2009 - PUBLIC BENEFITS FUNDS & SOCIAL NETWORK CAMPAIGNS

Diffusion of Influence in Energy Awareness Campaigns on the Online Social Networking Site of Facebook

by

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Abstract

Sustainability has entered the lexicon, promoting a new dimension for our thinking on many issues. While it may be easy to achieve consensus on a broad-based definition of a moral obligation to achieve a more sustainable world, actual implementation and measurement are complex and wrenching issues. We are entering an era of radical change in the energy field which is partly dictated by new policy and institutional requirements, and partly motivated by new inventions and know-how. The successful diffusion of these ideas and innovations into the mainstream market will bring important benefits to energy consumers around the world.

The era of government jurisdiction based on separate and autonomous entities has been replaced with an intergovernmental and intersectoral network of industry, regulators, special interest groups and individual citizens. New forms of regulatory feedback will be inspired more by the concepts of networks- they will be flatter, leaner, and more flexible An evaluation of new methods for the diffusion of public awareness regarding energy technologies, policies and projects, was conducted using the technology platform of Facebook. This paper reports on the results of an eighteen month formal study of the *Diffusion of Influence in Online Social Networks*.

The dynamic aspect of this study is crucial to understand how virtal collective phenomenon emerges and will help inform practice within groups of professionals dealing with these network effects in social change efforts and in the diffusion of new innovations and ideas. Specific research identified unique dynamics of virtual community behavior with respect to building consumer awareness campaigns. Results found that online connections seem to differ significantly from face-to-face relations. This study found that strengthening a connection from a virtual stranger to an online collaborator relied more on a series of reciprocated acts or concessions instead of the development of trust, based on emotional bonding. Conclusions from this study highlight the importance in creating two-way involvement in building a sense of commitment and consistency in online communities.

Introduction

Energy has recently assumed centrality in a web of issues with which society must grapple: health, poverty, infrastructure, technology and the environment. Today's energy market is a globally interconnected and highly interdependent marketplace. Access and sustainability are problems in tandem. While the world is concerned about excessive emissions, there are nearly two billion people without any access to energy services at all. Individual consumers and entire economies pay a high price for lack of access and so does their environment. Even with the scale of such problems, the interest and understanding of the general public and elected officials has been focused on short-term, quick-fix solutions without regard to the longer term consequences. The energy environment problem is multi-scale in its complexity and we may only know the effect of changes we make today, fifty years from now.

Historically, energy policy issues have met with a genuine lack of consumer interest and therefore no impetus for change from the common populace. There have been scant sound bites of sensationalism that temporarily held fleeting public interest: blackouts, corporate scandals, increasing oil prices and environmental disasters. Recently, however, the general public has appeared increasingly motivated to influence the course that will derive the greatest long-term benefits from this generational shift to *Global Sustainability*. Yet, without a way to create dynamic communication channels, that are open and honest about the essential conditions and concerns of implementing new energy projects, policies and mindsets - industry led efforts will inevitably fall short.

Recently, people have re-engineered the power of the Internet to create webs of interconnectivity with the practical use of social network platforms. While technology and economics have traditionally acted as catalysts in propelling society through waves of rapid change, the force of population increase and the number of people now able to communicate with each other has created a crisis of complexity that requires new studies and new methods. We have entered an 'interconnected age' and today's social networks have clearly shown that physical distance is no longer relevant (Fono & Raynes, 2006). Two individuals on opposite sides of the world, with little in common can be connected through a short chain of network ties. Indeed a few highly connected ties can have a strong impact on the connectedness of the whole world (Gladwell, 2002). The illusion of independence quickly dissolves when it comes to epidemics of

disease, financial crises or revolutions (Barabasi, 2003, Capra 1996). It becomes painfully obvious that we are all connected by very short chains of influence. New forms of communities are underway and the ability to mobilize these communities into action is of critical importance in creating change. Given this emerging environment, it has become critical to explore these new conduits for connecting and communicating with the common populace as a way to propagate a new mind-set within the global energy market, from consumer complacency to engagement.

This paper reports on an eighteen month study entitled, *The Diffusion of Influence in the Online Social Network of Facebook* (Samaha, 2009), which explored how new technically enabled communication platforms, such as the online social networking site of Facebook, are creating new public forums and organizational structures to diffuse social change - particularly in the area of public awareness around energy projects and policy initiatives. Energy public awareness strategies will benefit greatly from understanding the dynamics of these new online communities and their associated impact on civil society. Many interesting dynamics of how online collective phenomenon emerges were uncovered which in turn, shed light on how interconnected social networks affect the process of social change.

Academic studies of distributed systems such as power grids and global financial markets have proven that distributed networks are at once more vulnerable and more robust than populations of centrally controlled isolated entities (Checkland, 2002, Gladwell, 2002, Watts, 2003). Looking carefully at network structures has revealed that even a large and complex network, seems to hinge on some small subset of influential players, information brokers and opinion leaders, which together form the functional center on which everyone else depends (Berry, 2003, Burt, 1995, 2005, Canuck, 2006, Lin, 1978, 2002). These key players may not be obvious - they may even seem unimportant by conventional measures of status and power. However, this study clearly illustrated that in the online world of social networks, a sense of community exists in the mind of the participants.

Virtual groups of people are no longer invisible given the advent of more sophisticated social networking sites such as Facebook. The platform's functionality imitates the local search process of real social networks and relies on the high clustering of social networks. Both offline and online social networks share values, beliefs, norms and expectations regarding appropriate behavior and how to manage one's identity,

commitments and associations (boyd, 2002, 2006, Preece, 2000). Some situations produce dynamics that enhance the tendency for people to be attracted to each other, while other situations produce dynamics that work against the baseline level of attraction (Charvet, 1997, Carl, 2006, 2008). The surprising results in terms of participation and reach are a true illustration that when people become aware that solutions are really at hand, the attitude of many is to become involved, even in their own small way. This is the reality of our interconnected age - while we all have an equal share in each others burdens, we also can form a collective voice in support of solutions.

Background

Classically, diffusion studies are concerned with how innovations, ideas or new practices are spread through a social system. Diffusion is a *process* in which an innovation or a new idea is communicated through certain channels over time until critical mass adoption occurs, creating widespread acceptance (Valente, 1995, 1996). Everett Rogers' seminal work established the criterion for adopter categorization in his first edition of Diffusion of Innovations (1962). This model has served as the backbone for thousands of further academic studies of diffusion phenomenon in its theory that a contagious idea, product or innovation moves through a population in a stage like manner (Allen, 1977, Coleman et al , 1966, Mahajan et al, 1990, Ort & Schoormansk 2004, Ryan & Gross, 1943).

Figure 1: Diffusion of Innovation Adoption Curve

The diffusion of influence depends heavily on *word-of-mouth* communication (Arndt, 1967, Berry & Keller, 2003, Katz & Lazarfeld, 1955), where participants in a

diffusion process can create new meanings by sharing information, influencing behavior and collectively reaching a new state of awareness. As novel ideas or innovations diffuse themselves through a social system, they alter its very structure and function, making the process less linear than Roger's imagined but more *complex and adaptive* (Asavathiratham et al., 2001, Goldenberg, 2001 a,b, Rogers and Medina, 2005). In this way, when new ideas are invented, diffused, adopted or rejected they lead to certain unforeseen consequences that can often result in a change in individual behaviors, which collectively can shift social norms (Banathy, 2000, Chircot, 1994). Consequently, diffusion theory looks at both the individual and global scales of behavior and the relationships between them.

Beginning with the level of local interactions diffusion takes place through a network consisting of individual units (potential adopters). As individuals adopt an innovation or idea their micro-behavior contributes to the macro-system scale of behavior (Marsden & Podlony, 1990, Prigogine, 2000). As the rate of adoption accelerates and diffusion takes off, emergent adoptive behavior occurs at the global system level. Through word-of-mouth influence, additional individuals in a system create a feedback loop as observability and peer modeling reduce uncertainties associated with the new idea, process, or technology (Bandura,1977, Bearden et al., 1989, Boissevain, 1974). A communication network consists of interconnected individuals who are linked by patterned flows of information. Networks have a certain degree of structure and stability that in turn, creates a pattern of human behavior (Luhman, 1990). Human's natural tendency to form clusters of friendships and associations within social networks has been labeled 'small worlds' and has been found to be a generic property of networks in general (Watts, 1998, 2003, Buchanan, 2002, Ibarra, 1995, Kochen, 1989).

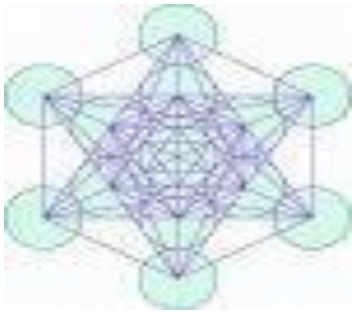

Figure 2: Diffusion through 'Small–World' clusters

Short separation between small worlds as implied in the *'six degrees of separation'* theory (Milgram, 1967) is not a mystery of modern society; most natural networks obey it. Patterns of communication flow consistently show a clustering effect with closed interlocking personal networks connected through certain individuals in a radial manner (Alba & Blau, 1982, Zenger & Lawrence, 1989). Such radial personal networks allow an individual to exchange information with a wider environment, giving them a key importance in the diffusion process (Burt 1982, 1995, Lin et al., 1978).

All innovations and new ideas carry some degree of uncertainty; hence social reinforcement is particularly critical in the persuasion phase. Comparing opinions with peers confirms or invalidates initial beliefs and has been found to be a much stronger reinforcement than mass media messages (Katz & Lazarfeld, 1955, Powell, 1990. Rosen, 2005). As an individual adopts, a form of social learning diffuses the message in a person-by person manner throughout the system. In diffusion models, it is word-of-mouth interactions at the local or micro-level of the network that leads to the emergence of global structures and behaviors (Brown & Reinegen, 1987).

Before any complex system (ie: a social network, a population or motivation in an individual) can move into an epidemic spread, or 'complex adaptation', it must have sufficient variety or variability (degrees of freedom or heterogeneity), which can be translated as sufficient resources and inclination toward new ideas and heterophilous interactivity between the system's subgroups (Banathy, 1996, Gharajedaghi, 1999, Gladwell, 2002). Similarly, diffusion displays a higher degree of contagion when there is a higher frequency of contact (interactivity) among heterophilous units in a system (Rogers, 2003, p. 19).

As new on-line tools emerge that create and expand our natural social networks, the diffusion of influence is bound to change to some degree. Creation of new 'virtual' friends (weak-ties) that we may interact with more frequently than our 'real' friends (strong-ties) has also opened new channels of influence, as more and varied opinions are available for the asking (Goldenberg et al, 2001a). Perception of the variation in nature and strategic characteristics of network ties was initially grounded in a dichotomous differentiation between the nature of weak and strong network ties (Granovetter, 1973, 1985). Strong network ties are characterized as having high levels of social relationship or personal interaction, demonstrate high frequency, reciprocity and affect (Granovetter, 1985; Krackhardt, 1992). As a result, these strong-ties carry

greater motivation to be of assistance and to be more easily available, as well as greater likelihood to be adopters in a managed diffusion of information and/or influence.

In contrast, weak-ties, which are not as heavily based on the social relationship or personal interaction between actors entail lower frequency, reciprocity and affect; yet they may provide strategic advantages in terms of resource availability beyond one's egocentric network (Granovetter, 1973, 1985; Hite & Hesterly, 2001). Weak-ties can be thought of as a link between two people who do not know each other very well and often have little in common. In 1973, Mark Granovetter proposed that weak-ties are often more important than strong-ties in understanding certain network-based phenomena. His argument rests on the assumption that strong-ties tend to bond similar people together and this leads to small world clusters of mutually connected people. Due to the high level of interconnection, information flow in such a network tends to be redundant. Granovetter therefore concluded that weak-ties, people in less frequent proximity and contact, constitute a 'local bridge' to parts of the social system that would otherwise be inaccessible. Therefore, a weak-tie is likely to provide new information from disparate parts of the system and is a better channel for diffusion of information/influence/innovation.

In classic opinion leadership theories, opinion leaders and opinion receivers often have close physical proximity, increasing the occurrence of influence based conversations (Heider, 1958, Katz & Lazarfeld, 1955). With the rapid growth in the use of the Internet, a type of close "electronic proximity" or "communities" is created, in which people of like minds, attitudes, concerns, backgrounds, and experiences are coming together in community sites or chat rooms to explore their common interests (Haythornthwaite et al., 1995, 1996).

Online social networking sites such as Facebook have created a novel portal in which the creation of a network of very diverse and dissimilar individuals is now possible. Movement within the Facebook environment is tracked and reported to one's social network by way of notifications, updates and associated marketing. If a friend supports a new product, endorses a movie or joins a cause or group, this information is fed back into the social network, acting as a subtle but very powerful autocatalytic feedback loop. Whereas previously only close friends with a high level of interaction frequency would know about your daily activities, Facebook creates a communication channel that allows even the weakest of tie access to large quantities of personal

information. In traditional media, such as newspapers, magazines, radio and television, the communication is overwhelmingly one-way. Social media such as blogs, user groups and online social network groups allow for multi-threaded conversations and create new forms of community (Kumar et al., 2006).

Social Networking Sites – The Facebook Phenomena

Facebook describes itself as a *'social utility'* intending to help people communicate more efficiently with friends, family and associates. Participation in the Facebook environment involves playful interactions with friends and social exchanges within groups. The backbone of social networking sites is the user profile, which are unique pages including descriptors such as age, location, interests, professional and personal backgrounds and a photo. The visibility of a profile varies by site and according to user discretion. After joining a social networking site, users are prompted to identify others that they have a relationship with. The labels for these relationships differ depending on the site – popular terms include "friends", "contacts" and "fans". The public display of connections is the crucial component of social networking sites. What makes online social networks unique is the ability to articulate and make visible social networks, creating the possibility to connect with people (friends of friends) in a social way.

Inherent in its design is its ability to awaken people's natural curiosity about knowing what's happening in other people's lives, who they are seeing, what movies they are watching or what music they are listening to. Once connected to others in the network, Facebook provides interaction summaries that are automatically generated and reported to one's 'friends'. The homepage of a person is all about the activities, events and happenings within that person's network. A 'news-feed' reports on one's social interactions while a 'status update' can be self-generated to give up to the minute reports on one's current activities or general state-of-mind. Identity on Facebook is less about demographic data and more about interaction (boyd, 2006, 2008, in press).

Facebook has created many unique features that allow this type of social signaling to occur automatically and without intention. The platform's functionality imitates the local search process of real social networks (by letting users browse the friendship network) and relies on the high clustering of social networks (the friends of our friends are likely to be friends as well). Communications and information relating to new

knowledge are embedded within the more general fabric of social interactions among individuals. Influence is accumulated through a pattern of information flows (received and transmitted) and is related to their social environment, their network of contacts and their status within the network (Ellison et al., 2007).

The notion of multiple people interacting on issues will continue forever. This trend of using the social web to gather information and circumvent traditional marketing messages is sure to continue and spread (CNET, 2007). The ease of use and popularity of these sites promises a new level of word-of-mouth (WOM) marketing strategies (Rosen, 2005). Social media marketers are predicting that the process of influence will change due to individual behavior changes that are dictated by the use of these new technologies. Inherent in the interface of these tools is an almost 'forced' sharing of information, applications, advice and social fun. This is the real genius behind Facebook. On Facebook alone, people are using the web to found web-based communities at a mind-boggling pace. People are using the immense search potential to find others with similar interests to shop more efficiently and to learn about products and services. More than one-third of consumers said in a recent study that in the future they will rely on product reviews found through forums and online networks. Already, 20% of consumers surveyed reported that based on information they found online, they purchased a different product than the one they originally intended to buy (S-Commerce, 2006).

The promise of the power of viral word-of-mouth marketing on new technology platforms such as facebook is having an intoxicating effect on advertisers. Could it be that these new platforms have really created such a different way of communication that they will alter the classic model of innovation?

With the realization that energy leaders are either going to rise to the level of leadership, innovation and collaboration required, or everyone is going to lose, the Bordeaux Energy Colloquim sponsored the study. The goal was to explore these new conduits for connecting and communicating with the common populace in order to more efficiently diffuse information and enthusiasm about the benefits of collectively entering the new energy paradigm of 'sustainability.' The open questions centered around consumer awareness campaigns and finding new channels of communication to diffuse ideas, paradigms, and even social movements into the global mainstream.

Could the 'Power of this Social Web' be harnessed to enact change in the global energy market?

The Research Process and Results

In order to achieve valid and testable results, the study was broken into phases, conducted over an eighteen month period. The first step was to create a large enough network. Using various methods of requesting friendship an initial network of over 500 virtual Facebook friends was created. Common interests and common friends played the most significant role in acceptance of the friendship request:

Friend of a Friend:	**Total 220 invites:**	**61% accepted**
***Member of a Common Group*:**	**Total 485 invites:**	**84% accepted**

Personality traits appeared to play less of a factor in the acceptance of a 'friend' request which may be due to the virtual environment making it easier to overcome introversion which might otherwise hinder active initiation of contacts in an offline setting (Mergel & Langenberg, 2007). A greater degree of anonymity and a lower level of commitment make it easier to create and disconnect from a tie. From this established network, a series of on-line sustainable energy campaigns was launched and participation was tracked and analyzed.

Phase I: Creating Groups – Common Interests Strengthen Ties

In this phase, I organized groups on Sustainable Energy and Social Network Analysis within the Facebook community. Results from the request to join a group are as follows:

Groups	Total fbf's* joined	% of total fbf's
O groups	70	15%
1 group	**430**	**86%**
2 groups	100	20%
3 groups	33	7%

Table 1: Group Joining Results

**fbf's –Facebook Friends*

Interaction through creation of groups created a channel for both informational and normative influence, which helped to strengthen ties (Stutzman, 2006, Walther et al, 2008). Interaction was strengthened by regularly providing informational links, videos, surveys and other relevant material about sustainable energy projects. This effort not only created a sense of co-orientation but also created a higher level of referent expertise, which eventually led to a higher level of influence. Acceptance of a 'friendship' connection in this online environment did lead to a level of reciprocity and expressed interest in knowing more about another. An 86% acceptance rate to join a group based on request was a surprisingly high number.

Initially joining a group when requested may have been a reciprocal act for agreeing to 'befriend' one another (Gladwell, 2002, Freedman & Fraser, 1966b). In befriending a person you are implicitly committing to be interested in them and their activities. Remaining consistent to this initial action may have caused the surprisingly high acceptance rate especially since the majority of these new Facebook friends had little or no previous involvement with sustainability or energy (Freedman & Fraser 1966a). After the group structure was in place, weekly group emails were sent which highlighted successful energy project case studies. In several of the emails I asked people to 'spread the word' and invite others to join the group. Recruiting activity was tracked over a ten week period to illustrate how word-of-mouth influence was diffused.

Members (10 week period ending 2-25-08)		**685**	
Total Joined		719	
Number of Drops		34	4.7%
Known (friend invites)		35	4.9%
Invites		131	18.2%
New Faces	**547**		**76.1%**
Friends of Friends	336		46.7%
Source Unknown	191		26.6%
Recruited	**316**		**44%**
Top 1 Recruiter – recruits	114		16%
Top 5 Recruiters- recruits	228		32%

Table 2: Recruiting Behavior Results

Conclusion: The majority of the recruiters had found the group site on their own (70%) and of the top 5 recruiters, only one had been invited and asked to recruit. This led to the conclusion that while virtual 'befriending' was enough for people to stretch their curiosities into examining other people's lives through a 'safe' level of interaction, it was not yet enough for people to activate their influence in recruiting others to join on my behalf. A separate *Facebook Behavior Survey (Samaha, 2008)*, conducted with the Social Networking Groups, also confirmed this finding. Survey results showed that many people were willing to ask for help or advice and imitate what they saw others doing, but much fewer were willing to promote or recruit others to join their activities:

- 53% of respondents claimed to ask online friends for recommendations about services, reputations and products
- 54% rarely invite friends to join groups, finding these types of invitations annoying to receive or send

When the top recruiters were asked how they recruited for the site they all used an *'invite all'* option based on their assumption that if they were interested in this group many of their friends would be as well. Again the previous *Facebook Behavior Survey* (Samaha, 2008) showed that this type of behavior was the exception and not the norm and that only a small percentage of the population has the propensity to influence, while others are more content to follow their advice. From these results, the recent marketing euphoria that word-of-mouth campaigns will create common viral hits in these new environments needs to be re-examined. It seems that people's natural behavior does not change dramatically when they go online. In summary the first phase of creating and managing Facebook groups provided the following insights:

- *Most active members of topic groups were 'early adopter' types* who found the group through searches and were already involved in the energy industry or sustainability movement
- *Active Recruiting is KEY to growth*
  - Averaged 70 new members per week
  - 44% of member growth from recruiters
  - 33% from the top 5 recruiters
- *Friends of Friends*
  - 47% of new members found the group through a friend
- *Weak -Ties are harder to maintain*
  - Group drop out rates averaged about 5% across the 4 active groups
  - Of the drop outs- 55% were second degree weak-ties (friends of friends invites)

While many social media marketing books still prescribe to a *"build it and they shall come"* attitude, this initial experience of administrating seven separate groups on Facebook, showed that content is not enough. Facebook Groups do provide a unique opportunity to create forums around shared interests and through these groups communication is easy and collaboration is possible. However, Facebook groups still are primarily passive and participation is limited to about 10-15% of the group members. Sending group emails, while easy to do, is often automatically disregarded as spam or not regarded as importantly as a personal note. Also accepting an invite to a group is quite easy and the first survey found that while many people sign up for 30-50 groups, they actively monitor less than five. As one of the group members commented:

> *To be honest a lot of people join a group simply because they find the title interesting and/or a friend sent it along, as such they seldom have any great interest in the topic.*

In this light, *Facebook Groups* should still be viewed more like mailing lists than active community spaces. From this initial exercise it was clear that a more active forum was necessary to create action. To further test participation, a second event was designed around more interactive engagement.

Phase II: Case-study Competition *- Virtual is Faster*

The second phase of the study centered on an online voting event. The event was designed around a case study competition and highlighted ten videos of sustainable energy projects from around the world. Members of the original group were asked to watch the videos and vote on which one they felt was the best example of individuals putting sustainable energy into action. The following is a summary of the projects:

1. Shelby Tyne- Greenway Farms - South Africa – Biogas from farm waste
2. Dan Robichaud - Canada - Solar Heater
3. DAXU - China – Biomass
4. Practical Action - Peru - Micro Hydro
5. AIDS - Phillipines - Hydro pumps
6. SKG - India - Biomass & Biogas
7. BioTech - India – Biomass
8. Center for Rural Technology - Nepal - Micro Hydro
9. Deng Ltd - Ghana - Solar PV Panels
10. SEEDS - India - Micro financing for Solar

Each of these projects represented real people out in the world making a real difference in people's lives while promoting a Sustainable Energy Future. Members of the orignial Sustainable Energy group were asked to come together as a group of concerned citizens

and commit their attention to how they might use their voice and individual actions to make a difference in the energy policy arena.

The case study competition was open in April 2008 and voting and recruiting was not restricted to Facebook users. The online survey site (Zoomerang.com) had over 1,400 visits to the competition survey page and over 800 registered votes. In total over 3,000 references to the site were reported. Videos were posted on the group site and weekly emails were sent out highlighting each of the videos and asking for people to comment and discuss the merits. From the commentary I received, ten videos of 5 minutes each was too much for the typical Facebook audience to handle:

> *Simplicity is the key…shorten the requirement that a person needs to expend.*
>
> *I think time is an issue and that most people spending a lot of time on Facebook are more likely there for social reasons (and to skip work) than being individuals looking at making a difference.*

In total 250 members of the group voted in the competition, representing 35% of the voting group and 22% of the Facebook group total. When I asked a few of our media and marketing members about their thoughts on the turnout - I received the following feedback:

> *Typically a 10% response is stellar in most marketing campaigns, but that's not what we're going for.*

Conclusion: The use of video certainly had a bigger impact on people's understanding of the human impact in creating a sustainable energy future, but as the survey showed, only a small percentage (<20%) of the voters actually watched all of the videos. The Facebook platform favors the use of video and photos and is not equipped to share documents, presentations or other more typical business medium. While Facebook is geared to this type of media, available internet connections make downloading and viewing videos slow and difficult. Survey results showed that most decisions were still made based on word-of-mouth requests or based on other criteria such as backing a certain type of technology or a geographic region. This supports another study by Kissielius & Sternthal (1984) that concurred that vividly presented information has a stronger impact on memory but not on judgment. They found that word-of-mouth recommendations still had the strongest influence on product judgments regardless of the vividness of the presentation.

On the positive side, results from this phase did clearly illustrated how social networking platforms such as Facebook have created innovative devices that allow new ways of reaching and influencing others which have never existed before. In line with diffusion of innovation/influence literature is accurate, having access to such a network should result in larger and more widespread diffusion at all levels. The demographic data supported the spread of this diffusion to a much more diverse age, geographic, professional and interest group.

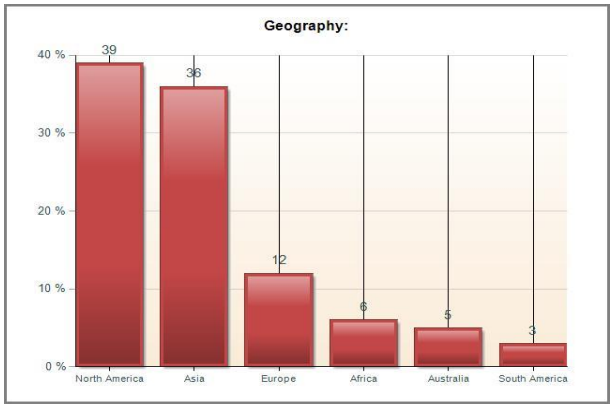

Figure 3: Demographic Results of Survey Participants

The goal of reaching into a younger demographic was also achieved

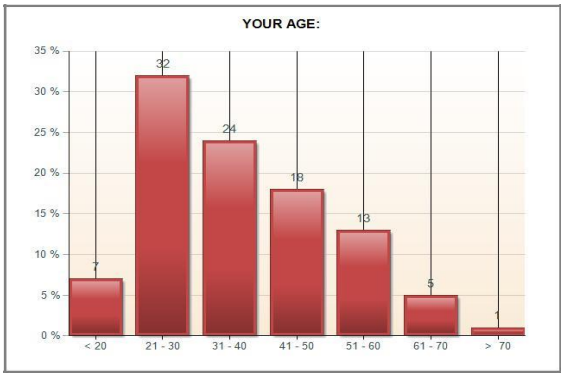

Figure 4: Age Demographics of Survey Participants

Finally spreading the word outside of the energy circle was the most successful with 90% of the voters from outside of the energy profession.

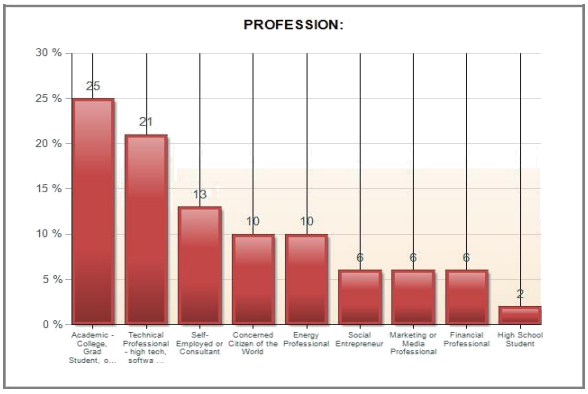

Figure 5: Profession Demographics of Survey Participants

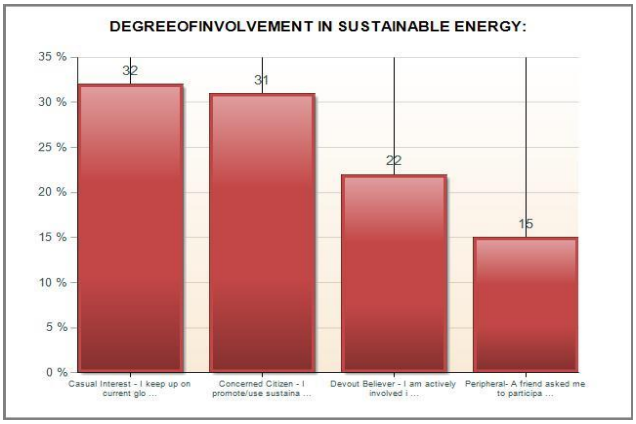

Figure 6: Reported Degree of Involvement in the field of Sustainable Energy

Tracking of the diffusion of influence through the online case study competition clearly illustrated the role of weak-ties as bridges that connect otherwise disconnected areas within the overall network and therefore span structural holes between two disconnected areas (Burt, 2002, Buchanan, 2002,Granovetter, 1973, 1975, 1985). Weak-ties link small worlds at the network level and are crucial to the success of the diffusion process. There were numerous international bloggers who wrote up the event, wired.com carried a piece, an entrepreneurial network in India posted the event, a newspaper in South Africa picked up the story and so did a TV broadcast in Canada.

Recruiting was successful with 58% of voters referred to the event while the remaining 42% came from the Facebook Sustainable Energy group. One person was able to rally significantly more support, capturing almost 50% of the votes. Those without recruitment efforts trailed significantly.

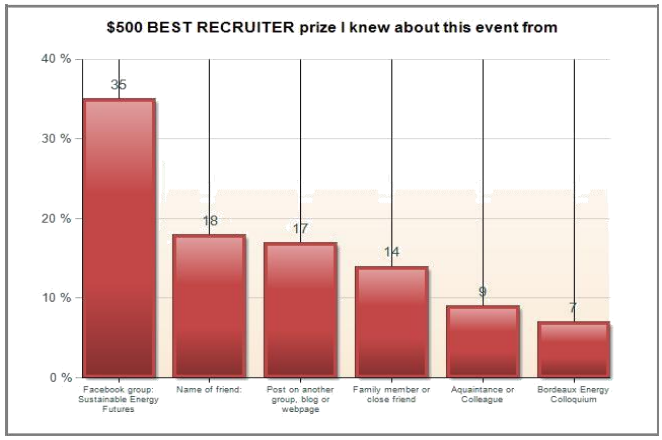

Figure 7: Self-Reports on Referral Behavior

The case study competition also highlighted a few critical elements to the limitations of the average attention span of Facebook users. Clearly some of the speculation about the Facebook platform being 'light, breezy and primarily for social fun' was proven to be true. Many of the group members (>40%) had signed up because they had been invited to and may have had little active interest in pursuing the topic to a level of detail. Member comments highlighted these limitations:

> From my experience I think it has to be made as simple as possible for the member. If they have to do too much it goes into the 'too difficult' box. With the internet you have two seconds to grab the reader's attention otherwise they are off onto something else.

The number and length of the videos was a limiting factor in this phase. In testing a virtual weak-tie's propensity for action, this seemed too large a task to ask. From the results of this phase, a third event was structured around a smaller, less time consuming request in hopes of generating higher results.

Phase III: Creating an Online Cause- Going 'Viral' is Still Unlikely BUT Success Should be Measured in Small Packages

Design of the third phase was constructed to better utilize some of Facebook's automatic signaling and tracking functions. The *Cause Application* on Facebook was designed to allow social causes and charities to recruit members and raise money within the Facebook community. Creators of the Cause application describe it as follows:

> Facebook Platform presents an unprecedented opportunity to engage our generation, most of whom are on Facebook, in seizing the future and making a difference in the world around us. Our generation cares deeply, but the current system has alienated us.

> Causes provide the tools so that any Facebook user can leverage their network of real friends to effect positive change.
>
> The goal of all this is what we call "equal opportunity activism." We're trying to level the playing field by empowering individuals to change the world. Existing nonprofits must raise hundreds of millions of dollars and leverage massive direct marketing campaigns to attract members. We're democratizing activism by empowering activists with an arsenal of tools for users of Facebook who want to leverage their network on Facebook to effect positive change.
>
> Any Facebook user with a little passion and initiative can create a cause, recruit their friends into that cause, keep everybody in the cause up-to-speed on issues and media related to the cause, and, most importantly, raise money directly through the cause for **any** U.S. registered 501(c)(3) nonprofit or Canadian registered charity. We process the donations automatically via credit card, tally the results, and report the donation activity via a public "scorecard" in the cause. This allows us to reward people who grow their causes, donate, and successfully raise money.
>
> This is a natural evolution of social networking. Leveraging real world social networks is an important part of activism, fundraising, and political campaigning. This is especially true of grassroots activism, local-chapter style nonprofit organizations, and the walks/runs used by many charities to raise money. Given all this, it's a bit surprising that online social networks haven't been more aggressively leveraged until now.

A cause of raising money to support a second case-study competition was set up – for every member who signed up for the cause, $1 of prize money would be donated by the Bordeaux Energy Colloquium. Once again, the established network of 500 Facebook friends was activated into action through a series of invitations sent out over a 5 week period. Of the group, 113 joined the cause representing a 24% response rate. In turn, 31 members (28%) recruited for the cause without being specifically asked to do so. Within the 2 month period the cause had attracted a total of 1,293 members, with close to half due to direct recruiting.

The automatic signaling function of the ‘newsfeed’ in Facebook definitely supported the recruiting activity since most of the recruiters had 1-3 people join, indicating that their friends had seen their activity and out of curiosity came onto the cause page to see what it was about. The top 100 recruiters accounted for 729 members, when my recruits are included it means that 76% of the members were recruited from the core group of the 113 people who were invited. All of the top 100 recruiters had over 4 recruits with an average of 7.4 recruits per person.

Conclusion: The automatic signaling function of Facebook was instrumental in spreading the word-of-mouth which decreased the need and inhibition of people to

directly recruit others. In all three phases, the sheer speed at which an electronically interconnected social network functions created a whole new dynamic, reaching entirely new audiences. Technically, this phase incorporated Facebook's built in social signalling devices which clearly helped to create a new form of word-of-mouth referral behavior that did not require the individual to directly recruit or notify their network.

The built in features of the site create many information feedback loops which led to increased observability and peer modeling resulting in a higher joining rate (Goldenberg & Muller 2001a). Due to the automatic signaling devices on Facebook, individuals need not be "aware" they are contributing to this endeavor - they are simply following their own micro-motivated rule-sets. Such signaling allows the system, as a whole, to process information and learn (Bandura, 1977; Ellison, 1993; Senge, 1994). Individual adopters are not usually cognizant of their contribution to a higher-scale order; rather, they make their decisions about innovations on the basis of social learning from their peers, primarily through common word-of-mouth (WOM) interactions (Hersberger et al., 2006; Luhmann, 1990).

The increase in weak-ties on the Internet can explain why information travels much faster today. There are many pieces of information that don't warrant a special call to distant friends but with a connection to Facebook, you can now know the daily thoughts of people you haven't seen in twenty years. This is the beauty of the finely crafted Facebook style word-of-mouth phenomenon. Every node in the network who decides to try something, inadvertantly passes the word further. This was clearly demonstrated in this third phase of the study, when each person signed up for the cause their entire network was informed of their action. Of the sample group, a 24% response rate would be considered an excellent response rate. The automatic signaling function of the 'news feed' in Facebook definitely supported the recruiting activity since most of the recruiters had 1-3 people join, indicating that their friends had seen their activity and out of curiosity came onto the cause page to see what it was about. While this may not be considered a 'viral' hit, from a one-hour effort to set up the cause and send out invitations, over 1,000 people became aware of the effort and took a moment of their time to express their support. Results at the macro-level supported the theory that while it may be possible to reach any individual through 'six degrees of separation', the adoption effect still happens within small cliques and it is the *connection* of these small worlds that creates a network effect.

Overall Conclusions: *The Pulse Generating Periphery*

A few hundred years ago, the only connections among human beings were made face to face. The first human to jump on the back of a horse elevated the network effect; then came the telegraph, the telephone and now the Internet. Every technological breakthrough allowed people to create links that were not bound by geography. The Internet has elevated the invisible network to an unprecedented level by creating millions of shortcuts of weak-ties across clusters. It is simply easier to maintain weak-ties on the Internet, particularly on sites like Facebook, which was designed around the principles of social networks. This, in turn, has changed the speed and nature of the diffusion of influence in word-of-mouth campaigns.

What this study ultimately found was that in a virtual environment, engaging in community based activity, may be based on a spur of the moment reaction or a sense of reciprocity, curiosity or simply time availability rather than based on good reasoning, moral correctness or a long-term commitment. In the extreme nature of an online community, the line between real and virtual becomes blurred due to the fact that interaction is limited to a few strokes of the keyboard. With the inordinate amount of choice and demands now available, it is increasingly easy to become frozen in "analysis paralysis" and instead rely on very primitive forms of social cues (imitation or word-of-mouth referrals) to guide online behavior. Results consistently illustrated these dynamics: in all three of the diffusion experiments, it was clear that word-of-mouth references brought new and diverse individuals into the system creating a larger and more diverse field of awareness, however when any significant time-related actions (such as watching the videos) were requested a much smaller percentage of people were willing to commit.

Within the professional field of energy and electricity, technological possibilities and social needs are driving us toward a whole new landscape of consumer participation. Truly arriving at a global energy infrastructure based on the principles of sustainability will require more than good intentions and political will - it will require the equivalent of a social movement. A movement aimed at displacing the well entrenched dynamics of the old hierarchical, vertically-integrated, supply-side oriented

structures of the globalization paradigm toward the new-found principles of sustainability.

Rising to this challenge requires the acceptance of the shared perception that our world is being shaped by the convergence of overcrowding and depleted resources. Yet, in order for a true sustainable energy paradigm to emerge, people need more than doomsday based motivation; they need hope. Broadcasting the success stories and illuminating the human face of overcoming energy poverty is the right first step in propagating a change this big, this long term and this daunting. So while the diffusion of influence through social networks such as Facebook may not ensure long-term commitment or subsequent action from the participants, it is a highly effective tool in creating successful awareness campaigns. The creators of the Facebook Cause application summarized the notion as follows:

> We're democratizing activism by empowering activists with an arsenal of tools for users of Facebook who want to leverage their network on Facebook to effect positive change.

This shared perception of creating a new societal structure within these virtual communities is not new, but finds its roots in the philosophy of *deliberative democracy* (Habermas,1991a). It is a remake of Habermas' optimistic future vision that imagines clusters of small associations forming a pulse-generating periphery of politics, fulfilling his hope that a *'context of discovery'* could play a more significant role than the *'role of justification'*. In this context, a dynamic interplay between institutionalized and non-institutionalized discourse might indeed result in a collective process of deliberative politics. Eventually, the public sphere could become a communication structure localized in civil society through an associational network of civil society. By maintaining the small scale of many interconnected small-worlds versus the large impersonal scale of bureaucracies, an intimate sphere based on personal, emotional bonds between members could be maintained.

Ultimately, the public sphere is a communication structure localized in civil society that functions on a person-by-person basis. It contains an intimate sphere based on personal emotional bonds between members, a voluntary sphere based on various commitments of membership and a cultural sphere where the interpretation and formation of opinions can take place. It is only when everyday citizens no longer feel they have the power to make a difference that the system imposes its own limitations.

Linking various types of associations – real and virtual - can truly enable people to become agents of change.

At the end of the day there is no central authority that will come up with a master plan to make our planet more sustainable. It will only be through a dynamic interplay between institutionalized and non-institutionalized discourse that a collective process of deliberative politics can take place. The tension of duality between the standards of an old regime and its processes combined with the dynamics of these newly emerging virtual social networks will inevitably create many unpredictable results. Patterns of interactions on these new virtual forms of social networks consistently show that in the diffusion of influence apparent chaos always results in some pattern of order. In response to a single scenario, the structure of the network could change, but so could the pattern of activity on the network. Each kind of decision helps set the context in which the subsequent decisions must be made.

Social networks are not lattices and not everything can be scale-free. All networks share resources and distribute loads in a way that is both good and bad. On the positive side small efforts can have big effects. On the negative side, in virtual online social networks, autonomy seems to be one of the by-products. Individuals in virtual communities can maintain loose degrees of relatedness and group realities can be socially constructed with only a partial understanding of context or future commitment from the participants.

In this light, creating the right type of organizational structures to bring about change in today's context will prove challenging. A torrent of theoretical work has tried to shed light on this matter, but at the core of these explanations lay two essential requirements: first, individuals must care about the future and second, they must believe that their actions affect the decisions of others. Hopefully, the findings and results of this study will encourage further efforts for individuals to start small and contribute regardless of size, knowing that all efforts ultimately have influence over the larger system. In actuality, it is not an isolated group of variables that unlocks a 'magic formula' and solves generalized problems, it is the intersection of a group of interested people and positive action that really creates change.

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