



HAL
open science

Crowdsourcing: What can be Outsourced to the Crowd, and Why ?

Eric Schenk, Claude Guittard

► **To cite this version:**

Eric Schenk, Claude Guittard. Crowdsourcing: What can be Outsourced to the Crowd, and Why ?. 2009. halshs-00439256v1

HAL Id: halshs-00439256

<https://shs.hal.science/halshs-00439256v1>

Preprint submitted on 8 Dec 2009 (v1), last revised 3 Oct 2012 (v3)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Crowdsourcing: What can be Outsourced to the Crowd, and Why ?

Eric SCHENK

INSA de Strasbourg

Graduate School of Science and Technology

24 boulevard de la Victoire

67000 Strasbourg, France

<eric.schenk@insa-strasbourg.fr>

Claude GUITTARD

BETA – Université de Strasbourg

61 avenue de la Forêt Noire

67000 Strasbourg, France

<guittard@cournot.u-strasbg.fr>

December 7, 2009

Abstract

Why should a firm outsource certain activities in countries where labor is inexpensive, when by using the Internet, firms are a mouse click away from an eclectic, university educated, population ready to invest in intellectually stimulating projects for little or no remuneration ? 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 aim of this paper is to characterize Crowdsourcing from a management science perspective. Our approach is mainly theoretical, although we rely on extensive illustrations. First we discuss the definition of Crowdsourcing, and provide examples that illustrate the diversity of Crowdsourcing practices. Then, we present similarities and differences between Crowdsourcing and established theories (Open Innovation, User Innovation) and a phenomenon that has inspired many studies in Economics and Management, Open Source Software. Our goal is to avoid future misunderstandings and to show that Crowdsourcing is a concept *per se*. Finally, 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 (routine, 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.

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. Indeed, as noted by Howe (2006), why should a firm outsource certain activities in countries where labor is inexpensive, when by using the Internet, firms are a mouse click away from an eclectic, university educated, population ready to invest in intellectually stimulating projects for little or no remuneration ?

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). This success contrasts with the relative lack of academic papers on the subject. Crowdsourcing is discussed but often only indirectly in papers dealing with Open Source (Dahlander and Magnusson, 2008; Ågerfalk and Fitzgerald, 2008) or simply mentioned as an example of Web 2.0 (Tapscott and Williams, 2007; Albors et al., 2008). Brabham (2008) however focuses specifically on Crowdsourcing by providing rich case studies about the Istockphoto platform.

The aim of this paper is to characterize Crowdsourcing from a management science perspective. The approach is mainly theoretical, although we rely on extensive illustrations. Our goal is to propose a characterization that is both operational and academically sound. The outline of our paper is the following. The first section defines Crowdsourcing and presents some exemplary cases. In the second section, we compare Crowdsourcing to related concepts such as Open Innovation, User Innovation and Open Source Software. In the third section, we propose a classification of Crowdsourcing practices to provide a global analytical framework. The last section discusses the advantages and limitations 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 the online journal 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.

The White Paper Version is based on the etymology of the term and seems both accurate and discriminating, while the Soundbyte Version will be looked at more closely as it seems in many respects contradictory.

Crowdsourcing is a form of outsourcing not directed to other companies but to the crowd (Figure 1) by means of an open tender (open call) *via* an Internet platform. It is important to emphasize that the call should not be limited to experts or preselected candidates. While many people may work simultaneously on a given project, the company will eventually choose the outcome that best meets its needs. For the company the benefit is substantial. It can externalize the risk of failure and it only pays for products or services that meet its expectations.

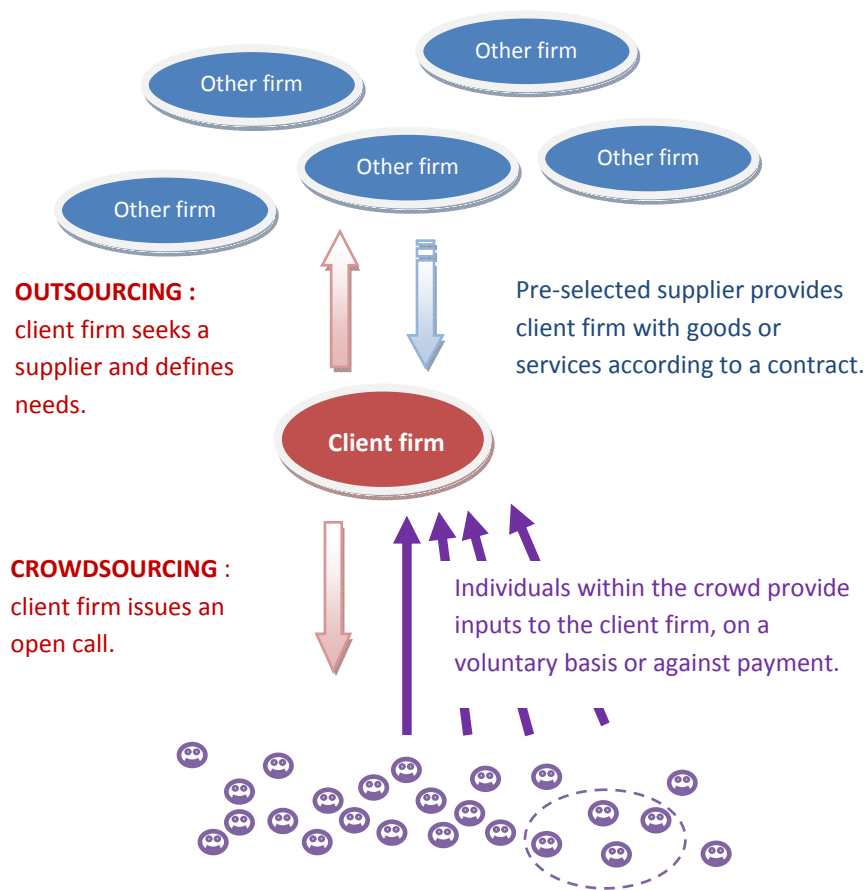


Figure 1: Crowdsourcing vs. Outsourcing

1.2. 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. Examples of Crowdsourcing are presented in Table 1.

Case	Purpose	Launch	Remuneration
OpenStreetMap	Geographic content	University College London, 2004	None
ReCaptcha	Digitize archives	Carnegie Mellon University, 2008	None
Mechanical Turk (MTurk)	Content analysis and artificial intelligence	Amazon, 2005	Micro-paiements (< 1\$)
Humangrid	Data analysis	Start-up, 2005	Remunerated (approx. €10/H)
Designenlassen.de	Graphical design	Start-up, 2007	Remunerated (€150-300)
Wilogo	Graphical design	Start-up, 2006	Remunerated (approx. €300)
Atizo	Innovative concepts	Start-up, 2007	Remunerated (> CHF2000)
InnoCentive	Problem solving and innovation projects	Eli Lilly, 2001	Remunerated (\$1 000-1 000 000)

Table 1: List of cases

This list shows the diversity of Crowdsourcing practices:

- Some cases (OpenStreetMap, ReCaptcha) rely on volunteer work, but in others, earnings can be as high as \$20 000 (InnoCentive).
- Crowdsourcing gives access to ideas (Designenlassen, Wilogo) or individual information (OpenStreetMap), but simple tasks (HumanGrid, ReCaptcha) or complex projects (InnoCentive, Atizio) can be crowdsourced.
- Crowdsourcing platforms derive from academic institutions (OpenStreetMap, ReCaptcha), start-ups (HumanGrid, Designenlassen, Wilogo) or large multinationals (InnoCentive).
- Crowdsourcing requests are either purely open or limited to individuals who are referenced on an intermediation platform. This platform can be the support for autonomous communities (Wenger, 1998).

- Even when the client company does not make an explicit request to the crowd, it is still Crowdsourcing if the crowd generated content is highly complementary to the firm's offer. For instance, OpenStreetMap data are integrated into the Garmin GPS solutions.

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

- The individuals forming the crowd who are 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.

This view is similar to the one developed by Cohendet and Simon (2008) in their analysis of creative cities. According to them, creativity takes place within autonomous groups in the underground and made profitable in the upperground. The interface between these layers is performed in the middleground. Regarding Crowdsourcing, 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.

The Crowdsourcing concept covers diverse situations and is steadily evolving with its real world applications. Since Crowdsourcing is an emerging phenomenon it seems useful and appropriate to propose an analytical classification of Crowdsourcing practices (Markus and Robey, 1988).

2. Crowdsourcing, Open Source, User Innovation, Open Innovation

Since the concept of Crowdsourcing is under construction, its contours are not clearly defined. The result may be either some confusion with related concepts, or a denial of the concept *per se*. The typology we propose in this section has a twofold objective: to define Crowdsourcing as compared to other concepts and to show that Crowdsourcing is a concept in its own right.

2.1. Open Innovation

Open Innovation is a concept developed by Chesbrough (2003, 2007) based on his study of large multinationals (IBM, Procter and Gamble).

The central idea is that in a world of distributed knowledge, companies should not only rely on their own research and development. It is relevant to outsource some R&D functions through Intellectual Property Rights (IPR) purchases from other companies. Conversely, internal knowledge and processes can generate profit through patents, joint ventures or spin-offs. This approach is particularly iconoclastic for firms naturally prefer the closed innovation model based on processes that limit the use of internal knowledge within a company and use little or no external knowledge. Patents play a special role for knowledge acquisition and financial valorization of knowledge that cannot be used internally (Pénin, 2008).

Open Innovation and Crowdsourcing fall within the same paradigm: 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 exclusively on innovation processes while Crowdsourcing does not. The second difference is that Open Innovation describes interaction between firms, while Crowdsourcing refers to links between a firm and the crowd. Lastly,

Open Innovation is a particular form of outsourcing, but it cannot be reduced to this aspect because it is a two-way process involving selling and buying knowledge and processes.

2.2. User Innovation

Crowdsourcing gives a central role to the crowd, *i.e.* individuals or communities without legal status, which companies can outsource some of their functions to. The resemblance to the User Innovation approach from von Hippel (1998) is straightforward. In the traditional paradigm, innovation originates in the firm (manufacturer centered innovation), while in the User Innovation paradigm (von Hippel, 1998), the focus has shifted to the user as a source of innovation (user centered innovation). Table 2 summarizes the characteristics of these paradigms.

Firm centered innovation	User centered innovation
<p>Firms identify customer needs</p> <p style="text-align: center;">↓</p> <p>Firms invest in new product development</p> <p style="text-align: center;">↓</p> <p>Firms make profits though IPR and selling their products</p>	<p>Lead users innovate in order to satisfy their own needs</p> <p style="text-align: center;">↓</p> <p>Lead users disclose their innovations</p>

Table 2: User Innovation principles

User Innovation is driven by pioneer users who face specific needs (and possibly anticipate market needs) and who are willing to bear the costs and risks associated with innovation. For instance, innovations in sports equipment (Sky-surfing) or software (Open Source Software) are sometimes due to advanced users. Community phenomena are an important feature of User Innovation.

Since both User Innovation and Crowdsourcing involve individuals working outside a professional environment, the same questions arise about the incentives of participants in such projects. Furthermore these two phenomena fully exploit the Internet and ICT tools in general, which give access to networks of people without need of formal structures or organizations.

The main differences between User Innovation and Crowdsourcing are :

- User Innovation refers to user-driven projects, while Crowdsourcing is firm driven.
- As we already mentioned, Crowdsourcing is not restricted to innovation issues.
- In User Innovation, innovation is made by users of the final product while in Crowdsourcing, any individual can be involved in the process. (For example, the InnoCentive does not address potential users but experts).

2.3. Open Source

In his Soundbite definition, Howe (2008) defines Crowdsourcing as an application of the Open Source principles to other industries. Open Source Software relies on the Copyleft principle which stands for free access to source codes and the possibility to alter and share codes. Thus Open Source Software can be copied and freely distributed on a large scale. This makes sense since, as noted by Foray and Zimmermann (2001), software is a particular economic good whose production can be self-organized and decentralized. Raymond(1999) clearly highlights the mechanisms that make the Bazaar production mode so efficient in Open Source Software. There is often no financial reward for contributions and viral or community led marketing through the Internet is inexpensive, fast and highly targeted (Krishnamurthy, 2005).

However, Howe's definition of Crowdsourcing as an extension of the Open Source principles to other industries deserves discussion. Crowdsourcing is not open in the sense that Open Source Software can be (the same holds true for Open Innovation). The opening is understood in a narrower sense as Crowdsourcing firms usually make traditional use of IPR, *e.g.* by patenting their output. Furthermore, it is obvious that Crowdsourcing is not restricted to software development (Brabham, 2008), while the transferability of Open Source principles (*e.g.* the Copyleft) to other industries is the subject of ongoing research (Raasch *et al.*, 2009). Lastly, let us mention the issue of rewards and incentives. Bonnacorsi and Rossi (2003), Lerner and Tirole (2002) or Weber (2004) have shown that participation in Open Source projects results from various motivations such as financial reward or technological interest. There is some evidence that this also applies to Crowdsourcing.

While there are similarities between Open Source Software and Crowdsourcing, these concepts have a different status. Open Source is an application of the Crowdsourcing production mode rather than a similar concept. Open Source also borrows from the User Innovation approach (von Hippel and Von Krogh, 2003) and following Ågerfalk and Fitzgerald (2008), we prefer the term opensourcing to name the Open Source Software production model.

Intersection areas between Open Source, Open Innovation, User Innovation and Crowdsourcing are represented in Figure 2. Open Source is an application field rather than a theoretical concept and is represented as a dotted line.

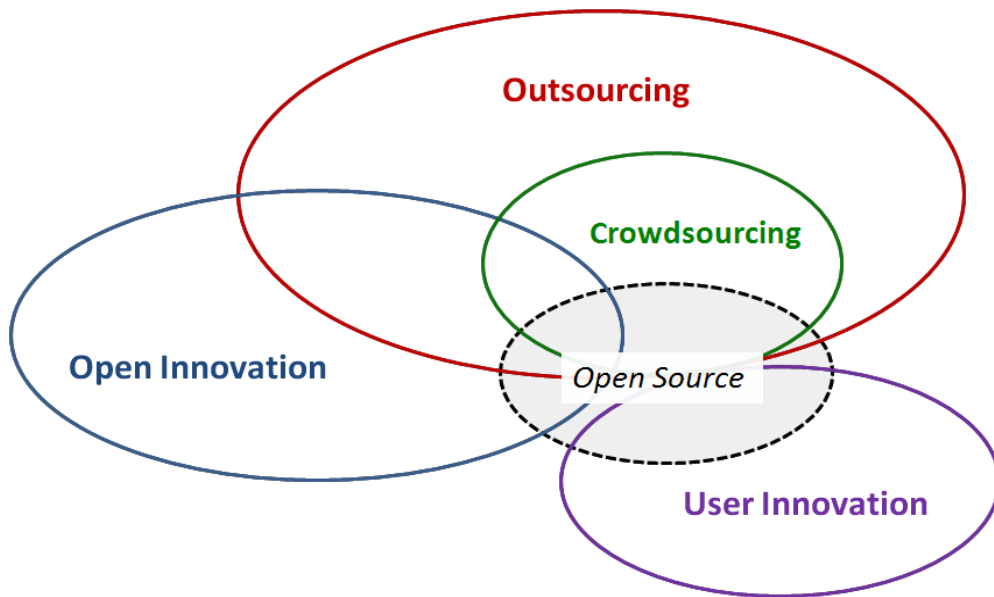


Figure 2: Crowdsourcing, Open Innovation, User Innovation and Open Source

3. Towards a characterization of Crowdsourcing

In general, Crowdsourcing seeks 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 relating to where he is, just like a technical expert has the competence to solve a problem (Bootz and Schenk, 2009).

Crowdsourcing covers a relatively diverse set of practices. Addressing the crowd, the firm seeks competences from a multitude of anonymous individuals through an open call. This means that potential contributors are not pre-selected. The selection, if any, occurs only *a posteriori*. But in some cases there is no selection at all but a pooling of individual contributions.

This leads us to a first characterization of Crowdsourcing. At one extreme, Crowdsourcing offers access to multiple and complementary information and data (*e.g.* geographical data).

We name this *Integrative Crowdsourcing* 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* since the client firm is led to choose an input from among a set of options that the crowd has provided.

We will now try to characterize the needs of the client firm. At one end, Crowdsourcing may be used for routine 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, etc.

3.1. Crowdsourcing routine tasks

Crowdsourcing routine tasks is, in essence, an integrative form of Crowdsourcing. On a small-scale, routine tasks can be done cheaply, but their implementation becomes an issue when the scale increases. The completion of routine 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. There are many typical examples of Crowdsourcing for routine tasks, including among others:

- OpenStreetMap (OSM) collects and pool geographic data in order to establish a world map under the Creative Commons license. Contributions are voluntary, with no financial reward.
- TxtEagle: This project enables client firms to have simple tasks (*e.g.* writing or image marking) completed via text message by ordinary mobile phone owners around the globe. Tasks are paid for with micropayments (\$0.02 per line).

In both examples, the tasks performed are rather poor from a cognitive point of view. Here, the added value of Crowdsourcing does not stem from individual abilities, but from the low-cost realization of simple tasks on a large scale. The involvement of individuals is relatively low, as well as their required skills. Therefore, financial incentives do not go beyond micropayment. It can happen that the task to be performed is so automatic that individuals participate in a Crowdsourcing project without even realizing it. ReCaptcha is an exemplary case of routine tasks Crowdsourcing.

Captcha (Completely Automated Public Turing test to tell Computers and Humans Apart) are screening devices for distinguishing virtual robots from human beings on the web: a site user is required to decrypt a sequence of distorted characters in order to pursue his session.

Computer programs such as robots cannot read distorted text as well as humans can. Luis von Ahn, a cryptography researcher at Carnegie Mellon and co-inventor of Captcha, had the idea to extend the Captcha technology in the following way.

ReCaptcha takes advantage of two points: over 200 million Captcha are solved every day, each test taking approximately 10 seconds. This adds up to 150 000 hours of daily human work. On the other hand, book digitizing projects use OCR (Optical Character Recognition) patterns which do not work perfectly due to book aging or poor acquisition quality.

Malformed characters resist digital recognition and human intervention is required.

ReCaptcha brings an original solution: the system offers two words to decipher. The first is a known word used as an anti-bot device. The second is a word rejected by OCR software and warped as a conventional Captcha. When such a Captcha is decoded in the same way by

several individuals, it is validated and can be inserted in the digitized text. Figure 3 shows a ReCaptcha window.



Figure 3: ReCaptcha window (recaptcha.net)

According to ReCaptcha over 30 million ReCaptcha are completed every day and over 100 000 sites use the system. In 2009, the ReCaptcha project was able to digitize the archives of the New York Times. As of September 2009, approximately 20 years of archives have been digitized and ReCaptcha hopes to have digitized 110 more years before the end of 2010. This success awakened the interest of Internet giants and on September 17, 2009, Google announced the acquisition of ReCaptcha. This will be of particular interest for Google Books scanning project.

Routine tasks Crowdsourcing seeks a number of complementary contributions necessary for the construction of data and information bases. Complex tasks Crowdsourcing follows a diametrically opposed pattern.

3.2. Crowdsourcing complex tasks

In a context of new product development and innovation projects, problem solving can be regarded as a complex process (Albano and Suh, 1992; Pahl and Beitz, 1996; 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 type of Crowdsourcing differs significantly from the previous one. Firstly, it is a selective type of Crowdsourcing. Indeed, if one accepts (Hatchuel, Le Masson and Weil, 2005; Lerch and Schenk, 2009) that problem solving involves identifying a satisfactory solution or circumventing problem causing factors, there are usually several possible approaches to solving a given problem, which are all candidates for eventual solutions. In this context, Crowdsourcing may allow a firm facing a complex problem to receive a set of candidate solutions from the crowd, and then select the solution that seems best suited to their needs.

The problem solving process requires time and skills of the people involved. Thus we can say that complex tasks Crowdsourcing requires a significant investment on the part of individuals forming the crowd. Like for Open Source Software (Foray and Zimmermann, 2001; Lerner and Tirole, 2002; von Hippel and Von Krogh, 2003), reputation and ego gratification mechanisms may be incentives for individual participation. That said, examples of complex tasks Crowdsourcing (Atizo, Crowdsprit and InnoCentive to name a few) show us that these projects are frequently associated with consistent earning schemes. Finally note that the answers to these sizeable and highly remunerative projects may be the result of hierarchical or autonomous groups (Wenger, 1998).

To illustrate this form of Crowdsourcing we consider the emblematic case of the InnoCentive platform. Brabham (2008) and Lakhani *et al.* (2007) have shown that this case perfectly illustrated the power of Crowdsourcing methods for problem solving issues.

InnoCentive is a spin-off of the multinational pharmaceutical company Eli Lilly, which launched this site in 2001. The InnoCentive platform connects individual innovators (solvers)

with applicants (seekers) that are generally companies. InnoCentive appears as a pool for innovative projects which are classified according to broad disciplines (Business & Entrepreneurship, Chemistry, Computer Science & IT, Engineering & Design, Food & Agriculture, Life Sciences, Mathematics & Statistics, Physical Sciences, Requests for Partners / Suppliers). Once an innovative solution has been chosen, the winning solver receives a premium between \$10 000 and \$1 000 000 depending on the project. Non-winning solvers are not rewarded. Thus while the winning premium can be very motivating, the risk that the investment in problem solving remains unrewarded cannot be neglected.

According to Lakhani *et al.* (2006), innovation on InnoCentive is distributed but it is not open since there is no cooperation between solvers who are myopic concerning the solution paths of other solvers.

This logic is largely dominant on the InnoCentive platform but has a notable exception, namely the growing number of unremunerated challenges. Since December 2006 InnoCentive has signed an agreement with the Rockefeller Foundation to add a non-profit space on its platform, in order to generate scientific and technological solutions specific to countries in the developing world. According to Dwayne Spradlin, CEO of InnoCentive, these non-profit challenges create more open spaces than business challenges (Spradlin, 2009).

The difference between profit and non-profit challenges lies not only in the existence of financial reward, but also in the management of IPR. On the one hand in the case of profit challenges, IPR management is classic *i.e.*, rights are transferred to the client firm. On the other hand, non-profit challenges build upon the Open Source model, *i.e.* knowledge and technical solutions are placed in the public domain. Therefore for strategic confidentiality reasons firms are often reluctant to submit non-profit challenges.

InnoCentive can be considered a real success with more than 70 applying companies (seekers) in 2009, among them large companies like Eli Lilly, Procter & Gamble and SAP. These applicants have proposed more than 900 challenges in 40 different disciplines and more than 175 000 solvers have tried to address these challenges. InnoCentive announced that currently about 40% of profit challenges are solved, this figure rises to 60% for the non-profit challenges (Spradlin, 2009).

3.3. Crowdsourcing creative tasks

The third model of Crowdsourcing concerns the realization of 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. Typical examples of this type of Crowdsourcing are Wilogo and Crowdspring. This Crowdsourcing can be both selective, when the client firm issues a request and eventually selects an outcome among the options proposed by the crowd, or integrative, when inputs from the crowd are pooled together. As far as creative tasks are concerned, the issue is not to solve problems but rather to provide some novelty. Uniqueness has a value *per se*.

In the cases we have identified, remunerations associated with Crowdsourcing of creative tasks are of an intermediate amount (usually a few hundred dollars). Although earnings and involvement are not directly related, economic theory (see *e.g.* Preston Mc Afee, 2009) suggests that in a context of individual achievements with selection (and therefore uncertain outcome), intermediate remuneration levels can be associated with moderate involvement on the part of contributors.

As an illustration of this third type of Crowdsourcing, we consider the Nokia *Calling All Innovators* project. This project shares many characteristics with InnoCentive but differs in two major respects. Unlike InnoCentive, *Calling All Innovators* is not an open platform but a proprietary Nokia platform. Moreover, Nokia does not crowdsource the resolution of complex problems, but seeks the creativity of unknown individuals within the crowd.

Calling All Innovators can be viewed as Nokia's answer to Apple's *App Store* platform.

Among other reasons, the unexpected success of Apple's iPhone is due to the quantity, quality and variety of applications that are developed by users and can be downloaded from the App Store. These include a wide-ranging variety of video games, GPS applications, etc. that are free of charge or relatively low priced. The App Store is a form of Crowdsourcing with network effects (Rohlf's, 1974), since the development of new applications increases the value of the Smartphone system. In September 2009, the App Store reached two billion downloads with more than 85 000 applications available to the 50 million iPhone and iPod touch users worldwide.

As an answer to the App store, Nokia (the world leader in mobile communications with 50 million Nokia Smartphone owners) launched the Ovi Store in May 2009. In order to speed up the development of applications for its mobile device and to avoid network effect related entry barriers (Farrell and Saloner, 1986), Nokia decided to launch the *Calling All Innovators* platform aimed at Crowdsourcing the development of applications.

Calling All Innovators works as a contest area where projects are divided into 3 broad categories: Internet Innovation (web oriented development, the goal being to create web based applications), Flash (Flash format applications such as games) and Emerging Markets and Mobile Necessities (innovative applications using mobile technologies for developing countries). Developers are rewarded by Nokia according the following scheme:

- The winning project earns \$30 000 and is under the spotlights on the Ovi Store home page for 4 weeks. In addition the developer will be invited to demonstrate its application at a special Nokia event at the end of 2009.
- The second project earns \$15 000 and is under the spotlights on the Ovi Store corresponding category page for 3 weeks.
- The third project earns \$10 000 and is under the spotlights on the Ovi Store corresponding category page for 2 weeks.

An important point is that non-winning applications are referenced and can be bought in the Ovi Store. Therefore while there are true winners, there are no real losers and all application developers are more or less rewarded. In this respect it is integrative rather than selective. This feature is an incentive for developers since even non-winning projects can be sources of profits for their developers.

Due to network effects, the quantity, quality and variety of applications available in the Ovi Store are a key factor for the success of this platform. According to Nokia executives, the success of its operation goes beyond expectations. In 2009 a few months after its first call for contributions and even though the Ovi Store did not exist yet, Nokia received over 1 700 proposals from developers in 85 countries. Due to the success of the operation, Nokia issued a second call in fall 2009, in which the contest was divided by regions (Africa, Latin America, the Middle East, Germany, Great Britain and France). While the project is a success as such, it is still too early to determine whether the initial purpose (to compete with Apple) has been fulfilled.

Finally, a summary of this section is proposed in Figure 4. Financial reward is related to the type of task that is crowdsourced and to the corresponding commitment of individuals in the production process.

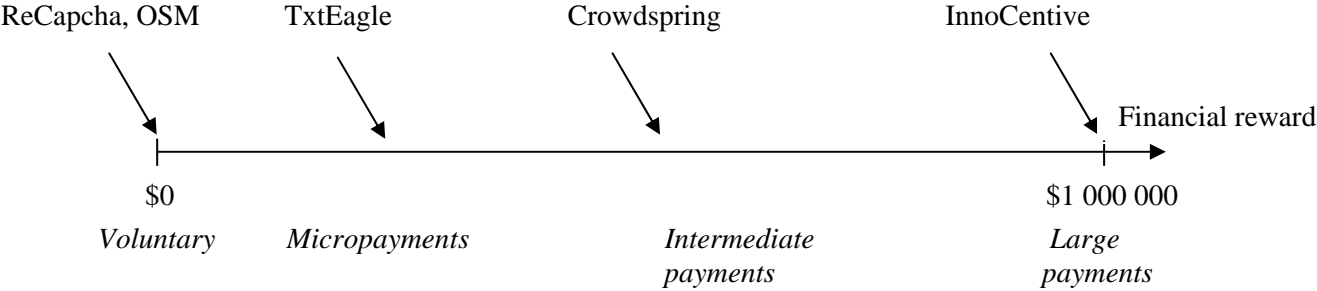


Figure 4: Continuum of Crowdsourcing practices

4. Discussion: benefits of Crowdsourcing

A firm that uses Crowdsourcing does not address its request to a known individual or a given company, but rather to an open set of anonymous individuals, who are mostly amateurs. In this section, we present some advantages of Crowdsourcing. But a caveat applies. The advantages that we identify are linked to specific Crowdsourcing practices rather than to the concept of Crowdsourcing in general. Moreover, we lack the distance to make definitive judgments about this emerging phenomenon and it is difficult to establish causal links between the elements observed. Therefore, this section has no other purpose than to provide an overview of the potential benefits of Crowdsourcing.

4.1. Cost

Using SMS concatenation, we have shown that 5 lines of audio text can be written down by hand and then copied into an SMS in less than 2 minutes.

Paying \$3/hour proficient users to do this work on their mobile phone drops the cost to 2 cents per line. ([Http://txteagle.com/tasks.html](http://txteagle.com/tasks.html), 11.24.2009)

Although the amounts involved vary considerably according to the type of Crowdsourcing, going from micro-payments to payments of on million 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, *Calling All Innovators*), scientists (InnoCentive) or simply individuals wishing to make use of their skill, spare time or some period of professional inactivity. Most of the time (InnoCentive probably being a counter-example) Crowdsourcing is considered a source of additional income for individuals.

While remunerations of Crowdsourcing can be relatively low, voluntary work is not the rule. Many authors have shown that the Open Source scheme relies on non-financial incentives such ego gratification, peer recognition or skill signaling (von Hippel and Von Krogh, 2003; Lerner and Tirole, 2002). The role of these non-financial incentives in the context of Crowdsourcing remains to be analyzed. The cases we have presented suggest that there is a strong link between the involvement of individuals in the production process and the amount of remuneration (see Figure 4): Crowdsourcing of routine tasks is associated with low or no revenue (ReCaptcha), while for the Crowdsourcing of complex tasks, revenues can reach a million dollars (InnoCentive).

4.2. Quality of output

Given a large enough beta-tester and co-developer base, almost every problem will be characterized quickly and the fix will be obvious to someone. (Raymond, 1999)

Quality encompasses various aspects depending on the type of Crowdsourcing. In Crowdsourcing of routine tasks, quality refers to the number and complementarity of tasks that are achieved. Since Crowdsourcing provides access to countless contributors, positive network effects (Rohlf, 1974) can be observed. For instance OpenStreetMap benefits from a growing reputation as contributions increase.

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. But for a given problem, there are usually several solutions (see Section 3) that correspond to different tradeoffs or technical paths. Thus, the variety of options provided by the crowd must be taken into account to assess the quality of Crowdsourcing.

Finally as far as creative tasks are concerned, quality refers to the originality of the solutions proposed and to the way they match with 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.

4.3. Risk

Finally, the Crowdsourcing may reduce the risk faced by the client firm:

- Since tasks are not outsourced to a single provider, the risk of firm dependence *vis-à-vis* the provider is likely to disappear.

- Since the client firm issues an open call with financial incentives, the risk of not obtaining a satisfactory input appears relatively limited.

Crowdsourcing can also be a risk factor for the client firm:

- Dependence on the Crowdsourcing platform. When Crowdsourcing relies on a third party platform, the client firm is partly dependent on the strategic decisions taken by the platform owner.
- Knowledge and know-how. Like for classic outsourcing, the firm that uses Crowdsourcing faces risks of unlearning and brain drain. But Crowdsourcing also generates a competitive risk to the client firm. As in the model of Open Innovation (Section 2), the relationship between the client firm and the solution developer may be ill defined from an IPR point of view. The solution developer may reuse the idea or solution developed to address the needs of other client firms.

5. Conclusion

The purpose of this article was to better understand Crowdsourcing. This phenomenon has developed remarkably in the last few years and is still under construction.

Our first task was to propose a both discriminating and operational definition of Crowdsourcing, with the parent concept of outsourcing as a starting point. We also mentioned cases illustrating the diversity of Crowdsourcing situations.

In the second section, we presented similarities and differences between Crowdsourcing and established theories (Open Innovation, User Innovation) and a phenomenon that has inspired many studies in Economics and Management, Open Source Software. Our goal was to avoid future misunderstandings and to show that Crowdsourcing is a concept *per se*.

In the third 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 (routine, 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.

We hope to have clarified the specificities and issues relating to Crowdsourcing and that our work will contribute to the reflection on this growing phenomenon. Our research agenda includes among other themes a precise assessment of Crowdsourcing benefits, and the study of the sustainability of Crowdsourcing approaches over time.

REFERENCES

- Albano L. D. and N.P. Suh (1992). Axiomatic approach to structural design. *Research in Engineering Design*, 4(3), 171-183.
- Albors J., J.C. Ramos and J.L. Hervás (2008). New learning network paradigms: Communities of objectives, crowdsourcing, wikis and open source, *International Journal of Information Management*, 28, 194–202.
- Ågerfalk P. and B. Fitzgerald (2008). Outsourcing to an unknown workforce: exploring open sourcing as a global sourcing, *MIS Quarterly*, 32(2), 385-409
- Bonaccorsi A. and C. Rossi (2003). Why Open Source can succeed, *Research Policy*, 32(7), 1243-1258.
- Bootz J.P. and E. Schenk (2009). Comment gérer les experts au sein et en dehors des communautés, *Les communautés en pratique : leviers de changements pour l'entrepreneur et le manager*, J.P Bootz and F. Kern (eds), Lavoisier.

- Brabham D. (2008). Crowdsourcing as a model for problem solving: An Introduction and Cases, Convergence, *The International Journal of Research into New Media Technologies*, 14(1), 75-90.
- Burger-Helmchen T. and C. Guittard (2008). Are users the next entrepreneurs? A case study on the video game industry, *International Journal of Entrepreneurship Education*, 6, 57-74.
- Chesbrough H.W. (2007). Why companies should have open business models, *MIT Sloan Management Review*, 48(2), 21–28.
- Chesbrough H.W. (2003). The era of Open Innovation, *MIT Sloan Management Review*, 44(3), 34–41.
- Cohendet P. and L. Simon (2008). Knowledge intensive firms, communities and creative cities, *Community, economic creativity and organisation*, A. Amin and J. Roberts (eds), Oxford University Press.
- Dahlander L. and M. Magnusson (2008). How do firms make use of open source communities?, *Long Range Planning*, 41, 629-649.
- Farrell J. and G. Saloner (1986). Installed base and compatibility: innovation, product preannouncements, and predation, *American Economic Review*, 76(5), 940-955.
- Foray D. and J.B. Zimmermann (2001). L'économie du logiciel libre: organisation coopérative et incitation à l'innovation, *Revue Economique*, 52, 77-93.
- Gassmann O. and E. Enkel, (2004). *Towards a theory of open innovation: three core process archetypes*, <http://de.scientificcommons.org/2287>
- Guittard C., E. Schenk and P. Cohendet (2009). TIC et communautés : le Forum comme espace de socialisation, *Les communautés en pratique : leviers de changements pour l'entrepreneur et le manager*, J.P Bootz and F. Kern (eds), Lavoisier.

- Hatchuel A., P. Le Masson and B. Weil (2005). *Activité de conception, organisation de l'entreprise et innovation, Travail, entreprise et société: manuel de sociologie pour ingénieurs et scientifiques*, G. Minguet et C. Thuderoy (eds.), Presses universitaires de France.
- Howe J. (2008). *Crowdsourcing*. New York: Crown Publishing Group.
- Howe J. (2006). The rise of crowdsourcing, *Wired*, 14(6).
- Kozinets R.V. (2002). The life behind the screen: using netnography for marketing research in online communities, *Journal of Consumer Research*, 39, 64-72.
- Krishnamurthy S. (2005). *The Launching of Mozilla Firefox. A Case Study in Community-Led Marketing*, MIT, <http://opensource.mit.edu/papers/sandeep2.pdf>
- Lakhani K., L.B. Jeppesen, P.A. Lohse and J.A. Panetta (2007). The Value of Openness in Scientific Problem Solving, *Harvard Business School Working Paper*, No. 07-050.
- Lakhani K. and E. von Hippel (2003). How Open Source software works: free user-to-user assistance, *Research Policy*, 32(6), 923-943.
- Lerner J. and J. Tirole (2002). Some simple economics of the Open Source, *The Journal of Industrial Economics*, 50(2), 97-234.
- Markus L.M. and D. Robey (1988). Information Technology and Organizational Change: Causal Structure in Theory and Research, *Management Science*, 34(5), 583-598.
- Pahl G. and W. Beitz (1996). *Engineering design: a systematic approach*, Springer.
- Pénin J. (2008). *More open than open innovation? Rethinking the concept of openness in innovation studies*, Working Paper n°2008-18, BETA, Strasbourg.
- Preston McAfee R. (2006). *Open Source Introduction to Microeconomics*, <http://www.introecon.com/IEA.pdf>
- Raasch C., C. Herstatt and K. Balka (2009). On the Open Design of Tangible Goods, *R&D Management*, 39(4), 382-393.

- Raymond E. (1999). *The Cathedral and the Bazaar*, O'Reilly.
- Rohlf J. (1974). A Theory of Interdependent Demand for a Communication Service, *Bell Journal of Economics*, 10, 16-37.
- Simon H.A. (1960). *The new science of management decision*, New York and Evanston: Harper & Row Publisher.
- Spradlin D. (2008). *Crowdsourcing Innovation: Q&A with Dwayne Spradlin of InnoCentive*, <http://www.fastcompany.com/blog/kermit-pattison/fast-talk/millions-eyes-prize-qa-dwayne-spradlin-innocentive>
- Tapscott D. and A.D. William (2007). *Wikinomics*, Pearson Education.
- Torwalds L. and D. Diamond (2001). *Just for fun : The story of an accidental revolutionary*, Harper Collins Publisher.
- von Hippel E. (2005). *Democratizing innovation*, MIT Press.
- von Hippel E. (1988). *The sources of innovation*, Oxford University Press.
- von Hippel E. and G. Von Krogh (2003). Open source software and the 'private-collective' innovation model: issues for Organization Science, *Organization Science*, 14(2), 209-223.
- Weber S. (2004), *The Success of Open Source*. Harvard University Press.
- Wenger E. (1998). *Communities of practice: learning, meaning and identity*, Cambridge University Press.
- Zeitlyn D. (2003). Gift economies in the development of open source software: anthropological reflections, *Research Policy*, 32(7), 1287-1291.