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Towards a characterization of crowdsourcing practices

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Abstract

The word Crowdsourcing –a compound contraction of Crowd and Outsourcing, was used by Howe in order to define outsourcing to the crowd. Beyond cost, benefits for the company can be substantial. It can externalize the risk of failure and it only pays for products or services that meet its expectations. The Crowdsourcing phenomenon covers heterogeneous situations and it has inspired a number of authors. However, we are still lacking a general and synthetic view of this concept.

The aim of our work is to characterize Crowdsourcing in its various aspects. First we define of Crowdsourcing, and provide examples that illustrate the diversity of Crowdsourcing practices and we present similarities and differences between Crowdsourcing and established theories (Open Innovation, User Innovation and Open Source Software). Then, we propose and illustrate a typology of Crowdsourcing practices based on two criteria: the integrative or selective nature of the process and the type of tasks that are crowdsourced (simple, complex and creative tasks). In either case, the client firm seeks to mobilize external competencies. Relying upon the crowd can be an adequate method, because of its unique characteristics that are fostered by the Internet. Finally, we present some potential benefits and pitfalls of Crowdsourcing.

Key Words : Crowdsourcing, Web 2.0, problem solving, creativity

Introduction

Even though Web 2.0 is the subject of much attention, and the Social Web is a proven reality, as evidenced by the stock market valuations of its major platforms (Facebook, MySpace, etc. ...), the business world has yet to fully explore the possibilities of Web 2.0. Notable exceptions are marketing (Kozinets, 2002) and business intelligence. The next logical step is to apply the potential of Web 2.0 to optimize firm performance.

As early as 1998, the American multinational pharmaceutical company Eli Lilly created a Crowdsourcing platform called InnoCentive to deal with this issue. The word Crowdsourcing first appeared 8 years later in an article by Howe (2006). The concept of Crowdsourcing has experienced runaway success with dozens of blogs treating the subject (*e.g.* <http://crowdsourcing.typepad.com>) and journalists have also written books about it (Howe, 2008; Tapscott and Williams, 2007). Crowdsourcing is also discussed in academic papers dealing with Web 2.0 or Open Source Software (Ågerfalk and Fitzgerald, 2008; Albors et al., 2008; Dahlander and Magnusson, 2008). Interesting cases studies are provided by Brabham (2008) and Chanal and Caron (2008). Finally, Burger-Helmchen and Pénin (2010) propose discussions of Crowdsourcing with respect to Transaction cost theories and evolutionary theories of the firm.

The aim of our work is to characterize Crowdsourcing in its various aspects. The first section defines Crowdsourcing through exemplary cases, and compares Crowdsourcing to related concepts such as Open Innovation, User Innovation and Open Source Software. In the second section, we propose a classification of Crowdsourcing practices to provide a global analytical framework. The third section discusses a few benefits and pitfalls of Crowdsourcing.

1. Crowdsourcing

1.1. Definition

The word Crowdsourcing is a compound contraction of Crowd and Outsourcing. Thus Crowdsourcing means outsourcing to the crowd. The origin of this word is itself, typical of the Web 2.0 phenomenon: an anonymous user launched the term for the first time on an Internet Forum. The term was popularized by Jeff Howe and Mark Robinson in an article published in *Wired*. Jeff Howe proposes the following definition:

Simply defined, Crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call. This can take the form of peer-production (when the job is performed collaboratively), but is also often Undertaken by sole individuals. The crucial prerequisite is the use of the open call format and the wide network of potential laborers. (Howe, 2006)

More recently in his book or his blog, Howe (2008, 2009) offers the following two definitions:

The White Paper Version: Crowdsourcing is the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call.

The Soundbyte Version: The application of Open Source principles to fields outside of software.

Crowdsourcing is a form of outsourcing not directed to other companies but to the crowd by means of an open call mostly *via* an Internet platform. Following Surowiecki (2004) and Nambissan and Sawhney (2007), a crowd can be defined as a large set of anonymous individuals. Due to anonymity, individuals cannot be individually identified or recognized. Implicit in this definition is the idea that a firm cannot “build its own crowd”. Moreover, the crowd is generally composed of heterogeneous individuals. In particular, a crowd may be composed of scientists and experts in various fields, but also of novices.

While many individuals may work simultaneously on a given project, the client firm will eventually choose the outcome that best meets its needs. Put differently, the client firm makes an *ex post* selection of its supplier in function of its offer. Therefore, eventual contract setting between the client firm and its supplier takes place only *ex post*. Roughly speaking, the client firm only pays for products or services that meet its expectations.

1.2. Different cases of Crowdsourcing

In recent years there has been a significant increase of Crowdsourcing. Long before the Internet, poster or photo contests showed how companies could benefit from crowd generated input. But the sheer scope of Crowdsourcing is relatively recent. The development of the Internet gives a new dimension to this phenomenon, giving much better and free access to the crowd for the companies. Examples of Crowdsourcing are presented in Table 1.

Case	Purpose	Launch	Remuneration
OpenStreetMap	Geographic content	University College London, 2004	None
TxtEagle	Text translations	Start-up, 2009	Micro-payments (<\$1)
Wilogo	Graphical design	Start-up, 2006	Remunerated (approx. €300)
InnoCentive	Problem solving and innovation projects	Eli Lilly, 2001	Remunerated (> \$1 000)

Table 1: List of cases

These examples show that Crowdsourcing generally involves three categories of actors:

- The individuals forming the crowd who are the providers.
- The companies directly benefitting from the crowd input, otherwise called the client companies.
- An intermediation platform building a link between the crowd and client companies. This serves as a Crowdsourcing enabler.

The intermediation is essentially virtual for a relatively simple reason: the Internet enables two-way and public communication. This communication allows firms to express their needs and individuals making up the crowd to respond to these needs.

1.3. Crowdsourcing and related concepts : Open Innovation, User Innovation, FLOSS

Since Crowdsourcing is an emerging phenomenon, its contours are not clearly defined. This may lead to confusions with related concepts. Crowdsourcing shares several ideas with

concepts such as Open Innovation, User Innovation and Open Source Software and it seems that misleading associations are likely to be made. We try to shed some light on the similarities and dissimilarities between these notions. We will restrict ourselves to succinct presentations of these approaches and we will not develop upon the controversies or debates concerning them.

Open Innovation

The central idea of Open Innovation à la Chesbrough (2003, 2007) is that in a world of distributed knowledge, companies should not only rely on their own research and development. According to Chesbrough, Open Innovation implies two types of knowledge flows. On the one hand, Inside-out (or Outbound) knowledge flows correspond to knowledge developed within the firm and made accessible to other firms. On the other hand, Outside-in (or Inbound) flows correspond to knowledge developed in the environment and being integrated by the firm. Scholars have noticed that patents play a crucial role in Chesbrough's Open Innovation (Pénin, 2008).

Open Innovation and Crowdsourcing fall within the same paradigm (Albors and al., 2008): knowledge is distributed and the opening of a firm's R&D processes can be a source of competitive advantage. The first difference is that Open Innovation focuses on innovation processes while, as we will see, Crowdsourcing does not. The second difference is that Open Innovation mainly describes knowledge flows between firms, while Crowdsourcing refers to links between a firm and the crowd as a large set of anonymous individuals. We can view Crowdsourcing as a way to implement outside-in knowledge flows with the crowd as a particular knowledge provider.

User Innovation

In the User Innovation approach developed by von Hippel (1998, 2005), users are active contributors to the innovation process. User Innovation is driven by lead users who face specific needs (and possibly anticipate market needs) and who are ready to bear some of the costs and risks associated with innovation. User Innovation depicts the “non-linear” dimension of the innovation process: users and market feedbacks are source of novelty for the innovating firm.

The possible confusion between User Innovation and Crowdsourcing stems from the fact that (end) users are likely to be found in the crowd. However these concepts describe very

different phenomena. Crowdsourcing suggests that the crowd can provide firm with resources under specific conditions, but it does not imply customer feedbacks in the innovation process.

Free-Libre-Open Source Software (FLOSS)

In his ‘Soundbite definition’, Howe (2008) defines Crowdsourcing as an application of the Open Source principles to other industries. The FLOSS acronym (Free-Libre-Open Source Software) is gaining momentum since it enables to avoid misinterpretations between Free Software and Open Source Software. FLOSS Software have various characteristics (Dalle and Jullien, 2003; Lerner and Tirole, 2002; Weber, 2004) among which the free access to source codes and the possibility to alter and share codes.

Crowdsourcing and FLOSS rely on the idea that knowledge and competencies are distributed and that “given enough eyeballs, all bugs are shallow” (Raymond, 1999). However, there are significant differences between these concepts. In Crowdsourcing, firms usually make traditional use of IPR (*e.g.* by patenting their output) while FLOSS makes (at least partly) use of Copyleft licensing. Ågerfalk and Fitzgerald (2008) use the term opensourcing to name the FLOSS production mode. Opensourcing borrows from Crowdsourcing, User Innovation and Open Innovation.

2. A characterization of Crowdsourcing

Due to economies of scale issues (individuals are usually unable to produce goods at a competitive cost), Crowdsourcing is *a priori* not relevant for production tasks. Crowdsourcing can be implemented to perform information or knowledge related tasks involving low fixed equipment costs. In general, Crowdsourcing makes it possible to mobilize competence and expertise which are distributed among the crowd. Competence generally refers to the ability of an individual to achieve a set of tasks. This concept therefore covers a relatively wide scope of situations: a mountaineer has the competence to provide accurate weather information related to where he is, just like a technical expert has the competence to solve a problem in his field.

Crowdsourcing covers a relatively diverse set of practices. Our main purpose is to propose a typology that can be used both in an analytical and an operational perspective. We distinguish broad classes of Crowdsourcing practices and characterize the types of tasks concerned by Crowdsourcing along several aspects:

- Cognitive dimension of the tasks
- Nature of incentives
- Benefits of Crowdsourcing

2.1. Integration or selection based Crowdsourcing

At one extreme, Crowdsourcing offers access to multiple and complementary information and data (*e.g.* geographical data). We name this *Integrative Crowdsourcing* (integrative CS) since the issue is to pool complementary input from the crowd. Individual elements have very little value *per se* but the amount of complementary input brings value to the firm. At the other extreme, Crowdsourcing gives access to individual problem solving skills. We name this *Selective Crowdsourcing* (selective CS) since the client firm is led to choose an input from among a set of options that the crowd has provided.

Integrative Crowdsourcing

Integrative CS will be relevant when the client firm seeks to build data or information bases. Therefore Integrative CS is a form of content Crowdsourcing. While gathering information or data at an individual's level can be unproblematic, building a data base generally requires significant amounts of resources. The rationale of integrative CS therefore lies in the cost of building large data or information bases. Since individuals within the crowd are heterogeneous, Crowdsourcing enables the client firm to gather a variety of contents. The firm seeking to implement integrative CS should however be aware of integration issues. Data or information stemming from various origins might be incompatible or redundant if no precaution is taken. Precautions include the definition of a data format and the sound selection of data sources.

Selective Crowdsourcing

Selective CS, on the other hand, will be relevant if the client firm has a specific need. For instance, a firm facing an R&D problem may rely on competences from the crowd in order to solve the problem. When there is no identified in-house solution to a given problem, the firm enters a problem solving process which implies problem formulation, searching and selecting solutions, and implementing them (*e.g.*, Pahl and Beitz 1996). Provided the problem has been well formulated, selective CS may be a way to find candidate solutions. Selective CS

generally implies a winner-takes-all mechanism where only the finder of the “winning” solution is rewarded.

As we will see, the selective or integrative nature of Crowdsourcing is related to the type of tasks under consideration.

2.2. What can be crowdsourced?

At one end, Crowdsourcing may be used for simple tasks such as data collection and translation of simple texts. At the other extreme, Crowdsourcing can be implemented to achieve complex tasks (*e.g.* problem solving) within innovation projects. Between these extremes, an intermediate category of Crowdsourcing relates to creative tasks in fields such as photography, artistic design or software applications.

Crowdsourcing of simple tasks

On a small-scale, simple tasks can be carried out cheaply, but their implementation becomes an issue when the scale increases. The completion of simple tasks on a large scale requires substantial resources. Crowdsourcing then becomes relevant, since it makes it possible to reach a large number of individual providers in the crowd. CS of simple tasks is, in essence, an integrative form of Crowdsourcing.

By definition, simple tasks (such as short text translations) are rather poor from a cognitive point of view. Moreover their completion requires a relatively low involvement from the individuals. Therefore, financial incentives in CS of simple tasks do not go beyond micropayments¹. There are many typical examples of Crowdsourcing for simple tasks. For instance, OpenStreetMap (OSM) collects and pools geographic data in order to establish a world map under the Creative Commons license. Contributions are voluntary and incentives may include self benefit from the system or the satisfaction of contributing to a public good. When simple tasks are concerned, the added value of Crowdsourcing does not stem from individual abilities, but from the low-cost realization of tasks on a large scale.

Crowdsourcing of complex tasks

¹ Of course, small earnings can cumulate, so that individuals contributing extensively to simple tasks CS projects may earn significant revenues.

In a context of new product development and innovation projects, problem solving can be regarded as a complex process (Simon, 1960). For various reasons (lack of either skills or satisfactory in-house solutions) a firm may decide to turn to the crowd for their problem solving skills. This corresponds to a selective Crowdsourcing: the client firm expects to receive a set of candidate solutions from the crowd, and then to select the solution that seems best suited.

Since problem solving skills are concerned, CS of complex tasks involves knowledge intensive activities. The notion of scale does not enter into account (as opposed to simple task CS) but the firm facing an unsolved problem hopes to benefit from expertise and problem solving skills of individuals within the crowd. CS of complex tasks only makes sense when expertise and skills are distributed among anonymous individuals.

Expertise and skills can be more or less scarce and difficult to mobilize depending on the type of problem. A firm may face a problem that has been solved widely in other contexts, or an extremely specific problem with no known solution (*e.g.*, the 2010 BP oil spill disaster). Obviously, individuals' involvements in the problem solving activity, as well as the relevant incentive schemes, will be situation specific. For problems that have already been treated elsewhere, the involvement and risk supported by participants to the CS project are limited. Problems that have no known solutions require more involvement (in terms of time spent for instance) from individuals, with a very uncertain outcome.

CS of complex tasks can be illustrated by the emblematic case of the InnoCentive platform (Brabham, 2008; Lakhani *et al.*, 2007). InnoCentive connects applicant organizations (seekers) with innovators (solvers). As soon as a seeker chooses a solution to his problem, the winning solver receives a premium, which is usually higher than \$10 000 (depending on the project). Non-winning solvers are not rewarded. InnoCentive can be considered a real success with more than 70 applying companies (seekers) in 2009, among them large companies such as Eli Lilly, Procter & Gamble and SAP. In 2010, BP launched a project concerning the oil spill disaster in the Gulf of Mexico.

Note that while CS of complex tasks may increase the likelihood of finding a solution to some problems, it does not provide any sort of guarantee as to the outcome of the process.

Crowdsourcing of creative tasks

The third model of Crowdsourcing concerns creative tasks. Long before the Internet, poster or design contests were early instances of this Crowdsourcing. With the advent of the Internet, this type of Crowdsourcing developed from a particular marketing mode into a major way of accessing the creativity of individuals. This Crowdsourcing can be both selective, when the client firm issues a request (*e.g.*, for a logo) and eventually selects an outcome among the options proposed by the crowd, or integrative, when inputs from the crowd are pooled together on a platform (or a catalogue). CS of creative tasks refers to cases where creativity and uniqueness have a value *per se*. The point for the client firm is not to have a problem solved, but rather to benefit from the creative power of the crowd.

As far as the completion of creative tasks is concerned, incentives of participants can be very heterogeneous, ranging from monetary driven to passion driven involvement (Amabile, 1998; Amabile *et al.*, 2005). As a matter of fact, observations of Crowdsourcing platforms for creative tasks indicate that remunerations associated with CS of creative tasks are of an intermediate amount (usually a few hundred dollars).

The Wilogo platform is a good illustration for this type of Crowdsourcing. Wilogo was created in 2009 and serves as a marketplace for graphic design productions. Wilogo clients state their requests and designers (which may be individuals or firms) provide design suggestions. Between the launch of Wilogo and January 2011, more than 160 000 logos have been suggested on the platform and according to a Wilogo statement, a client can expect approx. 80 logo suggestions from contest participants. Eventually, when a suggestion is selected by the client, the winning participant obtains a financial reward.

3. Discussion : benefits and pitfalls

A firm that uses Crowdsourcing does not address its request to a known individual or a given company, but to an open set of anonymous individuals, who are very often amateurs.

In this section, we present some benefits and pitfalls of Crowdsourcing. Since Crowdsourcing practices have heterogeneous characteristics, advantages and disadvantages will be largely dependent on the type of Crowdsourcing under consideration.

3.1. Some benefits of Crowdsourcing

Cost

Although the amounts involved vary considerably according to the type of Crowdsourcing, going from micro-payments to payments of several thousands of Dollars, the major advantage of Crowdsourcing is its relatively low cost.

Although professionals are not excluded *a priori* from Crowdsourcing, by nature they are more likely to function in classic outsourcing processes. Crowdsourcing project participants are mostly amateurs, for instance students and young graduates (Wilogo), scientists (InnoCentive) or simply individuals wishing to make use of their skills, spare time or some periods of professional inactivity. However while remunerations of Crowdsourcing can be relatively low, voluntary work is not the rule.

Quality

Quality encompasses various aspects depending on the type of Crowdsourcing. In Crowdsourcing of simple tasks, quality refers to the amount of tasks that are achieved. Concerning complex tasks, quality refers to the characteristics of a problem's solution. Addressing a mass of skilled individuals through an open call is a relatively proven approach for problem solving, as illustrated by the numerous security code cracking contests. Finally as far as creative tasks are concerned, quality refers to the originality of the solutions proposed and to the way they match user tastes and expectations. In this case, Crowdsourcing enables us to profit from individual ideas and hunches, which may be sorted according to their perceived relevance.

Network externalities

Positive network externalities (*e.g.*, Rohlfs, 1974; Katz and Shapiro, 1985) occur when the value of a system increases when more individuals decide to use it. Network externalities may be direct, as for instance for communication devices or social networks, or indirect, when the value of a network depends on the availability of complementary components, *e.g.* a smartphone and its applications.

Crowdsourcing is a way to foster network externalities and the adoption of new technologies. For instance, the value of OpenStreetMap (OSM) essentially depends on the richness of the geographical content and the possibilities to use OSM data with GPS devices. These contributions mainly stem from individuals, and make the further contribution of the crowd even more likely. Nokia's Ovi Store functions according to the same mechanism: the *Calling all Innovators* program generates a permanent flow of new applications, which contribute to

the value of Nokia's smartphones. Network externalities potentially generate self enforcing mechanisms (Arthur, 1989) where "success breeds success".

Agency issues

Several aspects of Crowdsourcing lead to a possible reduction of the risk faced by the client firm. Since the tasks are not outsourced to a single provider, the risk of firm dependence *vis-à-vis* the provider is likely to disappear. Moreover, since the contract setting between the client firm and its supplier takes place only *ex post*, the notion of agent monitoring is not relevant. Therefore the classic issues due to information asymmetries between the supplier and the client (*e.g.*, Laffont and Tirole, 1993) are likely to disappear.

Motivations and incentives

According to standard economic theory, coordination within the firm is the result of division of labour and financial incentives (*e.g.*, Alchian and Demsetz, 1972). Drawing on knowledge from social psychology, some authors show that this approach is no longer relevant when knowledge production and creativity work are at stake (Eisenberger and Shanock, 2003; Frey and Jegen, 2001; Frey and Osterloh, 2002; Frost, Osterloh and Weibel, 2010). On the one hand, extrinsic motivation relates to activities which are not an end *per se* but which through the associated incomes, serve to satisfy general needs. On the other hand, intrinsic motivation is based on the satisfaction associated with the activity itself (enjoyment-based motivation) or its social dimension (pro-social motivation).

Creative tasks and problem solving typically fall within the knowledge work category. They require skills of the participants and, to various extents, significant time investments. Therefore the issue of motivation and incentives is particularly relevant for Creative and Complex tasks CS. By definition, Crowdsourcing implies voluntary participation of individuals, with no hierarchy or contract related constraint, as well as a high degree of autonomy in the achievement of tasks. Coordination by hierarchy does not take place. Conversely, some elements suggest that in Crowdsourcing, voluntary participation and autonomy of participants are very likely to foster the motivation of experts and creative individuals.

3.2. Some disadvantages and pitfalls of Crowdsourcing

Transaction costs and knowledge appropriability

Burger-Helmchen and Pénin (2010) propose an extensive presentation of the limits of what they call “Crowdsourcing of inventive activities” (CIA) – a category that largely overlaps with our CS of complex tasks- along Transaction Cost Theory (Williamson, 1975) and evolutionary theories of the firm (Penrose, 1959; Teece and Pisano, 1994). They draw the conclusion that CIA can be relevant in fields where knowledge is highly codified and when the risks of opportunistic behavior are low. Conversely, they argue that due to knowledge circulation and production issues, CIA is less likely to work in fields that strongly rely on tacit knowledge.

Beyond these transaction costs and knowledge appropriability issues, Crowdsourcing raises some structural concerns.

Lack of contributors

While Crowdsourcing is likely to benefit from network externalities related bandwagon effects (see above), it may also happen that the client firm fails to attract sufficient contributors to a CS project. Crowdsourcing relies on voluntary participation and the reaching of a “critical mass” of contributions cannot be guaranteed. On the one hand, the client firm can rely on financial rewards in order to increase incentives for individual’s participations (thereby reducing the cost advantage of Crowdsourcing). On the other hand, third party Crowdsourcing platforms (such as InnoCentive) which serve as a marketplace are likely to enhance the matching between seekers and providers.

Request definition

Problem statement formulation is known as a crucial step in problem solving processes (Albano and Suh, 1992; Pahl and Beitz, 1996). We argue that this is even truer in the case of complex task CS. Indeed when addressing a request to the crowd, the firm seeks to obtain a number or candidate solutions to its problem. If the request is ill defined, the Crowdsourcing process is very likely to lead to non-satisfactory contributions. When problem solving is realized in-house or through a contractor (outsourcing), the way is to implement feedback loops in the shape of problem reformulations in order to achieve some convergence towards “real needs”. In the case of Crowdsourcing, such feedback loops cannot be easily implemented, essentially because potential solvers are numerous and dispersed. Another possible consequence of ill defined requests is that the client firm receives too high a number of candidate solutions from the crowd, so that evaluation and selection of contributions become critical issues.

Therefore problem and request definitions should be major concerns for firms engaging in Crowdsourcing processes.

4. Conclusion

Crowdsourcing has developed remarkably in the last few years and the concept is still under construction. Its contours and various aspects are not totally defined yet. The principal aim of this article was to clarify the concept and to propose a synthetic view of its dimensions.

Our first step was to propose both a discriminating and an operational definition of Crowdsourcing, with the parent concept of outsourcing as a starting point. In order to avoid future misunderstandings, we also presented similarities and differences between Crowdsourcing and established theories (Open Innovation, User Innovation and Free-Libre-Open Source Software). In the second section, we proposed a typology of Crowdsourcing practices based on two criteria: the integrative or selective nature of the process and the type of tasks that are crowdsourced (simple, complex and creative tasks). In either cases, the client firm seeks to mobilize external competences. Relying upon the idea that the crowd can be an adequate method, because of its unique characteristics that are fostered by the Internet. Finally, we proposed a brief overview of what we consider to be the major benefits and pitfalls of crowdsourcing.

We believe that our definition and taxonomy work has a twofold interest. From an operational point of view, it gives insights into the various application fields of Crowdsourcing. For instance, it is shown that Crowdsourcing is neither restricted to problem solving issues nor to content generation. From an academic point of view, our work seeks to propose a synthetic and analytical view of the phenomenon. While existing works give deep insights into specific Crowdsourcing cases (InnoCentive, Crowdspring...), we argue that a synthesis of various practices along some clear dimensions is likely to be useful for the orientation of further research on the topic.

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