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Sourcing Innov@tion Intelligence from LinkedIn Discussion Groups: An Exploratory Study

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Crowdsourcing may facilitate lower-cost knowledge production for R&D and innovation organizational processes. Crowdsourcing technological platforms have been increasingly used by innovative organizations.

We explore the usage of discussion groups in LinkedIn as crowdsourcing platforms. We perform a mixed exploratory study (netnography and survey) to study the perceived professional benefits from active/passive participation of R&D/innovation-related managers in a group linked to innovation professionals, academics, consultants and policy-makers.

Netnography results indicate that discussions focus on tangible innovation problems and idea debate and are dependent on a few brokers to maintain dynamic. Survey reveals that perceived benefits for innovation-related professionals are linked to R&D activities: personalized interaction with peers, up-to-date information and social surveillance. Group participation allows innovation-related professionals to become better knowledge integrators and improve their management practices.

While exploratory, results point towards usage of LinkedIn discussion groups to source solutions for R&D/innovation problems, clarify perspectives and benchmark good practices.

1. Introduction

The open innovation model can unveil the ways in which organizations open their borders to undertake lower-cost innovation (Lüthje et al., 2005, Ogawa and Piller, 2006, Souitaris, 2002) and to integrate external sources of innovation in their R&D and innovation processes (Chesbrough, 2004, Chesbrough and Crowther, 2006, Chesbrough, 2006).

Crowdsourcing is frequently used to source external knowledge, as it may facilitate lower-cost knowledge production to be incorporated and integrated in R&D/innovation organizational processes. Crowdsourcing online platforms are increasingly more used by innovative organizations

(Bonabeau, 2009, Hudson-Smith et al., 2009, Leimeister et al., 2009, Vojnovic and Dipalantino, 2010), as a way towards more sustainable innovation practices[1].

Recent studies point that with the emergence of discussion groups on online social networks[2], these might be used as crowdsourcing platform by group members, especially if those members look to source specific knowledge (Bonabeau, 2009, Cummings et al., 2010, Hudson-Smith et al., 2009, Santonen and Lehtelä, 2010, Saur-Amaral and Rego, 2010, Vojnovic and Dipalantino, 2010, Vukovic, 2009)

Our paper focuses on the usage of discussion groups in LinkedIn as a crowdsourcing platform and analyzes the perceived impact of active and passive participation of R&D/innovation-related managers in a LinkedIn group designated ISPIM.

We study R&D/innovation-related managers in their role as discussion group members and we see to understand whether the knowledge they may create/receive as a result of their participation is perceived as useful for them, in their professional activity (i.e. R&D/Innovation management).

In the theoretical component, we focus on crowdsourcing in social networks. In the empirical study, we analyze a discussion group in Linkedin based on a community of innovation professionals. We combine a) netnography and social network analysis to understand the community behind the discussion group, and b) online survey to analyze the perceived impact of active and passive participation of R&D/innovation-related managers in ISPIM discussion group. Next, we discuss findings and study limitations. Finally, implications for theory, practice and policy are discussed, and conclusions are presented.

2. Crowdsourcing in Social Networks

2.1. *Crowdsourcing: Usefulness for R&D/Innovation Managers*

The crowdsourcing concept is recent and emerges from practice. Howe (2006) introduces this concept as a way to use the crowd (people in general, unlinked to any specific organization and unrelated to any organizational hierarchy) as content/knowledge producer.

Several authors relate crowdsourcing to web 2.0 potential[3] to obtain contributions from a large number of people on a given issue at low cost (Bonabeau, 2009, Hudson-Smith et al., 2009, Leimeister et al., 2009, Vojnovic and Dipalantino, 2010, Vukovic, 2009).

We define crowdsourcing as a set of methods/techniques typically supported by web-based technologies, used to obtain low-cost external contributions (i.e. source external knowledge) potentially useful for an organization, from a large number of individuals. This is the operational definition we assume in our paper.

There are four types of crowdsourcing activities:

- Crowd wisdom (CW) – using knowledge and information outside the organization to help with decision-making, predict markets or perform specific tasks (Dahlander and Magnusson, 2008, Howe, 2008, Jouret, 2009, Leimeister et al., 2009, Thayer, 2001, Thayer, 2006);

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[1] We see organizational sustainability as the organizational capacity to strive, survive and compete in the market place e.g. via innovation (Schot and Geels, 2008). Pharmaceutical industry is e.g. focused on sustainable R&D processes (Achilladelis and Antonakis, 2001, Quéré, 2003, Saur-Amaral and Borges Gouveia, 2007, Saur-Amaral and Kofinas, 2010).

[2] From this point onward, when referring to social networks, we assume they are online social networks
[3] Ahonen (2007) exceptionally explores crowdsourcing from communities of practice via brokers.

- Crowd creation (CC) – generating content and value it (Almeida et al., 2010, Bernoff and Li, 2008, Buckley and Giannakopoulos, 2010, Han, 2010, Howe, 2008, Huberman et al., 2009, Kho, 2006);
- Crowd voting (CV) – filtering and ranking online content (Howe, 2008, Liu et al., 2008, Park and Pennock, 2007);
- Crowd funding (CF) – capacity of the crowd to finance specific activities or a specific project (Howe, 2008, Kiva, 2011, Levenshus, 2010, Lipton, 2009)

Crowdsourcing may be useful for R&D or innovation in organizations (Bonabeau, 2009, Cummings et al., 2010, Howe, 2006, Howe, 2008, Hudson-Smith et al., 2009, Leimeister et al., 2009, Santonen and Lehtelä, 2010, Saur-Amaral and Rego, 2010, Vojnovic and Dipalantino, 2010, Vukovic, 2009), by solving concrete issues in the R&D/innovation processes and helping R&D/innovation managers to better integrate information/knowledge (Becker, 2011) (see Table 1).

Table 1 – Main benefits of crowdsourcing for R&D/innovation managers (compiled by authors)

Focus	Benefit	Reference	Crowdsourcing Type
R&D	Problem identification	(Cummings et al., 2010)	CW, CC, CV
	Idea generation	(Muhdi et al., 2010, Santonen and Lehtelä, 2010)	CC
	Idea debate/development	(Saur-Amaral and Rego, 2010)	CW, CC
	Personalized interaction with and feedback from users	(Whitla, 2009)	CW, CC, CV
	Problem-solving	(Saur-Amaral and Rego, 2010)	CW
	Integration of disperse knowledge (better knowledge brokers and project managers)	(Becker, 2011)	CW, CC
Market / Strategy	Future scenario development	(Saur-Amaral and Rego, 2010)	CC, CW
	Opening markets and creating new market share	(Whitla, 2009)	N/A
	Advertising and promotion activities	(Whitla, 2009)	N/A

Crowdsourcing is usually supported by Internet-based technological platforms (Cummings et al., 2010, Muhdi et al., 2010, Santonen and Lehtelä, 2010, Saur-Amaral and Rego, 2010). However, the usage of social networks as technological platforms for crowdsourcing is still in its infancy (Saur-Amaral and Rego, 2010).

2.2. Online Communities and Social Networks: Dynamic and Current Usages

Social networks allow grasping knowledge shared by their members. They are rich knowledge sources for organizational innovation (Hampton and Wellman, 1999, Lai and Turban, 2008, Lee and Crawley, 2009), within the communities of practice framework (Santonen and Lehtelä, 2010, Vrasidas and Veletsianos, 2010) or linked to marketing and new product development (Cummings et al., 2010, Saur-Amaral and Rego, 2010, Whitla, 2009).

In social networks, both in real life environment and in virtual spaces, knowledge is constructed in the head of the learner through social interaction; rules of relationships are constantly renegotiated as a sign of mutual learning; active contributors have different importance in distinct moments (Kozinets, 2009, Vrasidas and Veletsianos, 2010).

Online communities[4] differ according to their scope/intended usefulness and to the type of interaction, ranging from gaming spaces to debate forums. Kozinets (2009) identifies four types of communities (Cruising, Bonding, Geeking and Building) and emphasizes that participants behave differently in those communities according to their commitment and skills to each specific community, as they "*have a transformational effect on their participants, allowing them to organize more effectively and to focus on the specific tasks needed for longer-term realization of their objectives*" (Kozinets, 2009, p. 39).

Facebook was created in 2004 to keep in contact university students and help maintaining their entertainment activities and social network sites were seen to support "*loose social ties*" and, by so doing, to increase "*bridging social capital*" (Ellison et al., 2007), due to their technological capacity to facilitate the maintenance of such ties. Later on, other uses are identified (Joinson, 2008):

- Social surveillance (virtual people-watching);
- Communication (private messages, writing on walls);
- Perpetual contact (seeing what people have put as their 'status', continuous updates, seeing what friends have been up to).

Nowadays, online social networks include community spaces for discussion and debate, or just for sharing information/knowledge (Joinson, 2008, Papacharissi, 2009, Shu et al., 2009, Skeels and Grudin, 2009). Research collaboration (Makridakis et al., 2010), possibility to learn (Cheung and Lee, 2010), opinion-making (Coenen, 2006, Coenen et al., 2006) are some of the collaboration-related usages.

Emergence of different technological platforms for online social networks allows creating several types of social networking online, with specific communication and relationships between their members, personal- and professional-oriented (Adamic and Adar, 2005, Kadushin, 2005, Licoppe and Smoreda, 2005, Papacharissi, 2009, Skeels and Grudin, 2009, Tampubolon, 2010, Toivonen et al., 2009).

LinkedIn (2011) is a worldwide professional-oriented social network that "*operates the world's largest professional network on the Internet with more than 100 million members in over 200 countries and territories*". Papacharissi (2009) considers that a key success factor in LinkedIn is trust between the connected members and the specific way of communication, more professional: "*LinkedIn employs an architecture that provides its members with a 'professional sense of place', thus enabling and suggesting professional modes of interaction: referrals, introduction, networking, professionally related questions, answers and conversation*" (p. 204).

Saur-Amaral and Rego (2010) analyze two discussion groups on innovation-related topics in LinkedIn, identify the type of themes posted by group members and show that:

- There is interest for knowledge sourcing from those groups, yet knowledge sourcing attempts seem to receive different feedback;
- A large part of the members of both groups are not actively participating in discussions.

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[4] Online communities are cyberspaces composed by individuals which share similar interests/values and adhere to communication norms (Papacharissi, 2009, Skeels and Grudin, 2009). They have two components: a) Where: online, on Internet-based platforms (Papacharissi, 2009, Shu et al., 2009); b) How: behavior, rules, norms and actions (Albors et al., 2008, Dahlander et al., 2008, Ebner et al., 2009, Kavanaugh et al., 2003, Lytras et al., 2009, Skopik et al., 2010).

Skeels and Grudin (2009) identify different behaviors and usages of LinkedIn according to generation: Facebook generation uses Linkedin to connect, keep in touch and share knowledge while the older generation uses it as a substitute to business cards. They also refer that LinkedIn is used by recruiters to identify and contact job candidates and only scarcely to collaborate and discuss ideas.

Social networks are, therefore, connecting and knowledge-sharing platforms, used in different ways by different people (see Table 2)

Table 2 – Main usages of social networks

Usages	References
Create and maintain social ties	(Boyd and Ellison, 2008, Kozinets, 2002, Kozinets, 2009, Papacharissi, 2009, Skeels and Grudin, 2009)
Social surveillance/passive contact	(Joinson, 2008, Kozinets, 2009, Papacharissi, 2009, Saur-Amaral and Rego, 2010)
Collaboration, need to belong to a community	(Makridakis et al., 2010, Papacharissi, 2009, Skeels and Grudin, 2009)
Development of intellectual capital, via development of individual knowledge, i.e. learning	(Cheung and Lee, 2010, Coenen, 2006, Coenen et al., 2006, Joinson, 2008, Papacharissi, 2009, Saur-Amaral and Rego, 2010, Shu et al., 2009, Skeels and Grudin, 2009)

2.3. Crowdsourcing in Social Networks

Drawing on previous discussion, we adapt key elements of crowdsourcing to online communities and their rules (Table 3). To use social networks as a crowdsourcing platforms via the individual worker in a given organization, additional care should be taken to integrate the community, the knowledge sourcing process is done at individual level.

There are additional benefits at R&D level: informational, networking and tacit knowledge transfer via observation, i.e. social surveillance. However, as it requires integration and obtaining legitimization from a community, crowdsourcing in social networks may take longer than regular crowdsourcing.

Empirical studies are necessary for testing whether this specific type of crowdsourcing can be efficiently applied in practice. In this paper, we focus on understanding the perceived impact of active and passive participation of R&D innovation managers in discussion groups.

Table 3 – Comparison of Regular Crowdsourcing with Crowdsourcing in Social Networks

	Regular Crowdsourcing	Crowdsourcing in Social networks
Approach	Set of methods/techniques supported by web-based technologies, used to obtain low-cost external contributions potentially useful for an organization	Methods = discussions in groups or interaction via direct messages or polls to social network members. Topics of discussion/interactions should be relevant for the member (professional side), which then acts within an organization
Crowd	Content/knowledge producer	Social network members, in discussion groups or connection network
R&D benefits	• Problem-identification • Idea generation • Idea debate/idea development • Personalized interaction with and feedback from users • Problem-solving • Learning (capacity to integrate)	• Problem-identification • Idea generation • Idea debate/idea development • Personalized interaction with and feedback from peers or users • Problem-solving • Learning (capacity to integrate) and opinion-making • Informational purposes • Best practices (social surveillance of peers) • Networking (social capital)
Market / strategy benefits	• Future scenario development • Opening markets and creating new market share • Advertising and promotion	• Future scenario development • Opening markets and creating new market share • Advertising and promotion
Organizational activities	• Marketing, advertising • New product development	• Marketing, advertising • New product development
Type of crowdsourcing	• Crowdwisdom • Crowdcreation • Crowdvoting • Crowdfunding	• Crowdwisdom • Crowdcreation • Crowdvoting (a lot!) • Crowdfunding (less frequent)
Organized and promoted by	Organization, via specific platforms, with or without intermediaries	Individuals, as professionals part of an organization, without intermediaries (but it could be part of an organizational strategy
Interaction with crowd	Can exist or not	Always exists
Key issues	• Define properly the issue to be crowdsourced • Target crowd • Evaluate cost and integration in organization	• Define properly the issue to be crowdsourced • Target discussion groups and relevant members • Evaluate integration in organization • Be part of the community • May take a while to put in place

3. Methodology

We use mixed-method approach (see Table 4) to study The International Society for Professional Innovation Management (ISPIM) discussion group on LinkedIn, declared as "*a worldwide network of professionals involved in Innovation Management*" with the goal "*to create a worldwide network of excellence in the field of innovation management, enhance collaboration and research on innovation*" (ISPIM, 2008).

Table 4 – Methodological overview: Units of analysis and rationale

Methods	Unit of analysis	Rationale
Netnography	Discussions between group members on LinkedIn, measured in terms of themes and corresponding comments, type of discussant member, period when discussion took place	Identifying knowledge subject to crowdsourcing in the group, assess potential for R&D/innovation and evaluating active participation of group members in discussion. Integrating the community to allow evaluation of findings
Social network analysis	Interaction or relation between group members, measured in terms of connections of individuals, types of contact, frequency of contact	Identifying relationship patterns between group members and themes and their evolution in the analyzed period
Survey	Individual group members, measured as individual profile on LinkedIn	Identifying perceived usages of discussion groups in professional activity of R&D and innovation-related professionals

Our choice of this discussion group is motivated by:

- Assumption that R&D/Innovation-related managers use innovation-related discussion groups;
- Good group membership/dynamic (as observed by Saur-Amaral and Rego, 2010) - 2.352 members when data was collected; one author was an active member;
- Group access/familiarity with discussed topics (Kozinets, 2009).

Our empirical study includes two data collection moments:

- 11/03/2011: collection of all discussions and comments between 11/12/2000 and 11/03/2011 via copying and pasting into an Excel spreadsheet, giving 240 comments to 109 discussions.
- 26/03/2011: survey launch via personalized emails, giving 74 respondents.

3.1. Netnography

Netnographies are ethnographies applied to online communities (Kozinets, 2002, Kozinets, 2009). Table 5 presents our methodological approach.

Content analysis on discussions and corresponding comments is performed in NVivo9. Coding focused on the identification of the type of knowledge sought on this LinkedIn group and followed the typologies of discussions identified by Saur-Amaral and Rego (2010).

Table 5 – Netnography: Methodological Concerns

Netnography steps	Our methodological approach and choices
Definition of research questions, social sites or topics to investigate	Our research question follows the research questions of our paper. We use netnography to explore **usage of discussion groups in LinkedIn as a crowdsourcing platform**. We plan the research, debate various options between the three authors and decide to focus on innovation-related discussion groups, as crowdsourcing is linked to inputs to R&D and innovation.
Community identification and selection	We choose a discussion group which is dynamic and has a lot of members, using Saur-Amaral and Rego (2010)'s clue that not all discussion groups were dynamic and had interactive discussions. We choose ISPIM Discussion group on LinkedIn because it fulfils above-referred criteria, is linked to a community of innovation-related professionals and one of the authors knows the discussion group (community participant – immersion).
Community participant observation and data collection	One of the authors has been a member of the community for more than one year. Data collection is performed from onsite discussions and comments between mid-December 2010 to mid-March 2011. Before initiating data collection, permission to study is obtained from group manager.
Data analysis and iterative interpretation of findings	We perform content analysis with NVivo9 on all discussions, identifying topic type (i.e. problem solving, idea debate etc.). We identify innovation-related themes.
Write and report research findings and theoretical or policy implications	We analyze results in the light of the model of crowdsourcing in social networks. We complement results with survey results (see next section).

3.2. Social Network Analysis

We perform social network analysis (Borgatti et al., 2002, Nooy et al., 2004, Scott, 2000, Wasserman and Faust, 1994) to map and analyze individual networks (post and comment) and monthly topical networks (topic and discussion clusters), focusing on the social relations among a set of actors, i.e. R&D/innovation-related professionals, members of ISPIM Discussion group. We use Pajek (Batagelj and Mrvar, 2003, Nooy et al., 2004) to generate the network, with the network data constructed from the same Excel spreadsheet.

Discussions were grouped in three periods to show the dynamics of the network over time and to grasp the change in the structural features of the network: (1) Dec'10-Jan'11; (2) Feb'11 and (3)

Mar'11. We focus on social roles (member of discussion group) and cognitive (engagement in certain discussion topics or threads)[5].

Subsequently, we create two types of networks: a) communication, i.e. those who post and comment in the discussion group; b) topic, i.e. the network of individuals who responded to same topics. For both networks, we keep the members anonymous (Kozinets, 2009), focusing uniquely on network's structural features.

3.3. Survey

Five hundred personalized emails were sent via the LinkedIn InMail interface. Individuals were asked to answer to three questions: a) *How did your participation in ISPIM discussion group help you to improve your professional activity?* b) *Think about people you know that are doing the same function as you do. What benefits could they obtain from participating in this specific group?* c) *Think about other LinkedIn discussion groups where you participated. Are there any other benefits you have not mentioned before, that helped you improve your professional activity?*

Survey structure is based on previous studies (Haythornthwaite, 2000, 2001, 2002a, 2002b, 2005; Haythornthwaite and Wellman, 1998; Haythornthwaite et al., 1995).

Seventy-four individuals (14.8%) responded (22,3% female). Twenty-one respondents are professors, seventeen innovation professionals, fourteen top managers, nine consultants, five research professionals, four students, one editor, one policy-maker and one unemployed.

Most innovation professionals (10) are in job for less than 5 years; they might belong to Facebook generation. Top managers, consultants and professors are distributed between new in function and more experienced professionals. There is one research professional working in this area for more than 30 years.

Most respondents started using discussion groups on LinkedIn in the last two years. Experience in other discussion groups outside LinkedIn might create a learning background and perhaps compensate this. More than 20% of all respondents have been using discussion groups for more than two years, which indicates a certain experience in dealing with such groups.

We analyze data with NVivo9 and coding follows the types of benefits for R&D and market referred in Table 3, in an open exploratory-confirmatory approach. We look closely at answers by R&D/innovation-related managers and contextualize them in the discussion group, which acts like an innovation eco-system.

4. Results
4.1. Netnography

Table 6 contains a synthesized perspective of the discussions. Most members post discussions focused on sharing public knowledge (i.e. articles, free book chapters on innovation, academic papers) or on the resolution of tangible innovation problems that members dealt with in their professional lives. Idea debate and invitation to join specific initiatives (i.e. European projects, specific events) are scarce. Advertising own products, businesses or oneself is quite prominent.

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[5] Some dyadic attributes that become focus of network analysis are *kinship*, *social roles*, *affective*, *cognitive*, *actions*, *flows*, *distance*, *co-occurrence* (Batagelj and Mrvar, 2003, Borgatti et al., 2002, Nooy et al., 2004, Scott, 2000, Wasserman and Faust, 1994)

Some types of discussions are more commented than others. Tangible innovation problems receive the highest number of comments, followed closely by idea debate.

Table 6 - Types of discussions/themes posted by group members within the analyzed period

Type of discussions launched	N.º of discussions launched	N.º of comments received
Advertising	18	18
Idea debate	8	66
Invitation to join initiative	6	30
Job search	1	0
Other	3	1
Poll	5	8
Sharing public knowledge	46	22
Synthesis	1	1
Tangible innovation problem	20	70
Thematic spam	1	10
Total	109	240

We look at discussions that received more comments (Table 7). Four discussions on tangible innovation problems are among the most popular, and so are two discussions on idea debate.

Content analysis indicates that discussions containing short questions asking for help/opinion are more commented than those with longest questions. In those discussions, discussion creator frequently gives feedback after comments have been posted, synthesizes and thanks contributors.

Table 7 – N. º of comments for top commented themes

Discussion	N.º of comments
Idea debate 1	39
Invitation to join initiative 1	24
Tangible innovation problem 1	18
Tangible innovation problem 2	16
Advertising 1	15
Other	15
Idea debate 2	10
Tangible innovation problem 3	10
Thematic spam	10
Poll 1	7
Sharing public knowledge 1	7
Tangible innovation problem 4	7
Total Top 12 discussions	178

Top 12 commented discussions receive 178 comments (85% of all comments), suggesting lot of discussions with no comments. Of a total of 109 discussions, 66 received no comments (see types of such discussions in Table 8), indicating unilateral communication.

Most situations were of information shared to participants, followed closely to advertising self, own products or business. Seven out of 20 tangible innovation problems remained unanswered. Several reasons may explain the finding: a) discussion doesn't interest members; b) discussion doesn't require comments, e.g. is just to inform; c) member who posted discussion is inexperienced and did not put the question properly to motivate members to answer; d) member isn't considered part of the community (i.e. worth responding) by other members and is, therefore, ignored.
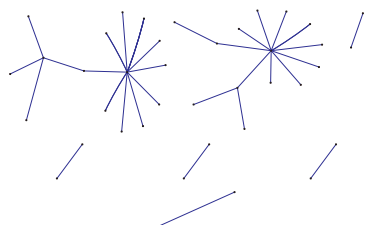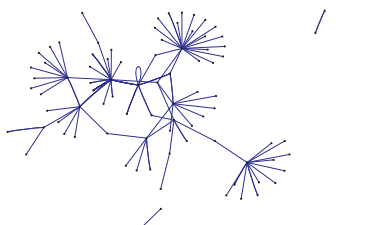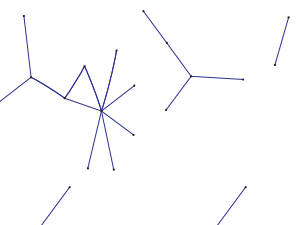
Table 8 - Uncommented discussions

Type of discussions	N.º of themes with no comments
Sharing public knowledge	36
Advertising	15
Tangible innovation problem	7
Poll	3
Invitation to join initiative	2
Other	1
Job search	1
Idea debate	1
Total of uncommented discussions	66

4.2. Social Network Analysis

We build the first network, mapping members who post and comment. Table 9 shows that February 2011 is the period when most of the group members (N=86) engage in the discussion.

Table 9 - Network dynamics of poster and commentators: 3-months perspective

December 2010 - January 2011	February 2011	March 2011
N=39 d [loops allowed] = 0.0499671 d [no loops allowed] = 0.0512821 4-core Betweenness Centralization = 0.10830	N=86 d [loops allowed] = 0.0339373 10-core Betweenness Centralization = 0.43805	N=24 d [loops allowed] = 0.0833333 d [no loops allowed] = 0.0869565 3-core Betweenness Centralization = 0.16085

All nodes depicted using Pajek with Kamada-Kawaii algorithm with separate components.
Data gathered on 11/03/2011

Table 10 - Network dynamics of topic discussion

December 2010 - January 2011
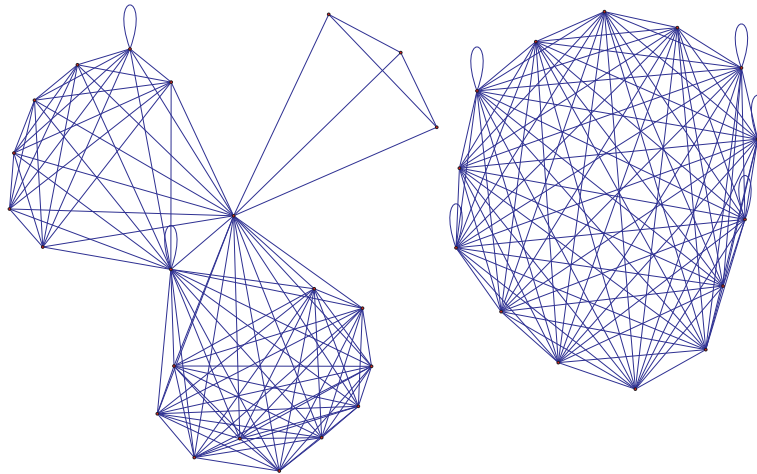
N=36
d [loops allowed] =
0.3109568
13-core
Betweenness
Centralization =
0.14790

February 2011
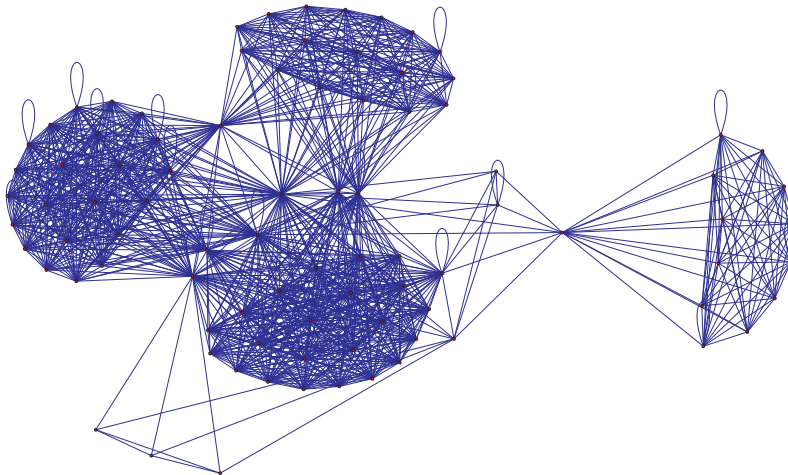
N=88
d [loops allowed] =
0.2776343
28-core
Betweenness
Centralization =
0.27995

March 2011
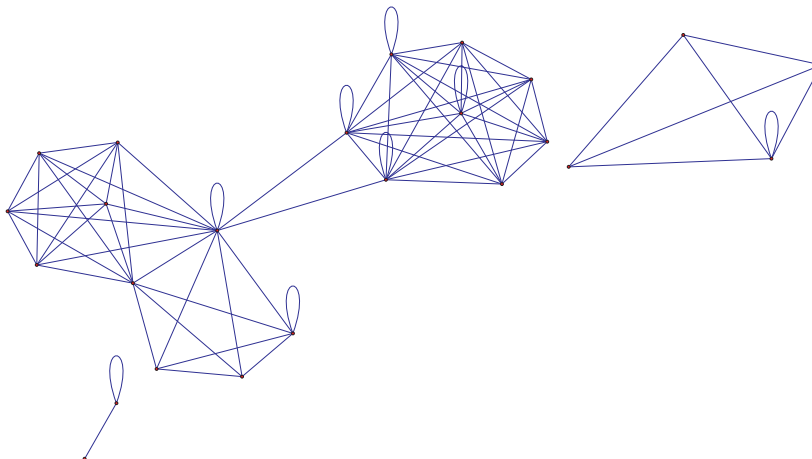
N=24
d [loops allowed] =
0.2465278
7-core
Betweenness
Centralization =
0.30263

All nodes depicted using Pajek with Kamada-Kawaii algorithm with separate components.
Data gathered on 11/03/2011

Density measures show that although the network grew from Dec'10-Jan'11 to Feb'11, cohesiveness was decreasing (d=0.049 to d=0.03). This cohesiveness is restored in Mar'11 but overall network

shrinks dramatically indicating low exchange in post-and-comment activities. We didn't identify any external event that might have led to this variation. Posts seem to be random.

Network structure shows that, as the network grows, its centralization increases. Information flows quicker within the network, with brokers connecting subgroups playing their role as information hubs. This structure enables quick post-and-comment exchange.

We can also see that those isolated from the main network fluctuate over time (from five components in Dec'10-Jan'11 to two in Feb'11 and three in Mar'11).

Two possible explanations can be offered: a) this might indicate instability of *participation*, i.e. the group member posting discussion topic(s) and those commenting on them; b) this might indicate 'stability' and 'focus' in terms of the *topic* being discussed, i.e. relatively fewer new topics and as discussion matures over time, only concerned individuals respond and further idea exchange.

We then map the second network dynamics of the group members discussing certain topics (see Table 10). Each cluster maps members discussing the same topic.

Changes in network structure show a crystallizing period (i.e. Feb'11), when all network components are linked. Network measures do not reveal anything extraordinary other than increasing centralization (rather than fluctuation, from 0.147, doubled to 0.279, to 0.302), i.e. discussion network becomes dependent more and more on fewer individuals – without whom the discussions on the topic will collapse.

In Dec'10-Jan'11 there are four topic clusters: *Poll* (PL), *Sharing Public Knowledge* (SPK), *Invitation to Join Initiative* (IJI) and *Tangible Innovation Problem* (TIP). TIP is a relatively big cluster and discussed by lot of network members, yet is detached from the rest. While IJI is the smallest cluster, it links to P and SPK discussions, with two members bridging these three topics. These two members, acting as bridge or 'brokers' play vital role in linking the two big groups (SPK & PL) and a much smaller one (IJI).

In Feb'11, all seven topics (IJI, TIP, *Idea Debate* – ID, *Advertising* – AD, *Synthesis* – SY, and *Other* – OT) are linked, making up the whole network without separated components. Centralization jumps from 0.147 to 0.279, indicating the effectiveness of the network as communication channel. Topics are not discussed in isolation (notable exception might be SY and AD, the least discussed).

We can see the emergence of new *brokers* (or bridges), linking two or more discussion topics. This could mean *an adoption and amalgamation of ideas embodied in the brokers*. While they participate in a certain conversation, they also link to other topics, becoming more knowledgeable. These brokers might act as information/topic channel if maintaining for longer periods, like the adoption channel in diffusion theory. The high core value (28-core) indicates that intensive discussion might happen in the network.

In Mar'11, network size shrinks dramatically to nearly a quarter of previous month. Two subgroups separate from the main network. There are six topics, i.e. IJI, AD, TIP, SPK, ID, and Thematic Spam (TS). Despite this, much less group members engage in discussions.

Network structure in Mar'11 resembles Dec'10-Jan'11. It has separate components and fewer brokers. Main network component consists of three subgroups linked by one broker, without which the network collapses undoubtedly (also reflected by a relatively high centralization value of 0.3).

This structure reflects a high dependence on key member (i.e. broker) and perhaps poses a threat of a blockage in the idea diffusion once the key member leaves the network.

4.3. Survey on perceived impact of discussions on professional behavior of R&D and innovation-related managers

Respondents mention distinct benefits (see Table 11). R&D-related benefits (Level I) are top references of the respondents (mentioned 355 times), while Market and strategy benefits (22 times) and Community contributions (12 times) are rather scarce. Individual interests, e.g. job search and individual opportunities also appear, in low number (4 times).

Table 11 – Perceived usefulness of ISPIM Discussion Group for self and others

Benefits: Level I Level II	N.º of times the benefit was referred by respondents
A. R&D BENEFITS	273
1. Problem identification	6
2. Idea generation	0
3. Idea debate/development	36
4. Problem solving	0
5. Personalized interaction with peers and feedback from them	79
6. Learning (interaction and opinion making)	40
7. Social surveillance for best practices	20
8. Networking	40
9. Information	52
B. MARKET AND STRATEGY BENEFITS	22
10. Development of market share	18
11. Advertising and promotion of organization	4
C. COMMUNITY CONTRIBUTIONS	12
Belonging	7
Helping others	1
Influence, help people understand issues	4
D. INDIVIDUAL INTERESTS (IRRELEVANT FOR CROWDSOURCING)	6
Identify potential personal opportunities	6

Diving to Level II benefits, in the category of **R&D-related benefits**, surprisingly, respondents don't use discussion groups for idea generation or for problem-solving. This contrasts with the number of discussion launched to solve Tangible innovation problems, identified in the netnographic component of our study.

Most respondents indicated as benefit Interaction with their peers and opportunity to get feedback from them (mentioned 79 times). Maybe these respondents see the discussion group as a community of practice with legitimate professionals able to provide quality feedback/inputs.

Obtaining up-to-date worldwide information and keep up-to-date with trends was mentioned 52 times. As innovation is seen as a global challenge and there is far too much information to analyze, information recommended by peers is seen as quality information.

Networking is not a surprising result in a networking platform (40 times). Learning via interaction and opinion-making (40 times) and idea debate/development (36 times) indicate respondents value the development of their capacity to decide, evaluate, apply and integrate knowledge.

Social surveillance is quite strong (mentioned 20 times). Several group members simply observe discussions and develop their perspectives on innovation based on that.

In **Market and strategy benefits**, we find people that actively promote themselves/their business and search opportunities via the discussion group. Some seek to potentiate new business opportunities; others desire to influence understanding of members on innovation. There is conscious planning of intervention to source knowledge or obtain results from the discussion group.

Advertising is less frequent than what we would expect from the netnography. There are two possible explanations: a) few of the advertisers answered the survey; b) they did answer, but they did not admit they were advertising.

Development of market share was mentioned 16 times, based on input given by group members to specific issues or on social surveillance.

In **Community contribution**, respondents feel the need to help others in a non-profit manner, which may be a good sign for crowdsourcers in such discussion groups.

Table 12 – Perceived limitation of current discussion group (all participants)

Categories	N.º of times the category was referred by respondents
IMPROVEMENT - Group Dynamics	2
IMPROVEMENT - Group moderation	1
NEGATIVES - New experience	15
NEGATIVES - no use	19
OTHER GROUPS - idea evolution and implementations	2
OTHER GROUPS - Reward Knowledge share	1
OTHER GROUPS - seize gap between industry and academia	1
POTENTIAL - more feedback and learning	2
POTENTIAL - more networking	2

Table 12 shows perceived limitations of using the discussion group. Moderation and more dynamic are mentioned by some, several others mention to be a new experience, which limits group usage. Several members did not use the group, in spite of being associated to it.

In Table 13, we present key types of respondents linked to main benefits. Innovation-professionals mention frequently R&D-related benefits, yet so to professors! For professors it is utmost important to debate ideas and to learn, to get up-to-date information, and to network. Professors also observe participants. For innovation professionals, the utmost important benefits is the interaction with peers and information. Learning is also mentioned, yet rather unfrequent, just as networking, debating ideas or doing social surveillance. Researchers give importance to learning, social surveillance, networking and information. Top managers favor interaction, information, debate and social surveillance and surprisingly somewhat do not look for market share increase or business opportunities, or they do not declare they do.

Table 13 - Perceived usefulness of ISPIM Discussion Group for self and others, by key job functions

	Innovation professional	Research professional	Top management	Consultant	Policy-maker	Professor
A. R&D BENEFITS	**25**	**7**	**12**	**8**	**1**	**26**
1. Problem identification	1	-	1	-	-	-
2. Idea generation	-	-	-	-	-	-
3. Idea debate development	3	-	3	-	-	2
4. Problem solving	-	-	-	-	-	-
5. Personalized interaction with peers and feedback from them	9	1	4	-	-	7
6. Learning (interaction and opinion making)	3	2	2	2	-	6
7. Social surveillance for best practices	3	2	3	1	-	5
8. Networking	4	2	-	2	-	9
9. Information	9	2	4	4	1	7
B. MARKET AND STRATEGY BENEFITS	**3**	**1**	**-**	**-**	**-**	**1**
10. Development of market share	3	1	-	-	-	1
C. COMMUNITY CONTRIBUTIONS	**1**	**1**	**-**	**4**	**-**	**1**
Belonging	1	1	-	2	-	1
Helping others	-	-	-	-	-	-
Influence, help people understand issues	-	-	-	2	-	-

5. So what? Discussion and implications for theory, practice and policy

5.1. Theory

Netnography results indicate that discussions focus on tangible innovation problems and idea debate and depend on a few brokers to maintain dynamic. Survey reveals that perceived benefits for innovation-related professionals are linked to R&D activities: personalized interaction with peers, up-to-date information and social surveillance.

There are indications that LinkedIn discussion groups may be used for crowdsourcing, yet a number of issues need to be considered in future studies.

The first ones relate to **group choice**. Group should be analyzed for identification of key brokers which may significantly influence discussions and comments, because they may have second intentions. Group maturity should be assessed. Discussion with group owner and moderators is advisable, as they accompany group evolution on a regular basis and they can assist in choosing the right group. It is important to keep assessing number of members and observe dynamic as suggested by Saur-Amaral and Rego (2010), yet it should not limit to this.

The second ones relate to **type of perceived benefits** by survey respondents.

The most frequent benefits were linked to interaction with peers, feedback and information exchange. Respondents seem to seek, at individual level, learning, competence development and becoming better professionals by contacting with a community they see as knowledgeable and legitimate. Social surveillance is also performed with the same intent. This somehow reminds the benefits of communities of practice (Kavanaugh et al., 2003, Lesser and Storck, 2001, Swan et al., 2002, Wenger, 2000) and may reopen a previous debate.

Also, while R&D-related benefits were mentioned innumerous times, market-related benefits seem scarce. In a group where content analysis revealed advertising as a frequent activity and some survey respondents affirm they participate so as to become visible and gain opportunities, biased responses to similar surveys should not be ignored. A method should be sought to validate responses.

5.2. Practice

Group participation allows innovation-related professionals to become better knowledge integrators and improve their management practices, as pointed by Becker (2011). Even professionals which are not part of Facebook generation should consider learning how to source knowledge from this type of discussion groups.

While exploratory, results point towards usage of LinkedIn discussion groups to source solutions for R&D/innovation problems, clarify perspectives and benchmark good practices. Therefore, we would expect more receptivity in organizations to use LinkedIn discussion groups as crowdsourcing platforms via their knowledge workers. There should be concern to devise effective strategies to train professionals for such interventions and to monitor results in a prompt manner.

For those maintaining a discussion group on LinkedIn, attraction of good brokers within the group to launch good discussion may be advisable. If there was dependence on a few

brokers in the second period, when network dynamic was at its best, fluent and effective, getting the right facilitators could be the key to have a successful discussion group to be used as a crowdsourcing platform for several organizations.

5.3. Policy

There was a policy-maker in survey respondents, whose main benefit was to obtain up-to-date information on innovation-related issues.

Access to such a group, where innovation ecosystem actors are represented and participate in idea debates, may be useful for policy-makers: a) to get an overview of innovation professional concerns and create more effective policies by responding to those concerns; b) to identify market failures commented by innovation professionals and academics which can be a good intervention target; c) to become better information and knowledge integrators, i.e. better brokers (Becker, 2011); d) to test receptivity to new innovation policies.

5.4. Critical perspectives and limitations of study

Our study is exploratory. It is limited to only one discussion group, a specific community with specific dynamic.

While number of members and observed dynamic seemed good criteria at start, network analysis revealed dependence upon a few brokers and collapse risk if they left.

This raises two questions for future studies: *What is a good group to study/use for crowdsourcing? Do discussion groups have a life cycle? Did we chose a group in the Introduction/Growth phase while we should have chosen e.g. a Maturity phase?*

A large number of group members were inactive. Only 109 discussions and 240 comments were identified in a 3-months period, in a group of more than 2000 members.

Inexperience was mentioned by survey respondents as a barrier to participation. Social surveillance was pointed as practice to source information and to learn from discussions. Yet several respondents mentioned they did not use the group, and wished that would change.

This raises another question for future studies: *Up to what point can we source inactive members for an organized crowdsourcing initiative?*

Regarding survey, a study on online communities with thousands of members would expect more results. It may happen that our sample is not representative.

Another issue is linked with language. We performed the survey in English, as group is international. Language barrier may create misinterpretations which we might have missed.

Mixed-methods methodology is critical in future studies. Findings revealed from content analysis, network analysis and survey are complementary and occasionally contradictory, therefore there is need to combine these perspectives to obtain a wider picture.

6. Conclusions

When most people think of crowdsourcing, they see platforms on the internet like Innocentive or NineSigma, where they can place a challenge after discussing with an experienced team that helps them to prepare properly. They just need money to pay, launch the challenge, get results and then try to apply them in organizational environment.

This type of crowdsourcing is more easily controlled. It is easier to see acceptable results.

When we look at social networks, we can set free a huge potential. But it is, at least it seems to be, unpredictable, for there is low control.

First, it is difficult to determine how participants do and will contribute. Motivations do not link to getting a prize, but is more in line with participation in open source communities. Participants in a social network answer to somebody because they might like that person, or they might want to contribute and feel satisfied with helping, or they just see an opportunity in the future to source you back or to get to somebody else. Many aspects are left unveiled, e.g motivation, status, visibility.

Second, it is difficult to trust in workers that make individual contacts on a discussion group to source specific knowledge for an organization. What guarantees that they will not take personal advantage of this task and go work for the competition? What guarantees they will actually try and source that knowledge instead of hanging over in the discussion groups? These are questions begging for answer.

Third, it is something very recent and still not understood. We are, and perhaps never will be sure, if it will maintain interest; if the discussion groups will become efficient places where organization can effectively source knowledge in an organized manner.

As any new technology with large adhesion by younger people (hereby referred as the Facebook generation), the oldest ones look at it with lack of confidence, with a touch of despise, saying it is a loss of time. However, losing time means different things to different people and opportunities should not be put aside by lock-in behaviors.

Social networks are a reality today. And if we do not understand yet their dynamic and usefulness, we should study them and understand how we can source their true potential, defining methodologies and testing more efficient tools.

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