Open Source Innovation: Enabler or Hinderer of Business Model Dynamics?

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Résumé:

In this contribution, we show that the editor's choice of open innovation in open source sector may constrain its decisions concerning the Business Model (BM), its definition and evolution over time. Open source innovation constitutes a particular case of open innovation. Specific rules guarantee a free access to enable a collaborative work between numerous contributors. The openness may favor creativity and adaptation to innovative and turbulent environments. However, the contribution of numerous, highly involved, participants may at time also constrain firm's strategic decisions regarding its BM evolution. In order to identify how open source innovation facilitates or limits the adaptability of a BM over time, we realize a deep longitudinal case analysis. We examine a situation where an open source project has been initiated, then supported then reorganized under different forms. We sequence the different combinations and identify BM evolution's supporters and hinderers. We observe that initiators, institutional managers, users or contributors may appear as facilitators or breakers of business model changes. We describe these actors' range of actions in order to push or avoid the BM dynamic. We finally show that BM evolution, while not supported by contributors, can hamper the openness strategy. Openness in innovation goes with a smooth management of external contributors.

Key words: open innovation, open source, business model dynamics, business model evolution

INTRODUCTION

Initiated by Chesbrough (2003), the concept of open innovation has brought numerous contributions on the advantages of opening the innovation process to external participants. Within these contributions, specific research has focused on the business model (BM) issue, tackling the question of how capturing and sharing the value when different participants contributed to its creation. Scholarship shows how open innovation requires new business models (Chesbrough & Rosenbloom, 2002; Rajala, Westerlund, & Möller, 2012). Open innovation introduces more turbulence and uncertainty in the innovation process which demands reconceiving the ability of the firms to develop technological advances allowed by openness. It also requires a smart understanding of how to capture individually, the value created collectively, which supposes aptitudes of negotiation with partners and a clear knowledge of the value creation benefit for the firm. In such an innovative context, firms have to be able to adapt and modify their BM. Following this line, opening the innovation process is supposed to enhance creativity that stimulates BM changes and favors the BM dynamics (Cavalcante, Kesting, & Ulhøi, 2011). Indeed, a large number of contributors is a favorable factor to identify and stick to market trends and to implement new means of creating and sharing value. However, from the opposite perspective, the changes in the BM may appear even more complex in open innovation because the numerous participants having contributed to the value creation want to have a say on how to share that value. In this line, appealing to contributors to favor open source innovation may reduce the focal firm's choice and constrain the project evolution. In another words, the value creation through openness may impact the value appropriation and more interesting may counteract the focal firm's strategic objectives. Surprisingly, while the benefits of open innovation have been largely explored, few studies have considered these potential difficulties. From this point, while some studies begun to address how firms need to redesign their business models so as to accommodate their openness strategy (Hienerth, Keinz, & Lettl, 2011; Storbacka, Frow, Nenonen, & Payne, 2012), we call for a study that takes a reverse perspective, i.e. we want to address the impact of business model redesign on the open innovation strategy of a focal firm. From the focal firm's perspective, we propose to examine the external contributors' perception and reaction facing a business model change. As argued by Saebi and Foss (2015), "*Literature highlight the importance of adapting organizational functions and structure to absorb correctly and benefit optimately from external*

knowledge (Dahlander & Gann, 2010; Piller & Ihl, 2009). To do so, researchers advise to adapt the business model to the open innovation strategy. But few studies - or no- observed what kind of interaction is potential to emerge between the providers of external knowledge, i.e. individuals but also companies, and the focal company. More specifically, on the strategic side, how external stockholders influence the ongoing adaptive process of business model change." More precisely, we ask for more knowledge on the capacity of external stakeholders to influence directly firm's strategic decisions.

To do so, we consider the open source sector. It constitutes a specific situation from this concern because, contrarily to traditional open innovation, in this sector participants enter and leave freely the project community. Also, open source context offers a situation where an unlimited number of contributors participate in the value creation of an editor's solution. The editor has to work closely with them which creates interdependencies. The focal editor company opens its innovation process in order to enrich and foster the software development with the contributors' resources. Contributors may spend time and competences to work on the software and bring creativity and specialization. They find an individual or collective advantage in contributing, such as improving a software for their personal usage or influencing the evolution of a solution in order to shape the direction of future innovation (Dahlander & Wallin, 2006). Finally, the focal company and the contributors' interests are intertwined. The focal company has to deal not only with its own interests while building its model but with those of the contributors as well (Dahlander & Magnusson, 2005). When considering a strategic change, the focal firm has to deal with the community reaction. In this contribution, we aim at bringing knowledge on stakeholders' strategic influence, observing their capability to favor, limit or oppose the focal firm's BM strategy.

We first expose the literature review on open innovation in open source and business model dynamics. We then describe our case, the context and the method we used to deeply explore it. Finally, we present our results and discuss them in a fourth part.

1. LITERATURE REVIEW

1.1. OPEN INNOVATION IN OPEN SOURCE AND THE RISE OF CONTRIBUTORS

When companies call for external contributors, they open their borders and finally agree to open the discussion with those who contribute. In open source, this openness is extreme and open innovation is pushed to its limits (Chesbrough, Vanhaverbeke, & West, 2006). Focal firms calling for external resources have no control over the number and the types of contributors. They range from partner companies, customers, suppliers, institutions, competitors to individuals on their own behalf (von Hippel, 2007). Open source innovation belongs to the "libre" open innovation literature (von Hippel, 2010; Wikhamn, 2013). In this perspective, the knowledge flow is "libre" and open to all. As described by Wikhamn (2013), "*'Libre' openness could be defined as availability of ongoing, socially constructed knowledge, permitting any users to access, add and modify it without legal or technical barriers*." The weak intellectual property right constitutes the foundation of this innovation (von Hippel, 2005). This differs from Chesbrough's (2003) position that stands for a strategic use of intellectual property rights and for knowledge trading in order to benefit from openness.

Contributors willing to answer a focal firm's call actively participate in its value creation (Dahlander & Wallin, 2006). They constitute the community building a value proposition for customers. They bring new ideas and may propose important innovations. Their contributions have certain specificities (Raymond, 1998). Firstly, contributions are made on a voluntary basis. There is no obligation to contribute to a community as there may be an obligation to participate in a project within a company. Then, the contribution is offered for free. There is no payment for it. Finally, in the vast majority of cases, the contribution is public and made accessible to as many people as possible. These characteristics of liberty, gratuitousness and openness do not mean that the participants have no strategic or economic intentions (Dahlander & Wallin, 2006; Jullien & Zimmermann, 2011; Lakhani, Wolf, Bates, & DiBona, 2002; Lerner & Tirole, 2002). On the contrary, they may have concrete motivations. Researchers have identified the individual motivations essentially relating to the free software movement (Hars & Ou, 2002; Lakhani & von Hippel, 2003; Lakhani & Wolf, 2003). More recently, at the end of 90's, some important personalities of the free software movement started to address firms' needs and interests in the collective way of developing programs. Bruce Perens and Eric Raymond were the first in 1998 to put the basic principles of what would become the Open Source. In these principles, the focus is put on the "liberty" granted by open source licenses as the BSD one (Berkley Software Distribution). The standing point was that of "openness" to counter the

deviating lecture of the word "free" in free software that repealed firms' involvement. By doing so, they opened up the possibility for firms to consider market and business outcomes from their investment in the collective software development. Based on the method (higher quality of developments, gathered resources, innovation speed) rather than on philosophical aspects, the open source guarantees the possibility of a combination between openness and commercial interests. That is how Lakhani et al. (2002) showed that contributors to open source communities are mostly IT professionals who follow several rationale and economic interests such as improving the functionalities of a technology they use, building a reputation, learning and gaining in programming experience etc. A majority of them are skilled and experimented and 40% are paid to participate into communities (Lakhani & Wolf, 2003). Economic interests are also driven by the need of complementary open source programs (Iansiti & Richards, 2006) and the public image and legitimacy they obtain through their contribution (Lerner & Tirole, 2002). Strategically, firms may decide to contribute in order to orientate the development towards a direction they are interested in (Dahlander & Wallin, 2006). Finally, according to Jullien and Zimmerman (2011), FLOSS can represent a strategic component in the global business model of IT companies.

This literature considers the strategic interests of contributors in line with the editors' goal. However, sometimes, the advantages of the editor and the community may differ which creates a disequilibrium. For example, Viseur (2013) shows how the shift from traditional software distribution to cloud-based distribution (SaaS - Software as a Service) created tensions within some communities. Some editors have implemented evolutions in their licensing policy which entailed multiple problems: first, at the legal level, a modification of a license concerning contributors' intellectual property rights requires either specific contracts (e.g. contributor agreements) or the agreement of all contributors (R Viseur & Robles, 2015). Second, the change may generate technical problems, such as incompatibilities i) within the different third parties' licenses and ii) with complementary programs commercialized by involved professional contributors. Thus, a change in a focal firm's business model can directly impact the business of external contributors in open source projects. This is even more problematic when the number of contributors is high. Open source innovation supposes a massification of the network of contributors (in case of success) and the impossibility to select them. These specificities enhance the interdependence between the focal firm's interests and those of its contributors.

1.2. THE DYNAMIC PERSPECTIVE ON BUSINESS MODELS

Facing globalization, shortened product life cycles and technological innovation acceleration, firms are constrained to permanently adjust their business models. Chesbrough (2007) highlighted this phenomenon by explaining that innovation in business models is vital and far more important than innovation in technology. He states that a good technology has no value without a good business model whereas a basic technology can turn to a great success if exploited with a good business model. He enjoins companies to innovate and to do not hesitate to change their business models especially in open innovation conditions. This is even more important in open innovation conditions. As showed by Saebi and Foss (2015), open innovation strategy requires a fine grained business model adaptation. Going deeper into the assumption that open innovation requires new business models (Chesbrough, 2006; Chesbrough & Rosenbloom, 2002; Huizingh, 2011), they decomposes different degrees of open innovation (respectively regarding the breadth and the depth of knowledge search) and proposes correspondingly specific open business models. These specific open innovation BM should evolve over time to maximize the benefits of openness in changing environments.

The dynamic perspective on business models was addressed by scholars over the last 15 years (Foss & Saebi, 2017). According to Foss and Saebi (2017), this stream of literature endorsed different designations (business model "reinvention", "evolution", "transformation", "dynamics", "innovation" etc.) which contribute to a lack of theoretical consistency on the topic. Cavalcante et al. (2011) for example described four types of changes according to the relative importance of path dependency and inertia, called "creation, extension, revision and termination". Demil and Lecocq (2010) using the term "business model evolution" distinguished the changes imposed by the environment, versus those deliberate and initiated by managers.

To overcome these disconnected studies and define a broader umbrella on BM dynamics, Foss and Saebi (2017) recently proposed the concept of Business Model Innovation (BMI). They define a typology that cluster business model changes in terms of scope and novelty. The scope can be modular or architectural and the novelty can be new to the firm or new to the industry. Thereby, BMI can be evolutionary, adaptive, focused and complex. The table 1 below summarizes the different options.

Table 1. Business Model Innovation Typology

Novelty	Scope		
		Modular	**Architectural**
	New to firm	Evolutionary BMI	Adaptive BMI
	New to industry	Focused BMI	Complex BMI

Foss and Saebi, 2017

In open source sector, the BMI confronts a supplementary difficulty: the adhesion of the community. To examine the reaction of the community towards the editor's decision to change the BM, we realize a deep longitudinal case study.

We build on Osterwalder et al. (2005) definition of a BM. We study the BM dynamics through the definition of what constitutes a change from Cavalcante, Kesting, & Ulhøi (2011) and on BMI typology from Foss and Saebi (2017).

Osterwalder et al. (2005) define a business model as "*A conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value relationship capital, to generate profitable and sustainable revenue streams.*" We choose this definition because it gives indications on business logic, value proposition, customer segments, architecture of the firm, network of partners and revenue mechanisms (Al-Debei & Avison, 2010). In our analysis, we identify these themes and explain the changes regarding to them.

Table 2: Business model framework

Business model (Osterwalder et al. 2005)	Business logic
	Value proposition
	Customer segments
	Architecture of the organization
	Network of partners
	Revenue mechanisms

Building on Cavalcante, Kesting, & Ulhøi, (2011), we define business model dynamics as a change in at least one component of a BM, focusing essentially on the firm perspective of novelty. We consider any changes in the components from the moment they have an impact on the model as a whole (Cavalcante, Kesting, & Ulhøi, 2011). We consider the changes that are new to the firm and focus on the evolutionary and/or adaptive BMI in the Foss and Saebi (2017)'s typology.

Literature has underlined how in open source innovation contexts - firms have to continually interact with their external partners (Pénin, 2011). In this contribution, we study how this interdependence may limit the focal firms' choices. We question the consequences of adopting an open source innovation strategy on the ability to choose a BM and manage BM dynamics. More specifically, we aim at identifying the ability of external contributors to counteract the focal firm's decisions and observe consequences on the openness strategy. We argue that knowledge is required on the management of this interdependence as the environment is turbulent and requires frequent adaptive changes (Schneider & Spieth, 2013).

2. METHODOLOGY

2.1. THE CASE STUDY

Claroline is a learning management system born at the Catholic University of Louvain (Belgium) at the end of the 90s. It answered a pressing need of simplicity[1] in front of the complexity and the cost of the proprietary solutions of that time. Claroline was initiated by Professor Marcel Lebrun and Thomas de Praetere, teacher of philosophy who was in charge of the development of the solution as project leader. These two were rapidly joined by Hugues Peeters for the technical aspects.

The choice of open source development model was due to the lack of technical skills of the initial team. Because they were not engineers and did not know how to develop a software, they decided to reuse elements that already existed in open source community and that were freely accessible and usable. They tinkered a first base on the primary needs of university users. This

[1] "*Scratching a personnal itch*" is a common motivation to start the development of an open source project (Feller & Fitzerald, 2002).

first, very simple, version of the software experienced a big and fast success. The teachers seized the tool and abandoned the proprietary tools offered by the university at that time. Then, followed a period of improvements and an unexpected but international diffusion. Every day, people from all over the world wrote to the team to tell them that the tool had been translated into a particular language, was implemented in a university and that such functionality had been developed in addition. At that time, the community around the Claroline project included two types of actors: users and contributors. Users could be known or unknown. They could download the software freely without having to register anywhere. These users were a potential breeding ground for contributors. When users share problems or improvements they become active. They participate into the development work and are then considered as contributors. The community around the project had grown very fast. Facing this success, each of the initiators of the project imagined different future for the platform. From that moment, the project had entered a dynamic that we will analyze in the light of the business model concept.

Table 3: Claroline's community composition

Claroline's community composition		
Users	**Contributors** *users that contribute*	**Consortium members** *contributors that are engaged in strategic negotiations*

2.2. DATA COLLECTION AND PROCESSING

In order to identify the external stakeholders influence on the strategic decisions of the firm regarding its business model, we adopt Shneider and Spieth (2013)'s recommendations. According to them, researches need to address "*the process and elements of business model innovation as well as its enablers and effects*." To do so, we chose to adopt a longitudinal qualitative method that allows us scanning business model changes over a certain period of time (Thiétart et al., 2014; Yin, 2003). The total time frame is about 18 years of project life.
In a first phase, we conduct eight face-to-face semi-directive (and usually individual) interviews in tandem, based on a standard interview guide, with note taking and recording. The interviewees cover the current managers of the projects as well as the main initiators of the Claroline project. We limited intra-group contamination by accessing to sufficiently disjoint

subgroups coming from the initial project as much as its successive splits (forks). The stopping of the interviews was dictated by the saturation of information. The designation of interviewees' functions and the duration of interviews are reported in table 4 below.

Table 4. 2017 interviewees sample

Interviewee 1	Claroline co-founder Former Claroline main developer (first team) Dokeos founder and manager	2:35:19
Interviewee 2	Former Claroline developer (first team) Usability consultant at Emakina	1:21:08
Interviewee 3	Former Dokeos co-developer Chamilo founder	2:15:28
Interviewee 4	Professor at the Catholic University of Louvain Claroline project co-founder Claroline Connect Consortium Honorary President	2:06:39
Interviewee 5	Professor at ECAM Claroline project co-founder Claroline Connect Consortium board member	1:39:08
Interviewee 6	Expert edtech at Agence du Numérique Consortium Claroline board member	2:00:05
Interviewee 7	Technical director at University of Lyon 1 (iCAP) Claroline Connect Consortium president Spiral Connect project manager	1:56:01
Interviewee 8	Claroline Connect developer Formalibre co-founder Consortium Claroline board member	2:00:05
Interviewee 9	Lecturer at the University of Namur Involved in the migration from Claroline to Moodle at the University of Namur	19:05 (Skype)

The interviews started with a general non-directive question. More specific questions were then used to revive the exchanges or specify an issue. Special attention was given to the freedom of the interviewees' words, especially when differences of opinion appeared (e.g. conflicts). The interviews were conducted in tandem which allows participant authors to cross their perception, discuss the case and enables an inter-subjective analysis of the situation. The findings were confronted to the third author that did not participate to the interviews. This data triangulation guarantees the robustness of the results by avoiding possible biases. The preliminary results,

validated by the researchers (crossed views), are essentially based on interview notes and recordings transcriptions.

In addition to the interviews, secondary sources were used, in particular to establish the chronology of the different projects (e.g. project website, public presentations and professional reports). The Claroline project was the subject of a first case study using questionnaire in 2006 (Viseur, 2007). All the research material (questionnaire, answers to the questionnaire, references, webography, notes, recordings, preliminary results, ...) was shared between the researchers. The table 5 below summarizes the interviewee's function and exchange durations.

Table 5. First interview (2006)

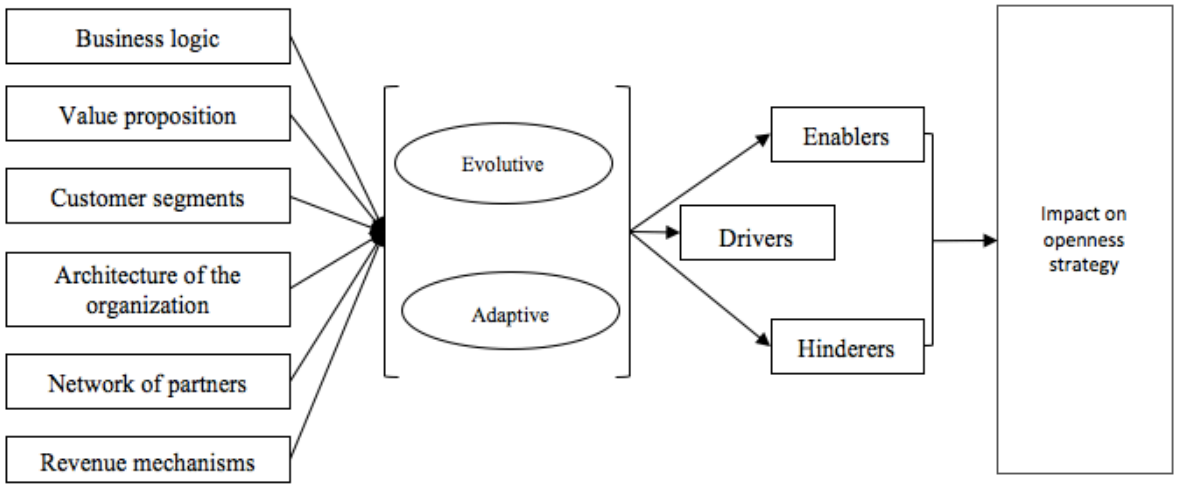
Interviewee 2	Claroline main developer	Questionnaire (14 pages)

In a second phase, a first presentation of the history, the preliminary results of the study as well as the questions raised was assured by the authors of the study at the occasion of the annual conference in Brussels gathering the users of the software (ACCU - Annual Conference of Claroline Users - 2017). On this occasion, a creative workshop was also realized. Called "Recharge your ACCU", it aimed to identify new ways for revitalizing the community around Claroline Connect. This phase also allowed to enlarge the access to the ground and capture the users point of view.

For analyzing the case, we point out the momentums of business model change, the drivers explaining the decisions and finally, the elements that enabled the change, and those who hindered it. An initial coding was processed thanks to Nvivo on i) the interview notes and ii) transcribed interviews.

We use the framework presented in figure 1 to organize our coding process.

Figure 1. Theoretical model guiding the coding process



3. RESULTS

3.1. IDENTIFICATION OF BUSINESS MODEL CHANGE ELEMENTS

Taking up the themes raised by the definition of Osterwalder et al. (2005), i.e.: business logic, value proposition, customer segments, architecture of the organization, network of partners and revenue mechanisms, we identify the critical changes that occurred in the Claroline project and point out the elements on favor of the change and those that slow it down. *Verbatim* supporting the analysis are reported in the table 6 below. The impact on the openness strategy is discussed at the end of the result section.

Construction of the value proposition: lead users as dynamic initiators of a growing community

Initially, Claroline was born informally within an institution. At this point, there was no business logic. The goal was purely utilitarian and focused on building an effective and simple tool. The project was in the value proposition construction stage. The success of this stage was largely due to the use of open source tools that does not require large investments. The availability of documentation and developer forums helped the project initiators in the construction of their solution. The choice to keep the Claroline software in open source has allowed triggering a diffusion mechanism which in return has played an important role in the construction of the product. As more and more users saw that they could contribute and improve

the product to suit their needs, they began to donate code and produce translations of the software that, in turn, contributed to its dissemination. A virtuous circle was engaged.

Emergence of a business logic: a disagreement between one of the project leader and supporting institution leads to rupture

Observing that the software was quite successful, that support and training needs were required and that investors were interested in the software, one of the initiators, Thomas de Praetere started considering an economic and commercial logic for the project. He wanted to create a commercial company to fulfill market needs. During this phase, we can identify elements that play favorably on the dynamics of change and others that play rather unfavorably.

With regard to positive dynamics, the existence of a large community with external contributors that provide ideas and labor power undeniably constituted a factor in favor of the economic logic. This resource was all the more positive as it was interesting for investors. The external recognition via media publications and the official support of the Catholic University of Louvain took the project out of the shadows and made it possible to imagine commercial prospects.

On the other hand, the institution that had come to recognize the existence of this software did not want to be dispossessed of its project in which it had committed resources, even if it was completely informal at the beginning. Negotiations started on Claroline brand ownership and the institution's equity participation in the future trading company. Negotiations with the institution failed and Thomas de Praetere forked the project and created Dokeos. He wrote a public letter announcing that Claroline was becoming Dokeos - which was not true as Claroline was always available -. The eponymous trading company was created offering services around Dokeos.

Consolidation of the value proposition: close collaboration between the editor and community to rebuild the offer

This episode has seriously undermined the Claroline project. Many users thought that Dokeos should now be used instead of Claroline. An important work of clarification and reconquers had to be done by the teams remaining at the institution. The latter has reinforced the teams working on the project internally in order to consolidate the platform and to counter Dokeos,

the new competitor. The community of the first users stood firm and participated in the consolidation of the product.

Building the organization's structure: some contributors are selected to constitute a consortium and structure the project

Three years after the fork of Dokeos, the Claroline platform was still in operation and had large number of users and contributors. The latter were mainly universities in Belgium, France and elsewhere in the world. The University of Louvain still supported the project by allocating human resources but development needs became more and more important and the search for financial support became inevitable. In order to be able to get financial resources, Marcel Lebrun, Philippe Mercenier - who joined the project in the name of the ECAM - and some of the main contributors decided to create an official consortium to materialize the organization of the project. They gave an independent legal existence to the project (not-for-profit association), operating rules and objectives. This new entity was better able to raise funds and reassure potential investors.

The elements participating positively in the dynamics of this change are the contributors strongly involved in the community - those who was part of the consortium -, the financing needs related to the development of the project as well as the potential future users - universities - who had difficulties in adopting a solution associated with a Catholic Belgian university. At the same time, this structuring phase was not welcomed by everyone: some contributors who were not involved in the process felt left out; community's activity has slowed significantly as a result of this new organization. Some advanced users / contributors felt dispossessed of their initiative capabilities by the new structure that would manage the future orientations of the project and they stopped to contribute.

	1999 2000 2001	2002	2003 2004 2005	2006 2007 2008	2009 2010 2011	2012 2013	2014 2015	2016 2017
Business model component change	Construction of the value proposition	Emergence of a business logic	Consolidation of the value proposition	Construction of the organisational structure	Value proposition reconfiguration	Extending and strengthening the network of partners	Search for monetization mechanisms	Customer segments reconfiguration
Characterization of change	Evolutionary	Evolutionary	Evolutionary	Evolutionary	Evolutionary	Evolutionary	Evolutionary	Evolutionary
Drivers	*Need for a simple learning management solution*	*Financial opportunities - External recognition - High level of contribution*	*Fork - Large installed user base*	*Organize contributions - Need for financial resources*	*Need for a better technical / functional / design version*	*Need for human resources*	*Need for financial resources*	*Economic imperatives*
	"... they wanted, on a voluntary basis, to teach online" *"At that time, there was WebCT (...) we immediately find that it was a white elephant (...) We say we will build a tool ourselves"* *"they tell me pfff .... your software is complicated, there are lots of stuff, it's ugly, then it's long, in short they did not like"*	*"And so it was very fast (...). A year later there were 50 or 100 teachers who used it in Louvain-La-Neuve, there were 1200 downloads of the software, 12 translations ... well it worked!"* *"the magazine Athèna, it was an obscure magazine of the Walloon region that got wind of the story I do not know how and who asked me for an interview. (...) They made an article on it (Claroline)." "There is a guy from the same DGO of the Walloon region who comes to see me, I saw your article in Athena, we will give you money. We will give you ... I think I can find you 1 million euros. And indeed the Walloon region has put 900,000 euros on the table. And in fact that's where the adventure started for me."* *"So in the meantime, there is an old gentleman who comes to see me (...) and who tells me I would buy many services (...) there was someone who was ready to buy me something still!"*	*"people helped to translate (...) there were Chileans who translated it into Spanish, Dutch people who translated into Flemish, it worked. People were hitting the software, they were installing it ... there was nothing else (...) so there were plenty of high schools, especially in South America, and everywhere"* *"there were a hundred countries that used it, it was translated into 30 languages, it was very simple"*	*"we realized that the community is fantastic but we have to organize it (...) And that was the idea of a consortium"* *"We thought at one time we need to be able to better manage and coordinate better and that's why the consortium was created"* *"to go to some users who may be institutional obviously, I think going in the name of a consortium, based on institutions, has a different gateway from a service company"* *"The universities and all that were partners in Fce, the fact of having joined a consortium that validated their approach"* *"it was partly to structure the community, partly also for funding issues"* *"The consortium was created for financing issues mainly"*	*"And then the platform continued, and then very quickly, I think we are in 2010, 2011, 2012, there was a moment where we did not know very well... We felt that there were strong demands to go to more modern tools like social networks, community of practice, etc."* *"the platform was not as sophisticated as that, and therefore the slightest addition of a module or what was asking too much work"* *"she was too simple, everyone blamed us for that"*	*"we ended up with developers, who were still trying to develop and maintain the old platform, while starting to think and develop a new on a completely different framework"* *"we felt abandoned by the other members of the consortium (...) So, I had to make new partnerships"* *"we suffered from an insufficient number of developers"* *"it was a team far too small. Maximum ten people to redevelop a platform from 0"* *"we should have been thirty"*	*"we suffered from an insufficient number of developers, in short money, to say things, we thought to start to create a company of services that is Formlibre"* *"there was a funding problem, not enough contributions coming in, no more European projects"* *"without the service company, we could not have done Claroline Connect"* *"when we are going to create the service company clearly it was to offer paid services around free downloadable software for free for customers who need it"*	*"When I go to Formalibre, the last time they said you know, we efforts to schools, at least for a year or two we will give up all that because it requires too much energy and it does not report"*
Enablers	Core team - Institutions - Lead users - Emergent contributors	Project leader (Thomas de Praetere)	Core team - Community - Institutions	Core team - Institutions	Consortium	Part of the consortium (core initial team)	Commercial company - new core team	Commercial company
	"the university still decided to support the project a bit, and I received the help of two people who came to help me to program the software" *"We showed this to some teachers who said "oh that's great this thing and it works and everything!"* *"And soon enough, it's not a fairy tale but we had people who wrote to us from France, from South*	*"you will never succeed in creating a company with 160 partners, who all want something different, it will never go"*	*"he hijacked all the Claroline.net domain names (...) and we were working on scattered development and in the morning "ah holds, I don't know how to get my code to keep working!""* *"it's not like being a plumber, you tell yourself that once you have your customers it's ok... there is competitors... no really, you have to want it"*	*"it is true that the CUL was the project's sponsor from the beginning and aspired for it to be more collaborative, aspired that somewhere responsibility, risk taking and steering of the project be carried by several universities and not only by them."*	*"we said ... and it was a drama ... we will abandon the development of the good old Claroline, everyone told us "but you're not going to do that ?!" Yes it is"*	*"Someone who is a friend of much longer than that, Christophe Batier and his team"*	*"the brand as such it belongs to the Consortium but by contract we have the exclusivity of commercial exploitation"*	*"for the private ones that are the actors of Formalibre, the school is not interesting. But having contracts with big banks, insurers, big companies that have training services, etc. Oh, it is not 0.50 euros per student, it is contract of 50, 60 000, 100 000."*

		America, saying we have reviewed the exercise model, you want the code? take it. Do we translate the platform into English, into German, do you want the data bases that allowed the translations? Yes all. And so this open source, at least in the beginning, it was also one of the elements of momentum"						
Hinderers	-	Institution (Catholic University of Louvain)	-	Part of the contributors - Institutions	Part of contributors / users - Institutions	Part of contributors / consortium members	Part of contributors / users / consortium members	-
		"you will never succeed in creating a company with 160 partners, who all want something different, it will never go" *"the rector of the time finally did not want and that's why TDP slammed the door"* *"Thomas had the idea to make a service company. He had been to see the CUL and the CUL said good idea but as we participated in the development of the product and you will make money on it we will take so many percent on the turnover of the company that you will create. Thomas did not agree he said Claroline is open source, anyone can decide to do service around. It ended very badly, very badly.*		*"an effect that we did not see coming is that when we created the consortium, well somewhere the CUL has disengaged. First of all in a totally informal way, we did not see it, but at one point we realized that for years they had financed salaries, they had lent premises and suddenly they felt that the consortium it was more them, so they started to no longer pay salary and then want to charge spaces ..."* *"In terms of coordinating the community it helped except that we lost the community, we no longer have a community of users no ... they are in nature"* *"At that moment, and I will say that until my death even if some say that it is not correct, we realized that the creation of the consortium as a structure of organization of a community had effect that those who spontaneously developed no longer developed"*	*"it was a lot of disappointment because a lot of people said, "Oh, but they do not develop Claroline any more, what's going to happen?""* *"we felt a bit abandoned by the other members of the consortium who said what is these ideas, why change the platform etc."* *"Leuven said, but wait a little bit, we are paying for everyone to develop a platform and when we said we wanted to make a new one, it was a hitch hike, they have said we are no longer following you. So here is."* *"We made calls to the community to help us develop the V2 (Claroline Connect) but no one came"* *"the consortium members contributed very little to the development of the new platform"*	*"somewhere the concretization of the development of a new version was possible in large part because CB who was developing Spiral connect to Lyon said to Marcel ok we will merge Spiral Connect and Claroline to make Claroline Connect"*	*"UCL went to Moodle. And even the ECAM who is one of the carriers at the origin is Moodle too. Even in Namur, the rector told us that it was better to err all together than to be right all alone. All this is around 2014, 2015. And very clearly we lost at the level of the community. We're back from almost nothing"* *"The co-existence between this private company if you want, and the consortium did not go well at all. Finally, Laurent Gruber said well I have my company, I develop, we try to earn money, with that we develop, so the Claroline Consortium has become somewhere Formalibre. And so, the consortium really does not have any reason to be"*	

Table 6. Chronological summary of drivers, enablers and hinderers of business model changes of Claroline project

Value proposition reconfiguration: top down decisions lead to the erosion of the external resources

Among the prerogatives of the consortium was the definition of the road map of the project, i.e. the technical and strategic orientations related to the Claroline platform. The governance mechanisms put in place required negotiations at the General Assembly and a vote by the consortium members to validate the road map. Two years after the consortium's official creation, an important decision was made: the redesigning of the platform and the move to a version 2 (v2) of the software. This implied a complete redevelopment of the solution. The specifications of the new version were negotiated and validated at the General Assembly. In order to be able to implement this project, all the financial and especially human resources of the permanent members have been mobilized. Version 1 (v1) of Claroline had no longer resources to maintain it. The v1 has therefore been left to the abundance. Users of this version felt abandoned. Remain only the community to help them. But latter, seeing that it was not consulted and that decisions were taken without it, continued to withdraw from the project and specially to contribute less and less. Because the users could not find support for the v1, the v2 was not out yet, there was a vacuum and the project experienced a strong erosion of users. As the consortium members launched calls for contributions, the community remained silent, signaling its disapproval against this strategic impacting decision. The development team then found itself lacking in human resources to develop the new version correctly and on time.

Expanding and strengthening the network of partners: rebuilding a development community from scratch

Cut off from the community's resources, the developers of the consortium's permanent members found themselves mired in the developments of the v2, which faced great difficulties. Marcel Lebrun and Philippe Mercenier have started looking for partners who can commit human resources to the project. A partnership with the University of Lyon will prevent the project from being abandoned and give a big breath to the developers. Engaging financial and especially human resources, the University of Lyon joins the consortium. On the other hand, the v2 still does not go out and the v1 abandoned, the erosion of the users continues. More and more

universities will then migrate to competing solutions like Moodle, thinking that the Claroline software was dead.

Search for monetization mechanisms: the need for financial resources to save the project

Four years after the start of the development of the new version of Claroline, Claroline Connect was finally out in 2014. It offers a whole new way of managing learning and is at the forefront of e-learning. But the users are no longer there, the community of external contributors disappeared and the v2 is no longer expected by anyone. Yet, the work has been provided and the product was there. It became urgent to make it sustainable. Monetization mechanisms will then be considered within the consortium. As it was a non-profit organization, commercial approaches were not possible. Thus, comes the idea of creating a commercial company, Claroline.com, which could offer services around the deployment of the new solution. The initial founders of the Claroline project (Marcel Lebrun and Philippe Mercenier) were in favor of this option and gave positive dynamic to this change. The rest of consortium members were rather at odds with this idea and did not see how this could help them improve the software. The new commercial affiliation of the project pushed many of remaining institutions to quit the project and consider alternative programs to support.

Today, the commercial company leaders exclude any monetization system that would go against the principles of open source development. i.e. that they exclude certain income channels (those passing by proprietary proposals for example) for fear of definitively disappearing the community.

Customer segments reconfiguration: in search for new business opportunities

Even if the consortium continues to deal with remaining universities that still use Claroline (v1 or v2) and supports the Claroline Connect platform (the v2), it is no longer the core affiliating structure for the project. Much of the development resources are shared between the new trading company and the University of Lyon. There are still a few active contributors in the community, but the institutional user segment is no longer the main target for Claroline Connect. The business model of the service company requires addressing private customers with greater financial opportunities.

3.2. OPEN SOURCE INNOVATION ENABLER AND HINDERER MECHANISMS AND THEIR IMPACT ON OPENNESS STRATEGY

Our preliminary results show that the adoption of an open source innovation strategy have undeniable positive effects although it requires several precautions. In the specific context of open source, open innovation can have very powerful effects. The mechanisms of increasing returns (Arthur, 1989) combined with the characteristics of open source can significantly accelerate the development of projects, requiring the vigilance of project promoters. They must be ready to negotiate business model adjustments very quickly. In the case of Claroline, the growing number of users and the enthusiasm that it provoked with the development of a community of active contributors pushed the project towards a reconfiguration that the initiators were not ready to negotiate. Thomas de Praetere was brought to light with his project and was confronted with opportunities that he did not have time to appreciate. The commercial emerging needs around the software - training, maintaining, configuration… etc. -, and the investors funding perspectives led him to consider a business logic under pressure. Moreover, open innovation arises the negotiation costs when critical strategic business changes are planned. In our case, all the business model changes are those of "Evolution" according to Foss and Saebi (2017)'s typology, i.e. changes were modular and concerned one component at a time. Thus, while Demil et al. (2013) suggested that bazaar governance reduces negotiation costs (Williamson, 1996), our analysis reveals that in the long-term perspective, the external resources parameter had a determining consequence on the BM evolution and requires negotiation.

Contributors from outside become active stakeholders in the decision-making process. When Thomas de Praetere wanted to launch a commercial company around the collectively developed project, he needed to negotiate with one of the main resource contributor, the institution. But when he was confronted to the requirements of this latter, he did not take time to really negotiate and left the original project to create a new one, Dokeos. He had to put a lot of energy to explain what was happening to the community and to convince Claroline users to change for his version. With hindsight, Thomas de Praetere expresses some regrets for how things went at this critical moment. He was not prepared to share what he considered as his "baby" at that time because he did not really understand the negotiation requirements of openness. In contrary, the commercial company around the new Claroline Connect project understood these negotiation

requirements and refused to develop certain revenue streams because of the possible community disagreement. It took into account the contributors' interests when building its business model.

In this case, open source innovation is at a time an accelerator of BM evolution and at other times, it could turn to a moderator. It accelerated the diffusion of the software and favored the success. The uncontrolled growth offered new perspectives notably financial opportunities which created new appetite from some participants into the community. The open source favors the evolution in the BM for three reasons: At first, the number of participants enlarges the opportunity of different perspectives and objectives between the different members of the community. Also, a large number of participants multiplies opportunities of changes in the participants' positions. As contributors engage in a free basis, they feel free to change their opinion on value creation and appropriation. Secondly, there is no control on the entrance and departure of the contributors which favors changes in the engagement of the contributors. A determining investment of a leader may lead to idiosyncrasy and convince the contributor that the project is based on its competence and expertise. This may entail the project of benefiting from the expertise acquired with leaving the project and building a rival project (fork). Freedom and asymmetry in the contribution result in asymmetry of information and in a difficulty to plan BM on the long run. For these reasons, open innovation plays as an accelerator of BM evolution. On the other hand, a focal firm may be hindered by its community. Indeed, contributors can publicly disapprove the decisions taken. Thanks to development platforms, forums and chats, contributors can express themselves and give their opinion to the rest of the members. If the change goes into force, we identify three consequences. First, the community can continue to use the product but no longer contribute. Thus, the new BM will have to be reconfigured according to this loss of resources. Second, the community can stop using the product and move to competition. If the losses of users are significant, the survival of the product and therefore the viability of the new BM is jeopardized. Third, the community can organize itself and make a "fork" of the product. In this situation, the parameters of the new BM will have to be reviewed according to this new competition.

Table 7. Hindering mechanisms

Hindering mechanisms			
Publicly express disagreement	Continue to use the software but stop contributing	Strop using the software	Forking

Regarding the openness strategy, the changes in the components of the business model can bring the game cards down for all participants. Because the interests of external stakeholders are highly intertwined with those of the focal firm, any change in the creation or appropriation mechanisms impacts directly the perspectives of the contributors and thus, play as an attraction or a repulsion to the contribution act. In our case, the business model evolution decisions, that were pushed by the openness strategy, finally annihilated it. Even if the Claroline Conncet project is still open source, the innovation strategy no longer benefits from openness.

4 DISCUSSION

Whereas open innovation is a provider of new ideas and enable fostering technological innovation (Chesbrough, 2003), it needs to be managed to avoid negative effects of higher negotiation costs that are inherent to the rise of exterior, actively implicated, stakeholders. This contribution enables engaging three topics of discussion.

First of all, it underlines the strategic implications relative to the decision to open the innovation process. This specific case demonstrated how openness places the firm in dependence to stakeholders not only for value creation but moreover for strategic decision-making. This dependence requires new insights to better anticipate and manage such relations, especially in the innovative and turbulent environment.

Second, we contribute in showing a relation between openness and BM. Researchers have identified drivers of BM in open source contexts. More precisely, Rajala and al. (2006) described endogenous aspects that determine the business model choices like firm's resources and offerings. Yet, they acknowledge that external exogenous factors can influence the decision-making process and has to be more explored. In our point of view, strategic idiosyncratic interests of contributors can be considered as exogenous to the focal firm. Thus, we add a new perspective on how a BM can be accepted, fostered or hindered by the firm partners according to their specific interests. This leads to a new understanding of a BM that

cannot be considered here as strategic decision issued from a top down process but rather as a continuously evolving empirical equilibrium between different participants driven by different goals and centered on a common project. This also entails considering the BM at the project level instead of the traditional conception that defines the BM for a firm.

Thirdly, we have considered a case in open source software context. Open source context has some specificities such as the multiplicity and the lack of control of contributors. For example, it can lead open source companies to spend resources in order to "*maintain some degree of control over the project to assure ongoing alignment between their investment in the community and related product goals*" (West & O'Mahony, 2008). The community becomes a key partner of the company and its management, a key activity resulting in costs due to infrastructure and human resources. We think these specificities are emblematic of open innovation and enable showing the importance of managing the contributors' community. This does not concern all situations in open innovation, when the partners are limited and when all the conditions of value creation and capture are formalized under contracts. However, innovations concern more and more participants to the value creation and we think that research need deeper insights on soliciting and guiding the crowd.

CONCLUSION

Open innovation is an attractive strategy for many firms. The development of the open source sector is a good indicator of the growing interest of economic actors in these new ways of doing business. Beyond positive effects of openness, firms and more precisely managers need to know that openness has to be managed. In our contribution, we highlight this imperative and point out the negative effects that can result from a mismanagement of this situation. Specifically, we point out the importance of including the contributors and users of an open solution to not only technical decisions but to strategic decisions too. West and O'Mahony (2008) already showed that offering external contributors membership rights might foster participation. Because contributors have rationale and economic interests, they are directly interested in the business model decisions of the company supporting the solution they contribute to. Accordingly, we classify four ways contributors have to express their disagreement.

Undeniably, this study is based on a unique case and concerns a very specific field, the open source software sector. We investigate the effects of openness on business model dynamics in

a particular sector with particular rules. Additional research, in more "classical" sectors would enrich the knowledge about the managerial imperatives of open innovation strategies regarding strategic decisions like those related to business model choices. In spite of these limitations, our case underline situations to avoid while taking strategic decisions about business model changes. Further researches are needed to help understanding how to avoid these situations and how to include contributors into strategic decisions without losing control.

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