Social media within sustainable product development: an exploratory multiple case study on the perception of social media usability in the new product development process

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Abstract: Social media can be a useful tool in order to interact with customers and open up innovation efforts. Our case studies of firms aim to outline if, how and why social media is utilised in their product development processes. Our results show that the use of social media within product development is limited among our respondents, mainly due to limited resources in combination with a low amount of customers. The results show that a low number of customers impede the ability to realise the possible gains of using social media to facilitate communication among a large number of users. Additional challenges are perceived to be the difficulty in controlling content, measuring gains and dealing with security issues. There is no consensus among the respondents with regard to social media’s perceived future potential within product development; some are quite hesitant, other companies anticipate increased potential in the future.
Keywords: social media; sustainable product development; new product development process; sustainable innovation.


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### 1 Introduction

An area of study that has received increased emphasis in recent innovation management literature is open or collaborative innovation models (Chesbrough, 2003; Gassmann, 2006; Kärkkäinen et al., 2010). The concept of open and collaborative innovation stresses the importance of retrieving and making efficient use of knowledge and information acquired from outside the company, for example from actors such as suppliers, other companies, universities, and communities, but perhaps foremost from a company’s customers (Chesbrough, 2003). The potential of customers as an external resource for a company’s innovation efforts, and more specifically in the product development process,
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has long been recognised in both theory and practice (Leonard-Barton, 1995; Rothwell et al., 1974; von Hippel, 1988).

The widely spread idea of the global impact of climate change and the depletion of fossil and natural resources are urging firms to reinvent their practices, products and services. This leads us to sustainable innovation. Jonker and Foster (2009) observed that, “Corporations nowadays tend to make more and more promises, not only about financial matters, but also regarding the way they are being managed (corporate governance), their use of natural resources (ecological) or their contribution to societal issues in general (safety, risk, health)”.

Sustainable innovation (or eco-innovation) has been broadly defined as the process of developing new ideas, behaviour, products, and processes that contribute to a reduction in environmental burdens or to ecologically specified sustainability targets (Rennings, 2000). The concept of sustainable innovation derives from the general concept of sustainability; the idea that systems – including natural and human ones – need to be regenerative and balanced in order to last (Odum and Barrett, 2004). Therefore, sustainable innovation means innovating towards the goal of developing more sustainable products and services. Most companies are aware of this fact but find it difficult to translate this insight into concrete actions, particularly small and medium-sized enterprises (SMEs), to evaluate how sustainability can affect their business (Venselaar and Hageman, 2008). This is also supported by Tsoutsos and Stamboulis (2005), who explain that sustainable innovations, and in particular renewable energy technologies, constitute a techno-economic system that is radically different from conventional systems in terms of density, structure, and regulatory and management practices.

In this research, we focus on sustainable innovation, as there are clear indicators that firms engaging in sustainable innovation must concentrate more extensively on a broader community involvement in their new business development processes (Beckett and Berendsen, 2010). Since the development and diffusion of sustainable products has proved to be a very slow process (Suurs, 2009), the success of these products and businesses is largely dependent on the willingness of customers to embrace new technologies (Beckett and Berendsen, 2010). Sustainable development requires radical and systemic innovations (Boons et al., 2013), which can be more effectively diffused and adopted by the involvement and engagement of a broader customer base in the early phases of development (Rogers, 1995; Tsoutsos and Stamboulis, 2005).

The purpose of this exploratory research on the topic of utilising social media in product development is to determine if, how and why companies choose to engage in this type of activity? What social media applications are used and for what reasons? What are the perceived possibilities and challenges? The purpose and problem description leads to the following research question: to what extent do companies interact with customers in the early phases of product development in sustainable innovation through the use of social media?

2 Theory

2.1 Customer touchpoints in product development

The incentives and benefits for a company to engage in open innovation and more specifically to include their customers are discussed by several authors. Connor (1999)
argues that information from the market and customer is important for various types of innovation to take place. Faems et al. (2005) argue that inter-organisational collaboration might imply access to complementary assets, foster knowledge transfer and spreading R&D costs. Investigating eight in-depth case studies O’Connor (1998) finds that customers play an important role in providing input for incremental product developments. And for Brown and Eisenhardt (1995), customer involvement in open innovation has, for example, proved to enhance aspects such as product concept effectiveness and product market fit.

Martini et al. (2014) found that using customers in the new product development (NPD) process made it possible to gather both incremental and radical innovation ideas concurrently. This aspect emerged over time in their case study as a rather unexpected outcome. According to the authors, it is necessary to put new procedures in place for selection of contributions and for assuring that practitioners inside the company are able to understand the potential innovativeness behind an idea.

Glessner (2012) and Kärkkäinen et al. (2010) provide an overview of the dimensions of value to consider when engaging customers in their innovation efforts:

- discovering customer demands and increasing customer orientation
- faster, more successful technology development
- increased probability of breakthrough ideas
- improved team productivity
- expanded revenue opportunities.

The interaction with and involvement of customers in product development is important for innovation to take shape. In new service development customer involvement through the use of touchpoints is mentioned as one of the three pillars of service design (Koivisto, 2009). Clatworthy (2011) defines touchpoints as the points of contact between a service provider and customers, and refers to touchpoints as one of the central aspects of service design.

Therefore, we define a customer touchpoint as an event created when a customer in some way interacts with a company. Throughout the product development process there are several potential touchpoints for customer interaction. The roles customers may take when interacting with firms varies, not least due to in which step they are involved, and this has managerial implications for how customer involvement could and should be shaped.

Using the right customer involvement approach can be easily established. According to a pilot study on involving customers in developing sustainable housing (Kamps, 2011), it was discovered that 67.5% of the participating customers were willing to exchange ideas and experiences more intensively. Social media were used heavily to contact and support the exchange.

As discussed above, successful product or service development, especially related to sustainable innovation, is nowadays often not solely dependent on a company’s internal R&D resources but rather on both internal and external input and knowledge. External input and information may take the form of both customers’ experiences and reviews using existing substitutes, their ideas about adaptations for available products, as well as changing needs and requirements. This is illustrated in Figure 1, where the innovation process is pictured as several intersecting development stages and external...
customer touchpoints. The focus of this research will be on the first four phases: Idea generation, Product definition, Production and Validation. These phases cover the product development process, which starts with the idea and moves on with consecutive steps until the product is launched into the market. After this launch, additional commercialisation activities and steps will follow, including marketing and sales activities, which are out of the scope of this paper because this area has been researched extensively (Mount and Garcia, 2014; Haarasilta, 2013) and will thus be left aside.

Gopsill et al. (2013) created requirements for the effective support of engineering design communication (EDC) by social media, emphasising that the need to support EDC is becoming more important due to the fact that product development is now more distributed, multi-disciplinary and involving greater re-use of past designs.

Figure 1 Examples of customer touchpoints throughout the innovation process (see online version for colours)

2.2 Role of the customer
Cooper (1990) and Trott (2005) outline that the different stages of product development are relevant and important, as there might be different purposes for involving customers in the development process depending on which stage it is currently in. Nambisan (2002) explains the different aspects of customer interaction change along with the stages. Prahalad and Ramaswamy (2000) observed that the role of the customer has evolved from a passive audience to active player. In management literature several roles of the customer have been identified with various definitions. The five main roles are resource, co-creator, buyer, user, and product (Gersuny and Rosengren, 1973; Lengick-Hall, 1996; Kaulio, 1998; Finch, 1999). However, Nambisan (2002) provides an overview of the explicit roles connected to the product development process, namely the customer as a resource, co-creator and user. As he states, customer involvement in product development can be either direct or indirect. Direct involvement could be seen as two-way communication between a customer and firm/producer, where both actors intentionally generate content and actively take part in the interaction. Indirect involvement could rather be seen as simple collection of market intelligence that is to extract customer demands and preferences from available public sources.

Prahalad and Ramaswamy (2000) argue that managers must come to grips with four fundamental realities in harnessing customer competence, stating that they must: engage
their customers in an active, explicit and ongoing dialogue; mobilise communities of customers; manage customer diversity; and co-create personalised customer experiences. However, this is not a straightforward process, as engaging in dialogue with a diverse and evolving customer base in multiple channels will place a high premium on the organisation and product development process. This comes with specific challenges and key issues that must be addressed to engage with customers in the product development process (see Table 1).

According to Nambisan (2002), there are several reasons why integrating customers in the product development process so far has had a relatively weak utilisation. One of the most limiting factors has been the poor connectivity between customers and producers. Though at this point, developments in information technology (IT) and new collaborative and social applications have the potential to significantly enhance this connectivity between customers and producers in terms of cost efficiency, and the support of new models and mechanisms of product development that involve customers in the innovation process.

<table>
<thead>
<tr>
<th>Customer role (indirect)</th>
<th>Ideation</th>
<th>Customer as resource</th>
<th>Appropriateness of the customer as a source of innovation</th>
<th>Selection of customer as innovator</th>
<th>Need for varied customer incentives</th>
<th>Infrastructure for capturing customer knowledge</th>
<th>Differential role of existing (current) and potential (future) customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer as co-creator (direct)</td>
<td>Design and development</td>
<td>Involvement in a wide range of design and development tasks</td>
<td>Nature of the product development context: industrial/consumer/products</td>
<td>Tighter coupling with internal product development teams</td>
<td>Managing the attendant project uncertainty</td>
<td>Enhancing customers’ product/technology knowledge</td>
<td></td>
</tr>
<tr>
<td>Product testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Adopted from Nambisan (2002)

There are many challenges and benefits connected to engaging customers in product development. Some of them appear to be more straightforward such as evaluating customer suggestions, managing trust and openness, information leaks, and creating
insinuates for customer participation (Kaulio, 1998; Nambisan, 2002; Glessner, 2012). Other challenges tend to be subtler with regard to balancing customer input and the effectiveness of the product development process. This is related to the risk of slowing down the process and adding costs to the overall project if all customer input would be considered in the early phases of the product development process.

The main benefit of engaging with customers in the product development process, as discussed by Prahalad and Ramaswamy (2000), Nambisan (2002) and Glessner (2012), is to discover their specific needs and requirements, and as such increase the customer orientation of the organisation and the product development process specifically. Furthermore, Nambisan (2002) outlines that other potential benefits are connected to faster technology development, improved team productivity and expanded revenue opportunities by allowing new and fresh ideas to enter the product development process. O’Connor (1998) finds that customers play an important role in providing input for incremental product developments and less so in more radical innovations, a notion also supported by Christensen (1997), while Nambisan (2002) and Glessner (2012) argue that engaging customers in product development increases the probability of breakthrough ideas.

An overview of the benefits and challenges of customer interaction in product development based on Nambisan (2002) and Glessner (2012) is summarised in Table 2.

<table>
<thead>
<tr>
<th>Challenges of customer interaction in product development</th>
<th>Benefits of customer interaction in product development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balancing input with effectiveness</td>
<td>Discovering customer demands and increasing customer orientation</td>
</tr>
<tr>
<td>Customer interaction risk slowing down the product development process and increasing costs</td>
<td>Faster, more successful technology development</td>
</tr>
<tr>
<td>Evaluation of customer suggestions</td>
<td>Increased probability of breakthrough ideas</td>
</tr>
<tr>
<td>Customer minority of activity</td>
<td>Improved team productivity</td>
</tr>
<tr>
<td>Management of trust and openness</td>
<td>Expanded revenue opportunities</td>
</tr>
<tr>
<td>Secret information leaks</td>
<td></td>
</tr>
<tr>
<td>Creating incentives for customer participation</td>
<td></td>
</tr>
</tbody>
</table>

2.3 The role of social media

The concept of social media is top of the agenda for many business executives today. Decision-makers, as well as consultants, try to identify ways in which firms can make profitable use of applications (Kaplan and Haenlein, 2009). To ease the transition towards opening up innovation efforts, web tools and applications such as the ones incorporated under the term social media have played a significant role (Kärkkäinen et al., 2010). A customer touchpoint prior to the boom in IT advancements were traditionally bound to either human touchpoints (e.g., sales, support, call centres) or static analogue touchpoints (e.g., promotions, advertising). Interactive digital touchpoints are now available for
companies interacting multidirectionally with customers through various different web tools and through social media.

The idea behind social media is not groundbreaking, although there are various views as to what social media really is and what should be included in the term (Kietzmann et al., 2011; Kaplan and Haenlein, 2010; Boyd and Ellison, 2007; Dijk, 1999). Kaplan and Haenlein (2010) conducted a thorough literature review and a systematic categorisation on social media, and we will mainly use their structured definition of what social media is and what it is not. Kaplan and Haenlein (2010, p.61) state that, “Social media is a group of internet-based applications that build on the ideological and technological foundations of web 2.0, and that allow the creation and exchange of User Generated Content”.

Social media provides various platforms and applications such as collaborative projects (e.g., wikis), blogs and microblogs (e.g., Blogger, Twitter), content communities (e.g., YouTube, Flickr), social networking sites (e.g., Facebook, LinkedIn) and virtual worlds (e.g., Second Life). Kaplan and Haenlein (2010) presented a systematic way of categorising currently available social media applications (see an overview in Table 3).

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Different social media applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td><strong>Example</strong></td>
</tr>
<tr>
<td>Collaborative projects</td>
<td>Wikis, social bookmarking applications</td>
</tr>
<tr>
<td>Blogs and Microblogs</td>
<td>Blogger, Wordpress, Twitter</td>
</tr>
<tr>
<td>Content communities</td>
<td>YouTube, Flickr, SlideShare</td>
</tr>
<tr>
<td>Social networking sites</td>
<td>Facebook, MySpace, LinkedIn</td>
</tr>
<tr>
<td>Virtual social or game worlds</td>
<td>Second life, world of warcraft</td>
</tr>
</tbody>
</table>

Source: Kaplan and Haenlein (2010), Angard and Hillerström (2012)

In their research, Kärkkäinen et al. (2010) describe several aspects that constitute challenges of using social media within the product development process. The challenges include difficulties in controlling customer content, adopting new working process and models as part of social media efforts, security issues with regard to information leaks, inadequate resources available to support the social media initiative, lack of a clear connection to the innovation/product development process, and lack of clear measurements to assess the value of using social media. As Kärkkäinen et al. (2010) state, if a company chooses to utilise social media in their product development they must
deal with its challenges in order to gain the potential benefits of social media in product development.

Kaplan and Haenlein (2010) discuss the benefits of using social media in product development, explaining it could lead to an increased importance of and create legitimacy for the customer by being involved in the early stages of the innovation. Furthermore, social media experience and use could lead to a convenient way of communicating with customers and keeping them updated, which in turns leads to increased social interaction and the development of a relationship between the client and its customer.

The benefits and challenges of the adoption and application of social media based on Kärkkäinen et al. (2010), Kaplan and Haenlein (2010), Angard and Hillerström (2012) are summarised in Table 4.

<table>
<thead>
<tr>
<th>Challenges of social media</th>
<th>Benefits of social media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of content and generation of negative content</td>
<td>Increased importance and legitimacy</td>
</tr>
<tr>
<td>Requires frequent activity</td>
<td>Convenient management of applications</td>
</tr>
<tr>
<td>Lack of case evidence and understanding possibilities</td>
<td>Efficient and convenient communication</td>
</tr>
<tr>
<td>Adopting new mental models and practices</td>
<td>Collaborative efforts increase potential success rates</td>
</tr>
<tr>
<td>Security issues</td>
<td>Established platforms; reaching many users</td>
</tr>
<tr>
<td>Inadequate time, personnel and financial resources</td>
<td>High social interaction</td>
</tr>
<tr>
<td>Applying to existing innovation process and information systems</td>
<td></td>
</tr>
<tr>
<td>Measuring financial value</td>
<td></td>
</tr>
</tbody>
</table>

2.4 NPD, social media and sustainable innovation

Sustainable innovation is driven by several factors, for example external ones such as regulations, green scorecards and other sustainability metrics, media and non-governmental organisations, climate change science, resource scarcity and consumer demand. There are several reports and studies that indicate that consumers’ interest in sustainable products has increased in recent years, and that today they have higher expectations of companies to deliver sustainable products (Ernst and Young, 2008; Arnold et al., 2010; Kiron et al., 2011). Moreover, it has also been stated that the focus of customer demands in terms of sustainable products are not to provide new features but rather the same functionality as in existing products but in a more sustainable way, for instance less resources needed and renewability (Ernst and Young, 2008).

Bessant et al. (2010) state that companies are experimenting with a variety of new and modified routines in open innovation collaboration, for example making extensive use of web-based approaches, exploring the role of social networking and user communities, and mobilising R&D from outside the firm. The authors suggest that there
are a lot of unanswered questions and we think that this is still the case; therefore, further research into the applicability of social media in the context of NPD is necessary.

This is confirmed by Mount and Garcia (2014), who explain that despite the growing influence of social media on organisational processes, research is limited in examining its application to innovation. The authors argue that this is particularly seen in how social media can be used as a tool to facilitate open innovation and user collaboration at the different stages of the innovation funnel. In their multiple case studies, they examined three cases to reflect the application of social media in different stages of the innovation funnel (Mount and Garcia, 2014).

Haarasilta (2013) showed that Finnish companies are utilising social media in R&D and innovation only to a small extent, although it is mostly used for marketing, sales and public relations (PR). (See Figure 2 for an overview of the utilisation of social media by Finnish companies.)

Figure 2  How Finnish companies utilise social media (see online version for colours)

Input for the innovation process can rely on the contributions of collectives or on asynchronous contributions by individuals, aggregated through the use of social media. The emergence of intelligent behaviour in a collective has been described as the ‘wisdom of crowds’, generating the concept of crowdsourcing (Surowiecki, 2004). Therefore, it is interesting to consider the role of crowdsourcing, enhanced by using social media, to access customers who are not closely linked to the NPD process. Boudreau and Lakhani (2013) state that crowdsourcing for innovation purposes is perceived risky when involving vast groups of outsiders all over the world, especially by companies that until now have only been relying on internal innovation. Although the perceptions of the companies are reasonable (concerns correspond with protection of intellectual property, integration into corporate operations and costs), excluding crowdsourcing from the corporate innovation toolkit means losing an opportunity.

A very successful example of using social media in publishing a new book is the work of the Foundation Our Common Future 2.0 in the Netherlands (Reinhoudt and van Teeseling, 2011). By involving 400 co-writers, who together spent about 32,000 h
developing a new horizon for our common future, a total of 19 themes were tackled and summarised in the book *Duurzaam Denken Doen*. This was impossible without the use of social media. However, relying on social media alone is not sufficient. An inspirational leader and their actual involvement in all aspects of the project is a crucial factor, including live contacts between the participants for building trust and fruitful teamwork, and carefully selecting teams based on competencies.

3 Methodology

Given the exploratory nature of this research, we conducted a literature study followed by multiple qualitative case studies to get a better understanding of why and how social media is used in the early phases of sustainable product development.

We selected companies that have been working on sustainable innovation in conjunction with one or more partners outside the company. These innovation needs can be reduced to two themes:

- generate durable energy, use this energy and realise a considerable reduction in energy consumption
- gain energy reduction by, for example, closing material loops as far as possible (~100%).

In the analysis, the cases will be compared and contrasted to each other to see differences and similarities.

The choice of the interviewed companies in our study was based on two criteria:

- working on sustainable innovation, in other words working in the field of energy production or energy reduction
- working on NPD.

In total, 13 case studies have been carried out in the Netherlands and Sweden (see Table 5 for company overview and information). The data collection is carried out following a similar interview protocol in all 13 cases in order to create replication logic between the cases (Eisenhardt, 1989).

The primary sources of our data collection were semi-structured interviews, which were recorded and transcribed shortly after the interview session. The interviews were based on categories related to product development, sustainable innovation and customer involvement, and analysed accordingly. When all of the interviews were transcribed the respondents’ answers in the different categories were compared in order to find similarities and differences. This was done through a matrix where the data were compared and assessed, as suggested by Yin (2009).

Through empirical data gathering, we aim to contrast with theory and provide an understanding of how companies within sustainable innovation are currently operating in order to interact with customers in their product development processes. More specifically, we aim to find out, using social media or not, how companies perceive the potential and usability, in other words what are the challenges and benefits of using social media as the application to facilitate customer interaction in product development.
Table 5  The use of social media by the interviewed companies

<table>
<thead>
<tr>
<th>Industry</th>
<th>No. of employees</th>
<th>No. of customers involved</th>
<th>E2B/E2C</th>
<th>Using social media in R&amp;D</th>
<th>Using social media for marketing</th>
<th>Future potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  Consumer electronics  10</td>
<td>2-3 for each segment</td>
<td>No</td>
<td>E2B</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>B  Construction  7</td>
<td>Yes</td>
<td>E2B</td>
<td>E2B</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>C  Construction  3</td>
<td>Fox</td>
<td>No</td>
<td>E2B</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>D  Wave energy  4</td>
<td>No, commercial product (few in future)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>E  Construction/energy monitoring  35</td>
<td>Manly</td>
<td>E2B</td>
<td>E2B</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>F  Solar energy/fuel cells  40</td>
<td>Approx. 50</td>
<td>No</td>
<td>E2B</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>G  Wave energy  12</td>
<td>No, commercial products yet</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 5

The use of social media by the interviewed companies (continued)

<table>
<thead>
<tr>
<th>Industry</th>
<th>No of employees</th>
<th>No. of customers</th>
<th>B2B/B2C</th>
<th>Involving customers in PD</th>
<th>Using social media in PD</th>
<th>Application</th>
<th>Using social media for marketing</th>
<th>Application</th>
<th>Future potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Anti-Fouling</td>
<td>4</td>
<td>Approx. 5</td>
<td>B2B</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Facebook, Hyes</td>
<td>No</td>
</tr>
<tr>
<td>I</td>
<td>Constructions</td>
<td>650</td>
<td>4000</td>
<td>B2B</td>
<td>Yes</td>
<td>No</td>
<td>–</td>
<td>Yes</td>
<td>Minor</td>
</tr>
<tr>
<td>J</td>
<td>Kitchen appliances</td>
<td>350</td>
<td>2000</td>
<td>B2B</td>
<td>Yes</td>
<td>Minor extent (mainly market intelligence)</td>
<td>LinkedIn, Facebook</td>
<td>Yes</td>
<td>LinkedIn, Facebook, Yes, interface testing</td>
</tr>
<tr>
<td>K</td>
<td>Construction</td>
<td>400</td>
<td>50</td>
<td>B2B</td>
<td>Yes</td>
<td>No</td>
<td>–</td>
<td>No</td>
<td>–</td>
</tr>
<tr>
<td>L</td>
<td>E-commerce/ Online marketing</td>
<td>70</td>
<td>1000</td>
<td>B2B</td>
<td>Yes</td>
<td>Minor extent (mainly market intelligence)</td>
<td>Yammer, Wiki, Blogs</td>
<td>Yes</td>
<td>LinkedIn, Facebook, Twitter</td>
</tr>
<tr>
<td>M</td>
<td>Construction equipment</td>
<td>500</td>
<td>Approx. 30/country</td>
<td>B2B</td>
<td>Yes</td>
<td>No</td>
<td>–</td>
<td>No</td>
<td>–</td>
</tr>
</tbody>
</table>

PD, product development; B2B, business-to-business.
4 Results

We learned from theory that there are several benefits of having a formalised product development process, not least in order to be able to identify what roles customers may take when interacting with a company throughout the different stages in the product development process. The four steps until the commercialisation of the product/service in our general model are:

- idea generation
- product definition
- production
- validation (Cooper, 1990; Trott, 2005; Song and Montoya-Weiss, 1998).

In all of these stages, it is possible to interact with customers in order to refine an idea into a successful product.

Despite the different advantages of having a structured product development process, some of the respondents who represent SMEs do not have a formalised product development process. The size of these SMEs and their limited resources make these companies disinclined towards structuring their product development processes. Some of the respondents said they are focusing on doing what has to be done at the moment and working with a structured product development process is not feasible, as it takes too much time and limited resources and implies acting beyond rigid structures. The larger companies have structured product development processes in contrast to the smaller ones because they have a need for it since they have a larger number of employees working with product development than do SMEs. They also conduct more projects in conjunction with product development than SMEs.

Table 5 provides an overview of the results, allowing for more insight into the use of social media by the interviewed companies.

Social media seems to be a viable tool to facilitate customer interaction, and not only for commercialisation and marketing purposes. As theory implies, social media provides both significant challenges to overcome and substantial benefits if executed correctly.

Eight of the interviewed companies have some contact with their customers during product development. They have customer touchpoints and involve customers in various ways (e.g., workshops, educations, informal meetings). These touchpoints are to a major extent established through either personal meetings or via phone and email. When discussing which roles the customers can take in the product development process, the respondents mentioned the opportunity of using customers as a resource for idea input and as product testers. Throughout the product development process, customer roles can change from acting as a resource to co-creator and user (see also Table 1; Nambisan, 2002). However, this is not something the interviewed companies are extensively considering.

In our case, we have seen four examples where companies follow blogs and/or are members of certain groups on LinkedIn focused on their area of green tech/sustainable innovation, but this is mainly carried out in order to get updates on market trends and the latest buzz rather than actively interacting with customers. Some companies are also using LinkedIn to extend their network among existing and potential customers, but it is used as just a networking tool rather than an active application in the product
development process. The most significant barriers (and thereby causes to virtually non-existent social media use) expressed by the interviewed companies are foremost related to the following challenges (see Table 6):

- **Security issues**: sensitive information might flow to competitors.
- **Lack of resources** (financial, human, time) in order to communicate with the customers through social media.
- **Difficulty to identify and realise the potential gains from social media**. This is connected to the fact that social media is a relatively new tool within product development with few existing case examples of best practices.

Table 6  Comparison between challenges related to social media stated in theory and confirmed empirically

<table>
<thead>
<tr>
<th>Challenges of social media</th>
<th>Described in theory/empirically</th>
<th>Confirmed by companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of content and generation of negative content</td>
<td>Incorrect and negative content, which cannot simply be erased</td>
<td>Company A, E, F, J, L</td>
</tr>
<tr>
<td>Requires frequent activity</td>
<td>Requires activity in order to achieve credibility</td>
<td>Company B, E, F</td>
</tr>
<tr>
<td>Lack of case evidence and understanding possibilities</td>
<td>Difficulty to find applicable case evidence due to current weak utilisation</td>
<td>Company E</td>
</tr>
<tr>
<td>Adopting new mental models and practices</td>
<td>Resistance to change</td>
<td>Not explicitly expressed</td>
</tr>
<tr>
<td>Security issues</td>
<td>Secret information leaks and intellectual property rights</td>
<td>Company A, C, E, F, G, K, M</td>
</tr>
<tr>
<td>Inadequate time, personnel and financial resources</td>
<td>Requires high level of engagement, commitment and personnel education</td>
<td>Company B, C, E, F, H, I, K</td>
</tr>
<tr>
<td>Applying to existing innovation process and information systems</td>
<td>Innovation process and information systems are optimised before adding social media</td>
<td>–</td>
</tr>
<tr>
<td>Measuring financial value</td>
<td>Difficulties to quantitatively measure the financial outcomes</td>
<td>Company A, B, C, F, G, H, J, L, M</td>
</tr>
</tbody>
</table>

Yet, some potential benefits of interacting with customers within product development through social media were identified. The most significant benefits we identified from the interviewed companies were (see Table 7):

- **social media is an efficient and convenient tool to handle communication with customers**
- **the possibility to reach a large number of customers through already established platforms.**

These results may depend on the fact that a majority of interviewed companies have relatively few customers, which in turn may be the result of the studied companies selling to other companies (business-to-business) and not the end customer. Also, some of the
companies mentioned additional benefits that have not yet been mentioned in the literature. These benefits were:

- *Reaching the right people.* By using segmented forums/applications the companies could reach and target specific customer groups depending on the company’s needs and goals.

- *Convenient product testing.* This was mentioned specifically for products that could be tested online.

The respondents of the interviewed companies do not give a homogeneous answer in terms of their perception of the future potential and benefits of the use of social media within their product development. As stated, the current use of social media is only minor, and some of the respondents are hesitant of the future potential of beginning to integrate or increase the use of social media.

### Table 7

<table>
<thead>
<tr>
<th>Benefits of social media</th>
<th>Described in theory</th>
<th>Confirmed by companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased importance and legitimacy (Kaplan and Haenlein, 2010)</td>
<td>Social media application are achieving increased importance and legitimacy from customers</td>
<td>Company K, L</td>
</tr>
<tr>
<td>Convenient management of applications (Kaplan and Haenlein, 2010)</td>
<td>Fairly easily managed if one is familiar with these type of applications</td>
<td>Company E, G, K, L</td>
</tr>
<tr>
<td>Efficient and convenient communication (Kaplan and Haenlein, 2010)</td>
<td>Efficient and convenient way of communicating and keeping users updated</td>
<td>Company E, G, K, L</td>
</tr>
<tr>
<td>Collaborative efforts increase potential success rates (Kaplan and Haenlein, 2010)</td>
<td>The collaborative efforts of several actors has greater potential to result in outcomes superior to what single individuals could have obtained</td>
<td>Company A, E, J</td>
</tr>
<tr>
<td>Established platform; reaching many users (Kaplan and Haenlein, 2010)</td>
<td>Several applications are already established platform, that is usually have extensive amount of users that can be reached</td>
<td>Company A, E, G</td>
</tr>
<tr>
<td>High social interaction (Kaplan and Haenlein, 2010)</td>
<td>High social interaction; relationship-building due to extensive and consequent communication</td>
<td>–</td>
</tr>
<tr>
<td>Reaching the right people (Namibian, 2002)</td>
<td>Using segmented forums/applications facilitate convenient communication with for different purpose targeted customer groups</td>
<td>Company E, I</td>
</tr>
<tr>
<td>Convenient product testing (Prabhalad and Ramaswamy, 2004)</td>
<td>For product applicable to test over the web (e.g., software)</td>
<td>Company E, J</td>
</tr>
</tbody>
</table>

This is in line with the outcome of Haarasilta’s (2013) study, which investigated how wood processing companies, log house builders and hardware stores currently exploit...
social media in their commercial efforts such as marketing and sales, as well as in their NPD process. For wood processing companies, specifically, the focus was on communication and PR. Besides the normal customer feedback systems there was no evidence that the companies of this study would actively use social media in collecting end-user driven ideas for R&D purposes.

5 Conclusions and expected contribution to practice and theory

The main research question driving this exploratory research was to what extent do companies interact with customers in the early phases of product development in sustainable innovation through the use of social media?

Social media is not being used as a tool to interact with customers throughout the sustainable product development process, mainly because of:

- security issues (the fear of leaking secret information)
- lack of resources (time, personnel)
- difficulty to assess and realise potential gains.

Therefore, when looking at the current utilisation of social media as a tool in the product development process, we can conclude that it should be considered as almost non-existent. Most of the companies in our research do not use social media at all, including for marketing purposes. For all companies it is a matter of prioritisation of people, money and time. The respondents claim that they must prioritise and therefore do not have the resources for social media use in product development since there are other tasks considered more important. However, there are companies that involve customers in the product development process, but it is often not well structured in accordance to specific outspoken stages of the process. Another major argument for not using social media is the low amount of customers; therefore, interaction can be facilitated through more direct communicative means such as by phone and face-to-face contact.

We can conclude that social media is only used within product development to a minor extent by four of the interviewed companies, namely A, E, J and K. This is in line with the research on Finnish companies utilising social media in R&D (EVA, 2011 in Haarasilta, 2013).

Our findings also imply that the application of social media is focused on retrieving market intelligence by following certain blogs and group discussions. In general, we can conclude that the use of social media as a carrier for interaction is very limited. Nevertheless, as indicated by some of the companies, there seems to be a clear potential for social media as a tool not only for one-way mass communication but also for interaction with smaller groups of (potential) customers or consumers. On the basis of our experience we see that customers and end-users especially oriented on sustainability are very active on blogs and group discussions centred on contributing to a better world. These groups are characterised by a higher willingness to collaborate and provide input for new sustainable products, which makes them more likely to interact with companies in the development of sustainable products and innovations. Social media is already a widely used and adopted tool by these groups and as such could be utilised by the companies to a larger extent. We see that the smaller companies in our research do not interact directly through social media, mainly because of the limited (direct) customer
base. However, by using social media they could potentially increase their customer base by developing sustainable products in close interaction with the customers and end-users.

Sustainable innovation may take place in various industries, but our empirical data have mostly been gathered within industries, which the respondents themselves portrayed as rather conservative in terms of the technological development and IT advancements. The respondents claimed, in some cases explicitly and in some cases subtly, that their customers are generally not prone to change with regard to new ways of communicating, and despite being around for some years now social media is still deemed to be something new and not yet tested and evaluated. This affects our results since the respondents cannot fully picture social media working in their own industry. It is important to bear in mind that we have not contrasted these empirical statements with theory on the topic of industry characteristics, and we can thus not surely indemnify any conclusions on this matter. This could be a topic for future research.

Although the literature proves that customers’ interaction in the NPD process is common and widespread, customer interaction in our cases is not widespread, while the use of social media as a means for this interaction is very limited. Nevertheless, there seems to be a great potential for social media not only as a tool for mass communication but also for interaction with smaller groups. For example, one of the interviewed Dutch companies is currently experiencing a change in customers. The company delivers to large construction companies; however, these companies are being replaced by much smaller builders so the company must find a new way to communicate with its customers. Although they still hesitate to embrace social media they are looking at its potential, but as the CEO said: “Seeing is believing, but we do not see it yet”. The company is exploring the challenges and benefits, but it still has not gained a clear approach and satisfying results.

In future research on the use of social media in the early phases of development of sustainable innovation, more qualitative and quantitative research must be conducted to find out the similarities and differences in the use of social media between SMEs. The size of firms could be an explanation on the availability and possibility of applying and using social media in close interaction with end-users and customers in the early phases of development.

Furthermore, as indicated above, to what extent do industry characteristics in terms of complexity, technological advancements and conservativeness influence the use of social media by companies acting in those industries? Finally, the role of (re)structuring procedures and involvement of new dedicated professionals should be taken into account.

References

Social media within sustainable product development


Social media within sustainable product development


