Chapter 6
How Do Leaders Embrace Stakeholder Engagement for Sustainability-Oriented Innovation?

Babak Ghassim and Lene Foss

Abstract In this chapter, we demonstrate how open innovation can be applied to sustainability contexts. In this regard, we specifically address the leadership challenges encountered in accessing the wide variety of knowledge from multiple external stakeholders. First, we demonstrate that implementing open innovation for sustainability requires specific organizational capabilities that are different from what a firm might already possess regarding its general innovations. Second, we argue that successfully leading open innovation for sustainability entails broadening the scope of external stakeholder engagement to collaborate with non-conventional stakeholders such as local communities. Some sustainability-oriented innovation initiatives may also benefit from transactional type of stakeholder engagement where frequent interactions assist companies to establish stable search platforms and secure timely access to external knowledge.

6.1 Introduction

During recent years, environmental and social performance has become increasingly central to firms' success in various industries, particularly in the resource extractive ones such as the minerals industry, whose business activities are closely intertwined with their impact on the social and natural environments (George et al. 2015). While the 'reactive' approach towards environmental and social sustainability positions them solely as costly practices driven by stakeholder and institutional pressures (Zollo et al. 2013), increasing awareness of the opportunities at the crossroads of these practices and shareholder value is giving rise to a more 'proactive' approach among company leaders (Hall and Wagner 2012). Such an integrated pursuit of economic, environmental and social sustainability has brought into focus the concept of 'Corporate Sustainability', which requires leaders to fulfill three critical tasks

B. Ghassim (✉) · L. Foss
The School of Business and Economics, UiT-The Arctic University of Norway, Tromsø, Norway
e-mail: babak.ghassim@uit.no

L. Foss
e-mail: lene.foss@uit.no

N. Pfeffermann (ed.), *New Leadership in Strategy and Communication*,
https://doi.org/10.1007/978-3-030-19681-3_6

in order to ensure success in the long term: economic prosperity, environmental protection and social equity (Wilson 2003). The underlying logic of an integrated corporate sustainability perspective is therefore its emphasis on undertaking practices that yield better socio-environmental performance and higher economic benefits.

This chapter builds on the recognition that 'innovation' is a key organizational factor in enabling firms to pursue integrated corporate sustainability practice (Hall and Wagner 2012; Nidumolu et al. 2009). Accordingly, the term 'Sustainability-Oriented Innovation' (SOI) (Adams et al. 2016) has emerged and is defined as: "Making intentional changes to an organization's philosophy and values, as well as to its products, processes or practices to serve the specific purpose of creating and realizing social and environmental value in addition to economic returns." (Adams et al. 2016, p. 181). We recognize that both academicians and practitioners pay considerable attention to the topic of 'what' makes some firms successful in simultaneously improving economic, environmental and social performance.

Consequently, this chapter offer insights to company leaders in the context of 'stakeholder engagement for SOI' (hereinafter, open SOI) by shedding light on how open innovation and developing internal capabilities can assist the leaders to fulfill their corporate sustainability objectives. Acknowledging the difficulty that firms encounter in undertaking SOI, research has shown that engaging external stakeholders is a prerequisite for the continuous creation and deployment of innovative solutions for tackling sustainability concerns (Hall and Vredenburg 2003; Segarra-Ona et al. 2017). Considering the variety of innovation types and the broad impact of SOI, company leaders are required to incorporate a diverse set of knowledge in their innovation processes, including knowledge about technologies, regulative standards, societal expectations and market demands (Clarke and Roome 1999; Ketata et al. 2015). Consequently, not only are the primary stakeholders, such as those within the value chain, relevant, but also the secondary stakeholders (e.g. not-for-profit organizations), who are deemed insignificant for general innovations can enable firms to overcome the complexity and uncertainty of SOI (Hall and Martin 2005).

Broadening the scope of external stakeholders in SOI does also challenge company leaders to develop particular capabilities, on top of those required for general innovations, in order to manage the knowledge inflow and effective learning. These capabilities range from stakeholder networking and competence mapping before the start of an innovation project, to relational capability and knowledge management during a project (Behnam et al. 2018; Kazadi et al. 2016). Openness towards external ideas and technologies does not by any means dispel the need for internal capabilities required for utilizing the external knowledge further down in the innovation processes.

For the purpose of this chapter, we will elaborate on the underlying processes of capability accumulation and open innovation in the context of open SOI. This will be achieved by explaining the main skills and organizational routines that are required when firm leaders aim to engage broader groups of stakeholders in their innovation processes, as well as specifying in what ways open innovation can improve the access to external stakeholders' knowledge. We illustrate our points with quotes from interviews in a recent study (Ghassim and Foss 2018). The remainder of the

chapter is structured as follows: the next section provides an overview of the concepts underlying the phenomenon open SOI. Section 6.3 describes the internal capabilities and mechanisms of open innovation in the context of SOI. Finally, Sect. 6.4 presents the implications for company leaders on how to handle the challenges of developing internal capabilities and opening up the innovation processes in the sustainability context.

6.2 Conceptualizing Open Sustainability-Oriented Innovation

To explain the phenomenon of open SOI, the three generic concepts of corporate sustainability, external stakeholders and innovation are relevant. Consequently, the perspectives that lay the basis for this phenomenon are stakeholder engagement for sustainability, SOI and open innovation (Fig. 6.1).

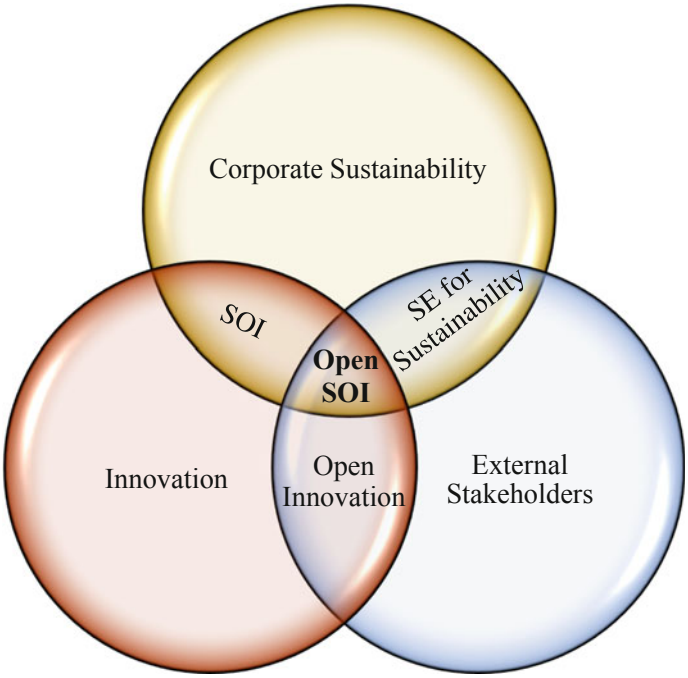

Fig. 6.1 Cross-section of concepts shaping the concept of open SOI

6.2.1 Sustainability-Oriented Innovation

Innovation is widely accepted as an important determinant of firms' economic success (Crossan and Apaydin 2010). Similarly, new technologies, products and organizational practices play a key role in addressing social and environmental issues (Hart 1995; Holmes and Smart 2009). This is reflected in the fact that the quest for corporate sustainability is increasingly resulting in innovation activities across different firms and industrial sectors (Nidumolu et al. 2009). Concerning the social aspect of SOI, innovation could appear on a continuum of purposes, from conflict resolution to the creation of social values (Murphy et al. 2012). In this regard, scholars in the field of corporate social responsibility (CSR) has emphasized that integrating social needs into organizational practices can enable leaders to find solutions with combined economic and social benefits, thus moving beyond purely philanthropic purposes (Jamali et al. 2011). By applying this perspective in a study of mineral firms in the UK, Bini et al. (2018) suggest that showing social commitment (to gain social license to operate) is an important driver for firms that set out to innovate their communication processes with societal stakeholders.

In the same vein, the significant pressure on firms to minimize their negative environmental footprint has led to increasing investment in technologies and products with the potential for minimizing pollution and waste throughout the production processes and overall product lifecycle (De Marchi 2012; Sharma and Vredenburg 1998). These innovations also have an inherent effect on the social aspect of corporate sustainability, since environmental impact is at the core of societal expectations (Suopajärvi et al. 2016). SOIs with primary environmental objectives cover a range of different classifications, including technological versus managerial (Peng and Liu 2016) and cleaner production versus end-of-pipe technologies (Muscio et al. 2017). Concerning the latter dichotomy, existing research (see for e.g., Bonte and Dienes 2013) highlights that cleaner production technologies have relatively greater potential to reduce environmental hazards, since they prevent intensive resource use and/or pollution at the source of discharge, instead of employing control measures at the end of the production processes. The quote below illustrates how the environmental issue is the core in collaboration between the industry and research organizations:

> We have good examples from research projects that manage to establish good cooperation with the industrial participants. This is mostly because the proposed research topic was of interest to the companies, such as environmental issues that is a real Norwegian challenge - or even a global challenge. Therefore, the research theme should be in such a way that companies could make more money at the end, or lowering the costs, and also improve the reputation of the industry. - Informant from Mineral Cluster Norway

Whereas SOI has received increasing theoretical and practical attention during recent years, it is still of relevance to ask what the specifics of SOI are and why they require changes in leadership approaches. The literature has so far focused on three facets of SOI, which can also act as barriers to leaders' involvement with these innovations: (1) balancing the multiplicity of sustainability dimensions and pathways; (2) the double externality problem; and (3) added complexity and uncertainty.

First, corporate sustainability, and hence SOI, require firms to adopt an integrated approach in which economic, environmental and social objectives are pursued simultaneously. In this respect, firms must develop innovation capabilities at different levels of process, product and social practices, in such a way that any improvement in one sustainability aspect does not, in any event, cause a negative effect on any other aspect of sustainability (Hart 1995). For example, if a mineral firm attempts to introduce asphalt aggregates with better possibilities for recycling and reuse, while continuing to produce high levels of air emissions, it would then face a challenge to make potential customers believe in its environmental responsibility, and thus fail to benefit financially from its product innovation. Accordingly, it is important to note that when talking about SOI, environmental and social improvements are not an 'accidental side effect' of general innovation practices, but should be at the core of a firm's business activities.

Second, the 'double externality problem' that is commonly used in the literature on environmental innovation (as a subset of SOI) can also apply to the broader context, such as SOI. In his influential paper, Rennings (2000) posits that such innovations produce positive spillovers in both the development and implementation phases, hence discouraging firms to invest in them. More specifically, in addition to the issue of knowledge spillovers (to competitors) during the development stage, which is common to all innovations, SOI produces an additional externality, as it generates social and environmental benefits (primarily for society) that are hard to be reaped in financial terms. Therefore, the role of regulative frameworks to punish harmful environmental and social impacts is crucial in incentivizing firms that may lose their competitive advantage in the market due to the higher costs resulting from SOI practices (del Rio et al. 2015). Nonetheless, company leaders operating in industries such as minerals have to address social and environmental issues, no matter what the strength of such regulative frameworks is, as low performance in these aspects can directly affect their survival in the long term.

Finally, and importantly, the added complexity and uncertainty associated with undertaking SOI differentiates it from general innovations (Hall and Vredenburg 2003). Complexity arises as a result of the socio-technical diversity inherent in sustainability contexts (Clarke and Roome 1999), where incorporating environmental and social considerations require knowledge about technologies, regulative standards and societal expectations (Adams et al. 2016). Uncertainty, on the other hand, points to the financial risks of SOI. Social and environmental improvements might be achieved at the expense of increasing the cost of processes and products, which could result in the market and system failures of these innovations (Foxon and Pearson 2008). SOI, with its potential impact on wider groups of stakeholders, may create conflict situations due to the opposing interests between the focal firm and its stakeholders, for instance local communities. Therefore, it is likely that the knowledge required for SOI is relatively more distributed among different actors in the innovation system, hence requiring the engagement of a diverse range of external stakeholders in innovation processes. This theme will be discussed in detail in the following sections.

6.2.2 *Stakeholder Engagement for Sustainability: Beyond Managing Stakeholders*

The emergence of stakeholder theory has given rise to studies that enquire into firms' relationships with external stakeholders and the consequences of such relationships. As stakeholder theory requires leaders to respond to the needs and expectations of a wide variety of stakeholders (Freeman 1984, 2010), scholars have paid considerable attention to investigating in what ways, if any, external stakeholders affect different aspects of corporate sustainability performance.

Within this body of work, two research streams are evident. In the first, research has focused on firm-level and institutional determinants of practices directed towards reducing/eliminating the negative influences of specific groups of external stakeholders on overall firm performance (see for e.g., Kassinis and Vafeas 2006). These studies frame the association between corporate sustainability and stakeholders based on Frooman's (1999) description of the resource interdependence between a firm and its stakeholders, in which the firm strives to manage those stakeholders (via undertaking sustainability practices) who can directly or indirectly influence its access to critical resources (e.g. financial, human, raw materials).

For example, Sharma and Henriques (2005) found that in the Canadian forest product industry, firms are most likely to adopt innovative environmental management practices when the managerial perception of threats coming from environmentalists and/or customers is high. Indeed, the substantial investments required to implement advanced environmental management (and its negative impact on short-term gain) impede firms from acting (environmentally) sustainably, unless, for instance, it is possible that customers will cancel their purchase orders.

The second research stream goes beyond such a pure focus on controlling stakeholders' negative influences, and instead tends to use the term 'stakeholder engagement' to indicate a more optimistic outlook of stakeholders' role in corporate sustainability (Aragón-Correa et al. 2008; Hillman and Keim 2001). In this case, stakeholder engagement is defined as "practices that the organization undertakes to involve stakeholders in a positive manner in organizational activities" (Greenwood 2007, pp. 317–318). Empirical studies in this area have employed the RBV, or occasionally its extension, the natural resource-based view (NRBV) (Hart 1995), to maintain that involving external stakeholders in efforts to alleviate environmental and social issues gives birth to valuable, rare and inimitable assets, which in turn assist firms in achieving higher financial performance.

In their study of automotive SMEs in Spain, Aragón-Correa et al. (2008) highlight that mutual understanding arising from collaborative relationships with external stakeholders enables firms to show more proactive approaches in environmental management and to achieve better financial performance relative to their competitors. Eccles et al. (2014) adopted a more inclusive view, by adding social issues to the sustainability aspects examined in the previous study. In this regard, they used a matched sample of U.S. companies and found support for their hypotheses, suggesting that firms with higher sustainability performance do engage external stakeholders

more frequently in daily operations, and that the high level of trust between them is a source of persistent competitive advantage by avoiding costly conflicts.

While both of the research areas discussed above have contributed substantially to understanding of stakeholders' role in corporate sustainability, the latter is in harmony with this chapter, which assumes a positive contribution of stakeholders in innovation processes, with the aim of creating mutual benefits for firms and their external stakeholders. For a firm and external stakeholders that have an economic stake in its performance (such as suppliers), this benefit arises in the form of cost savings or increased income, whereas other stakeholders take advantage of social and environmental improvements, in the form of either decreased negative impacts on the natural or social environment, or increased values in these respects.

6.2.3 Open Innovation: Leveraging on External Stakeholders' Knowledge

Since the introduction of 'open innovation' by Chesbrough (2003) over fifteen years ago, the concept has received great momentum from scholars across different scientific disciplines, even outside business and management fields. As the concept has been under development throughout the years, definitions abound. Nonetheless, Chesbrough and Bogers (2014, p. 17) synthesize the original and the most recent descriptions, defining open innovation as "a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model". Thus, it should be noted that openness implies inflows and outflows of knowledge, as well as a variety of practices for knowledge flow that might not necessarily involve monetary exchange.

At the core of open innovation is the understanding that knowledge is widely distributed among various stakeholders in the business environment, and that company leaders can, and should, use these external stakeholders as well as their internal knowledge base (Laursen and Salter 2006). This new paradigm of innovation management has challenged the traditional 'closed' and 'vertical' modes of innovation, by suggesting that the increased mobility of skilled workers, and less control of unwanted spillovers to other firms, are shrinking firms' margins from investment on internal resources, such as R&D (Chesbrough 2003). However, the crude distinction between firms which are or are not open has received criticism from scholars, who argue that the extremely closed mode of innovation does not occur in reality (Trott and Hartmann 2009). Instead, it is now widely accepted that different degrees of openness exist, and that firms can be placed on a continuum from closed to open innovators (Dahlander and Gann 2010). The quote from a CEO of a mineral exploration company illustrates this kind of openness:

> Compared to the level of activities in Norway, I think there is a huge number of meeting places for exchanging ideas, with both knowledge institutions and industrial players. Moreover, the industry association has several committees that are focused on specific challenges of this industry. Committees provide the opportunity to meet experts and various persons in a particular subject, so they are very good arenas for both established projects and for new ideas. For example, based on the ideas we received in a respective committee, we initiated mineral exploration in a very unconventional area where we have collaborators from NTNU and a university in Denmark.

Firms can generally employ three core processes of open innovation (Gassmann and Enkel 2004): enriching their internal knowledge base through exploration and acquisition of knowledge from external sources (outside-in); using external pathways to exploit abandoned ideas and unutilized internal knowledge (inside-out); and joint knowledge development and commercialization by collaborating with complementary innovation partners (coupled). Gassmann and Enkel (2004) further elaborate that while all these processes represent an open innovation strategy, they are not equally important for all firms and in all business contexts. For example, the outside-in process seems to be highly important for firms in low- and medium-tech industries that expect knowledge spillovers from their machinery suppliers and/or customers. By contrast, the inside-out process better suits large and/or research-driven firms, whose aim is to commercialize innovations before competitors. Similarly, Chesbrough and Crowther (2006) evidence that firms in mature industries focus on the outside-in dimension of open innovation in order to complement their internally developed knowledge. In light of these contributions, open innovation in this chapter centers on the outside-in and coupled processes, as these include (wholly or partly) the flow of knowledge 'into' a firm.

The outside-in dimension is often categorized into acquiring and sourcing practices according to whether they are pecuniary or not (Dahlander and Gann 2010). Acquiring involves practices such as outsourcing R&D services and technology acquisition, through which a firm purchases knowledge (also in the form of embedded knowledge in technologies) and expertise from the market, such as from suppliers, universities and commercial research institutes. Sourcing, on the other hand, refers to monitoring the outside business environment and absorbing the available knowledge without exchange of money.

The coupled process requires firms to engage in a simultaneous 'give and take' of ideas and knowledge with external stakeholders, either via formal mechanisms such as strategic alliances or socially constructed relationships, such as informal networks (West et al. 2014). Compared to the outside-in process, the collaborative arrangements used in the coupled process can provide access to complex and tacit knowledge that is not usually available through search mechanisms or market transactions (Spithoven et al. 2013). However, due to the increasing cost of being involved in such collaborative relationships, which can weaken the positive effect of open innovation on performance outcomes (Faems et al. 2010), a combination of outside-in and coupled processes seems to be an appropriate strategy for firms to optimize their external innovation sources.

6.3 Prerequisites for Successfully Leading Through Open SOI

6.3.1 Internal Capabilities Required for Open SOI

As discussed in Sect. 6.1, although open innovation moves the locus of innovation outside organizational boundaries, it does not by any means dispel the need for internal capabilities required to utilize the externally acquired knowledge. As such, the literature on open SOI has so far investigated a wide variety of internal capabilities and their role in enabling firms to achieve different types of SOI. In the following section, we build on the theory of absorptive capacity and its three dimensions of recognition, assimilation and exploitation capabilities in order to synthesize the findings from the literature. Table 6.1 maps these findings, based on the three aforementioned capabilities and their micro-foundations.

According to Lane et al. (2006), recognition capability enables a firm to identify and understand external knowledge resources. In the second step, assimilation provides the ability to integrate external and internal knowledge, which could result in only a slight change, or in an entire transformation, of a firm's existing knowledge base. Finally, firms should be able to exploit the new knowledge by applying it to their daily operations in order to develop innovations. Overall, recognition, assimilation and exploitation capabilities allow a firm to convert external knowledge into innovative outputs.

The existing findings reveal various resources, routines and processes that underlie the recognition capability for SOI, including R&D (De Marchi 2012), competence mapping (Kazadi et al. 2016), employee training (Cainelli et al. 2015) and managerial social/environmental awareness (Ingenbleek and Dentoni 2016). Among these, the majority of articles consider internal R&D processes as the most prominent component of firms' prior knowledge required for identifying and understanding external knowledge. The technological complexity of SOI, particularly the more radical innovations such as cleaner production technologies, make R&D a more important

Table 6.1 An overview of the internal capabilities required for open SOI

Capability dimension	Recognition	Assimilation	Exploitation
Underlying skills and organizational routines	Internal R&D	Knowledge management	Stakeholder relationship management
	Competence mapping capability	Flexible structure and open culture	
	Employee training	Cross-functional coordination	
	Managerial social and environmental awareness	Boundary-spanning	

resource for these innovations than general innovations (Galliano and Nadel 2015). Others, such as Ghisetti et al. (2015), took a step further and found a moderating role for R&D in the relationship between external knowledge acquisition and innovative outputs, hence claiming that higher degrees of technological knowledge emerging from R&D can reinforce the positive effect that openness has on SOI.

A relatively smaller part of the literature that deals with recognition capability has extended the limited R&D-based view to absorptive capacity and found support for the necessity of other types of organizational routines for improving firms' knowledge base. In this regard, employee training allows company leaders to compensate for the lack of formal R&D knowledge by updating their personnel on changes in environmental, social and market areas, alongside more general technological knowledge (Bos-Brouwers 2010). Besides educating employees, the way managers interpret environmental and social issues can have a significant influence on their engagement with external stakeholders. Thus, managers' response to these issues in the form of directing firms' activities towards innovation in products and processes is predicted by their awareness and understanding of social responsibilities and environmental protection (Ingenbleek and Dentoni 2016). Increasing environmental and social awareness among company leaders can also help their respective firms to establish stakeholder relationships that are based on mutual understanding and common language (Eccles et al. 2014), as crucial components of competitive advantage in corporate sustainability contexts.

Next to recognition capability, the literature also highlights the existence of various microfoundations for assimilation capability. Although it is widely agreed in the literature that intra-organizational relationships support the integration of external and internal knowledge, researchers suggest different processes and routines to augment such relationships, which can be differentiated in terms of their formality. The first group includes formal organizational processes such as knowledge management (Ayuso et al. 2011) and cross-functional coordination (Ghisetti et al. 2015), whereas the second considers informal processes such as boundary spanning and nurturing open culture (Holmes and Smart 2009).

For example, Dangelico et al. (2017) highlight that facilitating collaborations between specialized environmental units and functional departments (e.g. R&D and marketing), as well as within the functions will increase the probability of designing products that address environmental and economic sustainability. Instead, in the case of firm-NGO collaborations, boundary-spanners act as conduits of knowledge in an informal way, as they explore external opportunities and 'travel around' different functional departments to exchange ideas and solutions (Holmes and Smart 2009). It is important to note the fact that formal and informal mechanisms of integration do not work in all firms and in all situations, hence factors such as levels of hierarchy and trust should be taken into account in choosing the most appropriate process for assimilation capability. However, jointly pursuing formal and informal processes, for example knowledge management and nurturing open culture, seems to be an appropriate strategy. The quote below illustrates how a company active in construction minerals makes use of informal (open culture) and formal (hierarchical authority) to augment the assimilation capability:

> It [dissemination of knowledge between organizational functions] is mostly a natural process inside our company… My impression is that it is the top and middle management level that both do and push for knowledge exchange and new things.

The final capability, exploitation, has received minimal attention from researchers in the field of open SOI. Existing studies base their unit of analysis at the project level and argue that in an ongoing SOI project, a firm should be able to retain its relationships with external stakeholders in such a way that secures the exchange of knowledge until the desired project outcome is achieved (Kazadi et al. 2016). As more tensions could arise (particularly between firms and secondary stakeholders such as NGOs) in the later stages of innovation projects, when firms aim to apply the integrated knowledge into the development of tangible outputs, trust and commitment to shared goals play a key role in the ultimate success of innovations.

6.3.2 Open Innovation Processes in the Context of Open SOI

In this section, the findings from the literature are discussed according to the two prevalent processes of open innovation in the context of SOI, which are outside-in and coupled mechanisms, and the different types of stakeholders included in each one.

The research conducted by Arnold (2017) highlights that SOI can particularly benefit from four types of open innovation tools: innovation workshops, sustainability-related web communities, ideas contests and dialogue. She defines these tools as enablers of collaboration between a firm and its external stakeholders, particularly customers, NGOs and society at large. In her view, special attention should be paid to the level of interaction in these open innovation tools, which can consequently influence external knowledge transfer and learning abilities from this knowledge. For example, workshops and web communities allow company leaders to establish intensive interaction with external stakeholders and to have access to their tacit knowledge about environmental and social issues. Accordingly, Hansen et al. (2011) focus exclusively on ideas contests as an open innovation tool with a medium level of interaction, in order to examine its suitability for generating SOI. In this regard, they develop a matrix crossing market and environmental impacts of innovations, in which the most advanced SOIs are placed in the upper right-hand cell. However, their findings do not show a great contribution from such contests for SOI, especially concerning the environmental impacts of innovations.

Concerning outside-in open innovation, the widespread belief in the literature on open SOI is that both external knowledge sourcing and the acquisition of knowledge embedded in technologies/R&D services are beneficial for the propensity of firms to achieve SOI outputs (Cainelli et al. 2015; Ketata et al. 2015). Nonetheless, while firms should be able to source/acquire knowledge from a diverse range of external stakeholders, some studies have not found supporting evidence for the positive contribution of certain specific stakeholders, such as suppliers (Segarra-Ona

et al. 2017), customers (De Marchi 2012) and research organizations (Bonte and Dienes 2013). Such contradictory results can be explained by the various ways SOI is operationalized, as well as the variance in terms of empirical settings.

Based on these contradictory results, scholars have recently started to build a contingent link between external knowledge sourcing and SOI. In one of these studies, Mothe and Nguyen-Thi (2017) assert that although sporadic sourcing activities may result in SOI outputs, firms that persistently utilize external knowledge in their innovation are in a relatively better position to devise innovative outputs. Indeed, by conducting external knowledge sourcing over time, firms also develop a set of processes and routines (a capability) to diversify their channels of access to external knowledge. Other studies, such as Ghisetti et al. (2015), turn our attention to the deteriorating effect of excessive external knowledge sourcing on SOI, since too many external activities limit a firm's resources required for the subsequent stages of knowledge assimilation and exploitation. Thus, instead of a straightforward relationship between outside-in open innovation and SOI, managers should be aware of the limits for and conditional effects of their firms' reliance on external knowledge.

In contrast to outside-in open innovation, which is usually shown to comprise multiple types of stakeholders, the coupled process has been mostly conceptualized as restricted collaboration with specific stakeholder groups, mainly value chain partners and universities (Bonte and Dienes 2013) and NGOs/local communities (Holmes and Smart 2009). The point of departure of these studies is that knowledge in the context of corporate sustainability is not only distributed (hence requires open innovation in general), but is also complex and embedded in socially complex relationships and thereby can be effectively exchanged via two-way interactions between a focal firm and its stakeholders.

6.4 Implications for Policymakers and Company Leaders

This chapter has highlighted the complexity of open SOI by demonstrating its reliance on various mechanisms for external stakeholder engagement and internal capability building. As such, the findings can inform policies at national and local levels in designing appropriate structures for innovation in industries that are subject to sustainable development. Moreover, the study has important implications for firms regarding how to tackle the aforementioned complexity by embracing the value of stakeholder engagement.

6.4.1 Implications for Policymakers

In general, Norwegian politicians perceive the minerals industry and its further development as a double-edged sword. One the one hand, and besides their widespread use in everyday products, minerals are required for the development of a wide range

of renewable technologies and green infrastructures, which are highly relevant to the rising political support for sustainable development (Heldal et al. 2016). Conversely, the environmental and social issues arising from mineral exploration and production reduce political interest in the industry because the legal and informal power of indigenous people, youth organizations, environmentalists and labor unions can damage the reputation of governing political parties. This has led to occasions when such opposing entities have been responsible for stopping or postponing exploration and production operations, even after the government has granted the required licenses. Therefore, the Norwegian governments' desire throughout the years to develop the minerals industry has mostly remained a verbal promise, but not put into practice.

The findings of this chapter provide an important message for policymakers if they want to overcome this situation: they should facilitate firm-stakeholder relationships in order to create the momentum for SOI. Owing to its potential in integrating economic, environmental and social sustainability, SOI can assist the minerals industry to pursue environmental and social imperatives, without compromising its profitability. In this regard, the overarching policy implication from the chapter is the need to design and implement supporting schemes that not only address the external mechanisms (e.g. proximity dimensions), but also the firms' internal capabilities (e.g. employee training), in order to close the knowledge gap between mineral firms and their stakeholders.

As far as the external mechanisms are concerned, specific attention should be paid to ensuring that there is sufficient recognition of various stakeholder groups who provide technical, market, social and legal knowledge. From an innovation supply perspective, the minerals industry is heavily dependent on the acquisition of technologies and technical services from suppliers, universities and research centers. Therefore, providing stable financing possibilities to create industrial clusters and university-industry linkages is of utmost importance for securing the flow of technical knowledge to the industry. Taking a demand-side perspective, the government should support existing intermediary organizations (e.g. the Association of Norwegian Mineral Industry) to strengthen their links with national and international agencies such as Innovation Norway and the European Innovation Partnership (EIP) on Raw Materials, which will accelerate the industry's link with potential markets for raw materials. Moreover, to create effective communication between mineral firms and environmental/societal stakeholders, we suggest that policymakers direct their efforts towards establishing transparent mechanisms for stakeholder engagement (van der Have and Rubalcaba 2016), which entails using established frameworks for evaluating environmental/societal performance. A big advantage of these frameworks (e.g. Towards Sustainable Mining in Canada or Finland) is that they offer key indicators for measuring the impacts of the minerals industry, and thereby create mutual commitment to shared sustainability objectives in which none of the parties will be able to override the agreed terms.

We also found that there is a need for policymakers to make a clear distinction between formal and informal institutional environments in promoting SOI. Increasing the coordination between formal structures such as environmental and innovation policies is necessary for investment in and the diffusion of sustainability-oriented

processes and products, as a lack of such coordination could result in the market and system failures of these innovations (Ghisetti et al. 2015). On the other hand, policies that aim to promote social innovations should address cultural norms and values by, for example, nurturing trust-based relationships between mineral firms and local communities. In this regard, local governments can act as neutral entities to facilitate the trust building process and close the normative gap between the minerals industry and societal stakeholders.

Considering firms' internal capabilities, the findings point to a critical need for policies that aim to augment employee training programs, as well as the breadth and depth of higher education in disciplines related to the minerals industry. Indeed, what differentiates policy requirements in the context of SOI from general innovations is that governmental support for the former should include more than the R&D subsidies and financial incentives offered through generic policy schemes. An exemplary scheme in this respect is SkatteFUNN, the tax incentive scheme in Norway that is designed to stimulate R&D activities throughout all industries. As training programs in areas related to broader sustainability approaches such as environmental management systems require substantial human and financial resources, implementing an incentive system similar to SkatteFUNN could encourage firms to devote their resources to development areas in which immediate financial benefit is not evident.

6.4.2 Implications for Company Leaders

The call made in the chapter for policies that address both internal and external firm aspects of open SOI resonates directly with the need for firm-level strategies and practices that consider these two aspects. On the one hand, it is no longer an alternative for managers to isolate their firms from external stakeholders' knowledge. However, the findings presented throughout the chapter, and the quotes from company leaders in the Norwegian minerals industry also indicate that shifting focus to external stakeholders does not imply ignoring the internal capabilities required for utilizing the external knowledge.

Besides the importance of practices such as employee training that enable mineral firms to understand external knowledge and to assess its relevance, managers' attention should be drawn to the importance of setting specific objectives when dealing with social and environmental issues. The insights from the interviews specified that engaging a wide range of stakeholders, particularly those without any interest in the long-run financial condition of firms, will most likely expand the scope of social and environmental expectations. This will then pose a significant challenge for mineral firms to find a balance between their own and these stakeholders' interests, which might consequently lead to ineffective knowledge exchange and failure to take any innovative action. Instead, designing clear objectives and communicating them to external stakeholders not only facilitates mutual understanding, but also enables managers to better locate the required external knowledge as the objectives become narrower.

Concerning internal capabilities, another important implication for firms is that they should strengthen their organizational routines for knowledge assimilation, which simply implies dissemination and integration of externally acquired knowledge internally. In this regard, efforts are particularly needed to accelerate knowledge sharing across different organizational functions by means of assigning formal knowledge coordinators. While the use of informal practices of knowledge assimilation such as peer-to-peer interaction is more prevalent in the minerals industry, creating a balance between formal and informal structures is well suited to managers who want to optimize their organizational proximity to external stakeholders. This is because such a combination can assist firms to control their external knowledge transactions through hierarchical frameworks, while at the same time keep a certain level of flexibility to ease access to novel ideas and solutions.

The final remark about practical implications revolves around the external (to the firm) aspect of SOI mechanisms, specifically highlighting the necessity to consider both the relational and transactional types of stakeholder engagement in acquiring external knowledge. What we have seen so far in this respect is an unbalanced focus on reinforcing networks, industrial clusters and R&D alliances, which all aim to nurture collaborations between firms and external stakeholders. Although not reducing the significance of these relational mechanisms, this study, in agreement with Mothe and Nguyen-Thi (2017), strongly advises managers to establish stable search platforms to secure timely access to external knowledge. On some occasions, collaboration may lay the basis for such a platform when firms draw on their previous relationship with a specific stakeholder to continuously look for relevant knowledge in ongoing SOI processes. Other examples include creating/maintaining links with universities via employees who graduated from the same institute, or recruiting new employees from competitors or supplier companies.

Acknowledgements We thank Wim Vanhaverbeke for encouraging us to write this chapter and for his valuable comments. Lene Foss thanks Malin Kvalheim for her assistance.

Bibliography

Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented Innovation: A systematic review. *International Journal of Management Reviews, 18*(2), 180–205.

Aragón-Correa, J. A., Hurtado-Torres, N., Sharma, S., & García-Morales, V. J. (2008). Environmental strategy and performance in small firms: A resource-based perspective. *Journal of Environmental Management, 86*(1), 88–103.

Arnold, M. (2017). Fostering sustainability by linking co-creation and relationship management concepts. *Journal of Cleaner Production, 140,* 179–188.

Ayuso, S., Ángel Rodríguez, M., García-Castro, R., & Ángel Ariño, M. (2011). Does stakeholder engagement promote sustainable innovation orientation? *Industrial Management & Data Systems, 111*(9), 1399–1417.

Behnam, S., Cagliano, R., & Grijalvo, M. (2018). How should firms reconcile their open innovation capabilities for incorporating external actors in innovations aimed at sustainable development? *Journal of Cleaner Production, 170,* 950–965.

Bini, L., Bellucci, M., & Giunta, F. (2018). Integrating sustainability in business model disclosure: Evidence from the UK mining industry. *Journal of Cleaner Production, 171,* 1161–1170.

Bonte, W., & Dienes, C. (2013). Environmental innovations and strategies for the development of new production technologies: Empirical evidence from Europe. *Business Strategy and the Environment, 22*(8), 501–516.

Bos-Brouwers, H. E. J. (2010). Corporate sustainability and innovation in SMEs: Evidence of themes and activities in practice. *Business Strategy and the Environment, 19*(7), 417–435.

Cainelli, G., De Marchi, V., & Grandinetti, R. (2015). Does the development of environmental innovation require different resources? Evidence from Spanish manufacturing firms. *Journal of Cleaner Production, 94,* 211–220.

Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Boston, Mass: Harvard Business School Press.

Chesbrough, H., & Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), *New frontiers in open innovation*. New York, United States: Oxford University Press.

Chesbrough, H., & Crowther, A. K. (2006). Beyond high tech: Early adopters of open innovation in other industries. *R&D Management, 36*(3), 229–236.

Clarke, S., & Roome, N. (1999). Sustainable business: Learning—Action networks as organizational assets. *Business Strategy and the Environment, 8*(5), 296–310.

Crossan, M. M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of Management Studies, 47*(6), 1154–1191.

Dahlander, L., & Gann, D. M. (2010). How open is innovation? *Research Policy, 39*(6), 699–709.

Dangelico, R. M., Pujari, D., & Pontrandolfo, P. (2017). Green product innovation in manufacturing firms: A sustainability-oriented dynamic capability perspective. *Business Strategy and the Environment, 26*(4), 490–506.

De Marchi, V. (2012). Environmental innovation and R&D cooperation: Empirical evidence from Spanish manufacturing firms. *Research Policy, 41*(3), 614–623.

del Rio, P., Penasco, C., & Romero-Jordan, D. (2015). Distinctive features of environmental innovators: An econometric analysis. *Business Strategy and the Environment, 24*(6), 361–385.

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science, 60*(11), 2835–2857.

Faems, D., De Visser, M., Andries, P., & Van Looy, B. (2010). Technology alliance portfolios and financial performance: Value-enhancing and cost-increasing effects of open innovation. *Journal of Product Innovation Management, 27*(6), 785–796.

Foxon, T., & Pearson, P. (2008). Overcoming barriers to innovation and diffusion of cleaner technologies: Some features of a sustainable innovation policy regime. *Journal of Cleaner Production, 16*(1), S148–S161.

Freeman, R. E. (1984). *Strategic management: A stakeholder perspective* (p. 13). Boston: Pitman.

Freeman, R. E. (2010). *Strategic management: A stakeholder approach*. Cambridge: Cambridge University Press.

Frooman, J. (1999). Stakeholder influence strategies. *The Academy of Management Review, 24*(2), 191–205.

Galliano, D., & Nadel, S. (2015). Firms' eco-innovation intensity and sectoral system of innovation: The case of French industry. *Industry and Innovation, 22*(6), 467–495.

Gassmann, O., & Enkel, E. (2004). *Towards a theory of open innovation, three core process archetypes*. Paper presented at the Proceedings of the R&D Management Conference, Lisbon, Portugal.

George, G., Schillebeeckx, S. J. D., & Liak, T. L. (2015). The management of natural resources: An overview and research agenda. *Academy of Management Journal, 58*(6), 1595–1613.

Ghassim, B., & Foss, L. (2018). Understanding the micro-foundations of internal capabilities for open innovation in the minerals industry: A holistic sustainability perspective. *Resources Policy*.

Ghisetti, C., Marzucchi, A., & Montresor, S. (2015). The open eco-innovation mode. An empirical investigation of eleven European countries. *Research Policy, 44*(5), 1080–1093.

Greenwood, M. (2007). Stakeholder engagement: Beyond the myth of corporate responsibility. *Journal of Business Ethics, 74*(4), 315–327.

Hall, J. K., & Martin, M. J. C. (2005). Disruptive technologies, stakeholders and the innovation value-added chain: A framework for evaluating radical technology development. *R&D Management, 35*(3), 273–284.

Hall, J. K., & Vredenburg, H. (2003). The challenges of innovating for sustainable development. *MIT Sloan Management Review, 45*(1), 61–68.

Hall, J. K., & Wagner, M. (2012). Integrating sustainability into firms' processes: Performance effects and the moderating role of business models and innovation. *Business Strategy and the Environment, 21*(3), 183–196.

Hansen, E. G., Bullinger, A. C., & Reichwald, R. (2011). Sustainability innovation contests: Evaluating contributions with an eco impact-innovativeness typology. *International Journal of Innovation and Sustainable Development, 5*(2–3), 221–245.

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review, 20,* 986–1014.

Heldal, T., Schiellerup, H., & Aasly, K. A. (2016). *Minerals for the green economy*.

Hillman, A. J., & Keim, G. D. (2001). Shareholder value, stakeholder management, and social issues: What's the bottom line? *Strategic Management Journal, 22*(2), 125–139.

Holmes, S., & Smart, P. (2009). Exploring open innovation practice in firm-nonprofit engagements: A corporate social responsibility perspective. *R&D Management, 39*(4), 394–409.

Ingenbleek, P. T. M., & Dentoni, D. (2016). Learning from stakeholder pressure and embeddedness: The roles of absorptive capacity in the corporate social responsibility of Dutch Agribusinesses. *Sustainability, 8*(10).

Jamali, D., Yianni, M., & Abdallah, H. (2011). Strategic partnerships, social capital and innovation: Accounting for social alliance innovation. *Business Ethics: A European Review, 20*(4), 375–391.

Kassinis, G., & Vafeas, N. (2006). Stakeholder pressures and environmental performance. *Academy of Management Journal, 49*(1), 145–159.

Kazadi, K., Lievens, A., & Mahr, D. (2016). Stakeholder co-creation during the innovation process: Identifying capabilities for knowledge creation among multiple stakeholders. *Journal of Business Research, 69*(2), 525–540.

Ketata, I., Sofka, W., & Grimpe, C. (2015). The role of internal capabilities and firms' environment for sustainable innovation: Evidence for Germany. *R&D Management, 45*(1), 60–75.

Lane, P., Koka, B., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *Academy of Management Review, 31,* 833–863.

Laursen, K., & Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal, 27*(2), 131–150.

Mothe, C., & Nguyen-Thi, U. T. (2017). Persistent openness and environmental innovation: An empirical analysis of French manufacturing firms. *Journal of Cleaner Production, 162,* S59–S69.

Murphy, M., Perrot, F., & Rivera-Santos, M. (2012). New perspectives on learning and innovation in cross-sector collaborations. *Journal of Business Research, 65*(12), 1700–1709.

Muscio, A., Nardone, G., & Stasi, A. (2017). How does the search for knowledge drive firms' eco-innovation? Evidence from the wine industry. *Industry and Innovation, 24*(3), 298–320.

Nidumolu, R., Prahalad, C. K., & Rangaswami, M. R. (2009). Why sustainability is now the key driver of innovation. *Harvard Business Review, 87*(9), 56–64.

Peng, X., & Liu, Y. (2016). Behind eco-innovation: Managerial environmental awareness and external resource acquisition. *Journal of Cleaner Production, 139,* 347–360.

Rennings, K. (2000). Redefining innovation—Eco-innovation research and the contribution from ecological economics. *Ecological Economics, 32*(2), 319–332.

Segarra-Ona, M., Peiro-Signes, A., Albors-Garrigos, J., & De Miguel-Molina, B. (2017). Testing the social innovation construct: An empirical approach to align socially oriented objectives, stakeholder engagement, and environmental sustainability. *Corporate Social Responsibility and Environmental Management, 24*(1), 15–27.

Sharma, S., & Henriques, I. (2005). Stakeholder influences on sustainability practices in the Canadian forest products industry. *Strategic Management Journal, 26*(2), 159–180.
Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal, 19*(8), 729–753.
Spithoven, A., Vanhaverbeke, W., & Roijakkers, N. (2013). Open innovation practices in SMEs and large enterprises. *Small Business Economics, 41*(3), 537–562.
Suopajärvi, L., Poelzer, G. A., Ejdemo, T., Klyuchnikova, E., Korchak, E., & Nygaard, V. (2016). Social sustainability in northern mining communities: A study of the European North and Northwest Russia. *Resources Policy, 47,* 61–68.
Trott, P., & Hartmann, D. (2009). Why 'open innovation' is old wine in new bottles. *International Journal of Innovation Management, 13*(4), 715–736.
van der Have, R. P., & Rubalcaba, L. (2016). Social innovation research: An emerging area of innovation studies? *Research Policy, 45*(9), 1923–1935.
West, J., Salter, A., Vanhaverbeke, W., & Chesbrough, H. (2014). Open innovation: The next decade. *Research Policy, 43*(5), 805–811.
Wilson, M. (2003). Corporate sustainability: What is it and where does it come from? *Ivey Business Journal (Online)*, 1.
Zollo, M., Cennamo, C., & Neumann, K. (2013). Beyond what and why: Understanding organizational evolution towards sustainable enterprise models. *Organization & Environment, 26*(3), 241–259.

Dr. Babak Ghassim is currently working as a research advisor at UiT The Arctic University of Norway. He took his Ph.D. in February 2019 at the School of Business and Economics, UiT, where he studied sustainability-oriented innovation in the Norwegian minerals industry from an open innovation perspective. His research addresses the firm-level capabilities and inter-organizational factors that assist firms in benefiting from their stakeholders' knowledge towards pursuing various innovation pathways aimed at a broader sustainability approach. He has several years of experience working with companies in resource-extractive industries and has been a dedicated member of the Norwegian Research School in Innovation (NORSI). Babak has published his work in journals such as Journal of Cleaner Production and Resources Policy.

Dr. Lene Foss is Professor of Entrepreneurship and Innovation at UiT The Arctic University of Norway, School of Business and Economics. She teaches and publishes within the fields of university entrepreneurship, entrepreneurial education, entrepreneurial networks, gender in entrepreneurship and enterprise development. Her research has 932 google citations. Foss has been associate editor in Journal of Small Business Management and serves now on its international board. She is editorial consultant in International Journal of Gender and Entrepreneurship, and board member at Norwegian research school in innovation (NORSI). Foss has been visiting research fellow at Cambridge Judge Business School, Cambridge and Säid Business School, Oxford, both UK as well as University of North Carolina at Chapel Hill, US.