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Strategies for Integrating Stakeholders into Sustainability Innovation: A Configurational Perspective*

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Sustainability is a key driver of innovation for products, services, and business models. Sustainability innovations are aimed at improving the environmental, social, and economic performance of the innovated solution. Given the complexity of many sustainability challenges, leading innovators may seek to boost their innovation capacity by tapping into the ideas, knowledge, and expertise of their stakeholders. In doing so they need to consider how many and which stakeholders to integrate into new product development (NPD) processes, and at what stage. This study investigates stakeholder integration strategies associated with high sustainability performance of innovation. Building on the literatures of sustainability innovation and stakeholder integration in the context of NPD, this study developed a configurational model to analyze stakeholder integration strategies. The empirical data consisted of 80 interviews and documents from 13 medium to large companies and their stakeholders in Europe. Using the fsQCA method, it was found that there is not just one effective strategy but three stakeholder integration strategies for high sustainability performance of innovation. The results imply that deep organizational engagement with stakeholders is necessary for the achievement of high performance. Otherwise, the three strategies range from progressive openness, which allows stakeholders to exert a fundamental influence on the sustainability innovation, to limited openness toward stakeholder integration. With the early secondary strategy pointing to progressive openness, companies integrate secondary stakeholders early on and so maximize the influence of different views on the innovation. As to limited openness, companies following the selective strategy limit the number of stakeholder groups in NPD but are indifferent to the timing of these groups' inputs. Finally, the fine-tuning strategy is least open to atypical views as it restricts the share of secondary stakeholders and only allows external inputs after the fuzzy front end phase when key decisions regarding the innovation have been made.

Practitioner Points

- If firms want to make use of stakeholder knowledge in their sustainability innovation processes, they need to consider how many and which stakeholders to integrate into new product development, at what stage, and who to task with engaging with stakeholders.
- In order to achieve high sustainability performance of innovation it is necessary for top management or multiple other individuals from the innovating firm to engage in the stakeholder integration process.
- Companies can regulate the degree of external influence through their choice of strategy. Progressive openness entails integrating secondary stakeholders from outside the firm's value chain early on in the innovation process. Such integration is expedient if an innovation project goes beyond incremental and market-specific fine-tuning. Interorganizational liaising between R&D and the Corporate Responsibility department in search of promising secondary stakeholders can be highly beneficial.
- Limited openness restricts stakeholder inputs in two main ways: companies either select only a few stakeholders or integrate stakeholders after the fuzzy front end phase, when key decisions regarding the innovation have already been made.

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Introduction

Innovations oriented toward sustainability (hereafter "sustainability innovations") are needed to incorporate environmental, social, and economic considerations into the production and consumption patterns of business and society (Figge and Hahn, 2012; Nidomolu, Prahalad, and Rangaswami, 2009). Research has shown that the focus of sustainability is shifting from minimizing the negative impacts of operations to enabling wider changes that are favorable to the environment and society (Boons and Lüdeke-Freund, 2013; Schiederig, Tietze, and Herstatt, 2012). Previous research also suggests that R&D cooperation is more intense for sustainability innovations than for other innovations (De Marchi, 2012) and that companies pursuing sustainability innovations benefit from engaging with external stakeholders—groups that can affect the achievement of the company's objective or vice versa (Freeman, 1984)—more than companies working to develop traditional innovations (Klewitz, Zeyen, and Hansen, 2012; Messeni Petruzzelli, Dangelico, Rotol, and Albino, 2011). This is because sustainability innovations are often systemic (Bos-Brouwers, 2010; Halme and Korpela, 2014; Schiederig et al., 2012), complex, and have a multistakeholder focus and thus require a certain level of critical collaboration and outside-in process (Du, Yalcinkaya, and Bstieler, 2016). Stakeholders' relationships help broaden the scope of a firm's external innovation search while reducing its search costs (Du et al., 2016).

Consider BMW's Project i. In 2007, a cross-disciplinary innovation team from BMW traveled to Germany, the United States, China, Japan, France, and the United Kingdom to visit different types of stakeholders: mayors, infrastructure planners, and regulators in order to seek out sustainable and future-oriented mobility concepts. The Project i team needed to come up with ideas that would reinvent the architecture of the car along the value chain. In subsequent years, Project i collaborated with a wide range of stakeholder groups including governments, energy companies, universities, and research institutions from six countries and expanded into long-term field studies and co-creation labs for users. BMWi3, the group's first mass-produced electric vehicle and the first car under the BMWi sub-brand, was launched in 2013. The offering extended beyond the car and included establishing a nationwide network of charging stations, installing a charging station at home, BMW Add-on Mobility (the option of using gasoline-powered cars for longer vacation trips), and the opportunity to purchase green electricity for charging. The innovation process also spawned services such as BMW DriveNow and BMW ParkNow.

Competent use of information from stakeholders in new product development (NPD) can contribute to enhance firms' competitiveness (Aschehoug, Boks, and Støren, 2012). However, this requires formal collaboration rather than just ad hoc interaction (e.g.,

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Driessen and Hillebrand, 2013). Earlier case studies have laid the groundwork for research into sustainable innovations and stakeholders by focusing on questions of internal capability (Ayuso, Rodríguez, and Ricart, 2006; Dangelico and Pujari, 2010; Driessen and Hillebrand, 2013). But this viewpoint does not take into account the range of strategic options available for integrating stakeholders. In order to continue the theory building in the nascent field of sustainability innovation, one further step is taken by examining strategies of stakeholder integration into sustainability innovation.

Drawing on the Porterian (1996) view of strategy as a configuration of activities and Driessen and Hillebrand's (2013) definition of stakeholder integration, stakeholder integration strategy is defined as the configuration of key elements determining the incorporation of stakeholder knowledge into the innovation process. To that end, it is necessary to consider what elements are central to stakeholder integration. Based on the existing innovation and stakeholder research, it is known that the breadth and type of integrated stakeholder network and the depth of organizational engagement with stakeholders both influence NPD (Greenwood, 2007; Laursen and Salter, 2006). The breadth of the stakeholder network portrays the range of groups that are involved and heard, while depth refers to the quality of organizational engagement in maintaining the relationship. Moreover, openness with external parties in the NPD context requires that aspects of temporality are taken into account. Specifically, the fuzzy front end of the innovation process can be critical for innovation success (Cooper, 1998; Markham, 2013; Thanasopon, Papadopoulos, and Vidgen, 2016).

Stakeholder integration is a complex phenomenon because firms can combine the above elements in a variety of ways. Viable combinations form a number of stakeholder integration strategies that have been overlooked in the stakeholder management literature (Greenwood, 2007; Laplume, Sonpar, and Litz, 2008). There is a need for a more comprehensive understanding of how stakeholder integration strategies influence the sustainability performance of innovation.

As theory development around this complex phenomenon is still in its early stages, a configurational approach and fuzzy-set qualitative comparative analysis (fsQCA) is applied to elaborate the theoretical propositions. QCA makes it possible to conceptualize stakeholder integration strategy as a configuration of elements associated with the sustainability performance of innovation as it can handle features underlying the causal complexity that is typical of complex organizational phenomena (Rihoux and Ragin, 2009). The first feature, equifinality (Fiss, 2007; Rihoux and Ragin, 2009, pp. 8–9), implies that there is not just one, but several stakeholder integration configurations—strategies in our terminology—that are associated with high sustainability performance of innovation. Second, conjunctural causation may be present. This means that the stakeholder integration elements highlighted above do not operate in isolation, but in an interdependent manner. Third, QCA embraces asymmetrical causation: both the presence and the absence of elements may be connected to the outcome. In addition, QCA allows permanent dialogue between thick case knowledge and systematic analysis of the cases (Misangyi et al., 2017).

Drawing on the above, the influence of stakeholder integration strategies on the sustainability performance of innovation is examined by taking into account changes in economic, ecological, and social impacts. The research question is: *Which stakeholder integration strategies are associated with high sustainability performance of innovation?*

This study contributes to extant literature in two main ways. First, NPD literature has explored the inclusion of stakeholders through the capability lens (Watson, Wilson, Smart, and Macdonald, 2017). Existing knowledge is extended by showing that stakeholder integration strategies also matter when it comes to the sustainability performance of innovation, and that high performance can result from both progressive and limited openness. Further, while NPD literature has tended to focus on primary stakeholders (Bozdogan, Deyst, Hoult, and Lucas, 1998), this study examines a wider range of stakeholder groups and proposes to explore the influences of integrating secondary stakeholder groups in the early phase of NPD, when innovating companies are often open to shaping the innovation via stakeholder input.

Second, this study contributes to stakeholder literature, which has theorized stakeholder integration through separate elements such as stakeholder network and quality of interaction (Greenwood, 2007). An entirely new concept for stakeholder integration is introduced: the stakeholder integration strategy,

which consists of a configuration of elements pertaining to integration. This concept is applicable beyond NPD in the context of general stakeholder management. As this article also exemplifies how to measure the concept in relation to an outcome of interest, it can be expected that the concept and approach will enrich future theorization on stakeholder management.

Next, the theoretical background of this study is discussed. The next section introduces the data, NPD processes in 13 medium-sized to large firms, and a description of the method and conceptual framework for analyzing the stakeholder integration conditions that influence the sustainability performance of innovation. Discussion of the results section concludes with propositions for a mid-range theory (Crilly, 2011; Misangyi et al., 2017) about stakeholder integration in NPD. Finally, discussion on managerial implications, the limitations of the study, and directions for further research are outlined.

Literature Review

Sustainability Innovations and Stakeholder Integration

While early works on corporate sustainability tended to view environmental and social issues as pressure-driven incremental betterment of companies' operations (Bansal and Roth, 2000), it has now become increasingly common to frame ecological or social problems as a source of inspiration for innovating new products, services, and business models, and thus to treat sustainability challenges as business opportunities (Halme and Korpela, 2014; Halme and Laurila, 2009; Hart, 2005). Conceptualizations of sustainability innovations range from perspectives focusing on ecological improvement, labeled as eco-innovation or green product innovation (Dangelico and Pujari, 2010; Tseng, Wang, Chiu, Geng, and Lin, 2013), to viewing sustainability as the integration of all three bottom line items—social, ecological, and economic—throughout the product life-cycle (Tischner and Charter, 2001). This study adheres to the latter, comprehensive sustainability view.

While innovation performance has received some attention, the main interest has been focused on financial success. Its measures have ranged from the success of new product and service introduction (Frishammar and Hörte, 2005) to market performance and sales volumes (van Beers and Zand, 2014) and customer acceptance (Griffin and Page, 1993). Contrariwise, sustainability performance is based on all three bottom line items. These items are important for the creation of a win-win situation that is scalable from a business point of view and that makes it possible for sustainable products and services to draw market share away from traditional products and to make a positive societal impact (Genç and Di Benedetto, 2018, p. 235).

Previous research in the field of open innovation has shown that organizations benefit from early stakeholder input in the innovation process (West, Salter, Vanhaverbeke, and Chesbrough, 2014). Innovation scholars have encouraged colleagues to examine sustainability and open innovation together and to view these two major shifts in the business environment as synergistic (Slotegraaf, 2012). Firms are developing sustainable innovations by means reminiscent of open innovation, and there are indications that stakeholder integration might be even more important to sustainability innovation than to NDP in general (Ayuso, Rodríguez, Garcia-Castro, and Ariño, 2011; Goodman, Korsunova, and Halme, 2017; Watson et al., 2017). This is particularly because radical sustainability innovations often go beyond products: they involve the development of product-service combinations or new business models, which ultimately may necessitate institutional development and lead to system-level changes. These changes are complex and exceed the capacities and competences of individual companies (Hofman and de Bruijn, 2010).

Earlier exploratory works of stakeholder integration in sustainability innovation have concentrated on firms' distinctive capabilities. They suggest that the ability to identify stakeholders for collaborative networks, stakeholder dialogue, and stakeholder knowledge integration, particularly the acquisition of technical knowhow from stakeholder networks, are important for integrating sustainability issues into product design (Ayuso et al., 2006; Dangelico, Pontrandolfo, and Pujari, 2013). Furthermore, they stress the importance of coordination mechanisms and prioritization principles in ongoing stakeholder integration work (Driessen and Hillebrand, 2013).

The capabilities recognized by earlier studies are a necessary foundation for high sustainability

performance of innovation. However, a core shortcoming of these pioneering exploratory studies is that they disregard stakeholder integration strategies, i.e., how companies organize their collaboration with external groups, although that is a key determinant for the success of innovation projects (West and Bogers, 2014). Following the advice of Frooman (1999) and Greenwood (2001, 2007), the focus in this article is on this particular issue: how companies organize the integration of stakeholders into their sustainability innovation process and how this in turn influences the sustainability performance of innovation.

Stakeholder Integration Strategies

When integrating stakeholders into NPD, companies need to decide who, how, and when to work with in order to achieve high sustainability performance for the focal innovation. Existing studies of stakeholder management and open innovation indicate that stakeholder integration involves four key strategic choices: (1) breadth of the stakeholder network (Watson et al., 2017), (2) type of integrated stakeholders (Lynch, O'Toole, and Biemans, 2016), and (3) the quality of organizational engagement (Greenwood, 2007; Laursen and Salter, 2006). (4) The product development context furthermore underscores the importance of timing stakeholder integration in NPD (Markham, 2013).

Breadth of stakeholder network. Breadth of network refers to the number of distinct stakeholder groups integrated into collaborative activity. Innovation research has shown that a diverse range of integrated stakeholders favors novelty of innovation more than collaboration with a single type of partner (Nieto and Santamaría, 2007).

However, the integration of a large number of stakeholders may also contribute to slow down progress (Laursen and Salter, 2006; Smith and Reinertsen, 1998): while the diversity of stakeholder experiences may lead to better decisions, there is a threshold of decreasing returns (cf. Goerzen and Beamish, 2005) if different integrated stakeholder groups have contradicting goals and demands that impede decision-making (Ayuso et al., 2006). The key is to find the optimal conditions under which to incorporate the interests and inputs of stakeholders (Greenwood, 2007). Studies on the optimal stakeholder network from the perspective of sustainability performance in NPD are lacking. It is possible that the breadth of the network in relation to performance might prove to be contextual: there may be situations that favor the integration of a high number of different stakeholder groups.

Type of integrated stakeholders. Breadth of network is not the only concern for the sustainability performance of innovation. It is also important to find optimal types of integrated stakeholder groups (Goodman et al., 2017). Knowledge transfer from a narrow set of stakeholders can prove to be highly complementary if the integrated stakeholders have very different knowledge about the domain concerned than the innovating company. Here, it is particularly useful to make a distinction between primary and secondary stakeholders, based on the type of relationship between company and stakeholder (Clarkson, 1995).

According to Clarkson (1995), a primary stakeholder group is "one without whose continuing participation the corporation cannot survive as a going concern." A company and its primary stakeholders are highly interdependent. Primary stakeholder groups are typically comprised of owners, employees, suppliers, and customers using services or products produced. These groups have alternatively been called organizational (Henriques and Sadorsky, 1999), market (Lawrence, 2010), and economic stakeholders (Cummings and Doh, 2000). A common feature of all these definitions is that these groups engage in the direct exchange of goods and services, labor, and capital with the firm. A number of authors (Du, Leten, and Vanhaverbeke, 2014; Holmes and Smart, 2009) have suggested that these stakeholders should be distinguished from others and that the research focus should be expanded to include knowledge flows from other, so-called secondary stakeholders, i.e., "groups that influence or affect, or are influenced or affected by the corporation, but are neither engaged in transactions with the corporation nor essential for its survival" (Clarkson, 1995). These secondary stakeholders can include nongovernmental organizations, academics, media, and other individuals or groups that are able to influence the company (Garvare and Johansson, 2010).

Collaborating partners in NPD are usually primary stakeholders: shareholders, financial institutions, and companies that are positioned either upstream in the value chain as suppliers for the firm

(Bozdogan et al., 1998; Kamath and Liker, 1994) or downstream as customers, dealers, or competitors (Gruner and Homburg, 2000; Maidique and Zirger, 1985).

Research is ambiguous as to which stakeholders are most important for the sustainability performance of innovation. As for the integration of primary stakeholders, it is reported that suppliers positively influence environmental process innovations (Geffen and Rothenberg, 2000; Simpson, Power, and Samson, 2007). Shareholders, financial institutions, and employees have been found to matter the most for firms with an environmental leadership strategy aimed at minimizing the environmental burden through the development of novel innovations (Buysse and Verbeke, 2003). As regards secondary stakeholders, nonmarket groups like research organizations and NGOs can improve innovation performance (De Marchi, 2012).

Quality of organizational engagement. Another element that matters is the depth of organizational engagement in stakeholder integration, i.e., the set of practices used for creating and maintaining a productive relationship—the ways in which a productive relationship is created and maintained between the company and its stakeholders (Greenwood, 2007). This may involve preemptive practices such as disclosing company information to legitimize various actions or reputation-building, which might be valuable in the presence of conflicting events (Deegan, 2002), listening and responding to stakeholder requirements (Sillanpää, 1998), or collaborative work that fosters innovation in the form of information sharing, consultation, communication, dialogue, and exchange (Driessen and Hillebrand, 2013). Top management involvement may be vital to the success of sustainability innovations because the recognition of sustainability issues sometimes challenges the existing organizational culture (Genç and Di Benedetto, 2018).

Timing of stakeholder integration. Stakeholder literature does not consider the project-based nature of NPD. Innovation management research has given increasing attention to the notion of temporality in the acquisition and use of external knowledge in product and service development. NPD has been conceptualized and divided into stages using different types of stage models (Gruner and Homburg, 2000; Hoyer, Chandy, Dorotic, Kraft, and Singh, 2010). Increasing focus has also been given to the fuzzy front end (FFE) activities that precede formal and structured R&D (Khurana and Rosenthal, 1997; Koen et al., 2001; Markham, 2013).

These activities comprise the entirety of exploring and identifying opportunities, to the point where initial specification is available and implementation in R&D can start (Katz, 2007). Previous research stresses the importance of openness in the front end phase as well as its impact on product success, time to market, market penetration, and financial performance (Markham, 2013; Thanasopon et al., 2016).

Although front end innovation is a topical subject in innovation research, no work has as yet been done to explore the importance of FFE activities in sustainability innovation (Bocken, Farracho, Bosworth, and Kemp, 2014; Dewulf, 2013). Previous research suggests that the integration of environmental issues in the early stages of an innovation process can be beneficial as most environmental impacts are determined in the product-planning phase (Bocken et al., 2014; Charter and Tischner, 2001; Hoffmann, 2012). However, this research has overlooked the conditions under which FFE openness is beneficial and leads to improved innovation performance.

Methodology

Toward a Configurational Approach in Stakeholder Integration

Firms may combine the above elements of stakeholder integration in a number of ways, which is one of the reasons why stakeholder integration into NPD, and its effect on (sustainability) performance of innovation, is such a complex organizational phenomenon. This article argues that an examination of the way these elements are combined would benefit from a configurational approach, which is increasingly popular in management studies because it can help to explain how different causal elements in combination are associated with an outcome (Crilly, Zollo, and Hansen, 2011; Crilly et al., 2012; Fiss, 2007). It is now also making its way into innovation research (Gilbert and Campbell,

2015; Hofman, Faems, and Schleimer, 2017; Meuer, Rupietta, and Backes-Gellner, 2015).

For purposes of studying complex organizational phenomena, QCA has a number of advantages over standard statistical methods (Domínguez and Hollstein, 2014, p. 260). First, QCA can detect *equifinality*, i.e., the fact that there is not just one but several possible stakeholder integration configurations that can lead to a high sustainability performance of innovation (Misangyi et al., 2017). Second, QCA can capture *conjunctural causation*. One example is the integration of secondary stakeholders, which is potentially beneficial when certain other elements are present. In order to benefit from the atypical voices coming from secondary stakeholders, NDP may need to incorporate any radical ideas and knowledge coming from outside the organization at as early a stage as possible. The stakeholder integration elements may not operate in isolation but rather in an interdependent manner, and certain configurations of these elements are likely to be meaningful in determining the sustainability performance of innovation. Third, QCA embraces *asymmetrical causation*. Depending on the context, i.e., what other strategic elements are involved, the presence as well as the absence of any element may produce the same outcome (Misangyi et al., 2017).

The following explains how the data for this research were collected and analyzed, and then proceeds to explain the QCA design for this study.

Data Set

As the main interest of this study lies in the role of stakeholder integration in developing the sustainability performance of innovations, it makes sense to focus on products and services produced for the consumer market. In this connection, it is logical to target innovations that enhance sustainability by changing consumption patterns, reducing environmental impact, bringing social benefits, and by being systemic. These increase the likelihood that companies can benefit from the integration of stakeholders' knowledge.

With this in mind, this study relied on a purposeful sampling strategy and used criterion-based case selection (Patton, 2015). The first criterion was to find companies that had recently created sustainable innovation for the consumer market in the domains of energy, mobility, housing, or food; these domains have the biggest impact on sustainability (UNEP, 2010). The search began by looking at Forbes rankings of the 100 most innovative companies and Dow Jones Sustainability Index companies, and then contacted experts—sustainability experts from academia, the corporate sector, and government agencies—who assisted in finding prominent cases where sustainable innovation was pursued with the help of stakeholders.

The second case selection criterion was stakeholder engagement in innovation. The search took place in EU countries and yielded 127 companies that had developed innovations with sustainability features by drawing on stakeholder inputs. Many of these companies had integrated stakeholders through crowdsourcing or idea competitions, which although classified as stakeholder integration meant it was impossible to trace the stakeholders for interviews. As the research design includes stakeholder interviews, stakeholder traceability was introduced as the third selection criterion.

These three criteria yielded sustainability innovations from 13 medium to large companies from Austria, Denmark, Finland, France, Germany, Poland, Spain, and the United Kingdom. These were the cases for the research. Integrated stakeholders included test users, consumer associations, public authorities' regulators, research institutes, and NGOs and municipality representatives. Out of a total of 53 stakeholder groups, 37 can be classified as secondary stakeholders.[1]

Of the 80 semi-structured interviews carried out in 2014–2015, 34 were with managers involved in the focal innovation and 46 with integrated stakeholders (Appendix A). The company interviewees, two or three per company, were usually project managers for the innovation, heads of R&D, and/or business development managers. All interviews were recorded and transcribed.

The company interviews focused on describing the sustainable innovation product or service; the details and timeline of the innovation process; and stakeholder integration activities (listing the stakeholders involved, their contributions, and timing in the innovation process). The interviews with stakeholders addressed their involvement in

[1]In these cases the integrated consumers were not customers in a transaction relationship with the company, and were therefore categorized as secondary stakeholders (Appendix A).

the innovation process. Documentary data were also consulted when available. The combination of company and stakeholder interviews with document analysis made data triangulation possible. The interviews ranged in length from 10 to 90 minutes depending on the extent of the respective stakeholder's involvement.

QCA Model

Following good QCA practice, our analytical model was developed by drawing on previous literature (Misangyi et al., 2017) and complemented with case knowledge when needed (Aversa, Furnari, and Haefliger, 2015; Basurto and Speer, 2012). Building on the literature review above, the key ingredients of our configurational research design, which include outcome and conditions, are further detailed below.

Measurement of outcome. This study's measurement for outcome is the *high sustainability performance of innovation.* The operationalization of sustainability performance was guided by the work of Adams, Jeanrenaud, Bessant, Denyer, and Overy (2016), which places the focus on impacts after the diffusion of an innovation rather than the firm's operational optimization (e.g., eco-efficiency or social issues in own organization). Three earlier studies were used from Bansal and Roth (2000); Halme, Anttonen, Hrauda, and Kortman (2006); and Paulraj (2011) to construct the measurement instrument, which considers all three dimensions of sustainable development—economic, ecological, and social—that are then further divided into nine distinctive subdimensions that assess the sustainability of the innovation (Appendix B).

The data were coded from the 13 cases according to the sustainability performance of the innovation (i.e., points that the interviews or documents showed had yielded an improvement in sustainability). Following Dewar and Dutton (1986), the reliability of the evaluation was increased by inviting expert evaluators to rate each innovation according to the nine dimensions. These evaluators were four experts in the mobility, housing, food, and energy domains. They only rated innovations within their own domain. For purposes of inter-rater reliability, one research team member assisted the evaluators to ensure they understood the evaluation procedure in a similar manner. The researcher provided in-depth information about the specifics of cases, and their impact on sustainability performance was discussed with the evaluators. The evaluators also considered the possible negative effects of the innovation in their domain. All dimensions were rated from –2 to +2, where ±2 represented a strong positive or negative change from an earlier similar or competing product and ±1 a positive or negative change. The dimension was rated as 0 if no change could be identified in sustainability performance for the dimension.

Measurement of causal conditions. Our configurational model is designed to establish the effectiveness of stakeholder integration in producing high sustainability performance for innovation. Using the four causal conditions identified in previous literature, factors influencing such performance were operationalized. As discussed above in the literature review, these conditions are stakeholder network breadth, share of secondary stakeholders, depth of organizational engagement, and stakeholder integration during FFE. Their operationalization is discussed below.

First, *stakeholder network breadth* (Greenwood, 2007; Laursen and Salter, 2006) is measured by calculating how many different types of stakeholders were integrated into NPD. Second, based on the distinction between primary and secondary stakeholders, and the nascent sustainability innovation literature (Driessen and Hillebrand, 2013; Goodman et al., 2017) hinting at the relative importance of secondary stakeholders for sustainability innovation, the *share of secondary stakeholders* is measured. This condition explores whether sourcing ideas and information from stakeholders outside the company's own value chain is beneficial for sustainability innovation. This is measured as the number of secondary shareholder groups as a proportion of the total number of stakeholder groups.

The third condition, *depth of organizational engagement,* focuses on how information is exchanged between a company and its stakeholders. It draws on Greenwood's model of stakeholder integration (Greenwood, 2007), according to which deep organizational engagement involves numerous and/or high-quality activities. Accordingly, the quality of activities in the development of sustainability innovations is measured, and organizational

engagement is considered to be deep when top management collaborates with stakeholders (Genç and Di Benedetto, 2018) or when collaboration involves several members of the focal firm. Furthermore, higher value is attached for direct collaboration without intermediaries than to indirect collaboration in cases when collaboration with stakeholders has been managed through external agency only. In this case, the lowest score is given for the condition.

As a fourth condition, *stakeholder integration during the fuzzy front end (FFE) phase* (Khurana and Rosenthal, 1997) is examined. FFE consists of three stages: idea generation, concept development, and project definition. Drawing from the operationalization of Lynch et al. (2016), the stages which external stakeholders contribute are counted as well as where the QCA value is based on distinctive stages during FFE, ranging from 0 to 3.

Table 1 summarizes the operationalization of outcome and the four conditions. Raw case data with detailed outcome scores by sustainability dimension and condition information is presented in Appendix C.

Analysis

Data Calibration

The next step in FsQCA analysis is calibration of the data set. Calibration defines the set membership score with the goal of converting the category measures of outcome and conditions into a scale ranging from .0 to 1.0. The direct method (Ragin, 2008a) is used with qualitative anchors to transform the original interval scaled values into a fuzzy-value scale (Table 2). Drawing on the knowledge acquired from the cases, visible value breaks are used to set the three

Table 1. Operationalization of Outcome and Four Conditions

Outcome and Conditions		Operationalization
Outcome	High sustainability performance of innovation	Based on evaluation of 9 sustainability dimensions: score –18 to +18. See Appendix B.
Conditions	Broad stakeholder network	Total number of integrated distinctive stakeholder groups
	High share of secondary stakeholders	Secondary stakeholder groups as a proportion of total stakeholder groups (range 0 to 1)
	Deep organizational engagement	Organizational engagement (scale 1 to 4) Through an agency or another actor = 1 Through one employee from a firm = 2 Through multiple members of the organization = 3 Through multiple members of the organization involving top management = 4
	Stakeholder integration in FFE	Number of phases involving integration during FFE (scale 0 to 3)

Table 2. Calibration Table for Stakeholder Integration

Case		Outcome	Conditions			
Industry	Firm	High Sustainability Performance of Innovation	Broad Stakeholder Network	High Share of Secondary Stakeholders	Deep Organizational Engagement	Stakeholder Integration in FFE
Energy	A2A	.67	.01	.59	.82	.01
Mobility	BMW	.76	.82	.85	.82	.73
Energy	E.ON	.38	.82	.85	.82	.18
Food	Ecoveritas	.93	.01	.59	.99	.73
Food	Fiskars	.08	.18	.78	.01	.73
Food	Frosta	.18	.99	.89	.18	.18
Mobility	HSL	.56	.01	.59	.82	.18
Housing	Ikea	.67	.00	.01	.82	.18
Housing	Rockwool	.67	.18	.98	.82	.73
Housing	Skanska	.67	.82	.25	.82	.18
Food	Unilever	.18	.82	.85	.99	.73
Mobility	JCDeceaux	.97	.01	.59	.99	.18
Energy	Verbund	.83	.18	.01	.82	.73

Table 3. Qualitative Thresholds of Outcome and Conditions

Outcome and Conditions	Threshold Full Nonmembership	Crossover Point	Threshold Full Membership
High sustainability performance of innovation	.5	3.5	10
Broad stakeholder network	3.5	4.5	5.5
High share of secondary stakeholders	.55	.63	.92
Deep organizational engagement	1.5	2.5	3.5
Stakeholder integration in FFE	.5	1.5	3

qualitative thresholds (Table 3) for full nonmembership, crossover point, and full membership.

In the direct method, calibration is not a linear transformation of the interval data but based on estimates of the log odds of full membership (Ragin, 2008b). In line with Basurto and Speer (2012), sensitivity was considered in regard to the case context when developing the fuzzy-sets thresholds for the conditions, as well as for the outcome, because there is no universal criterion that defines full membership, full nonmembership, or the crossover point.

Configurational analysis is interested in whether a condition or combination of conditions is necessary or sufficient for the outcome in question. A condition is considered sufficient for an outcome if the outcome always happens when the condition is present. A necessary condition implies that the outcome always requires the condition in question. The analysis of necessary and sufficient conditions was conducted using fsQCA 2.5 software (www.fsqca.com). If a condition was present in all configurations and resulted in a given outcome, it was deemed necessary (Ragin and Fiss, 2008). First, a truth table was created to identify combinations of causal conditions associated with a high sustainability performance level. The consistency cutoff was set at .76, higher than the recommended minimum of .75 (Ragin, 2006), and specified a minimum threshold frequency of one case per configuration. Each of the three solutions received a consistency score of over .8, as recommended. A conservative approach was taken and the intermediate solution was relied upon (Ragin and Fiss, 2008).[2] The parsimonious solution was used to distinguish between core and peripheral conditions in the result sets. Core causal conditions are more "decisive causal ingredients" and do not require simplifying assumptions. Core conditions would remain in the solution term regardless of the assumptions made. Peripheral causal conditions consider what is plausible and show weaker evidence for a causal relationship with the outcome. However, the removal of peripheral causal conditions from the contribution solution would require implausible assumptions. Distinguishing between core and peripheral conditions is a convention that increases transparency in the analysis (Misangyi et al., 2017).[3]

Sensitivity Tests

Our model, analysis, and results follow good QCA practice (Schneider and Wagemann, 2009). An extremely high solution coverage of .96 was reached, which means that the solution explains a large proportion of the empirical cases (Misangyi et al., 2017). The stability of the solutions was also tested by running several checks. In QCA analysis consistency thresholds are immediately reflected in the results of QCA analyses, and therefore it is important to run these analyses with at least two slight threshold changes (Basurto and Speer, 2012; Schneider and Wagemann, 2012). Any raw consistency[4] level should remain above .75 (Schneider and Wagemann, 2012, p. 18). Tested levels should have one threshold above and another one below this figure. The analysis was first conducted with a

[2]FsQCA software provides three types of solution terms: a complex solution, a parsimonious solution, and an intermediate solution. All the results in these solutions are logically equivalent and true and are based on empirical information. Different solution terms simply differ in their degree of complexity, or better, precision. The first solution term does not include simplifying assumptions and leads to a more complex solution. The second one is based on simplifying assumptions and leads to the most parsimonious solution. The third solution term is based on so-called easy counterfactuals and leads to intermediate complexity (aka an intermediate solution) (Schneider and Wagemann, 2010).

[3]For further information on counterfactual analysis, see Schneider and Wageman (2012).

[4]Raw consistency measures the degree to which the configuration found is in line with the empirical evidence (i.e., case data) at hand. Before minimizing the truth table, which leads to result configurations, the researcher must decide upon the level of consistency required. If the raw consistency threshold level is increased, fewer truth table rows are used for minimization. This will lead to more consistent solution terms, but the received solution coverage will be lower (Ragin, 2008b).

Table 4. Stakeholder Integration Strategies Associated with High Sustainability Performance of Innovation

	Strategies for High Sustainability Performance of Innovation		
	Progressive Openness	Limited Openness	
Condition	Early Integration with Secondary Stakeholders (*early secondary*)	Selective Integration with Any Type but only a Few Stakeholders (*selective*)	Integration of Primary Stakeholders after FFE (*fine-tuning*)
Broad stakeholder network		⊗	
High share of secondary stakeholders	●		⊗
Deep organizational engagement	●	●	●
Stakeholder integration in FFE	●		⊗
Consistency	.83	.88	.94
Unique coverage	.08	.24	.06
Number of case companies under the configuration	4	7	2
	Solution consistency: .83 Solution coverage: .96		
Key:	●	Core causal condition (present)	
	●	Peripheral causal condition (present)	
	⊗	Core causal condition (absent)	
	⊗	Peripheral causal condition (absent)	

reduced consistency threshold. At the threshold level of .74 it becomes difficult on substantive grounds to maintain that a subset relation exists (Ragin, 2006; Ragin, 2008a, p. 136). The threshold was then raised to .94, which resulted in only two solution terms. The two remaining solution terms were the same as those at the lower threshold of .76. A separate analysis was also conducted for low sustainability performance strategies, which differed significantly from the positive results.[5] These findings indicate that the results are highly robust.

Results: Strategies of Stakeholder Integration into Sustainability Innovations

The results of the fsQCA analysis suggest three stakeholder integration strategies that lead to high sustainability performance of innovation. These strategies are presented in Table 4, in which the presence of a condition is indicated with black circles and the absence with crossed-out circles, as per QCA conventions. Blank spaces in a configuration indicate an "indifferent" situation, in which the causal condition can be present or absent. The value for coverage ranges from 0 to 1 (Ragin and Fiss, 2008). Unique coverage measures the contribution of each configuration to the explanation of outcome. Analysis of the unique coverage suggests that the second configuration in the middle is relatively distinct because its unique coverage is high. Solution coverage measures the empirical importance of the solution as a whole, i.e., the extent to which the solutions explain all cases of development of the novel sustainable innovations.

Deep organizational engagement was present in all three strategies identified in the analysis, and it is a necessary condition to achieve high sustainability performance of innovation. Otherwise, in accordance with the equifinality feature that QCA is able to capture, these three strategies reveal specific combinations of conditions that can be interpreted as sufficient conditions for the outcome. In other words, they indicate dissimilar configurations associated with high sustainability performance of innovation. The early stakeholder integration

[5]Two strategies were recognized with a solution consistency of 0.84 and a solution coverage of 0.82. The first one was based on shallow organizational engagement and a narrow stakeholder network (other elements being indifferent). The second one was based on a wide stakeholder network with a high share of secondary stakeholders (other elements being indifferent). These solutions lack the necessary condition of deep organizational engagement. High sustainability performance of innovation never resulted from a combination of a wide stakeholder network with a high share of secondary stakeholders.

strategy with secondary stakeholders (*early secondary*) takes input from stakeholders before engineering starts and relies on secondary stakeholders. The next strategy is selective integration with any type, but only a small number of stakeholder groups (*selective*). The third stakeholder integration strategy relies predominantly on primary stakeholders and avoids integration at the fuzzy front end of the innovation (*fine-tuning*).

These three strategies are next scrutinized and, following good QCA practice (Aversa et al., 2015; Misangyi et al., 2017), the QCA results are complemented with qualitative case knowledge. This paves the way for the theoretical propositions that are developed at the end of the article.

Strategy 1: Early Integration with Secondary Stakeholders (Early Secondary)

The *early secondary* strategy builds on early stakeholder integration and deep organizational engagement with secondary stakeholders. A network composition with a high share of secondary stakeholders helps to maximize the benefits of novel views early on. A blank space denoting an "indifferent" situation for broad stakeholder network indicates that in this strategy, the number of integrated stakeholders is not decisive for the high sustainability performance of innovation (Table 4).

BMW followed an *early secondary* strategy and developed electric cars with innovative sustainability features such as lightweight materials (carbon-fiber reinforced plastic) and recycled aluminum (80%). Thermoplastics were replaced with recycled or renewable raw materials, and the manufacturing process as a whole used 50% less energy, 70% less water, and 100% renewable energy. In the early phase, BMW's electric car and mobility services development project involved intense stakeholder collaboration. After interviewing key mobility decision-makers at the launch of the project, the company held an idea contest in its Co-creation Lab on future mobility services. Then, following community idea development, BMW held internal workshops with experts from universities to consider the most noteworthy ideas. As is often the case with groundbreaking innovations, it was difficult for BMW to envision future mobility needs, so it engaged with stakeholders early on to explore and kick off the development process:

> *The difficulty for us was there was no one customer and we could not say whether the few existing electric mobility customers represented a typical target group. This prompted the idea of running pilot projects in a large-scale, international setting. (Project Leader, User Research Electromobility, BMW)*

In the aftermath of the 2008 economic downturn, Rockwool, a Danish construction material manufacturer, applied the *early secondary* strategy to find growth through radically new applications for stone wool beyond insulation. To stimulate creative thinking, Rockwool introduced an R&D system called "under-the-radar," allowing R&D staff to dedicate 10% of their time and budget to developing their ideas, without managerial approval.

The idea of stone wool refugee shelters was born in conversations between Rockwool's Prototype Coordinator and a manager from Orange Innovation (OI), a sustainability innovation enterprise, who in their discussions about shelters for rock concerts realized that stone wool had several advantages over tents. Stone wool is fire-resistant, provides protection from the cold and heat, and is more soundproof. OI introduced Rockwool to the Roskilde Festival, where the shelter prototypes were tested. Festivals bear some similarity to refugee camps in that both accommodate large nonpermanent populations in high-density environments. The shelters were tested by festival guests and representatives of refugee organizations. The concept underwent a round of iterations based on stakeholder experiences. As well as a functional stone wool shelter, this process led to a whole new way of thinking about innovation at Rockwool. The cost and time savings achieved through stakeholder engagement transformed the company's way of thinking. In the words of Rockwool's People and Processes Manager: "I tried to calculate how many months it would take us to get the feedback from 54 users of the shelters—now we get it in 10 days!"

The Director of Innovation at OI explained that although a music festival is not the most obvious collaborator, it had a lot to offer to Rockwool:

> *Because a festival with our tradition and a lot of volunteers — we are very close to our customers. It's very normal here to make projects, which are not finished, which the customers are participating in. Communicating about them,*

surveying them, but also testing them. And inviting customers here before the festival starts to do something — we have done a lot. And I think Michaeel (Innovator, Rockwool) saw that possibility, that his company was not used to having the customers at his place. But he could use us as a way of doing that. (Director of Innovation, Orange Innovation)

Strategy 2: Selective Integration of a Few Stakeholders (Selective)

Collaboration with multiple stakeholders might not be feasible from the point of view of resource use. The *selective* strategy is based on a combination of a narrow stakeholder network and deep organizational engagement. This strategy is indifferent to the share of secondary stakeholders or integration during FFE. Stakeholder integration may start early on or late in the NPD process, but only a limited number of different stakeholder groups can be included. Stakeholders can be either primary or secondary.

In the study's sample, Ecoveritas, a medium-sized Spanish retail company specializing in organic food products, integrated two stakeholders in its NPD. Top management at the company wanted to reduce their food waste. Together with the Alicia Foundation, a nonprofit organization dedicated to innovation in cuisine, Ecoveritas developed soups, broths, and jams from fruit and vegetables that were nearing the end of their shelf-life. One new idea came from the foundation early in the project:

The idea of adding something special to products that we already had came from the Alicia Foundation (…) to make a product that was a bit exclusive (…) We know now that apple jam, for instance, is also used as sauce for meats (…) (Project Manager, Ecoveritas)

In addition, the company collaborated with Grupo Sifo, an organization that specializes in facilitating employment for groups at high risk of exclusion (immigrants, the long-term unemployed, persons with disabilities). Grupo Sifo became a mediator between the innovating company and potential employees for new operations that the innovation entailed.

Having a narrow stakeholder network means more focused stakeholder integration and can help companies with resource constraints. Furthermore, this configuration underscores the importance of the quality of collaboration and puts pressure on the way in which stakeholders are selected.

Strategy 3: Integration of Primary Stakeholders after FFE (Fine-Tuning)

In contrast to the first two strategies, the *fine-tuning* strategy relies on deep organizational engagement of stakeholders that mainly come from the value chain of the innovating company. Only one or a few innovation phases are opened up for input from these primary stakeholders, typically after the fuzzy front end when the concept has been defined and engineering work has started. Companies following this approach prefer to refine the eventual acceptability of the solution with the help of stakeholders, instead of taking onboard new ideas about product or service fundamentals.

Two of the case companies, Ikea and Skanska, followed this strategy. Skanska's innovation project resulted in affordable and ecological housing with garden access and proximity to public transportation. Ikea's innovation project, then, developed a new type of waste segregation kit. Skanska collaborated with a large number of stakeholders including developers of construction materials, a provider of interior solutions, user focus groups, and city planners. Compared to the previous two strategies associated with high sustainability performance of innovation, Skanska's and Ikea's innovation projects did not involve a high share of secondary stakeholders.

Qualitative case knowledge helps to understand why it was possible for these two companies to achieve a high-impact strategy and therefore allows better understanding of the preconditions for this strategy. Both innovations were based on earlier work done in Sweden. These innovations were refined and contextualized for local markets in Poland (Ikea) and Finland (Skanska). This type of fine-tuning after the fuzzy front end of innovation provides an opportunity to take into account local conditions and user requirements within the target market and so to improve its markets success.

As was emphasized by Skanska employees, it was at first an intensive internal company effort to elaborate a holistic concept for Finland based on the Swedish experience:

My impression is that we saw that it was good business in Sweden. It was kind of seen, okay there might be an opportunity. So it was more a test to try out a new product, kind of ready product, and then they copied it from Sweden but in the end it became a totally different solution. (Business Development Manager, Skanska)

Discussion and Conclusion

Discussion of the Results

In this study, the authors set out to improve the current understanding of stakeholder integration strategies associated with high sustainability performance of innovation. A configurational approach was adopted and stakeholder integration strategies were conceptualized as combinations of the number and types of integrated stakeholders, the quality of organizational engagement with these stakeholders, and the timing of integration, which together influence the sustainability performance of the resulting innovation. The results show that there is not only one effective strategy, but multiple strategy options that vary considerably in terms of their openness toward stakeholder inputs. The results are discussed below and their theoretical and managerial implications, and then the limitations of the study are addressed and suggestions for future research offered.

Organizational engagement with integrated stakeholders. The findings of this study indicate that the presence of top management or multiple members of the innovating organization and their direct exposure to stakeholder voices helps in absorbing the views and conceptions of stakeholders. These voices often challenge internal thinking about the innovation opportunity in the firm, and such unexpected or challenging views are easily discarded if only one person from the innovating firm has been exposed to them, let alone if stakeholder integration has been outsourced to an external agency. Moreover, top management essentially has a pivotal role in making sustainability efforts legitimate and influences key decisions in NPD projects. If stakeholder inputs are aimed at improved social and environmental performance, there might be financial tradeoffs, in which case it becomes essential to have legitimate decision-making power. Thus, leading to the following proposition:

Proposition 1: The company's deep organizational engagement with stakeholders is crucial for achieving high sustainability performance of innovation.

Multiple strategies for high sustainability performance of innovation. Apart from the necessity of deep organizational engagement with integrated stakeholders, the results imply that firms can choose between multiple stakeholder integration strategies that help to reach high sustainability performance of the resulting innovation. Three such strategies were discovered that vary with regard to their openness toward stakeholder inputs in the innovation process. Hence, the following proposition is formulated:

Proposition 2: To achieve high sustainability performance of innovation, companies can choose between multiple stakeholder integration strategies, which vary in their openness toward stakeholder inputs.

Progressive openness toward stakeholder integration. By examining the share of primary versus secondary stakeholders integrated in innovation processes, it can be inferred that companies especially benefit from atypical knowledge coming from secondary stakeholders, provided that this knowledge is integrated early on at the fuzzy front end phase. This is indicated by the *early secondary* strategy of the configurational analysis, which is based on the early integration of secondary stakeholders that may provide complementary views for innovation.

In this study, these two conditions (high share of secondary stakeholders and stakeholder integration at FFE) only existed in combination (*early secondary* strategy), implying conjunctural causation (Misangyi et al., 2017). In other words, neither a high share of secondary stakeholders nor stakeholder collaboration at FFE were present in other configurations associated with high sustainability performance of innovation. On this basis, it is apparent that the integration of a high share of atypical views at FFE makes the most sense when the innovating company is still more open than in later stages of the innovation process to shape the resulting innovation according to stakeholders' views. This leads to the following proposition:

Proposition 3: Companies that are prepared to incorporate highly diversified stakeholder inputs can achieve high sustainability performance of innovation by integrating secondary stakeholders at the fuzzy front end of the innovation process.

The *early secondary* strategy points to progressive openness because it entails a company listening to different voices early on and thereby maximizing the influence of secondary stakeholders on innovation.

Limited openness toward stakeholder integration. Since the QCA method makes it possible to identify equifinality (Misangyi et al., 2017), the empirical analysis helped to show that high sustainability performance of innovation can also be accomplished with limited openness toward stakeholder integration. It is possible to identify the limited openness feature by scrutinizing the similarities and substitutability of the conditions that make up the *selective* and the *fine-tuning* strategies. These similarities and substitutability point to different options for limiting the incorporation of stakeholder views. The *selective* strategy entails the integration of a narrow stakeholder network, i.e., limiting the number of integrated stakeholder groups. This strategy gives the freedom to integrate stakeholders either from the value chain or to integrate secondary stakeholders provided that only a few stakeholders are included. Similarly, integration at FFE was an ambivalent condition and thus stakeholder integration can take place at FFE or after FFE.

Further scrutiny of the two strategies shows that *selective* is less limiting than *fine-tuning* in terms of stakeholder influence on innovation. The *selective* strategy is ambivalent toward the share of secondary stakeholders and toward the NPD phase of stakeholder integration. It only limits network breadth, which helps a company benefit from stakeholder knowledge, but with limited time and organizational resources. The *fine-tuning* strategy displays the most limited openness toward stakeholder inputs in temporal terms and in terms of atypical voices. The qualitative data of this study indicated that *fine-tuning* was appropriate when there existed a former version of the innovation which was not yet ready for commercialization but needed adjustments in testing or market launch phases. The above leads to the following supposition:

Proposition 4a: Companies can achieve high sustainability performance of innovation by integrating a narrow stakeholder network. This choice allows flexibility with regard to the share of secondary stakeholders and stakeholder integration at the fuzzy front end of the innovation process.

Proposition 4b: Companies can achieve high sustainability performance of innovation by integrating predominantly primary stakeholders after the fuzzy front end of innovation, if they are fine-tuning a solution that already exists in other markets.

To summarize, an organization can achieve high sustainability performance for innovation via either progressive or limited openness toward integrated stakeholders. Progressive openness implies a company's receptiveness to new, even atypical influences early on in the innovation project; while limited openness suggests that the innovating company makes selective use of external knowledge, allowing it to keep the reins of control by restricting the amount of external influence on the innovation project.

Theoretical Implications

Previous research has established the relevance of stakeholders in general (Watson et al., 2017) and applied the capabilities lens to the development of sustainability innovation (Ayuso et al., 2011; Dangelico et al., 2013; Driessen and Hillebrand, 2013). Our theorizing complements previous research on stakeholder integration in sustainability innovation and shifts the focus from an internal firm view toward the integration process. The study contributes to the theory by showing, first, that stakeholder integration strategies matter; second, that not only capabilities but also organizational engagement (in terms of who from the firm is involved) is crucial for the sustainability performance of innovation; and third, that there are multiple successful stakeholder integration strategies, which display progressive or limited openness toward the incorporation of stakeholders' views.

The results support the conclusion by Ayuso et al. (2011) that organizational engagement with stakeholders contributes to a firm's sustainable innovation orientation, but the QCA analysis refines this notion further by showing that the quality of engagement matters for sustainability innovation. The results indicate that deep organizational engagement,

i.e., the involvement of top management and/or multiple members of the organization with integrated stakeholders, is a necessary condition for high sustainability performance of innovation. This is in line with earlier studies on pro-environmental strategies, which have found that deep linkages between the firm and its stakeholders improve innovation performance (Buysse and Verbeke, 2003).

Earlier research has highlighted the role of secondary stakeholders (Driessen and Hillebrand, 2013; Goodman et al., 2017). On this basis, one might be tempted to assume that building a wide stakeholder network, or integrating a large number of secondary stakeholders could help reach high sustainability performance of innovation. But this study's findings suggest a more nuanced view. The results imply that integrating a broad range of stakeholders does not support high sustainability performance of innovation. Instead of putting effort into searching for new stakeholder groups and increasing the number of integrated stakeholders, innovating companies should pay attention to choosing the right type of stakeholders and the timing of integration.

In line with Buysse and Verbeke (2003), the results found that secondary stakeholder groups can be important sources of knowledge that is not available elsewhere. This is indicated by the *early secondary* strategy that follows progressive openness toward the incorporation of stakeholders' views. Although prior literature has found highly positive effects of fuzzy front end performance on product success (Markham, 2013) and the sustainability innovation literature has underscored the importance of fuzzy front end stakeholder integration (Bocken et al., 2014; Dewulf, 2013; Hoffmann, 2012; Tischner and Charter, 2001), the latter claim has remained at a rather general level.

This finding advances these three earlier streams of theorizing by linking the integration of secondary stakeholders and integration during FFE. In the case of the integration of secondary stakeholders, early integration during FFE is associated with high sustainability performance of innovation.

Finally, perhaps somewhat counter-intuitively in the context of sustainable innovation (Ayuso et al., 2011; Watson et al., 2017), this study reveals two strategies that display *limited openness* toward the incorporation of stakeholders' views, which implies that the company either limits the number of voices or limits atypical voices, particularly in the early phases of the innovation project. This finding is consistent with previous studies which show that while access to heterogeneous knowledge is important for innovation performance (Rodan and Galunic, 2004; Sammarra and Biggiero, 2008), it may also be counterproductive for performance (Goerzen and Beamish, 2005).

Managerial Implications

Managers and innovation practitioners can draw several lessons from this study. The findings show that companies can benefit from integrating stakeholders into the innovation process in their pursuit of high sustainability performance of innovation. In developing sustainable innovations, firms should adopt a strategic approach to stakeholder integration and take advantage of their stakeholder networks. Managers have some discretion and flexibility in the choice of the integration strategy elements studied here, namely the composition of the integrated stakeholder set and the timing of their integration in the innovation process.

Integrating nonvalue chain stakeholders is useful particularly if the company is open to untypical ideas and is prepared to integrate these so-called secondary stakeholders in early phases of the innovation process. Secondary stakeholders, such as civil society organizations, sustainability think-tanks, and social enterprises, may not be an obvious partner for an innovating company. Without previous experience of collaboration, therefore, it may require significant effort to understand the knowledge gaps, to recognize suitable secondary stakeholders, and to create trusting relationships with stakeholders. However, the results suggest that successful integration of secondary stakeholders for high sustainability performance of innovation is linked with the condition of integrating stakeholders at FFE of the innovation process. The integration of primary stakeholders at FFE would often be relatively easier because of the established relationships and existing commercial arrangements in the value chain. However, finding suitable secondary stakeholders in time can improve the innovation opportunity although it may also create coordination challenges for managers of the NPD. The company's existing relationship with stakeholders from internal departments working with secondary stakeholders, such as the corporate responsibility organization, can be crucial to the

integration of secondary stakeholders into the innovation process. Preexisting links with innovation intermediaries (Lauritzen, 2017; Slotegraaf, 2012) can also help in the search for a suitable composition of stakeholders.

The kind of progressive openness described above makes the most sense when developing entirely new solutions, but there are two other strategies for achieving high sustainability performance of the innovation when the setting is different. For one, if the innovating company is not in the position to dedicate the necessary time resources in order to include highly different stakeholder inputs, it can limit the number of integrated stakeholders and follow the *selective* strategy. For another, if the company has prototyped the solution in the other countries, it can successfully favor the *fine-tuning* strategy, where predominantly primary stakeholders are integrated after FFE of the innovation process. One plausible way for managers to gain sustainability-related information about stakeholder expectations and technical opportunities would be via boundary spanning activities (Carbonell and Rodriguez Escudero, 2018; Marrone, 2010). In the *fine-tuning* strategy value chain partners can be found by collaborating internally with functions that are working closely on the customer interface. Marketing, sales, and after-sales functions in particular can provide valuable links in NPD projects that follow the *fine-tuning* stakeholder integration strategy.

Finally, it is important to stress that the options of progressive and limited openness require that top management or multiple other members of the innovating organization interact with the integrated stakeholders to ensure that the resulting innovation can gain the maximum benefit from stakeholders' knowledge. Although managers may be tempted to outsource stakeholder integration to an external agency or to one specialist, these choices should be avoided if the purpose is to pursue high sustainability performance of innovation. If the integration process is outsourced, the company will not be sufficiently exposed to ideas coming from stakeholders.

Limitations and Directions for Future Research

There are three limitations to this study that need to be recognized. First, the number of cases was limited to 13 medium to large companies headquartered in Europe. Two suggestions for further qualitative research spring from this limitation: it would be useful, first, to scrutinize the peculiarities of stakeholder integration in smaller companies; and second, to consider companies with culturally different conceptions of stakeholders than those in Europe.

The second limitation relates to measuring the outcome, i.e., the sustainability performance of innovation. Our expert evaluators estimated this performance based on indicators drawn from previous research. However, the innovations in focus were still new in the marketplace and therefore a retrospective analysis of their economic, social, or environmental performance was not possible. In the future, when sustainability innovation with stakeholders will likely become more commonplace, an examination focused on mature products and services with lengthy marketplace presence will make it possible to use actual numerical data and to measure performance more accurately.

A third limitation was that the outcome measure was based on researcher-assisted expert evaluations using one expert per domain. No statistical tests were performed of inter-rater reliability.

Moving on to future research, one possible direction for studying sustainability innovation is to synthesize the capabilities view from previous studies and the stakeholder integration strategy perspective introduced here. There is beginning to be enough knowledge about stakeholder integration into sustainability innovation for such a synthetic investigation of these factors and their interplay. The QCA method would lend itself to this purpose, but as a synthetic investigation requires a larger number of conditions, it would also be necessary to have a somewhat larger sample of companies. Another natural path would be to use our propositions about stakeholder integration strategies in hypothesis building and to test causality with larger empirical data sets and quantitative methods.

Sustainability innovations and the importance of FFE remain underexplored and undertheorized. The study indicates that inbound knowledge openness in FFE activities can have a positive impact on sustainability innovation performance under certain conditions, but the process underlying this impact may be more complex than the literature suggests (Dewulf, 2013), inviting further exploration into the multiple ways in which external knowledge is acquired and into the contingent factors that influence knowledge utilization.

It would also be worthwhile to explore the aims and motivations of stakeholders with regard to sustainability innovations; to study the processes of searching for stakeholders; and to look at how collaboration with stakeholders can be established and maintained. There is great variation in the ways that stakeholder integration comes to be and how legacy, long-established relationships between organizations and individuals influence the selection process and knowledge transfer. The integration of secondary stakeholders in delicate matters like sustainability innovation may give rise to complexity when a relationship involves both co-operative and conflicting interests. The study demonstrates the potential of secondary stakeholders but does not scrutinize the details of practical interaction. A qualitative inquiry might be able to show how companies evaluate potential stakeholders for sustainable innovation purposes, what methods are used and when, and what type of tensions stakeholder integration may entail, particularly in the case of secondary stakeholders.

In the present study, we have charted the path for a configurational approach. We hope this effort will encourage future research into how a range of interplaying factors can influence the outcomes of innovation projects.

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Appendix A. Cases

Firm (country)	Industry Domain	Firm Size	Number of Interviews: Firm	Collaborating Stakeholder Groups (Number of Interviews in Parentheses): Secondary	Collaborating Stakeholder Groups (Number of Interviews in Parentheses): Primary	Description of Sustainability Innovation
A2A (Italy) Energy supplier in Northern Italy: heat and electricity	Energy	12500	1	University (2) Consumers (2)	Home appliances partnering company (1)	Product-service innovation: Energy management application for new generation-integrated home appliances (consumption managed via integrated Wi-Fi connection to home appliances)
BMW (Germany) Automobile manufacturer	Mobility	101000	4	Municipality Consumers (2) Universities (1) External experts	Innovation agency	Product and hybrid innovations (related services and products): The group's first mass-produced electric vehicle—BMW i3
Eco-Veritas (Spain) Retailer of organic food	Food	200	3	Civic society organizations (1) Consumers (1)	Consultancy	Production innovation, potential for business model innovation: New products from top quality fruit and vegetables that consumers reject due to appearance and that would otherwise go to waste
E.ON (UK) Energy supplier: electricity and heat	Energy	61000	4	Municipality University (1) Consumers (2) Civic society organization	Technology specialists	Product-service innovation: Smart control system for solar power in households
Fiskars (Finland) Gardening and household tools manufacturer	Food	4000	2	Civic society organization (1) Consumers (3) Gardening schools	Consumer insight agency (1)	Product innovation: Indoor gardening device for herbs with integrated LED light
Frosta (Poland) Producer of frozen fish, seafood and frozen meals	Food	1500	2	Universities Public institutions Consumers Expert group Civic society organization (1)	Consumer agency	Product innovation: New additive-free recipes for frozen fish and seafood meals
HSL (Finland) Provider of public transportation services	Mobility	400	1	University Consumers (1)	Spin-off company (1)	Service innovation: Taxi and bus hybrid service: Demand-responsive mini-bus transportation service that complements other types of public transportation
IKEA (Poland) Retailer that designs and sells ready-to-assemble furniture	Housing	139000	4	Municipality Consumers		Product innovation: A novel segregation kit for household waste separation adjusted specifically to the conditions of typical Polish homes with scarce under-sink space
JCDecaux/Velib (France) Outdoor advertising and street furniture	Mobility	10000	2	Municipality Consumers (2) Cycling association (1)	Start-up communications company (1)	Product-service innovation: Largest self-service bicycle sharing system in the world

(*Continued*)

Appendix A. (*Continued*)

Firm (country)	Industry Domain	Firm Size	Number of Interviews: Firm	Collaborating Stakeholder Groups (Number of Interviews in Parentheses): Secondary	Collaborating Stakeholder Groups (Number of Interviews in Parentheses): Primary	Description of Sustainability Innovation
Rockwool (Denmark) Manufacturer of innovative products based on stone wool	Housing	11000	3	Civic society organization (1) Consumers (7) Universities Expert groups		Product innovation: A housing shelter for refugee camps, made from stone wool. Protects from heat and cold, reduces noise levels when inside, and is fire-resistant.
Skanska (Finland) Construction company, builds residential homes and blocks of flats	Housing	58000	3	Municipality (1) Consumers (4) University	Consumer insight agency Partnering firms (1)	Product innovation: Affordable and comfortable housing for low-income families who want to own their home. Functional (eco-efficient) layouts, common spaces and gardens, and proximity to public transportation.
Unilever (Spain) One of the world's leading fast-moving consumer goods companies	Food	172000	3	Civic society organizations Municipality (1) Consumers (2)	Recruitment agency Technology specialists	Business model innovation: Inclusive business proposal developed to fight youth unemployment in Southern Europe through a new retail business model: mobile ice cream vending, using low-carbon emission vehicles and providing micro-entrepreneurship opportunities to the unemployed. Bulk ice cream is sold by the "parent company."
Verbund (Austria) Electricity company specializing in hydropower	Mobility/ Energy	3000	2	Consumers (3) Research institute (1)	Consumer insight agency Partnering firms	Service innovation: A nationwide network of charging stations for e-vehicles, a flexible system of related services via mobile apps. All energy for charging is 100% hydropower.

Appendix B. Operationalization of Outcome

Environmental aspects							
Material use	Product has increased environmentally harmful inputs and impact (including waste)	–2	–1	0	+1	+2	Product has less environmentally harmful inputs and impact (including waste)
Energy use	Manufactured product has increased energy use due to efficiency improvement and/or it has increased carbon emission	–2	–1	0	+1	+2	Manufactured product has decreased energy use due to efficiency improvement and/or it has reduced carbon emission.
Space use	Product enables reduced use of space	–2	–1	0	+1	+2	Product enables reduced use of space
Social aspects							
Customer health, safety and risks	Product decreases customers' well-being (health/safety/reduce risk)	–2	–1	0	+1	+2	Product increases customers' well-being (health/safety/reduce risk)
Employee health and safety	Product decreases employee health and safety	–2	–1	0	+1	+2	Product improves employee health and safety
Other stakeholder health, safety and risks	Product increases health and safety risks of other stakeholders	–2	–1	0	+1	+2	Product reduces health and safety risks of other stakeholders
Economic aspects							
Profitability of the company	Product decreased profitability of the company	–2	–1	0	+1	+2	Product increased profitability of the company
Employment opportunities	Product worsened employment opportunities	–2	–1	0	+1	+2	Product increased employment opportunities
Economic impact for other stakeholders	Product worsened economic situation of other stakeholders	–2	–1	0	+1	+2	Product improved economic situation of other stakeholders

Notes: Example of one indicator in each sustainability dimension: +2: a major positive change; +1: a modest positive change; 0: the product or service does not change from previous product or competitor product; –1: a modest negative change; –2: a major negative change. Maximum points: 18.

Appendix C. Raw Case Data

Case		Outcomes				Conditions			
Industry	Firm	Environmental score (range –6 to +6)	Social score (range –6 to +6)	Economic score (range –6 to +6)	Sustainability performance (range –18 to +18)	Total number of integrated distinctive stakeholder groups	Secondary stakeholder groups as a propotion of total stakeholder groups (range 0 to 1)	Organizational engagement (scale 1 to 4)	Number of phases involving integration during FFE (scale 0 to 3)
Energy	A2A	1	1	3	5	3	.67	Multiple members from the organization but not top management (3)	No stakeholder integration during early phase (0)
Mobility	BMW	2	2	2	6	5	.80	Multiple members from the organization, but not top management; Through an agency or another actor (3)	Idea generation, product concept development (2)
Energy	E.ON	1	0	2	3	5	.80	Multiple members from the organization, but not top management; Through an agency or another actor (3)	Project definition (1)
Food	Ecoveritas	3	3	3	9	3	.67	Top management and other members of organization (4)	Idea generation, product concept development (2)
Food	Fiskars	–2	2	1	1	4	.75	Through an agency or another actor (1)	idea generation, product concept development (2)
Food	Frosta	1	0	1	2	6	.83	Through one employee from a firm; Through an agency or another actor (2)	Product concept development (1)
Mobility	HSL	4	1	–1	4	3	.67	Multiple members from the organization, but not top management (3)	Product concept development (1)
Housing	Ikea	2	1	2	5	2	.50	Multiple members from the organization, but not top management; Through an agency or another actor (3)	Idea generation (1)
Housing	Rockwool	1	3	1	5	4	1.00	Multiple members from the organization, but not top management; Through an agency or another actor (3)	Idea generation, product concept development (2)
Housing	Skanska	1	2	2	5	5	.60	Multiple members from the organization, but not top management; Through an agency or another actor (3)	Product concept development (1)

(*Continued*)

Appendix C. (*Continued*)

Case		Outcomes				Conditions			
Industry	Firm	Environmental score (range –6 to +6)	Social score (range –6 to +6)	Economic score (range –6 to +6)	Sustainability performance (range –18 to +18)	Total number of integrated distinctive stakeholder groups	Secondary stakeholder groups as a propotion of total stakeholder groups (range 0 to 1)	Organizational engagement (scale 1 to 4)	Number of phases involving integration during FFE (scale 0 to 3)
Food	Unilever	–2	1	3	2	5	.80	Top management and other members of org (4)	Idea generation, product concept development (2)
Mobility	JCDeceaux	5	3	3	11	3	.67	Top management and other members of organization (4)	Product concept development (1)
Energy	Verbund	3	2	2	7	4	.50	Multiple members from the organization but not top management; Through an agency or another actor (3)	Idea generation, product concept development (2)