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Our Collaborative Future: Activities and Roles of Stakeholders in Sustainability-Oriented Innovation

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ABSTRACT
While stakeholders have long been at the forefront of sustainable development debates, the emphases have tended to be on different stakeholder pressures, or managing stakeholder expectations about controversial issues. In this paper we bring a fresh direction to these debates and ask in what ways different stakeholders can contribute to sustainable innovation in firms. Based on 80 semi-structured interviews, we conduct a fine-grained qualitative analysis of stakeholder activities in sustainability-oriented innovation (SOI) processes in 13 different companies across Europe. Our analysis identifies eight roles that stakeholders play in SOI processes: stimulator, initiator, broker/mediator, concept refiner, legitimator, educator, context enabler and impact extender. More traditional roles such as legitimator and educator are less common in our cases. However, emerging roles such as stimulator, concept refiner, context enabler and impact extender are clearly identifiable and could be particularly valuable for SOI. We enhance a collaborative perspective of stakeholder theory, finding that stakeholders can play highly collaborative and proactive roles, and argue that secondary stakeholders may actually be more relevant for SOI than primary stakeholders. Copyright © 2017 John Wiley & Sons, Ltd and ERP Environment

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Introduction

THE QUEST FOR SUSTAINABLE DEVELOPMENT FOR OUR COMMON FUTURE (BRUNDTLAND *ET AL.*, 1987) FUNDAMENTALLY challenges many contemporary business practices. From an organizational perspective, stakeholders and innovation are at the heart of this challenge. This is because, first, moving toward sustainable development calls for innovation: minor adjustments in business as usual are not sufficient. Second, the content of 'sustainability' cannot be defined and decided upon by company managers alone: it is a multi-dimensional concept, the content of which needs to be continuously negotiated between the multiple stakeholders concerned (Hall and Vredenburg, 2003). In this paper we bring these essential aspects together by focusing on collaboration between

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companies and their stakeholders in sustainability-oriented innovation (SOI) processes, and asking in what ways stakeholders can contribute to innovation aimed at creating new, more socially and/or environmentally sustainable products or services.

Stakeholder engagement has a variety of different meanings and uses in the literature (Greenwood, 2007). A common focus of stakeholder engagement is the differing interests between companies and a stakeholder group, to the extent that stakeholder theory is assumed to be 'about managing potential conflict stemming from divergent interests' (Frooman, 1999: 193). Stakeholder engagement research often focuses on multi-stakeholder initiatives, partnerships and platforms (Mena and Palazzo, 2012; Rasche, 2012; Selsky and Parker, 2005) and on processes where stakeholders are relatively distant from the strategic core of a company (Laplume *et al.*, 2008). Our paper goes beyond these typical foci to the heart of product and service innovation. Traditionally seen as a company's internal remit, recent trends in innovation suggest that there is value in exploring wider partner networks (Baldwin and von Hippel, 2011; Chesbrough et al., 2006; Kazadi *et al.*, 2016; Lee *et al.*, 2012; Schaltegger and Wagner, 2011). Understanding stakeholder engagement in a broad sense as the interaction with, and/or involvement of, stakeholders in a positive way in the activities of an organization (Ayuso *et al.*, 2011; Greenwood, 2007), we examine what deeper forms of stakeholder engagement there are in SOI, and in what ways stakeholders can contribute to such innovation. Thus, we respond to calls for research into the changing roles of different stakeholders in the transformation to a sustainability-focused society (Hines and Marin, 2004), and for unusual and positive cases of stakeholder inclusion, and opportunities for innovation through bringing together diverse stakeholders (Laplume *et al.*, 2008).

Given that stakeholder engagement in new product development for sustainability is an understudied phenomenon (Driessen and Hillebrand, 2013), a qualitative approach is appropriate for exploring the different ways in which stakeholders can contribute (Yin, 2009) to SOI. We follow a multiple case study approach and investigate 13 successful SOI processes from nine European countries. The cases were identified through an extensive search for business firms where stakeholders were actively involved in creative innovation activities (Piller *et al.*, 2011). While this practice is still rare, collaboration with different stakeholders has been hailed as a new paradigm in innovation (Lee *et al.*, 2012), providing a valuable and untapped research setting particularly relevant to our common future.

While a unified definition of 'sustainable innovation' does not yet exist (Perl-Vorbach *et al.*, 2014), for the purposes of this paper we define sustainable innovation as a new or significantly improved product or service whose implementation in the market solves or alleviates an environmental or a social problem (Bos-Brouwers, 2010; Halme and Korpela, 2014). Due to the newness of many of the innovations in the cases, it was too early to assess their actual impact on sustainable development. Thus, a key qualifier for including an innovation in the sample was that the firm had the *intention* of developing a product or service that contributes to environmental and/or social sustainability. We therefore use the term 'sustainability-oriented innovation' or SOI.

Responding to the calls for bridging stakeholder theory with other organization theories and in new empirical contexts (Freeman *et al.*, 2010; Laplume *et al.*, 2008; Steurer, 2006), we bring a fresh direction to stakeholder theory by inspecting innovation practices through a stakeholder lens and identifying different stakeholder roles. Building on the work of Mead (1934) and Biddle (1986), we define 'role' as a pattern of actions that becomes apparent during the process of innovation and that is affected by both the attributes of the stakeholder (e.g. whether it is primary or secondary to the company) and the context, which in our study is SOI. We find that stakeholders can have a multitude of roles, some of which can be highly proactive, and we provide empirical support for previous claims (Hall and Martin, 2005; Hall and Wagner, 2012; Hart and Sharma, 2004) that secondary stakeholders are potentially more relevant than their primary counterparts in SOI.

Next we review stakeholder theory in the context of sustainability and explore the literature on open innovation and more specifically SOI. We then discuss our data and method, after which we present our findings and propositions. The following section discusses the implications of our research and avenues for future research.

Stakeholders And Sustainability-Oriented Innovation

Stakeholder theory represents a shift in worldview from managing the business firm for the benefit of purely its shareholders, to following a management strategy which creates value for a wider group of stakeholders (Freeman,

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1984; Freeman and Reed, 1983). Stakeholder theory is therefore well placed as a theoretical lens for examining SOI, which, by its very nature, affects other stakeholders through its inherent social and environmental impact (Bos-Brouwers, 2010; Halme and Korpela, 2014).

One of the key themes in the stakeholder engagement literature is the focus on different types of stakeholder and their attributes (Frooman, 1999). While several classifications of stakeholder exist (Driessen and Hillebrand, 2013; Laplume *et al.*, 2008; Phillips, 2003), we follow the widely accepted division into primary and secondary stakeholders, who can indirectly influence or be influenced by the firm (Clarkson, 1995; Eesley and Lenox, 2006; Freeman, 1984; Hall and Martin, 2005). We use the term secondary stakeholders to refer to parties such as civil society organizations (CSOs), public authorities and academic institutions. Particular attention has been given to primary stakeholders such as shareholders, employees and suppliers, while a large body of research has developed around multi-stakeholder platforms and initiatives (Mena and Palazzo, 2012; Rasche, 2012) and cross-sector partnerships (Selsky and Parker, 2005) to engage secondary stakeholders. However, much of this work is outward looking and tends to explore differing interests and how to resolve them rather than the interaction with, and involvement of, stakeholders in a positive way in the core activities of organizations (Clarkson, 1995; Eesley and Lenox, 2006; Greenwood, 2007).

The innovation literature has also shown interest in a diverse range of stakeholders. Firms have been typically viewed as innovating in their laboratories and through formal, internal R&D processes. However, this closed view of innovation has increasingly been challenged by alternative innovation paradigms such as open innovation (Chesbrough, 2003; Gassmann *et al.*, 2010), user innovation (von Hippel, 2009), co-creation (Kazadi *et al.*, 2016; Prahalad and Ramaswamy, 2004) and co-innovation (Lee *et al.*, 2012). These new paradigms require business firms to be more open to collaboration with both primary and secondary stakeholders, because it is not always clear which stakeholders might possess the necessary knowledge. Primary stakeholders have been acknowledged as potential sources of innovation, with knowledge providers ranging from suppliers (Li and Vanhaverbeke, 2009; Schiele, 2010) to customers (Joshi and Sharma, 2004), to consultants (Gemünden *et al.*, 1996) and even to competitors (Lim *et al.*, 2010). Research on innovation collaboration with secondary stakeholders is scarce and is predominantly focused on universities and research institutes (Cassiman *et al.*, 2010).

Usually collaboration with stakeholders is understood as the collection of stakeholders' suggestions, which are taken into account in decision-making (Luyet *et al.*, 2012). By collaborative innovation we refer more specifically to more active involvement and creative activities of stakeholders, which need to be structured and facilitated by companies (Piller *et al.*, 2011). We also recognize that the idea of collaboration emphasizes its evolving nature, joint decision-making approach and sustained dialogue to advance a shared vision (Gray, 1985; Selin and Chevez, 1995). Still, the kinds of activity and role stakeholders take in collaboration with companies in SOI remains underexplored. We respond by asking in what ways stakeholders can contribute to innovation aimed at creating new, more socially and/or environmentally sustainable products or services.

The open innovation literature has shown some stakeholders to take brokering and intermediating roles (Howells, 2006), and developed the notion of an 'architect' or co-creator role (Agogué *et al.*, 2013). From a network perspective, researchers have explored existing literature to detail the contributions of both primary and secondary stakeholders to innovation at the commercialization stage of the innovation process (Aarikka-Stenroos *et al.*, 2014) or developed configurations of specific stakeholders for innovation (Gemünden *et al.*, 1996). However, this literature on open innovation in a collaborative context is still lacking an extensive understanding of the different activities and roles a variety of stakeholders can play throughout the whole innovation process in multiple national contexts.

Sustainability-Oriented Innovation

The increasingly complex environment facing business firms, such as the constraints of the critical issues of climate change and natural resource depletion, have led firms to look towards innovation for sustainability (Dangelico, 2015; Perl-Vorbach *et al.*, 2014). Recent literature on sustainable development has suggested that stakeholders have a key role to play in helping business firms address social and environmental challenges and in driving innovation towards the development of sustainable products, services and business models (Ayuso *et al.*, 2011; Lee and Kim,

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2011; Slotegraaf, 2012). Compared with regular innovation processes, innovating for sustainable development is usually more complex and ambiguous due to the wide range of stakeholders it has to consider, and their often contradictory demands (Driessen and Hillebrand, 2013; Hall and Vredenburg, 2003). Eco-innovations often reveal technological uncertainties, and require fundamental changes to raw materials and to the whole set of services being provided (De Marchi, 2012).

Specific studies of stakeholders in sustainability innovation are rare, although the presence of stakeholders is noted in the sustainability innovation literature (Hall and Wagner, 2012; Schaltegger and Wagner, 2011), and the engagement of stakeholders is claimed to improve a firm's sustainable innovation orientation (Ayuso *et al.*, 2011). To our knowledge this topic has been only addressed in a few empirical studies, which involve small samples of a single or up to four cases (Driessen and Hillebrand, 2013; Hall and Martin, 2005; Holmes and Smart, 2009; Lee and Kim, 2011). These studies indicate that there is potential for different stakeholders to play valuable roles in the innovation process (Driessen and Hillebrand, 2013).

We adopt a commonly used representation of the innovation process with four main stages: ideation, development, commercialization and post-launch (Hoyer *et al.*, 2010). Although we recognize that the innovation process may be cyclical as well as linear (Cooper, 2008), we utilize the aforementioned stages of innovation as a background for analysing stakeholder involvement in the SOI process.

Existing studies have made some preliminary claims suggesting that secondary stakeholders contribute to innovation in different ways: CSOs have potential for collaborating with business firms to innovate for social good (Holmes and Smart, 2009) or to offer complementary resources, which can accelerate innovation and add legitimacy (Yaziji, 2004). The single case study by Hall and Martin (2005) focusing on the conflictive role of secondary stakeholders and their disruptive effect on a firm's familiar innovation routines indicates that, despite the ambiguity and complexity of dealing with secondary stakeholders, collaborating with salient secondary stakeholders leads to more radical innovations.

Data and Method

Given that previous studies have only scratched the surface of stakeholder engagement in new product development for sustainability (Driessen and Hillebrand, 2013), a qualitative approach is ideal as it allows detailed analysis of collaboration between firms and their stakeholders (Denzin and Lincoln, 2000; Yin, 2009).

In order to build theory on the nascent phenomenon of stakeholder collaboration in SOI, we employ a multiple case study design (Eisenhardt, 1989; Eisenhardt and Graebner, 2007) using purposeful sampling to identify cases (Patton, 1990) where business firms had engaged stakeholders in an innovation process aimed at a new or improved sustainable product or service. We use collaborative innovation with end users as a proxy for openness in innovation and therefore their inclusion was a prerequisite for case selection. Cases were required to have the intention of contributing to social and/or environmental sustainability through four domains: energy, living, mobility and food, and to be occurring in established business firms. Our sample primarily consists of SOI in large companies[1] across four regions of Europe – Nordics and Central, Eastern and Southern Europe – to include contextual variation between countries.

An extensive desk-based search was necessary to identify the cases because the practice of engaging stakeholders in SOI is still rare. This search included databases such as Forbes Global 100 Most Sustainable Corporations and Global 100 Most Innovative Companies, as well as examples solicited from experts in the field such as local innovation fund agencies in each country. This led to an initial sample group of 147 cases, which was then narrowed down using the abovementioned criteria into SOI processes in 13 different firms from nine European countries (Table 1).

Data Collection

We used a variety of qualitative and quantitative sources to generate thick case descriptions and to triangulate responses. First, we developed interview protocols for companies and for stakeholders, which were developed with

[1]Company size is defined according to the European Union categorization for companies based on the number of employees (micro, <10; small, <50; medium, <250; large, >250).

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Company description	Sustainability innovation	Involved stakeholders	Process in brief
A2A (Italy, large) energy supplier in Northern Italy: heat and electricity	*product–service innovation* energy management application for new-generation integrated home appliances (consumption managed via integrated Wi-Fi connection to home appliances)	university; home appliances partnering company; end users	Wanting to develop an energy management application for integrated home appliances, A2A contacts the technical university to connect with the home appliances company, which is already a close partner of the university. The home appliances company provides appliances for testing the new application in local households, and runs most of the testing with households. The university designs written communication with households simplifying technical language, and develops hardware such as a generator.
Big E (UK, large)* energy supplier: electricity and heat *case anonymized at company request	*product–service innovation* smart control system for solar power in households	municipality; university; market research company; technology specialists; end users	Big E enters a partnership with the local municipality to ensure trust from locals while searching for households to test their newly developed smart control system. Household users provide feedback on the tested system during in-home interviews and a focus group. The Open University helps to deepen users' understanding during testing by applying participatory methods in discussions.
BMW (Germany, large) automobile manufacturer	*product and hybrid innovations (related services and products)* the group's first mass-produced electric vehicle – BMW i3	municipalities; end users; universities; innovation agency; external experts on megacity mobility	In order to develop an electric vehicle, BMW co-operates with an open innovation agency to set up a co-creation lab. This lab is the focus point of a contest set up to capture ideas on future mobility solutions from outside BMW. Simultaneously, field trials are set up in several countries to explore customers' attitudes to such products, to get feedback on usability and technical issues, and in a third phase to explore more specific cases such as long-distance driving. These field trials are conducted in collaboration with municipalities, universities, research institutes and other specialist knowledge partners.

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Company description	Sustainability innovation	Involved stakeholders	Process in brief
EcoVeritas (Spain, medium) retailer of organic food	*production innovation, potential for business model innovation* Cuina Veritas is a project for new products from unattractive but high quality fruit and vegetables that consumers reject and which are wasted	CSOs; end users; customer insight agency	End users challenge EcoVeritas about food wastage. Co-creation workshops are set up after discussions between the CEO of the company and a foundation specialized in educating and promoting healthy eating. These workshops help to develop recipes and ideas for new products made of seasonal food that was still good to eat but that cannot be sold. A CSO also collaborates to integrate mentally and physically handicapped people into the production process. In stores, staff help to educate and get feedback from customers about new products.
Fiskars (Finland, large) gardening and household tool manufacturer	*product innovation* indoor gardening device for herbs with integrated LED light	CSOs; end users; gardening schools; consumer insights agency	Fiskars R&D personnel study contemporary gardening trends by observing users. They come up with an idea for indoor gardening and set out to develop a product, hiring an agency to run user focus groups in early and late stages of the product development. Gardening schools help to test the equipment and bloggers make the product known among users.
Frosta (Poland, large) producer of frozen fish, seafood and frozen meals	*product innovation* new additive-free recipes for frozen fish and seafood meals	universities; public health institutions; end users; Marine Stewardship Council (MSC); consumer agency	The Polish branch of Frosta hires an agency to conduct a survey of end user expectations concerning additive-free frozen products. Thanks to encouraging survey results they develop additive-free recipes for frozen fish meals and test them during workshops with famous chefs and food bloggers. The local public health institution publishes a dictionary of common food additives to educate the public. As part of internships, university students organize events in the local stores with support from MSC to communicate with end users and explain the benefits of additive-free food.

Company description	Sustainability innovation	Involved stakeholders	Process in brief
HSL (Finland, large) provider of public transportation services	*service innovation* demand-responsive mini-bus transportation (DRT) service, Kutsuplus, that complements other types of public transport	university; end users; local traffic agency; spin-off company	A university professor suggests the DRT system to HSL. Development receives funding through a municipal innovation competition. HSL focuses on service development, while researchers develop the software. HSL collects end user ideas on how they would utilize DRT service in their everyday lives. The university mediates end user integration to fine-tune the service.
IKEA (Poland, large) retailer that designs and sells ready-to-assemble furniture	*product innovation* a novel segregation kit for household waste separation adjusted specifically to the conditions of typical Polish homes with scarce under-sink space	municipality; end users; customer insight agency; partnering firm (waste sector)	Because of new legislation in Poland on waste segregation, IKEA introduces segregation kits for households. To better understand the reality of typical Polish households, IKEA practices home visits to observe kitchens and under-sink spaces. Customer insight agency helps to design questions and agenda for home visits. IKEA store customers propose to add stickers to the kits to make sorting easier. To further encourage waste recycling, IKEA builds a first recycling station in Poland near its store in partnership with Warsaw municipality and a recycling company, Stena.
JCDecaux–Vélib' (France, large) outdoor advertising and street furniture	*product–service innovation* largest self-service bicycle sharing system in the world	municipality; end users; start-up communications company; cycling association	JCDecaux enters into a partnership with the City of Paris to develop a zero carbon cycle share system for the city in return for outdoor advertising rights. JCDecaux builds on its experience with smaller systems in other cities by observing the behaviour of users. At the request of the municipality an end user committee is set up with volunteers who meet with JCDecaux and the City of Paris to discuss new ideas and service extensions and to trial new innovations. Cycling associations are involved by the municipality to improve the infrastructure and facilitate cycle use. A start-up focused on sustainability promotes the use of Vélib' and helps to create a sustainable community around it.

Company description	Sustainability innovation	Involved stakeholders	Process in brief
Rockwool (Denmark, large) manufacturer of innovative products based on stone wool	*product innovation* a stone wool housing shelter for refugee camps: protects from heat and cold, reduces the noise level when inside, fire resistant	CSO; end users; universities	Together with a CSO's innovation director the prototype coordinator from Rockwool invents an idea for refugee shelters made out of stone wool. The CSO supports the innovation process, and facilitates rapid prototyping and testing of shelters with the guests of a local rock music festival, organized by the CSO.
Skanska (Finland, large) construction company, builds residential homes and blocks of flats	*product innovation* affordable and comfortable housing for low income families who want to own their home. Functional (eco-efficient) layouts, common spaces and proximity to public transportation	municipality; end users; university; customer insight agency; partnering firms	Skanska hires an agency to run end user online focus groups on affordable and comfortable housing development. IKEA helps to design optimal standardized solutions for kitchens and storage to fit compact-sized apartments. University (Hanken) organizes a workshop to increase the understanding of the innovative project among involved stakeholders. As a result, the City of Vantaa helps to find flat plots for construction, which allows a reduction in building costs.
Unilever (Spain, large) one of the world's leading fast-moving consumer goods companies	*business model innovation* reducing youth unemployment through a new retail business model: the mobile vending ice cream, using low carbon emission vehicles and providing micro-entrepreneurship opportunities to unemployed; bulk ice cream is sold by Unilever	CSO; municipality; end users; recruitment agency	Drawing on the success of Asian Unilever micro-entrepreneurship initiatives for food deliveries, Unilever decides to design an innovative business model for mobile vending of ice cream with low carbon emission vehicles in Southern Europe to tackle local unemployment problems. Spanish municipalities help in negotiating permits to deploy the initiative in their towns. A CSO specializing in integration of high risk exclusion groups (e.g. immigrants) assists in identifying the eventual participants for the initiative, who later became the micro-entrepreneurs.

Company description	Sustainability innovation	Involved stakeholders	Process in brief
Verbund (Austria, large) electricity company specializing in hydropower	*service and business model 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	end users; research company; customer insight agency; partnering firms	Verbund enters into partnership with multiple Austrian companies and institutions to receive funding for e-mobility from the Climate and Energy Fund. The innovation agency collaborates with Verbund to conduct a lead user study to benefit the development of an innovative business model for e-vehicle services. Verbund and the project partners implement a pilot run to test hardware and software solutions developed with real customers and analyse their feedback on usability, customer offers and use cases.

Table 1. Case companies and sustainability innovation processes in brief

'a priori' consideration of theory (Eisenhardt, 1989). Questions for firms asked for details of the typical and specific innovation process, the barriers and facilitators arising during the SOI process, the tools used and the different stakeholders involved. Questions for stakeholders asked for details of their collaboration in the SOI process, the motivators and barriers, the outcomes of their collaboration and any tensions that were faced. The protocols were used to conduct a total of 80 semi-structured interviews. Each case included interviews with one to four company representatives knowledgeable about, and involved in, the SOI process (e.g. project manager, head of R&D department), and with up to eight stakeholders involved in the innovation process (e.g. public authority, CSO, end user). Interviews lasted between 15 and 120 min with an average of 60 min and were conducted face to face or by video or phone call; they were recorded and later transcribed and translated, when necessary, to English (Table 2)

Second, we utilized desk research to gather data such as press releases, news and blogs related to the innovation. These different data sources enabled us to triangulate the interview responses with external documents and formed the basis of the within-case reports that we developed for each innovation (Eisenhardt, 1989).

Data Analysis

The unit of analysis for our research was the product or service innovation process. Our case reports had 30–50 pages[2] according to a standard reporting structure to facilitate comparability between cases (Eisenhardt, 1989). We took an iterative approach to the data analysis, moving between theory and the case reports to identify emerging patterns in the data. A coding process was then undertaken using NVivo 10. We began a first order analysis (Gioia *et al.*, 2013) of the case reports by using an open coding technique (Strauss and Corbin, 1998) to identify all the different stakeholders involved in the SOI process, the different activities these stakeholders undertook and the stage in the innovation process where the activities occurred (ideation, product development, commercialization, post-launch). The analysis was discussed on a regular basis between the three authors and all the authors were familiar with all the cases.

During the process of identifying the different activities, a number of more generic activity categories began to emerge from the original codes, and the different activities were grouped under these broader activity categories. The categories led to a second order analysis (Gioia *et al.*, 2013) as stakeholder roles, or patterns of actions that became apparent as the innovation process evolved, began to emerge from the data. We used a matrix analysis to compare the emerging roles with the activity categories and found that there was a strong match between them. This enabled us to extend the activity categories into stakeholder roles, which were discussed, defined and redefined by the three authors and triangulated with the original emerging roles until they became distinct, resulting in eight different roles.

Company name	Interviews with company representatives	Interviews with stakeholders	Total
A2A	1	5	6
Big E	4	3	7
BMW	4	3	7
EcoVeritas	3	2	5
Fiskars	2	5	7
Frosta	2	1	3
HSL	1	2	3
IKEA	4	0	4
JCDecaux–Vélib'	2	3	5
Rockwool	3	8	11
Skanska	3	7	10
Unilever	2	4	6
Verbund	2	4	6
Total	33	47	80

Table 2. Interview sources

[2]The length of the case reports varied according to the complexity of the cases.

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Findings

Our analysis revealed eight stakeholder roles that emerged from the generic activity categories. Table 3 summarizes the roles, the generic activity categories that inform the roles, and the individual activities from the first order coding. Our cases demonstrated that stakeholders may have several roles at different stages of the innovation process and that there are roles that bridge a number of different stages. The prevalence of each of the roles among the different stakeholders is shown in Table 4.

The stakeholder roles that emerged from our analysis are presented in the following subsections, focusing on first proactive stakeholder roles, then reactive roles and finally those that could be either of the two. We then go on to specify which stakeholders take the different roles. Proactivity here refers to the initiative of the activity coming from the stakeholder and is exemplified by the stimulator, initiator and impact extender roles. In contrast, the roles of legitimator, educator and concept refiner show how stakeholders can be reactive to a request for engagement by the firm, whereby the firm continues to be more dominant. Thus we differentiate between the proactive and reactive nature of the different stakeholder roles. We use examples from the cases to provide illustrative descriptions in each subsection.

Proactive Roles

Stimulator

The stimulator role refers to a stakeholder role involving a call for ideas or offer of initial funding to resolve a social or environmental issue that sets the innovation in motion. Our findings imply an important proactive role for public authorities in stimulating sustainability innovation in companies. This role was identified in four different cases, and each time was played by the public authority. The specific activities involved a government or municipality calling for ideas or proposals and/or offering funding to support the stated project. In the case of Vélib', it was the project of the Mayor of Paris, Bertrand Delanoë, to 'green' the city and his call for proposals to provide a zero carbon, cycle share project in return for the outdoor advertising contract for the capital that stimulated Vélib'.

The Austrian government offered funding for developing electric powered mobility solutions: 'the call for applications... which was very well funded with 12 million euros, has triggered us, and also other companies, to gain momentum to focus on the topic, simply because the situation was very attractive due to public funding' (Project Leader, Verbund). Kutsuplus was developed by HSL as a result of winning the prize of Helsinki City's Innovation Fund. Finally, in the A2A Smart Domo case, Italy's Economic Development Ministry called for research into innovative technology solutions in the electricity sector.

Initiator

This role comprises initiating, inspiring and/or generating the idea for the innovation. A stakeholder assuming the initiator role may also be actively involved at later stages of the innovation process. Here we stress the importance of the stakeholder being known, rather than an anonymous suggestion, e.g. through an idea competition, because in the cases it led to active collaboration in the ensuing innovation development. In Kutsuplus, a university professor initiated a project around demand-responsive transport (DRT) due to his personal research interests. After the initiation, the professor, his team and the academic institution played an ongoing role in the innovation process as a broker/mediator and concept refiner.

In the Rockwool case, the ideation took place during personal discussions between Rockwool's prototype coordinator and the innovation director of Orange Innovation (OI), a CSO. 'Esben and I connected very well, we have some crazy ideas both.... We were standing by the coffee machine and just talking, and then suddenly we had an idea' (Prototype Coordinator, Rockwool). While drawing on Rockwool's experience of making insulation materials for buildings, the CSO's experience with societal issues steered the discussion towards sustainability. The end result was a housing shelter innovation for refugee camps aimed at resolving issues such as fire-safety, comfort and the possibility of re-using shelter parts in the (re-) construction of permanent housing in disaster relief areas. OI went on to play further roles in the innovation process as broker/mediator, concept refiner and impact extender.

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Role	Activity category	Activity	Stakeholder	Stage
Stimulator	Initial funding or call for proposals	city put out call for proposals	public	ideation
		ideas competition for demand-responsive transport	public	ideation
		project funded by Austrian government	public	ideation
		provided initial call and funding	public	ideation
Initiator	Inspiring and generating ideas	informal conversation around the coffee machine	CSO	ideation
		professor had the idea	academic	ideation
Broker/mediator	Integrating other stakeholders	initiative for implementing lead user study	business	development
		enabled user integration for product development	CSO	development
		facilitated participatory data analysis	academic	development
		identified pool of recruits and ran cocreation workshops	CSO	development
		mediated between project partners	academic	development
		organized multi-stakeholder workshop	academic	commercialization
		outreach to refugee organizations	academic	development
		collaboration to develop user integration	business	development
		set up and mediated user committee	public	commercialization
		tracking and analysis of user experiences	business	development
		trained end users to participate in testing	business	development
	Organizing testing, pilots and trials and collecting feedback	conducted interviews with 1000 people	business	ideation
		planned and organized focus group interviews	academic	development
		gathered consumer feedback	business	development
		designed and implemented field trials	academic	development
		end user research through interviews and focus groups	business	development
		implemented ideas contest	business	development
		interviews with trial participants	business	development
		moderated and gathered insights	business	development
		organized and carried out consumer research	business	development

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Role	Activity category	Activity	Stakeholder	Stage
		organized workshops and collected feedback	CSO	development
		launched and ran technical pilot	business	development
		qualitative interviews carried out	business	development
Concept refiner	Developing technical aspects	architectural design	business	development
		developed hardware solutions	business	development
		developed smart appliances	business	development
		developed apps	end user	development
		developed software	business	development
		product range development with expertise	CSO	development
		contributed design expertise	business	development
		on-going product and materials development	academic	development
		produced pre-manufactured modules	business	development
		researched specialized areas	academic	development
		designed usability test	academic	development
		on-going design improvements	CSO	development
	Participating in testing, pilots, trials and giving feedback	discussion and feedback on ideas	CSO	development
		brainstorming and future visualization	end user	development
		gave feedback through blogs, focus groups and surveys	end user	development
		made suggestions for product improvement	end user	development
		gave feedback on challenges and needs	end user	development
		discussions about ideas and problems	CSO	development
		concerns, information and satisfaction given	end user	development
		shared needs and expectations	end user	development
		gave feedback and ideas	end user	development
		shared ideas in surveys and on the website	end user	commercialization
		participation in lead user study	end user	development
		gave input in pilot study	end user	development
		feedback posted on blogs	end user	development
		shared experiences in workshop	end user	development
		participated in usability test	end user	development
		tested and shared feedback	end user	development
		participated in trial	end user	development
		tested and provided feedback	end user	development
		feedback on product appearance and motivations for purchasing	end user	development
		gave feedback and commented on product	end user	development
Legitimator	Assuring and promoting the brand	well known chef conducted workshop with bloggers	celebrity	development
			end user	commercialization

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Role	Activity category	Activity	Stakeholder	Stage
		shared knowledge on social networks and acted as product and service ambassadors		
		enhanced brand reputation	CSO	commercialization
		partnered to gain trust	CSO	development
		logo used on letter to gain trust	public	development
		presented the initiative to the media	academic	commercialization
Educator	Providing information and communications	launched educational consumer campaign	CSO	commercialization
		educational events	academic	commercialization
		prepared and simplified technical information	academic	commercialization
		prepared and published e-book with advice on segregating waste	business	commercialization
		ran the blog and attended user committee	business	commercialization
		nutrition and additives explained	academic	commercialization
		described food additives in a professional way	public	commercialization
Context enabler	Dealing with infrastructure and regulation	transport and infrastructure policies	public	development
		assisted with building regulations and permits	public	development
		set up recycling collection point	business and public	commercialization
		negotiated and obtained licenses	public	development
		arranged regulatory issues and permits	public	development
		installed facilities and provided infrastructure	business	development
Impact extender	Extending and increasing usage and impact	community management and animation	business	post-launch
		discussion to extend product use into different sector	CSO	commercialization
		offered reward points for other sustainable lifestyle products and services	business	post-launch
		integrated mentally and physically handicapped people	business	development
		created platforms to have a more transformational approach	public	ideation
		used brand image, marketing and sales channel	business	commercialization

Table 3. Coding outcomes for roles, activity categories, activities, stakeholders and stages

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	CSO	Academic institution	Public authority	End users	Business	Celebrity	Total	Cases
Stimulator	0	0	4	0	0	0	4	4/13
Initiator	1	1	0	0	0	0	2	2/13
Broker/mediator	3	6	1	0	13	0	23	13/13
Concept refiner	4	3	0	19	6	0	32	13/13
Legitimator	2	1	1	1	0	1	6	4/13
Educator	1	3	1	0	2	0	7	4/13
Context enabler	0	0	5	0	2	0	7	5/13
Impact extender	1	0	1	0	4	0	6	5/13

Table 4. Prevalence of roles among different stakeholder groups

Impact extender

Stakeholders in the impact extender role promote increased use of the product or service and may work to extend impacts to other areas of sustainable lifestyles. An example of this extension would be moving the impact from a focus on sustainable mobility to include healthier and more sustainable eating. This role emerged across the different stages of innovation and was the only role to be observed at all four of the stages. Our findings show that five of the six stakeholders who took this role, whether primary or secondary, had an orientation towards social and/or environmental sustainability.

At Rockwool, OI was proactive in suggesting an extension of the shelters' social impact by using them as refugee housing: 'We both had an interest in developing [the product] not only for the festival, but as a bigger product' (Director of Innovation, OI). In the Unilever case, the public authority helped to move the innovation towards more significant social outcomes: 'Three types of platforms were created to gather input and insights on how the program could further develop on the employability side, to achieve greater social and sustainable impact' (Communications and International Relations Director, Municipality). This role also clearly emerged in the case of the collaboration of Vélib' with CitéGreen: 'Vélib' was already very good, we just wanted to... catalyse or accelerate adoption. It's not thanks to CitéGreen that the service is working, it's thanks to CitéGreen that the community has accelerated its use' (Co-Founder, CitéGreen).

Not only did CitéGreen encourage greater usage of Vélib', but it extended the impact from the domain of mobility into other lifestyle areas. A reward points system enabled users to purchase other sustainable living products and services such as organic food or cosmetics. This role also appears in the case of EcoVeritas, where the environmental impact of reducing food wastage was extended to a social impact whereby handicapped people were integrated into the production process.

The three roles identified above emerge at different stages of the SOI process. However, close analysis of the cases and the stakeholders' activities in these roles revealed that the initiative of each activity came from the stakeholder rather than as a reaction to a request from the firm. The existence of a proactive stance taken by stakeholders is clear in all three of these roles. On the other hand, the legitimator, educator and concept refiner roles were fully reactive to firm requests. The broker/mediator and context enabler roles contained some examples of stakeholder proactivity and are discussed in more detail in the next sections. However, most of the activities within the two latter roles were reactive. This leads us to our first proposition.

> Proposition 1. *In SOI, stakeholder roles can range from reactive to highly proactive. Stimulator, initiator and impact extender are intrinsically proactive roles.*

Furthermore, within the three proactive roles, our analysis revealed an impact extender role for stakeholders with the attribute of having a sustainability focus. This was clearly evident in the extension of impact into other areas of sustainable lifestyles described above. The role is found across five different cases, and is the only role to appear at all four stages of the innovation process.

> Proposition 2. *The impact extender role is pertinent to SOI. This role is assumed by sustainability-focused stakeholders that seek to widen the social or environmental benefits of the innovation.*

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Reactive Roles

Concept refiner

Stakeholders in the concept refiner role give feedback and technical expertise to make the product/service more attractive to a wider range of end users. In contrast to the literature suggesting a highly collaborative role for end users in innovation (Baldwin and von Hippel, 2011; von Hippel, 2009), we found a more limited role, where end user stakeholders were mainly involved in 'participating in testing and giving feedback'. Both secondary and other primary stakeholders frequently undertook activities related to 'developing technical aspects'.

End users primarily offered incremental feedback. They lacked expert knowledge to be at the front end of more novel innovation. Instead, their inputs were relevant for making the final product more acceptable to other end users. 'We would show the floor plans... and people would suggest that "OK, well the entrance was good but there were too many doors and [the] walk-in closet shouldn't be there, it should be next to the bedroom"' (Market and Consumer Analyst, Skanska). Lack of expert knowledge was one of the main challenges to integrating end users in the SOI processes reported in the cases. Expertise such as the CSO's in-depth knowledge about nutrition innovation in the case of EcoVeritas, or the partnership with Green Wave Reality to develop smart home technologies in the case of the Big E, were essential to the development of the innovations.

While incremental, the inputs of end users could still be crucial for the success of the innovation in the market. This applies to providing early feedback on innovation concepts, as well as engaging end users at the commercialization stage for shaping marketing communication. In the case of developing the DRT service Kutsuplus, HSL reached out for end user ideas on how they would utilize such a mobility service for their everyday life activities. The initiative resulted in almost 1000 responses with creative and relevant ideas that were later employed in marketing. Our data suggest that getting end users involved during the SOI process helps to avoid some of the earlier pitfalls of 'green' products by widening the range of potential clientele (Peattie and Crane, 2005).

Legitimator

Stakeholders in the legitimator role provide assistance in building credibility and trust in the innovating firm and the innovation. The cases identified a need for building up credibility and trust either in the firm's actions and the genuineness of the SOI, or in the end product/service itself. The legitimator was evident in four of the analysed cases, with six instances coded. Apart from one, the activities coded were by secondary stakeholders.

Our data show how partnering with secondary stakeholders (e.g. public authorities and universities) can help to legitimize a firm's use of end user inputs for new product development. In the case of the smart control system development for solar power, the Big E quickly realized the need for long term testing with households. However, they had serious concerns around possible scepticism when reaching out to involve the community. 'We were very concerned, because people don't trust the Big E, that they would think it was some kind of scam or an attempt to trick customers. So we partnered with the local council, the municipality, and also with a local charity, who were energy efficiency focused' (Senior Project Manager, the Big E). Partnering with the local authority in the UK early on and involving them in initial communication provided the Big E with the necessary trust among households, and formed the basis for more insightful cooperation in the SOI process. The Frosta case also demonstrates how partnering with academics, a student association and a celebrity chef helped to legitimize the product among end users and the media. The legitimator role of secondary stakeholders has been previously explored in the literature (e.g. Yaziji, 2004), but more from the perspective of potential conflict resolution, in the spirit of 'heading off trouble'.

Educator

Stakeholders fulfilling the educator role educate and prepare the public on social and environmental issues pertaining to the innovation and a wider shift to sustainable lifestyles. For wider society, these sustainable lifestyle issues might not yet represent the norm. This role emerged in four of our cases, in each case at the commercialization stage. Our data shows that this role was mainly played by secondary stakeholders, including CSOs, academic institutions and public authorities.

The need to educate and re-orient public perceptions about certain sensitive issues is pertinent to SOI. Frosta relied on the specialized knowledge of the university students' 'institute of abused chemistry' to communicate with Polish supermarket customers about the benefits of additive-free food meals. 'The students helped us very much, working, serving [at] the stand... they were very knowledgeable, so they were [a] significant support too... they were

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the frontier while meeting the consumers' (Marketing Manager, Frosta). The Marine Stewardship Council (MSC) also took part in launching an educational consumer campaign to raise awareness of the MSC ecolabel. The local hygiene institute, part of the public authority, developed and published a 'dictionary' of food additives.

Another case that included an educator role was A2A, where the professors from the academic institution helped to coordinate the extensive innovation project, and prepared simple and understandable guidelines for the participating households. IKEA collaborated with a popular housing magazine to develop an e-book providing expert information on recycling and sorting waste. Finally, the Vélib' blog was set up at the request of the public authority to provide information and insights into the cycle share service.

Mixed Roles

Broker/mediator

A stakeholder fulfils a broker/mediator role when enabling and facilitating meaningful collaboration between the firm and other groups of stakeholders (as well as between different stakeholders), and through organizing testing and feedback, which are needed to further the innovation. This role was developed from two larger activity categories: 'integrating other stakeholders', and 'organizing testing and collecting feedback'. The role refers to bridging the gap between different stakeholders and was present in all cases, with a total of 23 occurrences across the 13 cases. There was a visibly strong role for secondary stakeholders such as academic institutions or CSOs here: out of the 13 companies from our data set, nine relied on secondary stakeholders for brokering/mediation.

Two-thirds of the activities categorized as 'integrating other stakeholders' were undertaken by secondary stakeholders. In these cases, CSOs and universities often had greater experience, networks, knowledge and skills to work with different groups of citizens in a meaningful way, extracting the insights and organizing them into structured findings, than firms did. In the case of Rockwool, the partnering CSO provided the company with access to festival grounds for carrying out shelter testing with festival guests. They also led the outreach to refugee organizations in order to further develop the product. In this instance, OI's experience enabled it to be proactive as a broker/mediator rather than the often reactive broker/mediator role in other cases. In the Vélib' case, the public authority insisted on having a biannually selected user committee, which brought together members of the public, the firm and the municipality, for continuous product and service development and idea testing: 'there's no direct relation between JCDecaux and the user committee, there's really the town hall in the middle' (End User, Vélib'). Stakeholders also possessed valuable contacts for potential innovation partners. Unilever cooperated with a CSO specializing in unemployed youths in order to identify participants who would be interested in becoming ice-cream entrepreneur-distributers using zero emission vehicles.

While integrating other stakeholders could be conducted on either a reactive or a proactive basis, i.e. from a request by the innovative firm or at the suggestion of the stakeholder, the other activity category, 'organizing testing and collecting feedback', comprised activities requested by the firm. Thus this role can take both proactive and reactive forms. The collaborating stakeholders were often consultancies specialized in consumer research or open innovation methods. Secondary stakeholders, both academic and CSOs, also took on this role. In the HSL and BMW cases, the universities designed the method of user integration and implemented it.

Context enabler

Stakeholders in the context enabler role help in reformulating or changing infrastructure policies and the regulatory context (e.g. permits and licenses) so as to enable the innovation's development and its entrance into the market. Similarly to the stimulator role, the context enabler role is played almost entirely by public authorities. The activities included in this role are fundamental to the development or commercialization of the new product or service. The role was reactive to firm requests in the cases of BMW, Skanska and Unilever, as well as proactive as described below. The context enabler role was present in five of the 13 cases in the study.

In the case of Vélib', the proactive role taken by the City of Paris in modifying and developing the transport and infrastructure policies was essential. For example, the mayor's mobility plan provided the impetus for doubling the length of the cycle paths in Paris and reducing the number of private parking places to create Vélib' stations. Unilever and Skanska also required operating licenses and permits for buildings.

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The public authority proactively partnered with a private recycling company to set up an eco-station at IKEA, the first recycling point in Warsaw to collect different kinds of material and waste. This created a context in which the segregation of waste became highly visible to potential customers and enabled them to connect the new product development with the new recycling services.

Roles and Stakeholder Types

The roles identified in the cases are unusual to the extent that they demonstrate a highly relevant and pronounced role for secondary stakeholders throughout the SOI process. Table 5 shows the prevalence of collaboration with each stakeholder type at each stage of the innovation process.

Proposition 3. *Secondary stakeholders are often more prevalent throughout SOI than their primary counterparts.*

In addition to secondary stakeholders being highly relevant to SOI, the data showed that some of these secondary stakeholders held several different roles within one SOI process. In four of the cases a single secondary stakeholder played three or more different roles at different stages of the SOI process, indicating an ongoing and deep form of collaboration.

Proposition 3a. *A single secondary stakeholder can take three or more different roles in one SOI process, indicating a deep form of collaboration.*

Our findings also highlight that particular stages of the SOI process are dominated by secondary stakeholders. Table 5 shows that seven of the eight stakeholders collaborating at the ideation stage were CSOs, academic institutions or public authorities.

Proposition 3b. *Collaboration at the ideation stage is dominated by secondary stakeholders.*

Secondary stakeholders are also highly prevalent in particular roles in the SOI process. In the four different cases where the stimulator role appeared, it was taken each time by the public authority (see Table 4). The context enabler role was also taken on five occasions by the public authorities and just twice by business partners, with no other stakeholders taking this role.

Proposition 3c. *The stimulator and context enabler roles are primarily taken by public authority stakeholders.*

While businesses representing primary stakeholders are prevalent in the broker/mediator role, further exploration of our findings, shown in Table 4, reveals a difference in the types of stakeholder involved in the two activity categories that make up the broker/mediator role.

Stakeholder	Ideation	Product development	Commercialization	Post-launch	Total
CSO	1	8	3	0	12
Academic institution	1	8	5	0	14
Public authority	5	5	3	0	13
End users	0	18	2	0	20*
Business	1	20	4	2	27
Celebrity	0	1	0	0	1
Total	8	60	17	2	87

Table 5. Prevalence of collaboration of stakeholder type at each stage of the innovation process across 13 cases
Stages from Hoyer *et al.* (2010).
*This number is predictably high, as the participation of end users in the SOI process was used as a proxy for the collaborative approach in innovation.

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Proposition 3d. *In the role of broker/mediator, CSOs and academic institutions are prominent in integrating other stakeholders, while specialized firms are frequently used to gather and process customer feedback through testing, pilots and trials.*

Our findings and propositions provide detailed insights into the ways in which stakeholders can contribute to innovation aimed at creating new, more socially and/or environmentally sustainable products and services. It is evident from the analysis that there are a variety of specific activities and roles played by different stakeholders during the SOI process. These findings have a number of theoretical and practical implications, which will be discussed in the following sections.

Discussion

The quest for sustainable development calls for innovating new solutions, which often require knowledge and contacts beyond the boundaries of one organization. Business firms may be able to innovate sustainability-oriented products and services not by themselves but rather in collaboration with stakeholders.

Our findings highlight that collaborative innovation is actually a multi-stakeholder engagement effort, and we therefore extend previous literature, which mostly addresses collaborative innovation in connection to specific groups such as business partners, particularly suppliers (Song and Thieme, 2009), company–end user interactions (Mahr *et al.*, 2014; Ramaswamy and Gouillart, 2010; von Hippel, 2009) and internal employees' roles in innovation (Ramaswamy, 2009). The results of our analysis imply that a broader approach is needed to better understand SOI.

In response to the lack of systematic knowledge about stakeholder collaboration in SOI (Driessen and Hillebrand, 2013), this paper provides a fine-grained qualitative analysis, and identifies eight stakeholder roles in SOI processes: stimulator, initiator, broker/mediator, concept refiner, legitimator, educator, context enabler and impact extender. We contribute to the stakeholder theory and sustainable innovation literature by specifying an extensive list of roles. We go beyond the existing innovation literature to document new roles of stimulator, concept refiner, context enabler and impact extender. We also provide empirical support for previously identified roles of legitimator, educator, initiator and broker/mediator (Aarikka-Stenroos *et al.*, 2014; Agogué *et al.*, 2013; Howells, 2006; Yaziji, 2004).

Proactive Stakeholder Roles in Sustainability-Oriented Innovation

Not only do our findings corroborate recent research suggesting that multiple stakeholders are involved in co-creation for innovation (Kazadi *et al.*, 2016; Ramaswamy and Gouillart, 2010), but we go further to show how collaborative innovation can include a range of more, and less, proactive stakeholder roles. The stimulator, initiator and impact extender roles, two of which are newly identified in this paper, demonstrate how stakeholders can have a highly proactive role in collaboration. Rather than reacting to the requests of a firm in the innovation process, such proactive stakeholders take the initiative themselves to contribute to the SOI process. A new collaborative innovation paradigm could increasingly require such proactive stakeholder roles, as suggested by Lee *et al.* (2012). For companies, this implies the development of new capabilities in order to capture value and achieve a competitive advantage (Ayuso *et al.*, 2011; Driessen and Hillebrand, 2013).

Our findings are highly relevant for understanding different patterns of activities that become apparent during the innovation process in the sustainability context. In response to the fundamental question raised by both De Marchi (2012) and Slotegraaf (2012) of whether there are differences between sustainability innovations and other innovations, we claim that there is a key impact extender role, which can be played by stakeholders with a sustainability focus. More traditional roles of legitimator and educator are present in less than a third of the cases. These findings suggest a step away from traditional stakeholder engagement in SOI towards a more proactive approach, with a shared sustainability agenda offering new opportunities for co-creating value in a sustainability context.

We posit that the impact extender role could be strongly related to innovation in a sustainability context, whereby all parties involved have an opportunity to advance a shared sustainability agenda. This moves beyond a simple

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transaction relationship and could provide a more holistic sustainability approach, integrating social and environmental impacts across different domains.

Secondary Stakeholders in Sustainability-Oriented Innovation

Our analysis of the three proactive roles reveals that the stimulator and initiator are dominated by secondary stakeholders, while the impact extender is a mix of primary and secondary stakeholders with a strong focus on sustainability. Secondary stakeholders can also be found to be proactive on some occasions in the roles of broker/mediator (CSOs and academic institutions) and context enabler (public authorities). These findings are novel given that previous research indicates that such proactivity can exist in one primary stakeholder group: customers (Howells, 2006). We also find secondary stakeholders in more traditional roles as legitimator and educator, and in a number of cases they were also found to play a deeply collaborative role, with a single stakeholder having three or more different roles in one SOI process.

Our empirical analysis therefore suggests that the groups of people found on the periphery of a firm's stakeholder network (e.g. academic institutions, CSOs and public authorities) may actually be more relevant for SOI than their primary counterparts, providing much-needed empirical support for similar arguments developed conceptually (Hall and Martin, 2005; Hart and Sharma, 2004).

Primary stakeholders, such as suppliers, were limited to brokering and concept refiner roles, particularly providing research, technical services or products, while the ideation stage was dominated by secondary stakeholders. This is a surprising finding considering the extensive research that explores collaboration with primary stakeholders in the innovation literature (Gassmann *et al.*, 2010; Hall and Martin, 2005; Kazadi *et al.*, 2016). One reason for this may be our use of end user collaboration in the SOI process as a case selection criterion, which could lead to a focus on market-facing, downstream innovations. Supplier innovations naturally tend to occur further upstream in the supply chain. However, perhaps more importantly, the sustainability focus of the studied innovations may explain this finding. The primary stakeholders along the supply chain have a stake in the current business model and consequently little interest in innovation that may require major changes in their own operations as well. If sustainability innovation disrupts the current business, which is relatively likely for a number of such innovations (Hart, 2005), it negatively affects the current supply chain stakeholders. In contrast, stakeholders with divergent thinking may expand the firm's boundaries (Gemünden *et al.*, 1996; Hall and Vredenburg, 2003; Hart and Sharma, 2004), particularly on sustainability issues (Driessen and Hillebrand, 2013). We posit that secondary stakeholders with innate concern for citizen wellbeing or environmental sustainability can help the firm to go beyond business as usual.

Enhancing a Collaborative Perspective of Stakeholder Theory

Our empirical evidence illustrates a deep, highly collaborative form of stakeholder engagement. This challenges the common focus of stakeholder engagement as a means to address and resolve conflict and divergent interests (Frooman, 1999; Sharma and Henriques, 2005). In contrast to claims made previously that conflict is an 'unstated premise' of stakeholder theory (Frooman, 1999, p. 193), we demonstrate that there is a need for a stakeholder theory even when the firm and its stakeholders are largely in agreement. This extends to secondary stakeholders, who are often conceptualized as participating in disruptive activities to achieve changes in the innovation value chain (Hall and Martin, 2005; Hart and Sharma, 2004). Our findings suggest that the greater inclusion of disparate stakeholders, and a recognition of the proactive nature of the roles they can take, is an opportunity for innovation, and a potentially untapped source of value. This is in line with calls for further research into the development of theory on stakeholder management (Laplume *et al.*, 2008) and initiates a promising new area for future research, which emphasizes a collaborative approach to stakeholder relationships.

Implications and Future Research

The identification of different stakeholder roles and differing degrees of proactivity of stakeholders has implications for the future study of engagement and collaboration. A corporate-centric conceptualization of firm–stakeholder relations 'has become the convention from which stakeholder theory has developed' (Frooman, 1999, p. 191; Kazadi

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et al., 2016). While we do not consider here a structural network approach to stakeholder engagement in SOI, such a perspective (Aarikka-Stenroos *et al*., 2014; Gemünden *et al*., 1996) could be a valuable complement in order to map the configurations of firm–stakeholder collaboration in SOI. Relatedly, organizations will need to develop the capabilities to capture competitive advantage from such collaborations, and further research into learning processes and the capabilities needed by companies to achieve such advantage is needed.

Our cases enabled an extensive exploration of the collaborative aspects of SOI processes, and demonstrate that in SOI stakeholders can have a multitude of collaborative roles. However, we do not claim that all SOI processes are conflict free. The fact that conflict was not reported by the interviewees may be in part influenced by the successful nature of the SOI processes in our study. While the roles identified here provide a valuable contribution, further opportunities for research lie in exploring a comparative dataset of innovations that were less successful, to identify additional roles that may emerge in such cases.

The findings show that some roles easily fit with certain stages of the SOI process, such as the stimulator or innovation initiator at the ideation stage, the concept refiner at the development stage or the educator at the commercialization stage. However, the data also demonstrate that stakeholders may have several roles at the same or at different stages within an innovation process. In many cases the collaboration with stakeholders evolved throughout the process and opportunities were identified for continuing collaboration with the same stakeholder in a different role. While we have used the stage model of Hoyer *et al*. (2010) to structure our research, an in-depth analysis of innovation at different stages is beyond the scope of our study. Further research and fine-grained analysis on different innovation stages (see Aarikka-Stenroos *et al*., 2014, as an example) is needed as well as an exploration of temporality and dynamism between the stages. More systematic research is required to address questions such as at what stage of the innovation process collaboration is most effective and with which parties, and how to find and select these parties (Huizingh, 2011).

Finally, this research implies that there is a sustainability agenda that is shared by a variety of different stakeholders, including the firm, which appears to drive SOI. Future research opportunities lie in comparing SOI processes with non-SOI, as well as exploring the newly identified impact extender role on a larger scale and in relation to the sustainability context.

Conclusions

30 years ago *Our Common Future* (Brundtland et al., 1987) asserted that attaining a sustainable future would require a collaborative future. Sustainable development calls for extensive collaboration between different stakeholders. Through the comprehensive analysis of the activities and roles of stakeholders in SOI, this article provides detailed insights into the deeply collaborative nature of the innovation process, which is at the strategic core of firms, and has traditionally been protected from outsiders.

The findings of this investigation imply that a broader approach to studying collaborative innovation, which includes a wide range of stakeholders, is needed. In particular, secondary stakeholders appear to play a vital role in SOI processes of firms. The specification of a range of different roles played by both primary and secondary stakeholders provides a valuable point of reference for future work on both innovation and stakeholder theory.

The identification of stakeholder roles of a more proactive nature contrasts with more modest roles to offer a more nuanced understanding of stakeholder collaboration in SOI. Such roles align with the documented emergence of new open innovation paradigms and challenge firm-centric assumptions in firm–stakeholder relationships.

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