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From Open Innovation to Crowd Sourcing: A New Configuration of Collaborative Work?

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Abstract

In the era of the digital economy (ICT, Internet Objects, Cloud, Big and Open Data, etc.), we observe important transformations linked to this digital revolution [1], including development of collaborative and participative platforms, the rise of inter-company, inter-organization and inter-network collaborations, as well as the development of sharing and open innovation dynamics (crowd sourcing, crowd funding, maker space, Fab Lab, Innovation Laboratory Open, etc.). We wanted to better understand how innovation was developed in this context and to this end, we conducted a thorough study of an open-value network aimed at developing innovative products. The network studied, Sensorica, is organized around three fundamental pillars, each with a specific role: an association, the NPO, for governance, a network of companies for commercialization and an open, international community for collaborative work and the development of innovation. It is thanks to a platform on the internet that individual workers, motivated by the values of the peer to peer (P2P) or participative economy are involved in creating together innovations on distributed projects. In the context of participatory economics, this network illustrates new forms of cooperation, ways of managing collaborations based on the model of P2P, based on a partnership of shared values system.

Keywords

Innovation Open, Collaborative Working 2.0, Peer-to-Peer, Communs, Crowd Sourcing

1. Context of Research for Innovation, for Originality and Singularities

The importance of a "commons" culture now seems to defy the classical rules of capitalism and lead to a form of collaborative economy reinforced by the digital economy. Several initiatives are emerging, including the Living Labs [2] which

are numerous in Quebec [3], the Fab Labs, and other related forms. The models of Living Lab and Fab Lab can encourage collaboration, creativity and innovation, and that's what has led to their rise in recent years [4]. These new collaborative, participative communities are part of a wider movement in which technological advances, and particularly digital innovations, favor a movement in the boundaries of employment [5]. Moreover, they allow the members from diverse professional backgrounds and countries to achieve open collaboration around open source projects. If the majority of the collaborations remain in regional or national proximity, we will want to study a case of collaboration open to the international scene, a case of open innovation, which relates to the production of common goods [6] [7].

In the following section, we present not only the theoretical framework on which our analysis of the organization studied is based and which makes it possible to understand the articulations between emerging forms of work organization and collaborations, but also the development process of the resulting innovation, based on a system of sharing common values.

2. Theorical Framework

Our research being situated is in the context of collaborative, participatory economy or sharing, which have different although close meanings, and are often used in an undifferentiated way, we must first define these concepts.

We must of course remain critical of the sharing economies that thrive on the Internet, but also the economic dynamics that they imply and the conditions of work that are strongly differentiated from one organization and from one sector to another. In this regard, Michel Bauwens (2012), theorist of peer-to-peer and defender of common goods (including free software and open source: Linux, Apache), denounces the rise of platform capitalists or "netarchiques" [6] [7] developed with information and communication technologies (ICT). Indeed, for Bauwens as a number of other analysts, these platform capitalists "do not share their algorithms in peer-to-peer relationships, nor do they share their profits or their customer database (although they are constituted by the customers themselves)" [8] [Our translation, p. 11]. Sharing is therefore very limited. They simply develop on the Internet what some have described as plat forming, based on a mode of collaborative consumption, which ultimately turns out to be only a kind of "transition" by investing in common platforms like "Facebook" [9], Uber, AirBnB, Amazon and more.

Going against this model, and clearly claiming the values of distributed capitalism, peer to peer (P2P) communities operating in open source, represent a better example of collaborative working [6] [7], based on genuine sharing and the production of common goods. Michel Bauwens explains the distinction between the real P2P[1] and platforms such as Uber:

> The difference between a peer-to-peer production and Uber is the fragmentation of labor, the competition between workers to obtain a service, without

[1]P2P Foundation created in 2005 http://p2pfoundation.net/.

access to this service, this "common good", in the form of the algorithm controlled by the firm. This leads to imbalances, and with them precariousness. When Uber settles in Paris, profits go to its shareholders in Silicon Valley (Le Monde, 2015), [10] [Our translation].

It is therefore, not easy to find a single definition of the sharing economy because:

[in] the current literature, there is a wide semantic confusion between the so-called sharing economy (sharing economy), the collaborative economy, the economy on demand, the economy based on services. Their only common point is the seemingly—and falsely—disintermediated encounter between a demand and an offer of service. These expressions reflect, to use Rifkin's intuition, the age of universal access to the planetary services into which we would have entered (Rifkin 2001), [10] [Our translation, p. 29].

It is therefore, in a network working in peer production that we have decided to study the innovation process, in a context of open and collaborative innovation, where members are motivated by social and collaborative values to develop new products and services, through a process that can be described as open innovation. This research and its results show how such a type of collaborative innovation process works, which little research has documented. However, we first explain the elements of problematics and contextualization of this new sharing economy, whose meanings and realities vary according to the case and the context.

2.1. What Meaning for the Sharing Economy?

Bauwens (2012) thus distinguishes the "netarchy" or platform economy from a distributed capitalism based on the logic of the "commons". **Figure 1** shows the characteristics of two axes and four quadrants that differentiate the models.

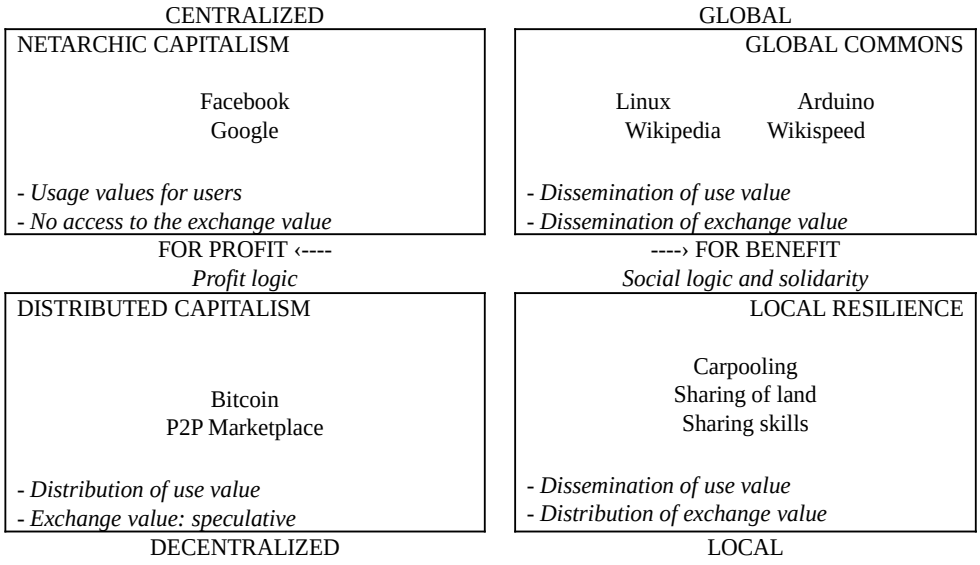

Figure 1. Collaborative economics in 4 quadrants by Michel Bauwens (P2P).

The first vertical axis refers to centralized (e.g. Facebook)/decentralized and the second axis between profit and non profit according to a social logic. This leads to the identification of four models of collaborative or participatory economics, four economic logics. Netarchic capitalism is located in the first quadrant, at top left (Facebook, Google, etc.). These companies benefit most from the activity of their users. The distributive capitalism (bottom left) is represented by the peer-to-peer, for example Uber, Airbnb, or eBay. These two models are based on intermediation platforms [11]. Distributed and netarchic models respond to a market logic where profit is the ultimate goal. The other two quadrants to the right, that is global commons or local resilience, pursue a social benefit. However, regardless of where one is located in this taxonomy, the problem of valuing and evaluating work remains the same, especially in a context where the opportunities offered by digital technologies are constantly increasing and blurring emerging business models. This is one of the elements we deal with in the analysis of our results.

The collaborative economy apparently leads to a society with extremely flexible professional careers, with periods of paid work, periods of unemployment (during which collaborative projects can be more easily carried out), periods of social entrepreneurship, etc. [12]. Some have referred to these as "boundaryless careers".

Capitalism platforms, represented by the uberisation of the economy leads to a reorganization of self-employment:

Platform capitalism transfers the risk of market fluctuation to the worker … This market risk was the historical responsibility of the entrepreneur. The platforms no longer take it, they appear as intermediaries. A platform like Uber no longer disables its workers, it "desactivates" them [13]. However, we find:

> [a] codependence of construction between peers in the capitalist system; the commons believe in the collective level but the individuals who contribute to the commons are obliged to be wage-earners in the capitalist firms that take added value in the system of accumulation of capital [7] [Our translation].

The question of the commitment and motivation of this category of workers is raised. Unlike the logic of competitive markets, innovators involved in collaborative communities (e.g. developers of Linux free software) engage in projects with intrinsic motivation, not based on direct profit, and they can even work for free [14]. As shown in **Figure 2**, these differences present two distinct worlds of values, and we will return to this question of values in our case study as it appears fundamental to the organization of collaboration.

2.2. Work 2.0: Crowd Sourcing and Open Source

The Foundation for the Improvement of Living and Working Conditions (2015) found that nine "new forms of employment" [10] [Our translation, p. 34] and trends are developing in Europe. The collaborative work of multiple job workers

and self-employment (see Figure 3) is what we are interested in. Many of these workers will work from platforms [13] linking employers and workers, often in the framework of large-scale tasks divided and divided among several workers organized into "Virtual Cloud" organizations [10] [Our translation, p. 35]. In the age of the digital, a new worker figure working in the immaterial world [15] is emerging: the *crowd worker*, the "Interim 2.0" [16], the contractual worker [10].

Software or algorithms [17] control the platform and enable online sharing, involving several actors in the development of crowd sourcing that allows "an umbrella of approaches" [18] (p. 8).

This term crowd sourcing is relatively new and refers to the sharing of ideas

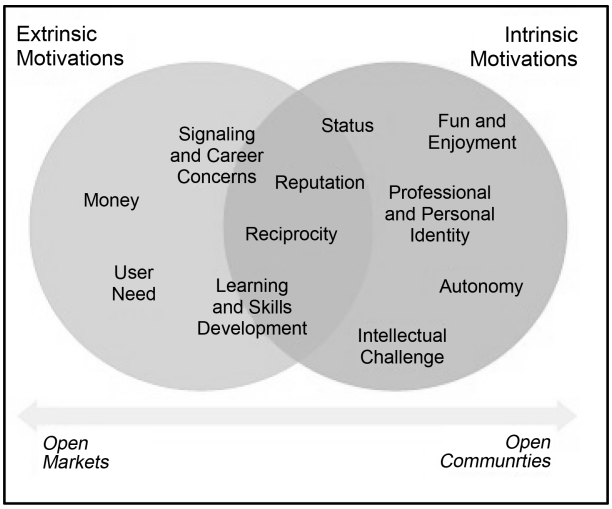

Figure 2. What motivates external innovators? [14] (p. 71)

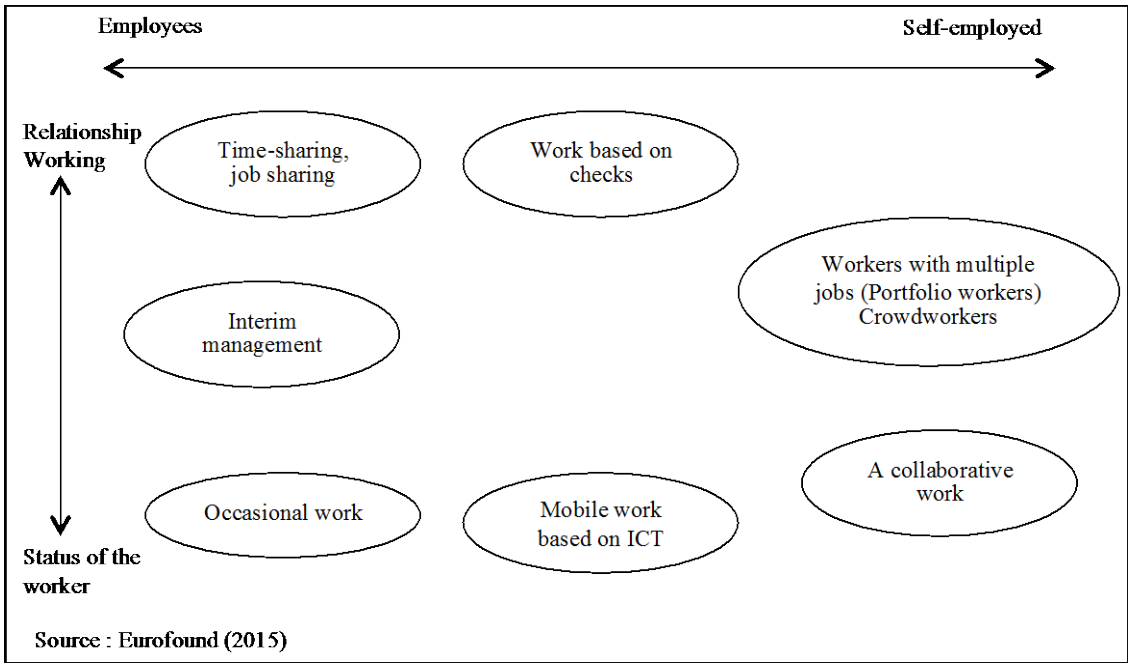

Figure 3. Classification of the nine new forms of employment [10] (p. 35).

and collaboration on the internet: "*the concept was derived from the general trend that information technology allows ideas and efforts to be openly shared over the Internet*" [19] (p. 41). The term crowd sourcing was introduced by Jeff Howe [18] [20] [21] [22] incorporates the principles of open source, "*crowd sourcing is to take the principles which have worked for open source software projects and apply them right across the entire spectrum of the business world*" [18] (p. 1). The underlying philosophy is that of open access: "*open source software* (*OSS*) *is to allow users to freely access, use, modify and redistribute software products and their source code under a public license* …" [19] (p. 41).

> Crowd sourcing 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) … The crucial prerequisite is the use of the open call format and the large network of potential laborers [22].

Jeff Howe then distinguishes four forms of crowd sourcing that change over time and that will profoundly transform the nature of work: "*crowd sourcing harnesses the power of today's communication technologies to liberate the potential which exists in large pools of people. It will shift the way work gets done*" [18] (p. 8). The first category is the collective intelligence or wisdom crowd; it allows the members of the crowd to solve problems, formulate new ideas, to be creative, which can lead to innovation (products, processes or services). The second is the crowd creation (or user-generated content), users of the crowd generate content they share with others either free or for a small contribution. The third is the crowd voting, where people give their opinions on ideas, products or services, but it also involves analyzing, evaluating and filtering information that is presented to them. Finally, the fourth is the crowd funding: people can raise money for investments, donations or "micro-lending of funds" [19]. A final category is identified by Chiu *et al.* (2004); it is similar to crowd creation: "*An additional type is microworking or microtasking. In this type of crowd sourcing, organizations assign small pieces of work* (*microtasks*) *to many workers. A well-known intermediary for this type is Amazon's Mechanical Turk*" [19] (p. 41).

Our case study is centered on how to organize the work of outsourcing to "crowd members", peer-to-peer, as this has not, to our knowledge, been documented in articles to this day. This process of sharing "micro-tasks" [19] (p. 41) is nevertheless essential to the development of open innovation and distributed in the context of projects entered into a shared platform on the internet.

The open source project refers to a wide community based on voluntary contributions, but coordinated by one or a few developers, "*a loosely coupled community, where work is totally delegated, relying on a high amount of voluntaristic contributions, but coordinated by one or a few developers*" [23] (p. 208). The best known example of this type of project is the distributed Linux operating system, "*anyone can download the code, contribute to it, send it back, and if it is*

considered good enough it will be included in the core product. The contributors come from all over the world and most of them have never met face to face" [23] (p. 208). Production in *open source* is as a peer production available to the public common goods, generally supported by a community motivated by shared values. Members adhere to the *open source* community informally, with the desire to get involved in a social project and work according to their will [23]. In the next section, we will define the concept of open innovation.

2.3. Open and Distributed Innovation

The concept of open innovation is associated with the concept of crowd sourcing, because they have a common basis for dealing with a process of co-creation of value, interactive collaboration of many stakeholders (e.g. peer-production), and an open call for projects on platforms. This is intensified by the new technologies of Web 2.0, which offer new business opportunities and collaborations. Indeed, "*the diffusion of various forms of digital technologies has acted as a disrupting force in several industries, promoting open and distributed innovation processes*" [23] (p. 205). This is why it is important to consider simultaneously open innovation, crowd sourcing and co-creation [24]. Moreover, the innovation introduced by crowd sourcing makes it possible to benefit from the knowledge of a vast network of qualified professionals. Indeed, it is defined as "*a way of using the Web* 2.0 *tools to generate new ideas through the heterogeneous knowledge available in the global network of individuals highly qualified and with easy access to information and technology*" [25] (p. 624).

Open innovation is thus defined as a non-linear process [26] [27] resulting from collaborations between a community and which can bring together private and public actors (research centers, universities, hospitals, organizations, industries, etc.) and users involved in the project development, as is the case of open source [28].

"*Open innovation is a paradigm which assumes that companies can and should use external ideas, in addition to internal ones, to facilitate innovations, share risks, and improve productivity and competitiveness*" [29].

"There are several methods for importing external ideas […]. *Lately, however, several new methods and tools have been developed, notably: co-creation, user innovation* […], *collective intelligence and crowd sourcing*" [19] (p. 41).

Henry W. Chesbrough [30] proposes the following model of open innovation, shown in **Figure 4**, by highlighting the porosities existing between the company and its environment, allowing innovations to circulate, which is not the case in closed innovation, where R & D processes occur only internally. Some authors have criticized this opposition between open and closed innovation, considering that there has never been a truly "closed" innovation, but varying degrees of openness [31], which seems to us more accurate. In any case, the work on "open" innovation highlights the external and sometimes very diverse sources of innovation.

Thus, as noted by Henry W. Chesbrough :

> *"In the new model of open innovation, a company commercializes both its own ideas as well as innovations from other firms and seeks ways to bring its in-house ideas to market by deploying pathways outside its current businesses. Note that the boundary between the company and its surrounding environment is porous* (*represented by a dashed line*), *enabling innovations to move more easily between the two* [30] (p. 37)".

As part of the company, the integration of collaborative innovation enables the use of external resources that may be lacking in the organization ["*the knowledge and expertise of bright individuals*", [30] (p. 37)] and to create added value by outsourcing part of the R & D, as shown in **Figure 5**.

In other words, it is important that companies, in a context of great competition and accelerated innovation processes, multiply collaborations (universities, research centers, organizations, collaborative communities, etc.) in order to develop more quickly new innovations, possibly more innovative ones, by involving users and consumers [24].

Technological advances in ICT and the Internet create many possibilities and in turn generate new innovations [23]. This is why innovations follow a social trajectory in an environment in transition, transformed by the digital economy,

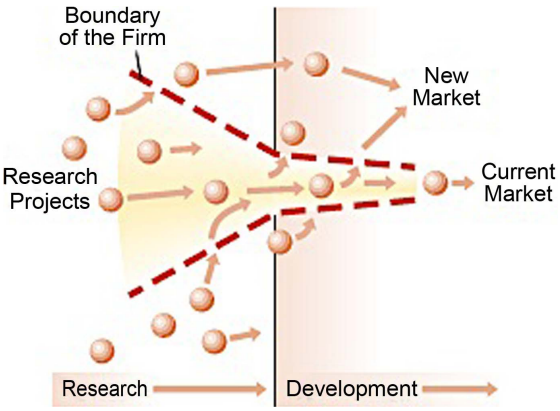

Figure 4. The open innovation model [30] (p. 37).

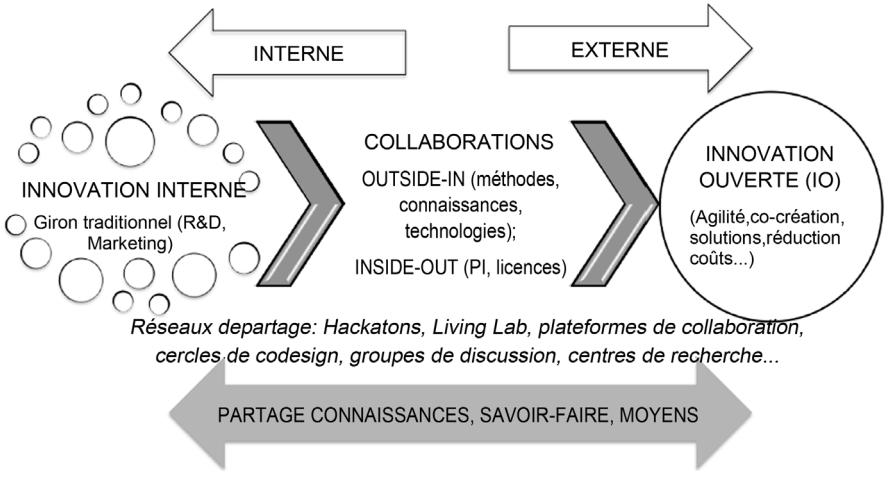

Figure 5. Open innovation process and collaborations.

transcending the boundaries of the territory and involving increasing interactions [32] as has been the case with the collaborative development of free software.

In addition, open, "horizontal", "cooperative" innovation without intellectual property clauses basically does not need to be protected because it would reduce its dissemination and even the possibility of being noticed by industrial players [15]. As noted by [32] (p. 314) "*Therefore*, *new forms of IP evaluation*, *monitoring*, *and management will emerge*".

Finally, some authors highlight new forms of production of values, based on the notion of the "commons", operated by collaborative communities [33] [34]. This introduces the notion of "commons-based peer production". This phenomenon of *peer production*, production peer result from the development of free and open software, "open source software" such as Linux [33], but extends beyond software today, to products. "*Benkler* (2006) *describes commons-based peer production as a third mode of production*, *where large aggregations of individuals independently searching for opportunities to be creative* […]. *To summarize*, *advances in IT have promoted new intermediary opportunities to match supply and demand*, *build relations and cross-pollinate creative idea*s" [23] (p. 209). It is in this context of technological advances, developments in algorithms, IoT (Internet of Things), etc., that we are witnessing the emergence of networks engaging in global collaborations to satisfy these socio-economic needs for innovation. Thus, we are interested in one of these networks in order to try to understand their mode of operation, which is the objective of our research, which we specify in the following paragraphs.

3. Objectives: Understanding the Collaborative Process in Open Innovation

The case study proposed here aims to understand the modalities of collaboration in an open innovation process. Indeed the network Sensorica is part of a new type of ecosystem including peer producing working from a collaborative Web 2.0 platform [35]. It is based on the commitment of a group of workers who possess broad and diversified skills to develop different projects and products. The values espoused by the network are those laid down by the peer to peer community. Acting as a "transforming incubator" (S), it claims shared values, and identifies itself with a new paradigm aimed at rethinking societal links and market dynamics by focusing more on the search for benefits Than on individual profit [6].

Sensorica clearly stands out from platform capitalism by being focused on new forms of collaboration to create products through the process we described above as open innovation. It is on the basis of a qualitative research that we decided to study the articulations between emerging forms of work organization, management of collaborations based on the model peer to peer (P2P) and open innovation on a collaborative platform. We also wanted to understand how individuals were motivated to participate in collaborative innovation processes.

4. Methodology

Given the novelty of the subject and the desire to understand innovation processes and methods of collaboration, we have chosen to carry out a qualitative research [36] [37]. Our research is based on participatory observations and comprehensive, semi-directed interviews [38]. In terms of observations, we participated in various events of the industry, discussed with participants and conference presenters and with various organisations of the sector. Our methodological choice was based on an abductive approach [39] [40] [41]. Given the novelty of the subject, this approach makes it possible to combine theoretical concepts and empirical observations.

We conducted five interviews in October and November 2015. Interviews were conducted with different members of Sensorica, founders and most active members. The first interview lasted 2 hours, took place in the presence of three members of the network, in their premises. The other three interviews were conducted with the same people, but in individual interviews, to explore various issues. These last interviews took place one month after the first collective discussion and lasted 35, 40 and 55 minutes respectively. They allowed reconsidering certain dimensions to better understand them. The most recent interview is based on a written exchange to clarify certain specific points. This three-step process allowed us to better understand the processes of cooperation associated with this new form of innovation process. It should be noted that we also carried out some 20 semi-directive interviews with private/public bodies and government officials (in 2015-2016) in order to better understand the characteristics of these new forms of innovation and their importance in the ecosystem. This also confirmed the value of this case study in particular. Our survey material was processed through a thematic analysis of data and content [36]. Let us now turn to the results concerning the observed innovation process, based on P2P.

5. Results

In this section we cover the Sensorica general organization, and we especially are interested in open innovation processes found there, that lead to innovative product developments based on the collaboration of many people, in various parts of the globe. Let us begin by defining this network and the functioning of its innovation process.

5.1. The Definition of the Network

Sensorica identifies itself as a Fab Lab, a Maker Space, an incubator, an accelerator "that combines elements of all these forms in a new structure called an open value network" (T3). The term "Value Network" was introduced by Verna Allee "… [the network] has taken this concept and pushed it into the Open" (T3).

The network is "peer production, commons-based peer production, peer to peer value … This is something more complex than Uber can do" (T). Peer to peer can be seen "as a sub-division of […] the social economy or social innovation" (T) which increasingly interests governments. The organization is thus

part of an ecosystem whose development is accelerated by new information technologies and the Internet.

At the beginning, the network operated with an open collaborative space of the Fab Lab type to promote its "ability to innovate" (V2), but it quickly perceived the limits of these operations: "one cannot stop there because these communities are not able to distribute a solution, an innovation. We said to ourselves—it takes us other structures" (V2). That is why the members of the network initially set up a binary structure based on an "open innovation community and a company for commercialization" (T). However, noting that such a "system was unstable" (T), in the autumn of 2014, they decided to add a third pillar, which is the NPO to ensure the governance of the network (V2) and ultimately "to avoid the divide between innovation and product exit" (V2). It is a "new organizational structure" (T3) that is then introduced to address problems or barriers between the various functions of governance, development and marketing.

Members of an open community are motivated to participate in projects and engage in an organization through a set of values including:

> [The feeling] of justice. And when they feel that the company that makes the marketing gets too rich with regard to the innovators, this feeling of injustice will take over and the community will be dispersed. Why? Because these people are not tied down. So it's an attractor, (T).

Sensorica wanted to avoid the risk of the community being destroyed because of a sense of injustice. It therefore decided to "take advantage of these functions from private enterprise … Since then, the network has been recognized internationally for this kind of model" (T). The ecosystem is based on this three-pillar model, a "platform for the creation of values, a distribution system and a governance system" (V2). The network is "a community of people working together on various projects" (V2) from a virtual space and "the open community is the source of innovation" (T). In addition, the organization must manage "a physical space, working with tools, equipment, managing production, determining where we go from an idea of innovation to production" (T). There is also participation of others who come less to the physical space and wo work elsewhere. As noted in an interview, "it's all very fluid" (T). In the physical space, a laboratory, "there are 20 people who come and participate quite often" (T). The value system is based on "*the who*, *the what and the product*. In conventional business, they release a product and the difference is that we work from […] values first and after, we distribute the product" (V).

While "on the internet, there are new forms of companies today that are also open innovation, such as Arduino, well known to those in electronics" (T), based on two pillars, they are distinct from their operating structure. From the viewpoint of Sensorica, this type of structure has two pillars:

> [a] community of people who innovate and a company for marketing, and the NPO, which is part of the company. It is a structure that has worked for ten years … The problem is that if you put a lot of investors […] in the

> business part, it will stifle the innovation side a bit … We'll have the profit motivation which will take over [on] the need to maintain an open innovation community. That's why we, we created a third party, the NPC, which guarantees these relationships then […] for support services […], financial tools […] there are also some governance rules [in place] … It stabilizes these structures, (T).

The administration of the platform "of Management of values created" (T) and the ecosystem is complex, so the development is long and requires a certain maturity over time. "Scientific productions will arrive in 2016: platforms like [ours] that started here in hybrid and have stabilized with these three parts […] it will begin [to arrive] in 2016" (T). In addition, the body associated with its development, "network of values and communities of practice" (V2). "Our model has already been adopted by other communities. At present, we have formed a kind of alliance just to be sure that we learn from others as well. It is only, perhaps, the production really, the other is for services they do" (J2). The network "provides R & D and consulting services to traditional institutions and this can be seen by these institutions as the crowd sourcing" (T3).

5.2. The Context of Participatory Economics, Source of the Development of the Network

From 2011 on, Sensorica has joined the movement of the participatory or sharing economy (J2), and it is clearly distinguishable from platforms such as Uber, as we have described them above, in particular as concerns values and property. When one "speaks of uberisation […] it is private property, *you know*, *you have to make sure to pay back the venture capital that put all the money down*" (J2), whereas when "talking about us, we speak of a platform that is based on values, the platform belongs to [no one]" (J2). The collaborative or participatory economics, "is just starting, it is something for the future, there are the new *buzz words* that we see everywhere: open innovation, decentralization, *crowd sourcing*, social financing, etc." (T2). The new economy, one that boasts of the peer to peer (P2P) movement increased gradually and there were different separate steps in its development. Sensorica is part of this movement, and it refers to three main stages in this development:

1) The first is marked by the idea of sharing in the cultural sector: "The *peer to peer* movement […] began with the sharing of music, we remember the App-store … The idea here is direct access to peers, and it is a direct exchange between individuals without intermediaries" (T2). People are then set to "collaborate online on products that are intangible, cultural production, for example […]. It means that people meet via internet and can produce music together, produce text, videos, etc." (T2).

2) The second step is important; it is based on the introduction of exchange of online services: service platforms. "It emerged in a strong way in California because of the investment that was present" (T2). In terms of "mainstream" of the sharing economy that:

> [the] people know: it's Airbnb, Uber … It's service platforms, it is very simple: it is contacting someone who needs something with someone who offers it. I have a car, you need a lift and the platform connects us and makes us pay, (T).

They "provide overall coordination, and coordination then makes sure that people can maintain relationships peer to peer, peer-to-peer, they can get these services mediated by these platforms" (T).

3) The last step introduces peer production that moves "in the production of material goods [for example] the movement of *open source* for software and material objects, it's called: *open source hardware*, […] a movement of peer production [which] is based on the idea of the commons" (T2). The "peer production of material goods […] comes last because of its complexity" (T2):

> When we make material production is made simultaneously in digital production, are documents that we create together, electronic design, mechanical design, but we also manage space, tools, materials etc., so it gets heavier, (T2).

In a P2P environment, particularly in Sensorica, the term "platform" is criticized and there is more emphasis on infrastructure:

> [The] platform has this connotation of control, someone has it and others are simply members. It's like a corporation that provides platforms for economic activities. P2P infrastructure such as block chain does not have that connotation. We must distinguish between P2P and platform capitalism. [For example], no one can control, buy or sell the Bitcoin network (T3).

When dealing with the collaborative economy, it is necessary to distinguish the platform capitalism from Peer Production:

> We are [tired of hearing] about service platforms … Now we will start talking about production systems based on the same logic. This is planned in 2016 … [We're] really spearhead in the production by peer to peer (T).

Regarding the phenomenon of peer production "the capital of the world, I think, […] it's Montreal" (T). In the USA:

> [it] is a movement which is very strong in California, especially around San Francisco, but they took a slightly different turn. We talk about the economy or the sharing platform of capitalism which is not quite the *peer to peer*, we must distinguish all this. Popular examples are Uber today … This is not quite the peer to peer because there still is an intermediary between those requesting the service and those who offer it: the platform of exchange where drivers are solicited. So we call this platform capitalism … In the eastern United States, there is a mixture between the two: there are many efforts that are peer to peer, it means disintermediation efforts, but also there are initiatives such as Uber and Airbnb (T2).

Platform capitalism differs ultimately from the peer to peer approach as follows:

> There are still big movements in the Internet of things; the most famous is still what we call platform capitalism: that is to say it is a company that offers measuring instruments, sensors and intelligent systems that make sense of this data there. They also offer to host these data services, that is to say they put on their server […] or on their cloud, the cloud, and there they will be able to analyze process and sell information … There's a platform that is private which is monopolized by a company, there are people who wear these sensors and then send the data to a platform. It's like on Facebook, it is our participation that creates value … On the other hand we have the peer-to-peer that is to say, this is disintermediation. We're going up platforms where people who have those sensors and these intelligent systems send data to a database that is distributed, which belongs to no one, so in that way everyone has access to these data, it belongs to everyone and it is not monopolized by one company. There is a new technology that has recently emerged that allows this kind of thing. So there are two poles emerging at this time for the processing of such data for their analysis and distribution. There is one that relies on data capture and sales analysis, there is another that promises free distribution or distributes this data free to everyone, (T2).

Other changes accompany this trend of distributed capitalism [7] such as virtual alternative currencies, Bitcoin; Internet of Things (e.g. intelligent home, the wearables, automatic farm, etc.); networks "of collaboration, exchange of knowledge and know-how" (V2) without "commercial vocation" (V2) where members work together "with technology and make things, etc." (V2): the Fab Lab, Maker space and third places. Networks in which innovations were born, such as "3D printers which are outputs from these places" (V2). Some have associated this with the concept of the "commons" [42]; the question of work and its value remain crucial, which leads us to discuss work organization in the sharing economy.

First, we must note that the type of employment status that is prevalent in the collaborative or participatory economy is mostly self-employment (self-employed).

5.3. Work in Open Source Projects

Working in open source is characteristic of the Sensorica innovation process. It is clearly distinguishable from existing collaborations in the co-creation spaces (e.g. Fab Lab) where often "projects are in silos, the world will help, but they are really focused on the project and there is not much sharing of expertise or know-how" (T). Finally, this type of work organization is built on a shared philosophy that motivates its members:

> It is in the background a better human model … I remember the first time

> […] I was talking with T, I showed him what I was doing without fear of [my idea] being stolen from me … [Previously] I had a partner and the problem […] was that he had special skills [while] I rather have technical skills [and finally], I was doing more work than he or more [committed] than him … When I learned how the network functioned, I put my next project aside and I lost interest because I saw that there were other much more important projects. At the same time, it is a learning environment, so that even if you do not know how to do something […] on a project, you can take the initiative to do something and you learn by doing and you put the time you spent on our accounting system that tracks contributions. Here no one [will tell you]—How do you mean you did not know how to do it and you did it even if it took you seven hours to do it … It really is a field where you can take on several initiatives, (J2).

Each project is invested with the respect of network values, including respect for the source of the ideas. The question of values is essential in Sensorica. One member presents the example of a project where sharing of social values is paramount:

> When working on an [open source] project, working on values, we do not work only on a product … [For example], for the game B there are people who [said]:—we want to buy it, it interests us … We do not want to sell! What we want is to create a community of people working on network games so suddenly it brings other investment models, other business plans, other ways of thinking … We do not want not sell, it is not our goal … We want to be able [to] sell something [like] a flow meter that is worth $1000, selling it at $100 [people] do not have the possibility to print in 3D next to home … We value working on projects […] because it is not normal to have a flow meter for $1000 for people, for children, it's ridiculous (V2).

Admittedly this type of collaborative innovation process raises the question of compensation or recognition of everyone's work. To do this, Sensorica has developed open source software but that was "built from A to Z" (T) and deposited on its platform. It is the "value accounting system, VAS" (T), an element that the organization considers critical to the collaborative work for the process of innovation described here. This software makes it possible to evaluate the contributions of the various autonomous workers worldwide involved in the various projects proposed over time. As noted by one of our interviewees, each project has its "VAS, its characteristics, weights, amounts allocated, the various by-products of each of the deliveries" (V); "A formula, algorithm values. This algorithm is dynamic, it changes per project" (J).

Thus the values accounting system (VAS) has a function of "recognizing the contribution of each person and then there is a redistribution of money that is managed by the NPO based on the contribution of each one" (T).

Our interviewee explains further that the work is not measured in terms of hours of work simply. They can measure other factors and give different weights

to different tasks or functions, possibly requiring more or less important skills.

The system of values shared by this online community is very important for the organization. Indeed, it considers that this is what unites the community while instilling a sense of justice in the recognition of the work within the global open innovation process.

5.4. Open Innovation, Open Source and Crowd

As pointed out by our interviewees, it is not possible to apply the principle of intellectual property in projects done in open innovation, so that the mode of innovation is different from most "classic" companies, where that principle is often the basis of the innovation process. Sensorica believes that its competitive advantage is based on the rate of production of innovation and arrival to the market, and not on exploitation of intellectual property.

> We want people to participate and for them to participate, […] there cannot be capturing of intellectual property by someone. Otherwise there would be a sense of injustice generated by this and people would say: *Well*, *wait a minute*, *here*, *working and innovation you there*, *you capture and monopolize access to the market*. So it no longer works. When one works in secret it decreases the ideas and innovation. Our strategy is a speed strategy. The strategy of conventional companies is a protection strategy. Both work, but I think today, the speed strategy is better than the protection strategy (T).

What then is the right environment for innovation? "-What do we need to do to innovate and bring a product to market? -We need talent, time, space, we need equipment, materials, we need social capital" (T2).

Unlike the closed innovation which "has not been socialized, has not been in contact with the user" (T) but developed in a start-up working "in closed circuit" (T) the network makes innovation a "global collaborative enterprise. We do it openly, that is to say that there is still market influence. The market participates in the development" (T). To attract innovators, "we created a network that is global, where people can participate and learn about our projects on our social media campaigns, Facebook, Twitter, etc." (T). It is through our "network capacity" (T) and "information that is permanently diffused" (T), as well as open source, that network members can have access to anything that comes out in terms of innovation.

> All innovation is *open source*, the *software*, which enables us to work on the community … If someone is for example in Spain and says: -I am interested in particular I adolescents, the person may say: -Ok for the project, here's the basic game! Then we can create an international group with expertise that is already there … (V).

As part of a crowd process production in P2P, Sensorica differs from "traditional *crowd sourcing* platforms" (T3) in which open innovation remains minor:

"It is a form of open innovation, but again 'open' with a small 'o'" (T3). These platforms "are intermediaries between companies and the *crowd*" (T3), between businesses and freelance workers 2.0. They are "very centralized and not collaborative" (T3). The crowd participates in the definition of value given to open source projects by the various participants of the open community. "It's the *crowd* that evaluates. It is the other participants … Think about how Wikipedia works: anyone can put in a false entry, but everyone has the right to correct it. So it self-corrects" (J).

> The reactions are much faster in open communities because when it belongs to a company before the company realizes […], it takes time. In open communities, it is much faster and therefore they are capable of innovation because whenever there is an error, it is corrected automatically. So we are really on values. For me this is the key word and people are attracted precisely because they share those values (V).

5.5. Development of New Projects and Accelerating Innovation: the Remix

Each project can be transformed in several projects through the network strength and expertise shared. This is for example the case of the technology used in a project, which can go from biological or physiological applications to smart sports equipment … About this technology, although it is not yet commercialized, a member the network said it would be possible to "apply it to bridges, cranes, to a variety of structures … It is a project that is still waiting to be woken up and started" (T). The organization holds several dormant projects, prototypes, etc., and according to the opportunities for collaboration that arise, if it receives orders and funding (grants), then it can decide either to advance a project or to finalize a prototype (T2). "Today, we work in an iterative cycle, progressively, with more research, the largest prototyping and it evolves in stages, it is not expected that the product be commercialized" (V). Moreover, "every time there is a new project, there is a restructuring of some elements to improve the whole" (V). It is the declination of innovation on several projects that makes it less expensive and faster, "it takes universities budgets of over $500,000 to do what we did in a few months through the network" (T).

> The technical term used for the transformation of things, this is what we call *remix*. That is to say, we take something and tweak the technology to make it do something different or we take two or three things or technologies and put them together to create something new … If you develop something in the context of this project, this thing will be reused in another form, in another project. And people who wander from one project to another […] will eventually see these needs and then go do this *remix* (T2).

This seems to help reduce costs. Indeed, because the projects are:

> [done] in open innovation, it reduces the cost of innovation […]. It results

> in a product that is much cheaper on the market. Statistics and research shows that some products developed in *open source*, since the cost of innovation is low, can reach the market at only 20% of the cost of equivalent products supplied by companies that followed the classic path of innovation: with developments in house, own resources, etc. It reduces costs, improves the product and it is also social innovation, (T).

It is therefore possible also to promote the "speed of innovation. So we decompartmentalize projects… Every project, such as a sensor for heart cells, can be considered a business" (T2). The risk of an error in prototyping is supported by the network, unlike classical businesses because "it is better to make a mistake that costs $5 rather than for 10 - 15 million·$" (T2).

> Recently we had a new project which was a combination of three projects: we already had the design in these three projects and then the prototype, it was things we had in drawers, and we had design in our database. Someone arrived with new needs, we talked and we realized we had all those resources. We put them together; we created something entirely new in four days with zero investment. So there we see the rate of innovation that is made possible by that tool, that allows us to identify things identified: we know, we have them, we inventoried them, we know what we will look for … So it is tremendously much faster and it is done quite well, increasing the capacity for innovation, speed of innovation, speed of network marketing. So this is really a huge economic advantage because there are no more silos finally, because people talk and things flow within the network, (T2).

For the financing of projects, organizing a crowd funding, the use of social networks, etc., is also one of the network's objectives.

> For project X, we will soon launch a crowd funding campaign, but again with all the steps properly assessed previously through the NPO. With the amount collected, we want to tackle other problems related to health, etc. (V).

This model of open value network is an organizational innovation, which illustrates one way of achieving open collaborations, as well as a new process of recognition of the contributions, including in what is called contexts of "remix". Here there are new forms of articulation between collaboration and creation through open innovation in a digital context. The importance of trust and the core social value system that forms the basis of collaboration within the network need to be stressed.

6. Conclusions

Our research and analysis of this case study made it possible to better understand how projects could operate in P2P and open source. It also contributed to documenting the specific case of Sensorica, as there has not been much research and documentation of such types of cases. Indeed, if there is a plethora of theo-

retical writings on the sharing and collaborative economy, as well as on open innovation, there are actually few cases documented on the practical operation of these open and collaborative innovation processes. Our interviews with members of Sensorica also show that there are many very different values in what is called the collaborative economy. If organizations like Uber are sometimes associated with the collaborative or sharing economy, the case documented here distinguishes itself by its values and mode of collaborative development of its products. It goes much further as a case of open and participatory process of innovation. Sensorica does not wish to be associated with a simple platform on the net; although it uses this type of technique or tool, the organization differs greatly from other cases by the values implemented and by a very different participatory organizational project.

This open innovation and collaborative project is definitely very innovative, although somewhat difficult to grasp, since its members are spread out across the globe. It is for this reason that we felt it important to try to document a case from interviews of members who have participated in this project for a few years already.

Regarding the limits of the research, given that we had chosen an exemplary study based on a single case in Quebec, we were limited to this single case, as there were currently very few similar cases in the world. In the future, it would of course be interesting to compare this model to others which appear to be similar. This could be the object of future research. Moreover, it would be interesting to gather other views, such as those of crowd-workers of the collaborative platform, on the organization of work, working methods, motivations and benefits. This remains to be done in future work; the challenge remains to identify similar cases and to reach the workers in their various locations.

Another aspect that could be the object of future research is the question of reputation in networks of open source and peer to peer communities, as reputation certainly plays a fundamental role in the trust established between members of the network, and in terms of cooperation and compensation. A member of Sensorica confirms this questioning. "You have a certain reputation in a community, it can be recognized by another community, and then it has some value. That's something we are working on now" (J2).

These are some ideas for future research but this in-depth study of one case has highlighted the characteristics of the modes of collaboration associated with these new forms of networks and the type of work observed in an open innovation network.

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