability of opportunistic behaviors is high and coordination costs are substantial.

TCE is commonly used to frame theoretical arguments regarding why certain open innovation forms or approaches are becoming more common or viable (e.g., Cassiman and Valentini 2009; Lazzarotti and Manzini 2009; Baldwin and von Hippel 2011). Baldwin and von Hippel (2011) and Demil and Lecocq (2006) develop governance models for open community innovation (Baldwin and von Hippel 2011). Demil and Lecocq (2006) consider the open community model based on open license to be superior when there is extreme uncertainty, weak incentives, and low levels of control. Baldwin and von Hippel (2011) argue that the open community model is viable in areas where rivalry is low as there are no costs to maintaining secrecy.

Agency theory is defined as aligning incentives across different actors when ownership and control are separated (Eisenhardt 1989). When organizations employ agents to represent them, there are costs from differences in the goals of the organization and agents. Transparent architectures are theorized to reduce agency costs (Baldwin and von Hippel 2011). However, the existing literature on open innovation suggests that agency issues are difficult, unresolved, and poorly understood (e.g., West and O’Mahony 2008). There is also an attempt to develop new notions of agency (Ulhoi 2005).

Open innovation research regarding TCE and agency theory is conceptual or relies on small samples. Compelling empirical evidence proving that open innovation leads to effective governance models is limited or the results are mixed at best. Niederman et al. (2006) note that there is little evidence that open source is a superior form of governance from the efficiency perspectives. Baldwin and von Hippel (2011, p. 1404) limit their developments to “bounds on the viability.” Some find that open innovation happens despite very high transaction costs (Christensen et al. 2005). Others (Remneland-Wikhamn and Knights 2012) question the use of transaction costs in shedding insight to open innovation. They argue that TCE has a limited descriptive power and potentially does normative damage to open innovation as the perspective does not consider the broader policy and cultural issues. TCE research in open
innovation also suffers from other weaknesses that are commonly associated in applying the theory to information technology–enabled forms. Information technology is rapidly reducing costs in all governance forms including vertically integrated forms. Moreover, information technology is increasing variety in all forms and so variations within forms can be as great as across forms.

### 68.5.1 Resource-Based View

RBV theorizes that firms are a bundle of resources and capabilities (Barney 1991). Whereas TCE assumes that resources and capabilities are homogeneously distributed across firms, RBV assumes heterogeneity and resource mobility across firms. Firms can develop firm-specific valuable resources, capabilities, competences, and dynamic capabilities, which can be leveraged for competitive advantages and favorably impact firm profitability.

Open innovation provides a way to source resources possessed by the partners, as well as acquire new resources via outsourcing. This, along with internal development, combines to produce uniquely configured capabilities that are valued in the marketplace. Open innovation requires that capabilities coevolve with the speed of market opportunities. The RBV helps explain why open innovation can boost growth via alliances and in-licensing of technology without acquiring the whole business. RBV also helps illuminate risks of open innovation. Open innovation presents risks of unwanted mobility of these capabilities or potential leakage of valuable knowledge to rivals (e.g., open alliances) (e.g., Han et al. 2012).

Case studies highlight the major challenges of employee training and a deep organizational change to deploy open innovation successfully. Chiaroni et al. (2010) studied the journeys of four different companies as they created an infrastructure for open innovation. The companies went through a deep organizational change. The companies developed inter-organizational networks (relationships with universities and outside research centers) and established new roles and skills (liaisons and gatekeepers). New organizational structures (e.g., IP office) were created and new evaluation processes, ICT systems (video conference), and knowledge and project management systems (develop patent filing systems) were implemented. To recap, open innovation presents the ability to tap to critical resources and capabilities outside, but the firm has to make major investments to develop the internal capabilities before the new combinations render imperfectly tradable resources and capabilities.

### 68.5.2 Absorptive Capacity

RBV suffers from focus on possession rather than the ability to deploy these capabilities. Deployment is the focus of absorptive capacity theory—a behavioral theory of the firm (March and Simon 1958). Absorptive capacity refers to the “ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” (Cohen and Levinthal 1990, p. 128). Absorptive capacity depends on the existing stockpiles of knowledge and networks of contacts. The stockpile is a product of past and present managerial choices.

Christensen et al. (2005) found that to successfully leverage open innovation, firms have to have “the abilities or luck to exploit more or less coincidental opportunities emerging outside the boundaries of the firm” (p. 1547). Lichtenhaler and Lichtenhaler (2009) developed a capability-based framework for open innovation. They recognized different knowledge management processes are needed to identify, select, retain, transform, and exploit external and internal knowledge resources for innovation. One significant contribution of their work is the concept of “desorptive” capacity, opposite of absorptive capacity. Desorptive capacity refers to “identifying external knowledge exploitation opportunities and subsequently transferring the knowledge to the recipient” (Lichtenhaler and Lichtenhaler 2009, p. 1322). Desorptive capacity allows the firm to engage in external exploitation. Without desorptive capacity, the firm licensing the innovation will not transfer the necessary tacit knowledge for the licensee to exploit the innovation. The lack of exploitation can lead to reduced licensing revenues and reduced demands for the innovation by other firms. Robertson et al. (2012) developed another capability-based model for process industries that emphasizes deployment of
external and internal resources and capabilities. They identified three capacities: accessive capacity, adaptive capacity, and integrative capacity.

Just as with TCE and agency theories, RBV of the firm and absorptive capacities are mainly used to develop conceptual frames that explain why firms succeed in open innovation. Failure stories are sorely lacking—either as standalone or as contrasted with successful cases. Large-scale empirical examinations are hard to find. Dynamic perspectives are still rarely examined although with some exceptions (Han et al. 2012).

68.5.3 Network Externalities

The network externalities theory posits that a product or service becomes more valuable as its user base expands (Katz and Shapiro 1986). This implies that innovations that are associated with large networks will tend to attract more users due to a positive feedback effect (Katz and Shapiro 1994). Adding variety to the platform attracts more users to the platform. More users in turn attract more complementors such as application providers. However, research such as online communities and peer-to-peer file sharing networks have shown positive and negative effects of increased network size due to the additional resources and to increased free riding, congestion, and cognitive load (Asvanund et al. 2004; Butler 2001), suggesting that larger networks may not always provide more superior value.

The network externalities theory (Shapiro and Varian 1999) has been used to study how the owner of the technology should open up the development and commercialization of technology. Opening creates momentum and can attract larger user bases but the opening can also leave the original owner with little control and ability to appropriate value. Using a measure of innovation as the rate at which new handheld devices were introduced, Boudreau (2010) found that granting access to independent complementors to a platform was preferred over giving up formal control over the platform itself. Diversity appeared to be more important than incremental shifts in formal control.

The network externalities theory has been used to study how many complementors (e.g., software solution providers) and contestants should be invited to participate in the open innovation platform. Boudreau (2012) examined a leading handheld computer platform as a two-sided market and studied the number of application producers and the selection of software solutions. Consistent with the network externalities theory, he found that adding producers using different software systems tended to increase innovation incentives, consistent with network effects. However, adding producers created crowding of similar applications that in turn negatively impacted novelty. In another study involving a crowdsourcing tournament, Boudreau et al. (2012) found that as competitors to the contest increased, greater rivalry reduced the incentives of all competitors to exert effort and make investments.

68.5.4 Social Capital

Social capital theories take into consideration embeddedness (Granovetter 1993), connecting with other individuals and organizations, and gaining access to greater and more diverse sources of knowledge. An important question is what type of social capital, or embeddedness, promotes innovation. Relational embeddedness relates to strong ties, repeated interaction, and solidarity with the same partners (Coleman 1990). Relational embeddedness facilitates innovation through the transfer of tacit knowledge but suffers from not-invented-here because of blindness to group norms (Katz and Allen 1982). On the other hand, structural embeddedness, or the presence of structural holes and nonredundant ties, promotes access to a wide range of information sources (Burt 1992). Nonredundant ties increase unique information, the ability to be more informed of opportunities, and have more options for creating unique combinations that result in innovation. Rost (2011) found that both structural and relational embeddedness contributed to the creation of innovation. Individuals who were part of strong social circles but with ties to broader networks came up with more innovations. Relational and structural embeddedness were complements rather than substitutes.
Others have found that emerging leaders in open source initiatives exhibit both structural and relational embeddedness. Fleming and Waguespack (2007) found that emerging leaders were brokers (connected and disconnected actors), boundary spanners (served as technical leaders, knowledge links, respected guardians), and engaged in bonding (enabled community building and community benefit). du Chatenier et al. (2010) found it important for professionals working in open innovation teams to have similar skill sets.

### 68.5.5 Organizational Paradox Perspective

Researchers widely acknowledge that open innovation paradigm represents a complex balancing act of paradoxes, tensions, competing demands, conflicts, contradictions, and dilemmas (e.g., West and Gallagher 2006; Jarvenpaa and Wernick 2011). There are many tensions in open innovation including balancing how internal innovation units compete for resources with external sources (Chesbrough and Garman 2009). There is the tension between losing control over proprietary knowledge and technology yet the importance of sharing for the benefits of collectivity (West and Gallagher 2006). Almirall and Casadesus-Masanell (2010) examine the trade-off of open and closed approaches to innovation: They find that when complexity is not too high, open innovation is preferred to closed innovation. Yet, the literature has rarely gone beyond recognizing the tension that exists regarding open and closed innovation and how to transcend it in a mutually reinforcing way.

The organizational paradox perspective (Smith and Lewis 2011) is a promising theoretical perspective that has yet to be fully exploited in open innovation research. It is based on dialectics and duality (Farjoun 2010). Paradoxical perspective differs from both TCE and RBV. In simple terms, where TCE focuses to minimize distrust to reduce coordination and opportunity costs and RBV focuses to maximize trust as an organizational capability, the paradoxical perspective argues that value arises from simultaneously maintaining both trust and distrust. This is because trust alone conceals complex mixed motive inter-organizational relationships that require vigilance. Distrust without trust leads to withdrawal from collaboration (Jarvenpaa and Majchrzak 2010).

The paradox perspective treats what is traditionally considered as trade-offs, as something that has to be managed in an integrative fashion (Jelinek and Schoonhoven 1990; Dougherty 2006; Bledow et al. 2009). For example, exploration versus exploitation and radical versus incremental are often viewed as alternatives rather than as something that is embraced simultaneously. The organizational paradox perspective argues more effective outcomes can be achieved if the seemingly contradictory principles or practices are juxtaposed so they remain independent but mutually enabling (Lewis 2000; Smith and Lewis 2011). Success is increased if the firm simultaneously attains exploration and exploitation rather than one over the other or in alternating sequence.

Several theoretical perspectives were reviewed that are present in the open innovation literature. The organizational paradox perspective was presented as a new promising theoretical basis.

### 68.6 Research Questions

Throughout this chapter, gaps in the current literature are identified. The gaps are also well highlighted in the existing literature. For example, West and Gallagher (2006) identified fundamental challenges in open innovation: (1) What internal resources and capabilities should be shared with the networks? (2) What is the best way to search, discover, and integrate external sources and innovations internally and then best exploit these new innovations in various external markets? and (3) How to motivate the various parties in the network, internal and external, to share their resources and capabilities when the outcomes of these efforts may be available to rivals? How do firms make choices in accessing external knowledge and protecting their own knowledge? Enkel et al. (2009, p. 312) summarized the situation: “we still lack a clear understanding of the mechanisms, inside and outside of the organization, when and who to fully profit from the concept.”
Traditionally, there has been a need to gain a better understanding of the costs (transaction costs and production costs) of open innovation and how information technology affects costs. What are the theoretical underpinnings of different open innovation forms and approaches? Following Baldwin and von Hippel (2011), what are the conditions under which these models become viable? We conclude with a few questions.

68.6.1 What Are the Bounds of Effective Open Innovation?

Open innovation has been heralded as decreasing the risk of missing market opportunity, not reinventing the wheel, increasing learning, lowering costs, turning customers and users into producers, building broader and deeper networks, and engaging community building. Open innovation is not inherently superior to traditional innovation and is associated with many hazards. However, the boundaries of effective open innovation are still uncertain. Therefore, more research is called for to explore the new frontier of open innovation thereby enabling forward looking firms to put the research into practice.

The viability of open innovation can be examined from the view of transaction efficiency, capability development, social tie formation, and others. Integration of multiple theoretical perspectives should be considered to continue to gain insight into open innovation.

68.6.2 How to Design an Organization for Open Innovation?

A relevant question to ask is: What are the organizational design principles for open innovation? Acha (2008) makes the compelling case that “design shapes open innovation practice.” Design can also shape the viable forms and approaches. A key concept in design is task partitioning that reduces the cognitive burden of complexity and allows work to be conducted in parallel (von Hippel 1990). Design is also important for horizontal and self-managing control (O’Mahony and Bechky 2008; Dahlander and O’Mahony 2011). However, design has been given little attention apart from the platform-based studies (Gawer 2009). Design science approaches and methods can and should be leveraged to develop and compare alternative designs (Hevner et al. 2004).

68.6.3 Is Open Innovation about Incremental or Radical Innovation?

A pertinent issue in the open innovation literature is whether the open paradigm promotes radical innovation or continuous improvement. To Chesbrough (2006), a move to open innovation is seen as a way to create discontinuity with the past as new business models create fundamental change. However to others, open innovation is about business experimentation and replication (Davenport 2009; Brynjolfsson and Saunders 2010). Experimental approaches reduce the length of the development cycle, making changes continuous and more easily adopted and diffused. The continuous experimental innovation process leverages the capture, measurement, analysis, sharing, and replication capabilities of information technology (Brynjolfsson and Saunders 2010). Davenport (2009) coins it as a “Test and Learn Wheel.” Amazon and Google run thousands of experiments daily. Many software companies are using open developer communities to modify, test, and release software in fast cycles. While these innovation outcomes are small, the innovation process itself is revolutionized by information technology (Brynjolfsson and Saunders 2010).

68.6.4 What Is the Role of Information and Communication Technology?

Technological changes have been key drivers as well as enablers of open innovation forms and approaches. ICT has provided ubiquitous global infrastructures that enable the firm to tap into distributed sources of information wherever it exists. Dell used a crowdsourcing platform, Salesforce CRM for its IdeaStorm (di Gangi et al. 2010). Brynjolfsson and Saunders (2010) identify a number of ways that
ICT facilitates innovation. ICT increases productivity and efficiency of transactions. It spurs innovation including new management techniques, business models, work processes, and human resource practices. ICT is changing the way innovation is performed making possible real-time and cost-effective business experimentation and replication where observations are shared and ideas are gathered widely. Dodgson et al. (2006) examined the technological development underlying Procter & Gamble’s connect and develop strategy. In this case, ICT was particularly important in enabling data searching, mining, simulation and modeling, and virtual and rapid prototyping. Yet, there is again of paucity of research examining how IT affects failure and success of open innovation, different degrees of openness, and how it affects radical versus incremental innovation in a wide range of contexts. In most studies on open innovation, ICT has taken a nominal role (Orlikowski and Iacono 2001, p. 121): “The IT artifact itself tends to disappear from view, be taken for granted, or presumed to be unproblematic.”

68.7 Concluding Note

This chapter covered the emerging open paradigm in organizational innovation management. Several key concepts from innovation management were introduced that are particularly relevant in terms of open innovation. Multiple views regarding open innovation were presented along with emerging notions of openness. Some forms and approaches of open innovation were reviewed. Various theoretical perspectives were briefly highlighted. This chapter concluded with research questions.

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