Exploring social media as a driver of sustainable behaviour: case analysis and policy implications

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Abstract

This paper describes an empirical study into the emerging effects of instantly available social media on collective environmentally sustainable behaviour. The first contribution to the literature is a model whereby social media is positioned as a means to overcome two important barriers to collective environmentally sustainable behaviour. The first barrier can be called fatalism, or a lack of belief on the part of potential participants that the sustainability initiative will have a significant impact. This study hypothesizes that social media can help overcome this barrier by presenting evidence to potential participants of the initiative's goals and achievements as well as by helping participants to share this information with potential participants in their own social networks. The second barrier is termed busyness, whereby the favourably disposed majority cannot permit themselves the time and energy needed to turn their attitude into behaviour. The second hypothesis is that social media can stimulate these people to take action by reducing the effort required to act and by helping participants to share their experiences with each other. These mechanisms are related to two outcomes: the scale of participation and the impact achieved by the initiative. The second contribution to the literature is an empirical investigation of the relationships between the aforementioned social media mechanisms and outcomes, whereby more than 30 relevant social media applications are analysed. Initial results show the strong influence of presenting evidence of the group's goals and achievements to potential participants on the scale of participation. A third contribution of this paper is to translate the effects of social media enabled collective behaviour into policy implications. This study shows that social media can enable a disruptive force that may affect the power balance between market, government and consumer groups. For these three parties we discuss the implications of this changing power balance.

Keywords: Internet, participation, sustainable behaviour, public policy, social media, social movements.

Introduction

A large proportion of society has a positive attitude towards the ideas of sustainability and yet most of these citizens and consumers exhibit limited structural behaviour aimed at environmental sustainability (Moser & Dilling 2007). Nevertheless, the fact is that this favourably disposed majority has a huge potential to significantly influence a nation's sustainability landscape. A growing number of researchers are claiming that social media, such as online social networks and smart phones, have the potential to encourage and empower people to really act on their sustainability intentions. However, current research shows limited evidence of this effect and hardly addresses the implications for policy on environmental sustainability. The growing use of social media enables users to connect and collectively create value and influence commercial and public institutions (Huijboom et al. 2009). Social media facilitate the bottom-up creation of social identities (Castells 2001), foster the process of social contagion (Lewis et al. 2008) and comparison (Grevet and Mankoff 2009) by allowing peers to share and reduce the individual effort required to take action (Garrett 2006). Additionally, with the advance of the mobile internet, social media are available at the immediate point of action, for example when buying a product.

This article describes an empirical study into the emerging effects of social media applications on sustainability behaviour within online communities. We concentrate primarily on the favourably disposed majority, as opposed to the activist minority or the uninterested. The focus of this article is the new phenomenon of internet-based initiatives which use social media to stimulate the sustainability behaviour of large numbers of people. For example, the Facebook application "I am green" was launched in July 2007 and has over 2 million members. It allows users to display their environmental attitude as a badge on their own page, provides the opportunity for like-minded people to chat and share their opinions and it provides tips and ideas for improving individual sustainability behaviour. In this article, the effects of social media applications on participation in such initiatives and on behavioural change are investigated in an empirical analysis. We propose a model of the role of social media in driving mass sustainability behaviour and identify antecedents which influence this process. We also analyse the strength of the effects that social media mechanisms have on this behavioural outcome. This paper also includes a discussion of the impact of initiatives driven by social media as a disruptive force that may affect the power balance between market, government, consumers / citizens and NGOs.

The sustainability initiatives can amass such a sizeable support that they can force companies and public administrations to act in a more sustainable way. For example, on 17 March 2010 Greenpeace activists opened a frontal attack on Nestlé, the producer of chocolate bars. Not outside their headquarters in Switzerland but on YouTube. In a spoof advert a man is shown breaking open a KitKat, removing the finger of an orang-utan and nonchalantly chewing on it. In this way Greenpeace brings a problem with the palm oil which is used to make KitKats to the attention of internet users. The palm oil from Indonesia is environmentally unfriendly because forest is destroyed to clear space for the palm trees; forest which forms the orang-utan's natural habitat. Greenpeace used this film to use the weight of a mass of consumers who watch the film into their attack on Nestlé and within a month Nestlé had agreed that as from 2015 they will only use eco-friendly palm oil.

Greenpeace's KitKat campaign is only one of a growing number of examples whereby large numbers of consumers are mobilized via the internet to put pressure on companies. In only three years, the campaign organisation Avaaz.org has become the world's largest online pressure group with over 5 million members signing petitions on a wide range of topics from saving whales to gay rights. In the US, moveyourmoney.info has encouraged ordinary Americans who are angry with the Wall Street banks for causing the credit crisis of 2008-2009 to move the money in their accounts to a local, community bank. In the first three months of 2010 they claim to have helped move $5bn away from the major banks. Besides these examples of activist initiatives, the social media represent a new opportunity for firms and governments to proactively connect with large groups of people.

Social media as a driver of sustainable behaviour

Most consumers have a positive attitude towards sustainability and seem to be increasingly interested in balancing quality of life and sustainable behaviour (Frantz et al. 2005; Lorenzoni, Nicholson-Cole and Whitmarsh, 2007; Moser 2009). Yet, most of these consumers exhibit limited structural behaviour aimed at sustainability (Moser and Dilling 2007). Research shows that the link between peoples' intention and their behaviour is generally weak (Langley, Ortt and Pals 2009; Sheppard, Hartwick and Warshaw 1988) and that this is also the case for behaviour related to sustainability issues (Lane and Potter 2007; Bamberg and Mösera 2007). There are several individual barriers to environmentally sustainable behaviour, which include lack of interest, lack of knowledge, uncertainty and scepticism, externalising responsibility and blame, importance of other priorities / busyness, fatalism and helplessness. Social barriers include a 'free rider effect', whereby individuals may be disinclined to adapt their

behaviour if they believe that others are doing enough for a better environment, and a lack of enabling initiatives (Lorenzoni et al. 2007).

Various internet communities have been set up by a range of individuals, social entrepreneurs, NGOs and others to stimulate the sustainable behaviour of individuals and organisations. They range from making individual CO_2 footprints more transparent (e.g. MakeMeSustainable and Treemagotchi) to microfunding websites supporting entrepreneurs in third world countries (e.g. Kiva and MicroPlace). Most of these communities are part of whole new range of internet applications, known as social media applications, in which on-line social communities with a strong bottom-up and user-friendly character play the key role and where the mobilisation (aggregation and syndication) of content generated by users is the main function. By active participation in these social media, value can be added in the form of knowledge, social capital, services (Slot and Frissen 2007) and sustainable value. Social media applications are beginning to be used by social entrepreneurs, groups of consumers and NGO's to close the gap between sustainable attitude and behaviour.

In sum, this paper offers three contributions to the literature. The first contribution is a model whereby social media is positioned as a means to overcome two important barriers to individual and organisational sustainable behaviour. The second contribution to the literature is an empirical investigation of the conceptual model, whereby 30 relevant social media initiatives are analysed, showing the relative effect of drivers of participation and behavioural change. A third contribution of this paper is to translate the effects of social media enabled sustainability initiatives into policy and strategy implications.

Conceptual model

The starting point for this study is two societal developments: the increasing attention for sustainability as a globally-shared value and the increasing use of social media applications. Taken together, these developments may result in a large scale change in the sustainable behaviour of individuals and organisations. We draw up a conceptual model in which social media applications are positioned as a means to overcome two important barriers to collective environmentally sustainable behaviour: *fatalism* and *busyness* (Lorenzoni et al. 2007). Fatalism in this context is considered to be a lack of belief on the part of potential participants that a sustainability initiative will have a significant impact. Busyness is the typical state of the majority of the population whereby other priorities do not allow them the time and energy needed to act on their pro-sustainability attitude.

Our first hypothesis is that social media applications can help to overcome fatalism (which prevents people joining sustainability initiatives), and thus stimulate participation, in two ways: by presenting evidence of the initiative's

goals and achievements to potential participants via the website and by helping existing participants to share this information with potential participants in their own social networks. The presentation of evidence of the initiative's goals and achievements via the website can stimulate participation in sustainable initiatives via a number of mechanisms. Users can see the effect of individual actions (Van Leeuwen et al 2009), for example by recording and learning about their energy consumption (Oakley, Chen and Nisi 2008). Such feedback from social media applications can work as a form of persuasion (Cornelissen et al. 2008; Froehlich, et al. 2009; Kappel and Grechenig 2009*)*. On a group level, the presentation of evidence can help users to achieve more sustainable results by stimulating competition or collaboration (Grevet and Mankoff 2009; Van Leeuwen et al. 2009). Margetts, John and Escher (2009) point out that potential participants are more likely to participate in initiatives which have already attracted a large number of participants. This relates closely to the social-psychological concept, "social proof" whereby people tend to look to what others do as a way of confirming appropriate behaviour (Cialdini 1993). Lastly, social media applications make the power of small actions visible (Salo, Lahteenoja and Lettenmeier 2008). The best known example of this outside of the sustainability area is the online encyclopaedia, Wikipedia; A colossal achievement of combining individual contributions. Another example is the internet search engine Forestle, which donates the advertising revenue it generates to the "Adopt an Acre" program of The Nature Conservancy. Users of Forestle see each time they search what they are contributing and how much forest their combined action has saved (at the time of writing 7.5 million square metres). These examples of social media show that by making individual, small contributions and their combined result visible, potential participants are able to believe that the initiative will have a significant impact.

Participation in the online sustainability initiative can also be stimulated if existing participants share their experiences with people in their social networks. Social media applications offer sharing options to participants to communicate experiences and information to their peers (Oakley, Chen and Nisi 2008). These options allow potential participants to see what their friends are doing, which enable social-psychological mechanisms that can stimulate participation such as social comparison (Grevet and Mankoff 2009), social contagion (Langley et al. 2010; Lewis et al. 2008) or social identity (Diani 2000; Castells 2001; Postmes and Brunsting 2002).

The second hypothesis is that social media can stimulate busy people who do join such initiatives to take action by helping existing participants of a sustainability initiative to share their experiences with each other and by reducing the effort required to act. Sharing experiences between participants can stimulate behavioural change within an online sustainability initiative in several ways. The

possibilities of sharing and communication within social media applications allows participants to see each other's actions, which could stimulate them to take action themselves, for example by signing petitions (Margetts, John and Escher 2009). This seems to enable the same social-psychological mechanisms as described above for sharing experiences with potential participants (social comparison, social contagion and social identity). The social media applications are used as an infrastructure to diffuse individual attitudes and life-styles (Reisch 2001). Sharing of experiences gives active members recognition of their activities, which can be an incentive to other members to become active (Butler 2001). Social media applications seem to make it easy to take action and therefore stimulate behavioural change. Garrett (2006) points out that *"Information technologies allow very small contributions to be effectively aggregated. Coordination costs have historically outweighed the benefits of small contributions, but new ICTs can be used to lower the associated overhead"*. Therefore, social media lower the costs of participation in environmental activity, for example by personalising actions and connecting participants to opportunities of behavioural change (Leizerov 2000; Mankoff, Matthews and Fuss 2007).

The variables and relations of these two hypotheses are presented in the conceptual model (figure 1). The scale of participation of the sustainability initiative and the degree of behavioural change within the sustainability initiative lead to sustainability impact. The impact can be related to the members of the sustainability initiative itself (e.g. reduction in CO_2 emissions) or organisational behaviour (e.g. animal welfare regulations).

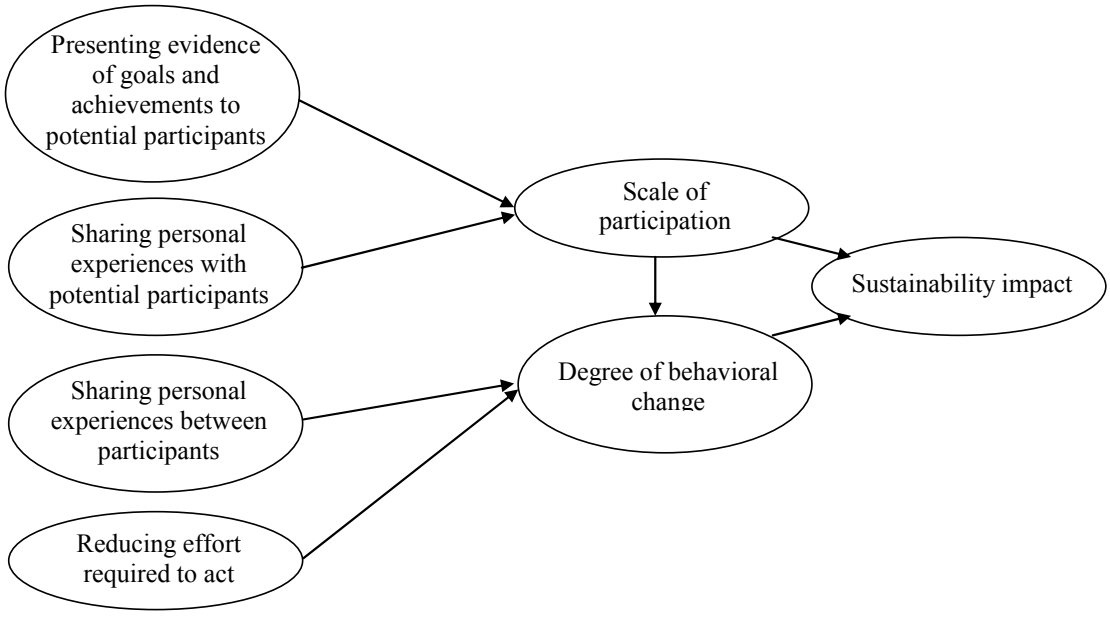

Figure 1 Conceptual Model of social media as a driver of collective environmentally sustainable behaviour

The rest of this paper is structured as follows. Firstly we describe the development of an instrument to analyse the effects of social media, based on our conceptual model. Secondly, we describe an empirical investigation of the relationships between the aforementioned social media mechanisms and outcomes in the model, whereby 30 relevant social media initiatives were analysed. Finally, we discuss the meaning of the results and in particular the implications for policy and business strategy.

Empirical study

The goal of the empirical part of this study is to explore the ways that social media influence participation in online sustainability initiatives as well as the behavioural change they bring about. During the development of the conceptual model, described above, we defined our focus for the empirical study. A relevant technique for exploring the relationships in such models is Structural Equation Modeling (Kaplan 2000) whereby, firstly, latent constructs which cannot be observed directly are estimated from a number of measurement indicators and, secondly, the relationships between the latent constructs are simultaneously determined. A Structural Equation Model (SEM) is composed of two parts: a structural model and a measurement model. The structural model presents the qualitative theoretical relationships between the latent constructs. The measurement model is used to link observable variables to each of these constructs.

For the empirical analysis described in this paper we base the structural model on the conceptual model presented in Figure 1, with the exception that we do not include sustainability impact directly but assume that participation and behavioural change together determine the impact. We also postulate a direct relationship between participation and behavioural change. For the measurement model, we begin with a long-list of candidate measurement indicators as we are exploring which characteristics of social media have an influence in the paths of the structural model. Based on initial analysis results it is then possible to select the variables which contribute the most to the latent constructs and thereby form an optimal model. As such, our approach comprises the following four steps, each of which is described below:

1. Development of an instrument to measure a long list of candidate characteristics of social media
2. Data collection from real world cases using this instrument
3. Exploration of the contribution of the candidate parameters to the main constructs in the model, whereby the long list is reduced to a short list
4. Analysis of the strength of the effects in our conceptual model.

Instrument development

In order to measure the constructs described in the Conceptual Model above, we develop an instrument allowing real world cases to be measured. We attempt to reduce the role of subjective opinion in the data collection by developing a measurement instrument which includes predominantly objective parameters. Most studies investigating characteristics of websites or of social media and their effect on behaviour make use of a panel of experts or a questionnaire to gather opinions regarding each measurement indicator (e.g. Katerattanakul and Siau 1999; Lee et al 2002; Palmer 2002; Van Schaik and Ling 2008; Zhang, Keeling and Pavur 2000). These studies take the individual experts' scores or a mean score of the opinions as input data for the analysis. We take a different approach by looking for measurement indicators to be as objective as possible, allowing for a single score for each measurement indicator per case (see Table 1). Measurement indicators are included for the four exogenous latent constructs as well as for the two endogenous constructs, Participation and Behavioural Change.

There are three measurement levels used in the measurement model:

- Some indicators are measured as dichotomous quantities, for example "Appearance", whether or not information regarding the achievements of an SMO appears on its webpage, measured as 0 or 1 (nominal measurement level).
- Some indicators are measured on five-point Likert-type scales, for example "Target orientation", the specificity of the target which the SMO aims to directly influence, measured as 1 = the world, 2 = a country, 3 = an industry or branch, 4 = an organisation and 5 = an individual (interval measurement level).
- Finally, some indicators are measured as integers, for example "Visitors", (log of) the proportion of global Internet users who visit the website daily, measured from the "Reach" metric available on Alexa.com (ratio measurement level).

Table 1. Long-list of candidate indicators for the measurement model, including the operationalisation of the items.

Construct	Variable name	Operationalisation	Measurement level
Presenting achievements to potential participants			
	Appearance	Whether information regarding achievements is present	Nominal
	Accessibility	Whether the quantitative information regarding the achievements is present on the homepage	Nominal

	Placement	The extent to which the placement of the information regarding the achievements enables instant attention from visitors	Interval
	Personalization	The extent to which the information regarding achievements is presented in a personalized form	Interval
	Vividness of achievements presented	The extent to which rich media (text, graphics, video, etc.) are used to present the information regarding achievements	Interval
	Quantitative	Whether the information regarding the achievements is quantitative	Nominal
	Qualitative	Whether the information regarding the achievements is qualitative	Nominal
	Simplicity	The extent to which the message regarding the achievements is simple and easy to understand	Interval
	Distinctiveness	The extent to which the information presented regarding the quantitative achievements is distinctive compared to the other information presented on the same webpage	Interval
	Source credibility	Whether well-known and trusted brand names are present on the homepage	Nominal
Sharing information with potential participants			
	Availability of sharing options	The presence of options to share content with potential participants to persuade them to join	Nominal
	Sharing simplicity	The extent to which sharing with non-participants is simple and easy to carry out	Interval
	Online embeddedness	Whether sharing options are embedded with existing social media, such as: micro blogging (Twitter, Buzz), online communities (Facebook, LinkedIn, Orkut) and social bookmarking (Digg, Delicious)	Nominal
	Vividness of shared information	The representational richness of the shared content, from text to games or video	Interval
	Personalization	The extent to which the message shared with non-participants is personalised	Interval
	Ranking	The presence of competition between participants to attract the most new participants	Nominal
	Practical reward	The presence of practical rewards for attracting new participants (e.g. prizes, points)	Nominal

	Persuasion	The degree of pressure exerted on participants to share information with non-participants	Interval
Sharing information between participants			
	Availability of sharing options	The presence of options to share information between participants	Nominal
	Sharing simplicity	The extent to which sharing between participants is simple and easy to carry out	Interval
	Interactivity: Communication	The presence of options for reciprocal information exchange	Nominal
	Interactivity: Synchronicity	The presence of options for real-time reciprocal information exchange	Nominal
	Vividness of shared information	The representational richness of the shared content, from text to games or video	Interval
	Social presence	The capability of a medium to facilitate awareness of the other participants' existence, from none to up-to-date user profiles	Interval
	Ranking	The presence of competition between participants for active participation	Nominal
Reducing the effort required to take action			
	Simplicity of action description	The extent to which information about the action is simple and easy to understand	Interval
	Action simplicity	The extent to which the action is simple and easy to carry out	Interval
	Compatibility	The connection, consistency and support between the action and existing or generally expressed behaviours	Interval
	Simplicity of joining	The ease with which potential participants can become part of the initiative (e.g. mandatory registration, number of steps to register)	Interval
Participation			
	Participants	Log of the number of people taking part in one way or another in the initiative	Ratio
	Visitors	Log of proportion of global Internet users who visit the website daily, as taken from the "Reach" metric on Alexa.com	Ratio
Behavioural change			
	New real-world behaviour	Whether the new behaviour takes place without computer mediation	Nominal

Delta: the extent of the change	The extent to which the new behaviour is different to the old behaviour	Interval
Longevity	The extent to which the initiative expects participants to keep on expressing the behaviour over a long period of time	Interval
Target-orientation	The specificity of the target which the initiative aims to directly influence, from an individual to the whole world	Interval

Cases and data collection

In order to investigate the effect of social media in stimulating collective environmentally sustainable behaviour we searched for topical cases. Our focus for data collection was on initiatives which use social media, via the internet, with the explicit intention of combining the collective positive attitude towards sustainability of a mass of people. We excluded initiatives intended for a small or niche community and email-only actions aimed at gathering signatures. After a search of internet sites and discussion forums on related topics we identified 67 English, German or Dutch language cases which were up to date, currently acquiring new members and focused on sustainability behaviour. Of these 30 were selected at random for inclusion in this explorative study. These cases are listed in the Appendix, showing the web address, the type of sustainability, the type of social media employed as well as a brief description. Each of these cases was given a single score for each of the measurement indicators described in Instrument Development above.

Exploration of the candidate measurement indicators

To study the effects of the characteristics of the sustainability initiatives on participation and behavioural change we apply a Structural Equation Model (SEM) including a path model (based on the conceptual model in Figure 1) and a measurement model (see Table 1) (McDonald and Ho 2002). The exogenous latent variables are of a formative nature (Diamantopoulos and Winklhofer 2001) as the different indicators of the measurement model together form each latent construct and there is no reason for the indicators for a particular latent construct to highly correlate as they would for reflective scales. The inner path model is also formative in nature, due to the theoretical basis for the model described above. The presentation of achievements and facilitating the sharing of information with non-participants are each postulated to contribute in different ways to the degree of participation. The facilitation of sharing between

participants and the reduction of the effort required to take action are together postulated, again in different ways, to influence the degree of behavioural change.

The Partial Least Squares (PLS) form of SEM (Fornell and Cha 1994) was used because the model is prediction oriented (Reinartz et al. 2009), focused on identifying the critical success factors for stimulating participation and behavioural change by sustainability initiatives. Also, PLS does not make assumptions about the population or scale of measurement and as such there are no distributional requirements, such as independent and identical Normal distributions (Fornell and Bookstein 1982). The SmartPLS software (Ringle et al. 2005) was used, which allows for single and multi-item measurement and the use of formative indexes (Hennig-Thurau et al. 2007).

As this study is exploratory in nature, we investigate the contribution of a wide range of measurement indicators to our four exogenous latent constructs and optimize our measurement model by removing the indicator which contributes the lowest weight in forming the constructs and reanalysing the model. In this way a contribution of the empirical investigation described in this paper is the identification of antecedents to participation and behavioural change. The indicators with the highest weight scores are retained for the analysis of relationships between the latent constructs and these are shown in Table 2.

Table 2. Weights of the measurement indicators on the exogenous latent constructs. Note that for the construct "Reducing the effort", a single measurement indicator, "Action simplicity", is used in the analysis.

Measurement indicator		**Presentation of achievements**	**Sharing with potential participants**	**Sharing between participants**
Qualitative	Whether the information regarding the achievements is qualitative	0.9467		
Simplicity	The extent to which the message regarding the achievements is simple and easy to understand	0.4722		
Vividness of achievements presented	The extent to which rich media (text, graphics, video, etc.) are used to present the information regarding achievements	-0.4513		
Persuasion	The degree of pressure exerted on participants to share information with non-participants		0.6067	
Vividness of shared information	The representational richness of the shared content, from text to games or video		0.5673	
Interactivity: Communication	The presence of options for reciprocal information exchange			0.6347
Interactivity: Synchronicity	The presence of options for real-time reciprocal information exchange			0.417
Ranking	The presence of competition between participants for active participation			0.3121

Analysis

Model fit

Overall model fit can be assessed using the variance explained of the endogenous constructs (Tenenhaus et al. 2005). The explained variance for participation and behavioural change is 0.435 and 0.365 respectively, which can be categorized as large (Cohen, 1988).

Predictive relevance (Q^2) is an alternative test of model fit (Wilson et al. 2007). This measure is calculated omitting an odd number of data points from the data set and then estimating the missing values from the reduced-data model. Q^2 values above zero give evidence that the omitted values are well reconstructed and the model has predictive relevance. For the model described in this article, the predictive relevance measure is 0.189 and 0.204 for participation and behavioural

change, respectively. Hence, from both statistics, it can be concluded that the overall fit of the model is highly satisfactory.

Results

As this study is exploratory in nature we are predominantly interested in identifying which of the candidate effects plays the largest role in stimulating participation and behavioural change. As such, and given the nature of our preliminary data set, we are less interested in statistical significance and look more towards the largest effect sizes (Armstrong 2007). The results of the analysis are shown in Table 3 and a correlation table of the latent constructs is shown in Table 4.

Table 3. Path coefficients for the characteristics of sustainability initiatives using social media to drive participation and behaviour change.

Effect of	**on**	**Effect size**
Presentation of achievements	Participation	0.310
Sharing with non-participants	Participation	0.503
Sharing between participants	Behavioural change	0.530
Reducing the effort	Behavioural change	-0.062
Participation	Behavioural change	-0.319

Table 4. Correlations between the latent constructs.

	Presentation of achievements	**Sharing with potential participants**	**Sharing between participants**	**Reducing effort**	**Participation**
Sharing with potential participants	0.2748				
Sharing between participants	-0.1874	0.0919			
Reducing effort	0.5528	0.2565	-0.2130		
Participation	0.4485	0.5879	0.1475	0.3665	
Behavioural change	-0.1492	-0.3630	0.4965	-0.2917	-0.2633

One of the main results shown in Table 3 is the large, positive effects on participation. Presentation of achievements and, in particular, Sharing with non-participants, whereby the website enables members to share their experiences with their friends, are both strong for social media initiatives which have a large number of participants. As far as Presentation of achievements is concerned, the most important indicator is the presence of qualitative information such as stories, testimonials or descriptions of what the initiative has accomplished (see Table 2). Interestingly, presenting information on the achievements in a simple way with low vividness, for example not using videos, has a positive contribution to increasing participation. As for sharing experiences with potential participants, persuading participants to share information with their friends is important and, interestingly, in this case it does pay to increase the vividness of the information rather than simply relying on text.

Table 3 also shows the strong, positive effect of Sharing between participants on Behavioural change. As shown in Table 2, this is mainly brought about by enabling information exchange, two way and in real time, as well as (to a lesser degree) visibly ranking the participants by their active participation. Behavioural change appears to be far less influenced by the extent to which the web site reduces the effort the participants need to make in order to carry out the required action. This is surprising as we may expect that there would be a clear relationship between low effort and low behavioural change as well as high effort linked to high behavioural change. As this relationship is weak we conclude that social media disrupt this normal relationship, meaning for some SMO websites a low effort may result in a large behavioural change or conversely that a high effort may be required to realize a small behavioural change.

Another main result is the strong negative relationship between participation and behavioural change. This shows that initiatives that expect less behavioural change have the most participants and initiatives that expect the largest behavioural change attract the least participants.

Discussion

Conclusion

In this study we measured the characteristics of online sustainability initiatives and investigated if these characteristics can help to overcome fatalism, which prevents people participating in sustainable initiatives, and thus stimulate participation. Secondly, we investigated if characteristics can reduce the barriers of busyness and stimulate behavioural change. Finally, we postulate that

participation and behavioural change combine to influence the impact that initiative have.

We can confirm the first hypothesis that participation is driven by the presentation of achievements on the web site and by stimulating participants to share information about the initiative with their social network. Main drivers are a simple, qualitative description of the achievements presented on the web site and the degree to which pressure is exerted on participants to share information with their contacts. For presenting achievements on the homepage low vividness is better. Perhaps this is because it is quicker and more straightforward to understand, making it better for the busy people who visit the web site and want to get the idea within a couple of seconds. For sharing with peers that are not part of online sustainability initiatives high vividness is better. Perhaps when a web site has been recommended by someone you know, you are more likely to take the time to look through videos and other information.

The second hypothesis is partially confirmed. We found that behavioural change is driven by stimulating participants to share their experiences with each other. The main driver in this case is the extent to which social media are used to enable participants to communicate with each other, two-way and in real time. We found only a weak negative relationship between low effort and behavioural change, indicating that it is not necessarily the case that the more difficult the action asked of members the less they are likely to carry it out.

We found a strong negative relationship between high participation and behavioural change. This finding signifies that online initiatives which expect their participants to make a significant change in their behaviour still have trouble recruiting large numbers of people. This could be evidence of the concepts lurking or social loafing, as found for social media in general (e.g. Beenen et al., 2004; Koh & Kim, 2007; Nonnecke et al. 2006) whereby less than 10% of members are expected to be active.

Implications

There are significant implications for business strategy and public policy of developments in online sustainability initiatives. Online initiatives can stimulate sustainability by targeting the individual behaviour of large groups of consumers or by focusing the behavioural intention of these large groups towards firms that behave in a socially irresponsible way. In the latter case, the use of social media applications in these initiatives seem be an infrastructure to organize a large mass of consumers, which otherwise remain unconnected and therefore unable to bring about change. Online sustainable initiatives may affect the power balance between firms, government, Social Movement Organisations (SMOs) and consumer

groups, as they could exert more direct power over the market. For these parties, we discuss the implications of this new market interaction.

Implications for SMOs and consumer groups. Online sustainability initiatives can be steered by professional SMOs or social entrepreneurs (Castells 2001; Garrett 2006). The main implication for SMOs and social entrepreneurs is that social media applications is a highly promising medium for improving the efficacy of their actions towards social change (Garrett, 2006; Diani, 2000), as they can gain membership and stimulate behavioural change in new ways. The antecedents to participation and behavioural change (see Table 1) are in fact a list of relevant and highly specific interventions which SMOs and social entrepreneurs can make use of. For example, whether to present quantitative or qualitative information about the sustainability achievements; whether to offer participants a means of communicating with each other and if so, whether this should be in the form of a discussion (asynchronous) application or a chat (synchronous) application. The easiness of taking action online does not influence the behavioural change negatively or positively. This means that simple actions taken by consumers do not necessarily decrease the impact of online sustainability initiatives. The initiatives offer consumers new ways to support a good cause, often in an easy, social and fun way. The cooperation between consumer groups, SMOs and social entrepreneurs possibly change the role of consumers in passive activists. SMOs and social entrepreneurs can increasingly act as 'platform organisations' that help these groups of passive activists to organize successful online sustainability initiatives. In this way, well-organised initiatives can have a real sustainable impact instead of making internet users only feeling good.

Implications for firms. Online sustainability initiatives involving large groups of consumers are uncommon stakeholders to most firms. Firms should be aware that these initiatives can occur suddenly and attract the attention of mass media. In the case of KitKat, Greenpeace successfully forced Nestlé in this way to change their purchasing strategy. This example shows a reactive way for firms to deal with online sustainability initiatives. What firms can do is to identify their vulnerable issues and prepare alternative scenarios. Alternatively, firms that use Corporate Social Responsibility in their Public Relations and that can possibly confronted with online sustainability initiatives should seriously adopt both in their stakeholder strategy and activities. Besides this, firms can pro-actively involve online sustainability initiatives in their marketing and communication activities, in the same way Toyota involved the environmental community in San Fransisco to promote energy-efficient cars (Rao 2009).

Implications for government. The internet is increasingly important for public policy (Margetts 2009). Public administrations are either directly or indirectly confronted with online sustainability initiatives. Online sustainability initiatives seem to increase the importance of nodality in policy (Margetts 2009), as public administrations can start online initiatives themselves. On the other hand, online sustainability initiatives can decrease government's authority (Margetts 2009), as it will compete with the authority exerted by large groups of citizens and SMO's. For example, online initiatives undermined the authority of the Dutch government during the cervical cancer vaccinations in the Netherlands in 2010. Online initiatives of concerned parents had more authority over the public opinion than the responsible ministry. How can public administrations react quickly to contentious activity between online sustainability initiatives, firms and themselves? In a reactive way, online sustainability initiatives can support public policy aiming at solving market failures regarding sustainability. For example, Greenpeace's KitKat campaign is possibly in line with public policy stimulating sustainable chocolate and government can take such a success as a cause to negotiate sustainability norms in the sector. Pro-actively, public administrations can stimulate or even start online sustainability initiatives directed towards social change in line with public policy. However, research on how online sustainability initiatives work is needed before public administrations can use the stimulation or organisation of online sustainability initiatives as a policy instrument. For example, a changing relationship between government, consumer and SMOs raises issues about blurring boundaries of accountability, arbitrariness of actions towards firms and privacy.

Future research

This paper describes an initial exploratory analysis of online sustainability initiatives and as such it has a number of limitations and avenues for further research. Clearly, the number of cases included in our analysis could be increased to provide a more reliable set of results. Our analysis could also be expanded to include a measure of the impact of the online initiatives. However, this raises the question of how to measure sustainability impact in a consistent and meaningful way? As each initiative is different, with different goals and ambitions, there is no single objective measure possible.

We plan to look more closely at mechanisms driving the efficacy of online sustainability initiatives and will look, in particular, at the role of social cognitive theory (Bandura 2001; Pajares et al. 2009) and collective efficacy (Bandura 2000). This theory describes how observing other people or role models via mass media our behaviour can be stimulated in a certain direction. Online social movements combine the effects of observing those we know and the actions of

other people via social media and can lead to a range of intended and unintended consequences.

The online initiatives included in our study cover a range of sustainability-related topics, such as environment, microfinance and food production. It would be interesting to zoom in on a particular area such as how citizens are beginning to make small investments in renewable energy production projects.

In some cases online sustainability initiatives are successfully combined with offline actions of SMO's. For example, Oxfam Novib used in their Groene Sint initiative role models and television commercials next to social media applications. More research is needed to investigate the mix between online initiatives and offline initiatives of SMO's and social entrepreneurs.

The results of this study and the idea of slacktivism, whereby large numbers of people take part in online initiatives by having fun such as watching a protest video, leads us to ask the question: Is behavioural change actually necessary in order to have a sustainability impact? Can slacktivists change the world whilst still consuming lots and living a hedonic lifestyle? The example described above of Greenpeace's KitKat protest video shows that consumers can entertain themselves watching a fun video and keep on eating their favourite chocolate bars whilst pressurising Nestlé to improve the sustainability of its production process. Will the same thing happen on a larger scale in other areas?

Another interesting question is what the effect is on the nature of the organisation behind the online initiative (SMO, social entrepreneur, consumer group, firm, government)? How believable would it be for McDonalds to begin an online healthy eating campaign? How effective would it be for a national government to start an initiative aimed at stimulating citizens to install solar panels? What if there was a consortium of SMOs, consumer groups, firms as well as government behind such an initiative?

One of the main areas for further research is what we can learn about how online social initiatives require a structural change to policymaking. Given that the internet allows for such initiatives, what is the role of the government and policy instruments? The government may no longer be the one to decide which topics to put on the agenda – a whole range of issues will spring up via social media and compete for the attention of citizens, organisations and the media. There may be no role for playing the referee when there is a difference of opinion or a misguided initiative – the winner will be decided via the media or in the courts. The government may not even be able to set the rules of play – in the global usage situation a single government is not able to define what it is that its citizens can or cannot do. The government can give their backing to certain topics or stand points, by offering subsidies, etc., and they may be able to encourage local initiatives by offering knowledge, support and platforms as a means of increasing participation in a wide range of areas.

One thing is clear: the use of social media applications by social entrepreneurs and a wide range of organisations to mobilize the masses has begun and firms and government would be well advised to take steps now to understand how these developments will impact upon them. They will need to devise strategies and policies for both reacting to groups which suddenly gain massive support as well as proactively engaging with their target groups by using the emerging strengths of the social media.

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Appendix. A list of the cases included in this study.

Case	URL	Type of sustainability	Type of social media	Description
Avaaz	http://www.avaaz.org/en	Various	Social network	An international civic organization established in 2007 that promotes activism on issues such as climate change, human rights, and religious conflicts.
Better Place	http://www.betterplace.com/	Transport	Social network	A venture-backed company based in Palo Alto, California that aims to reduce global dependency on petroleum through the creation of a market-based transportation infrastructure that supports electric vehicles.
Big carrot	http://www.bigcarrot.com/	Various	Social network	A web initiative that allows people with a common interest to come together and pool their contributions to create an inducement prize to stimulate, among other things, pro-environmental behaviour.
Carrotmob	http://carrotmob.org/	Various	Various	A form of consumer activism where a community buys a lot of goods from one company in a small time period to reward a business's commitment to making a socially responsible change to their operations.
Celsias	http://www.celsias.com/	Climate change	Social network	A web initiative to help individuals, companies and organisations do practical things to combat climate change.
De wereld redden	http://dewereldredden.nl/	Various	Video weblog	A web site whereby people can upload instruction videos explaining how others can carry out a particular sustainability-related action.
Dianovo	http://dianovo.com/	Various	Social network	A web-based community for exchanging sustainability ideas and promoting environmentally friendly businesses.
Energy battle	http://www.energybattle.nl/	Energy	Social game	A web initiative to stimulate high school children to undertake pro-sustainability actions.
Farm Foody	http://www.farmfoody.org/	Food	Social network	A web initiative connecting farms to people who want a direct relationship with their food producer.
Forestle	http://forestle.org/	Nature	Search engine	An ecologically inspired web search sites which donates 90% of its advertisement revenue to the Adopt an Acre program of is partner organization The Nature Conservancy.
Goede vis	http://www.goedevis.nl/	Food	Website	A web guide to sustainable fish educating individuals and restaurants about environmentally responsible choices.
Green heroes	http://www.green-heroes.org/	Various	Social network	A web-based community for exchanging sustainability ideas.
Groene Sint	http://www.groenesint.nl/	Food	Various	A web initiative aimed at increasing awareness of slavery in cacao plantations, centred around the traditional Winter holiday figure in the Netherlands.
Inhabitat	http://www.inhabitat.com/	Production	Weblog	A weblog devoted to the future of design, tracking the innovations in technology, practices and materials that are pushing architecture and home design towards a smarter and more sustainable future
Kiva	http://www.kiva.org/	Finance	Social network	An organization that allows people to lend money via the Internet to microfinance institutions in developing countries around the

				world and in the United States, which in turn lend the money to small businesses.
Make me sustainable	http://makemesustainable.com/	Energy	Social network	A web initiative aimed at helping individuals track their energy consumption and stimulating them to take action aimed at reducing their environmental impact.
One did it	http://www.onedidit.com/	Various	Social network	A web initiative aimed at helping individuals estimate the amount of natural resources they consume with their lifestyle and stimulating them to take action aimed at reducing their environmental impact.
Plant a billion	http://www.plantabillion.org/	Nature		The Nature Conservancy's campaign to restore 2,500,000 acres (10,100 km2) of land and plant 1 billion trees by 2015 in the Atlantic Forest of Brazil.
Planetfesto	http://planetfesto.org/	Various	Micro weblog	An environmental education and action movement for individuals worldwide to create a virtual ribbon of 6" pieces of ribbon, each made up of a photograph or drawing representing why the person loves the earth and a pledge of individual action.
Social Edge	http://www.socialedge.org/	Various	Social network	A global online community where social entrepreneurs and other practitioners of the social benefit sector connect to network, learn, inspire and share resources.
Social vibe	http://www.socialvibe.org/	Various	Social network	An online community aimed at connecting internet users with large brands (e.g. Microsoft) letting them sponsor good causes by performing branded activities (for example watching commercials).
Step Green	http://www.stepgreen.org/	Energy	Social network	An online community that provides information on individual actions to help them monitor their energy usage and chart savings and opportunities over time.
SustainUS	http://sustainus.org/	Various	Social network	A web-initiative that mobilizes young people advancing sustainable development and youth empowerment in the United States through education, research and advocacy.
TckTckTck	http://tcktcktck.org/	Energy	Social network	A web-initiative involving a growing number of national and global organizations to mobilize civil society and to stimulate public opinion in support of transformational change and action towards climate change.
Treemagotchi	http://www.treemagotchi.nl/	Various	Social network	A Dutch online community that stimulate consumers to implement small sustainable actions by linking them to online actions, games and competitions.
Utopia	http://www.utopia.de/	Various	Social network	A German online community of "green consumers" that gives product information, links internet users to green actions and bring green consumers in contact.
Vleeswijzer	http://www.vleeswijzer.nl/	Food	Website	A Dutch web-initiative that advises consumers about the environmental aspects of consuming meat. The website contains an interactive guide that educates internet users to make sustainable decisions regarding meat.
Wokai	http://wokai.org/	Various	Social network	A person-to-person internet platform that allows internet users to provide rural entrepreneurs in China with loan capital. Internet users can choose the borrower, make a contribution and watch their repayments

				and progress over time.
Yoink	http://www.yoink.com/	Various	Mash-up and iPhone app	A web-initiative that allows consumers to give and receive second-hand products for free. Consumers can search second-hand products by their iPhone and an online map.
Zimride	http://www.zimride.com	Transport	Various	An online community aims at reducing energy consumption and saving money by helping internet users to share cars.