

# **Network Interaction with Customers and Competitors as Source of Innovation in Software Industry**

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## **I. Introduction:**

Our research bears on the customer/supplier relationship in the development of radical innovations, and on the impact that the collaboration of certain customers has on projects of innovation in the sector of software designed for firms. The software vendors are confronted with problems linked to how to take users' current and future needs into account in order to steer the innovation process (Cusumano, 2004). They try to resolve these problems by involving the users in the different phases of these innovations: conception, development and integration (Fichman and Kemerer, 1997). As a result the innovation appears to be a product of a network of players (Hakansson et al. 1987). The first customers play a key role in the emergence of the software innovation (von Hippel and Katz, 2002) and can influence the process towards their own needs. It is therefore interesting to wonder to what extent should the designer of the innovation satisfy these needs, so as to subsequently be in a position to interest a significant number of customers. The aim of our research is to define, for certain customers, the methods behind their integration in the innovation processes. Our approach is to analyse the implications of such an integration on the organisation of the process, notably in the customer/supplier interaction, and on the architecture of the innovation itself.

## **II. Methodology:**

With a view to bringing answers to these questions, we have chosen to study the case of an innovative firm in the field of software.

### **II-1. Research setting:**

The methodological approach retained consists in taking the study of the SoftCo firm further; This firm edits innovative software packages: the software programs studied are *text mining* software, which allows the extraction, categorisation and cartography of information contained in some or other body of text (newspaper articles, legal texts, patents...). We intend to follow longitudinally the development projects and integration of innovative software solutions in large firms, thereby limiting the biases linked to a posteriori rationalisation (Yin, 1994 ; Dumez, 2004). In 2003, we began a first case study concerning the development of a knowledge-based system for the

PressCo group. This development was finished in March 2006. In 2005, we initiated a second case study bearing on the development of a knowledge-based system for the editor EditCo, which should be finished by the elaboration of a solution in 2006. The aim of these case studies is to deepen our knowledge of the real challenges facing the vendors and the first customers of a radically innovative software solution, and to determine the conditions for such a solution to emerge.

The firm SoftCo *text mining* software:

We will follow the innovative process, through two projects, relating to a solution of creation and management of a knowledge-based system (using *text mining* technology). This solution is based on extraction, categorisation and information archiving software designed for press groups and editors. These different software solutions were developed principally by two French start-ups: SoftCo, which offers *text mining* software as such, and KnowCo which develops a knowledge-based management system. This software is built on strong technological foundations: therefore SoftCo, over and above their own patents, draws on the patents developed at Xerox's European centre of research for which they have acquired the licensable rights, and which represents ten man years of research. SoftCo has a software range which principally comprises ESoft (terminological extraction), KSoft (document categorisation), CSoft (grouping of documents presenting similarities) and Text Mining Server (generic application able to join together the different SoftCo software programs). Next, for each customer, a personalised development which completes one or several standard software bricks must be carried out in order to define exactly the terms and concepts that the customer wants to extract: SoftCo calls this development a *skill cartridge*. Moreover, SoftCo, capitalising on previous projects can propose generic *skill cartridges* in its range: for example, the development of a skill cartridge of *economic intelligence* in the petroleum industry for a particular customer has given rise to a generic *skill cartridge* devoted to *economic intelligence* and which can be adapted to each economic sector, which has been added to SoftCo's standard software programs. We can therefore observe the elaboration of an innovative software offer, allowing the automated creation and enrichment of knowledge-based systems for *digital content providers*. The innovation studied offers both a technological disruption because it is based on a combination of innovative algorithms of semantic analysis and statistical analysis, and a disruption in the practices. In fact, the offer proposed by SoftCo to their customers constitutes a radical innovation in the sense that it modifies the working habits of the firms which adopt it, by permitting the automization of text analysis: automatic indexation and categorisation, which up until now had been carried out manually.

This subsequently allows the electronic storage of documents (enriched by metadata such as the date of publication), and of the knowledge they contain (such as the principal theme of an article), enabling a novel future exploitation, for example in a knowledge-based system.

## **II-2. Data collection:**

We are trying to analyse longitudinally several radical software development projects, possessing different characteristics. From this study, the objective is to understand the logic behind how the customer/supplier relationship is set up, and how the customer participates in the final development of the project. In fact, each sale undergoes the personalised development and integration of modules based on existing software, which is itself developing. These projects (design, development, integration of software) is spread over a period of six-month to two years. The aim is to obtain three levels of information. Firstly, in relation to in-house project management at SoftCo. Secondly, concerning the customer/supplier relationship. The third covering the role of the customer in the development of the innovation. Throughout the project we have carried out semi-directive interviews on a regular basis (on average once every two months) with the people in contact with the customer (project leaders, technical managers, account managers), but in fact with relatively few customers as such. We also attended twenty-four in-house project meetings and interviews between June 2004 and April 2006.

## **II-3. Presentation of the projects:**

The two projects studied involved different types of actors:

- Several software vendors (including SoftCo and KnowCo in the two case studies),
- The customer,
- And in the EditCo project, a *service provider*, i.e. an IT service firm in charge of ensuring that the software solution is integrated in the customer's information system.

In the two projects we have followed, the participation of one (or two) integrator(s) is frequently questioned:

- in the first case, the software vendors would have liked to have one but not the customer PressCo. The software vendors therefore had to carry out this task themselves, although they did not consider it to be their line of business.

- in the second case, the software vendors concerned could work with a *service provider*, a small firm specialised in Knowledge Management, a field related to *text mining*. Nevertheless, the presence of ConceptPro did not prevent SoftCo and KnowCo from interacting in parallel with EditCo in the context of the project. Moreover, a second *service provider*, a large firm, had been retained as “project supervisor”, alongside ConceptPro: but its participation in the project appearing to be very weak, this *service provider* was ousted after several months..

- **The first project, PressCo:**

<b>Start / Finish</b>	October 2003 / March 2006 (follow-up project of a “version 2” of the solution).		
<b>Integrator of the software solution (service provider)</b>	None (role ensured by the software vendors themselves)		
<b>Software project manager</b>	XLMLCo		
<b>Software vendors participating in the project</b>	SoftCo	KnowCo	XLMLCo
<b>Standard software used</b>	1. ESoft (terminological extraction), 2. KSoft (categorisation of documents)	ASL	XLMLCo Server,
<b>Specific software developed for the project</b>	1. “people” <i>cartridge</i> developed specifically for this project, 2. bridge between KnowCo ESoft and ASL.	1. Application joining together the software programs of SoftCo, KnowCo and XLMLCo 2. Thesaurus, and “biography” classification plan 3. coupling with SoftCo ESoft software.	1. filter enabling the recovery of PressCo archives, in the XLMLCo server, 2. bridge between ESoft and XLMLCo Server.

- **The second project, EditCo:**

<b>Start / Finish</b>	May 2005 (after a first contact for the development of a prototype in September 2004) / January 2006	
<b>Integrator of the software solution</b>	ConceptPro	
<b>Software project leader</b>	SoftCo	
<b>Software vendors participating in the project</b>	SoftCo	KnowCo
<b>Standard software used</b>	ESoft, KSoft	ASL
<b>Specific software developed for the</b>	1. “Legal” <i>cartridge</i> developed specifically for the project,	1. “Legal” thesaurus 2. coupling with SoftCo ESoft software

<b>project</b>	2. bridge between KnowCo ASL and ESoft (adaptation of the “PressCo” bridge)	(adaptation of “PressCo” coupling)
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### III Concepts mobilised:

In the analysis of our case, three concepts have been mustered which are presented hereafter.

#### III-1. The notions of *lead user*, *toolkit* and *user community* developed by von Hippel :

Von Hippel (1986) suggests that firms should generate innovative concepts in partnership with *lead users*. The notion of *lead user* characterises the users (individuals or organisations) who are aware of needs which will subsequently become those of a large number of users, and who hope that by satisfying these needs they will make significant profits. As it is generally difficult for a user to define needs in relation to new products, a possible approach consists in selecting *lead users* and then getting them to test the prototypes in order to acquire information which can subsequently be exploited. But, faced with the acceleration of the pace that innovations appear in each industry, it can be beneficial to leave certain users to develop their innovation themselves, as is the case for 80% of products in the scientific instrumentation sector (von Hippel, 1994). Hence, some firms go even further by choosing to equip their customers with tools enabling the customers to design and develop themselves the most suitable products for *them*. Von Hippel (2001) proposes an approach whereby the user receives a *user toolkit* which allows the user to completely take in hand the design of the product, the possible industrialisation still being the producers responsibility. The objective is to incorporate certain solutions developed by users in standard products which will subsequently interest a maximum number of users (Thomke and von Hippel, 2002). *Toolkits* also allow customers to develop a solution exactly adapted to their needs if they so wish. The *toolkit* approach involves the overall innovation process being broken down into sub-tasks assigned to either the user or the producer (von Hippel and Katz, 2002). Such task distribution can entail radical changes in relation to the architecture of a product, and lead generally to the development of a modular architecture, as we can observe in free software (von Hippel and von Krogh, 2003).

For von Hippel (2001), the existence of a *user community* is fundamental. This community freely shares the knowledge everyone has acquired relating to this innovation, and participates in the improvements which can be made (example of *open source software*). A *user community* can only function under three conditions. The first is that there are a significant number of sufficiently competent users who are motivated by the innovation. The second condition is that the multiple

sources of innovation can be activated, so that each member of the community can benefit (if not, each user would have to entirely develop or fine tune the solution himself). Sharing the innovation results from incentives such as growth of the reputation of the innovator and the creation of obligations towards the innovator. Knowledge sharing leading to the growth of the diffusion can push manufacturers to incorporate those results in the future concept of the product (Harhoff *et al.*, 2000). In the case of innovations which should be incorporated in physical products (which have to be manufactured and distributed physically) users can ensure significant development work and prototype tests, but production and diffusion continue to be ensured by the manufacturer. On the other hand, in the case of intangible products, the community can, according to von Hippel (2001), ensure the complete range of functions of innovation processes and user innovation should be in competition with the innovation of commercial firms..

### **III-2. Modularity at the heart of literature about software architecture:**

*Modularity* is at the centre of research on the creation of innovative software. “Different companies can independently design and produce components, such as disk drives or operating software, and those modules will fit together into a complex and smoothly functioning product because the module makers obey a given set of design rules” (Baldwin & Clark, 1997). *Modularisation* is the breakdown of a complex system into near-autonomous sub-systems which can be conceived independently (Baldwin and Clark, 1997 ; Aoki, 2002). The problem is then to elaborate a complex system integrating these sub-systems. *Modularisation* can therefore be seen as a strategy of specialisation and division of tasks enabling the complexity to be mastered. The interest for this strategy is reinforced for the following reasons (Aoki, 2002) :

- Systems have become so complex that the *modularisation* has spread to the modules themselves,
- In large complex systems the problems which arise and which will lead to a series of adjustments cannot be foreseen *ex ante*. These problems can therefore be resolved in an evolutionary manner,
- *Modularisation* is a way of managing innovation because each person in charge of a specific module is in a position to innovate while respecting the rules laid down by the architect.

The growing trend towards the *modularisation* of technologies and the disintegration of systems implies the production of new types of knowledge (Steinmueller, 2002), such as

standards and integration awareness (Shapiro and Varian, 1999). These new types of knowledge are necessary in the coordination, i.e. the integration of weakly linked groupings. The knowledge is then produced by two types of activities, research and coordination. The latter is in full expansion, determining the process of original innovation (Pavitt, 2002).

### **III-3. Flexibility of innovation processes:**

Dynamic and uncertain environments are challenges for those managing the innovation processes. Among the different generations of products, significant evolutions can be found in the customers needs and in the technologies used to meet these needs. Even within the innovation process, firms can take new information into consideration or risk developing a product which is already obsolete at the time of its release. McCormack, Verganti and Iansiti (2001) studying the creation of Internet software, show that the level of flexibility of innovation processes is correlated with its level of performance. This flexible process is characterised by the capacity to generate and reply to new information over a longer proportion of the creation cycle. Concretely such a process is supported notably by larger investments in the software architecture conception phase and the more precocious market feedback on the performance of the product. This type of conception process analysis has been highlighted in other sectors (Midler, 1993 ; Charue-Duboc and Midler, 2002).

### **IV Analyse du cas:**

The longitudinal monitoring that we have carried out over two years, has enabled us to see the emergence of a unique innovative offer: the linking of an extraction software tool (ESoft) and categorisation of information (KSoft) with a knowledge management system (ASL), designed for firms supplying electronic-support contents (texts). The two projects that we are studying have the aim to facilitate, on one hand, the creation of thematic press files for journalists of a large press groups and on the other hand the compilation of legal extracts/summaries sold to corporate law offices for a multiple-media publisher.

#### **IV-1. The role of the first customers:**

This offer emerged progressively thanks to the active but non exclusive participation of two customers. Have these two customers (PressCo and EditCo) played the role of *lead user*?

What have their contributions been? The active role of the first customer, concerning the innovation being studied, concerned firstly the constitution of a partnership between software vendors. In fact, at the origin of the PressCo project, we find the new head of service documentation, who requests SoftCo and KnowCo to associate their terminology extraction software and knowledge management system. Then, it is yet again PressCo who suggests associating XLMCo, specialist in XML format document archiving, at the beginning of the project. The customer therefore largely contributed in defining the modular architecture of the solution. During the design and development phases of the solution itself, meetings between groups of users and software project managers enabled the necessary information concerning the profession of documentalists and the context of use of the future solution to be transferred to the software vendors. The information the customer has concerning his profession, and the context of the use of the software is clearly *sticky* (von Hippel, 1994): it is effectively difficult to transfer this information to the producers of the innovation and the near-weekly meetings between the software project managers with the *user groups* show the extent of the efforts which must be made do so successfully. Finally, during the pre-production phase, i.e. during the phase prior to the definitive elaboration, PressCo's documentalists formulated several explicit demands concerning functionalities (relating to the constitution of files and information searches) that the three vendors had not considered. But the project managers at PressCo had difficulty in participating in the project development, as can be seen through the fact that they passed the development of the documentation application over to the software vendors.

Moreover, the work carried out in the framework of this first project enabled SoftCo, KnowCo and to a lesser extent XLMCo to learn about the creation of a knowledge-based system destined for *content providers*. This could not be done without the PressCo project:

- The project teams of these three software vendors learned to work together and to interface their software tools with the links developed for PressCo, by working on data of this first customer,
- The project managers of SoftCo and KnowCo defined a methodology, a means of collaboration, for their future common projects,
- SoftCo and KnowCo defined a joint offer associating several of their software tools.

Once the first project was launched and the SoftCo/KnowCo partnership was set up, a second *content provider* project could begin. It took advantage of the work carried out with and for the first



customer on the aforementioned points. The second customer also contributed to the realisation of the project and the structuring of the offer, but more actively than the first:

- It was EditCo who developed a fixed knowledge-based system to perform software tests. This led to the awareness that certain aspects of system performance, such as time to access the base, needed to be improved. This proved to be very useful for the project managers of SoftCo and KnowCo, because this also enabled the improvement of the interfacing of the software tools. These evolutions were even able to be integrated into the PressCo project which was still ongoing,
- The customer proposed a *service provider*, ConceptPro, specialist in knowledge management systems, who subsequently sealed a partnership agreement with SoftCo (as “referenced integrator” and future *value added reseller*),
- EditCo also proposed a project “supervisor” *service provider*, to supervise the works of SoftCo, KnowCo, ConceptPro and EditCo. But, in the project organisation this new entity was not retained and as the role of this integrator rapidly became inexistent,
- At the end of the day, the customer having accepted that SoftCo train their linguists on their personalised *skill cartridge*, EditCo could accomplish its own developments, and become a true *lead user*: this can also be instructive for SoftCo and KnowCo, and contribute to the evolution of their offer.

Additionally, the analysis of the projects leads us to the following observations:

- It had been advantageous to formulate the specifications more precisely than in the first project so as to promote a good comprehension of the project by the customer and subsequently favour customer satisfaction,
- There was a quick development of a simplified solution prototype which could nevertheless be tested, enabling feedback to be received from the customer (which had not been done for PressCo). This resulted in a better comprehension by the customer of the possibilities of the future system and subsequently to a better involvement in the project,
- The integrator ConceptPro played a useful role in the EditCo project but the direct interaction between the software vendor and the customer is however still indispensable,
- A better competency of the project managers in relation to knowledge-management systems and *text mining* technologies facilitates the smooth running of the project (EditCo case).

We therefore observe that users present characteristics of *lead users* in the sense where they seem to anticipate a future market demand concerning the automatized analysis of free text: this tendency stems from the growing volume of information which organisations and individuals can access and seems to follow the tendency of *data mining* which concerns the analysis and treatment of information which is formatted and stocked in databases. Moreover, the needs of these users seem to be acute because they understand that their satisfaction brings about increased productivity and an enrichment of user tasks (PressCo case), or an enriched offer susceptible to bring added value to their customers (EditCo case). In each case, customers sought solutions to their problems, and went as far as to define the outlines of the offer that was appropriate for them, retaining several software vendors with whom they request a partnership for this project. After the phase of selecting these vendors, we can observe that a close relationship has been formed between the customer, on the level of the users as well as the IT service, and the software vendors. The latter set up an organisation which allows them to work continuously with the future users groups, as well as with the customer's IT department.

Furthermore, we remark that the customer does not have the expertise of the technology brought by the innovation (statistical and linguistic analysis combined), nor the capacity to integrate a project including several software vendors who should supply a common offer. *Text mining* is a new technology, and even a new concept. It is therefore not well known by firms and it seems to be normal that the first customers are *of course* in relation to its potential, its limits and the way to implement this technology. This naturally contributes to limiting their ability to assimilate. The direct interaction between vendors of innovative software and users moreover also has the aim of evangelising the users, i.e. to convince them of the pertinence of the concept, while simultaneously trying to understand how they perceive it. It is true that PressCo, the first customer, had the idea of associating the software tools to different vendors. PressCo however could not really control the project nor perceive its limits. PressCo does not follow through the innovation development process to the end and is not able to construct a complete solution which is satisfactory in relation to their own needs, their action does however contribute to the elaboration of a finalised offer.

#### **IV-2. Toolkits and the difficulty to integrate customers in the development of an innovative solution:**

To be able to exploit SoftCo' software, it is necessary to develop what SoftCo calls a *skill cartridge*, which must contain the specific terminology of the sector studied (for example economic intelligence in the petroleum sector, pre-treatment of CVs received by the RHD of a bank). Initially, SoftCo thought that each customer could develop their own *skill cartridge*, having been supplied with a *toolkit* (set of tools destined to help programmers in their work), but this was not the case. Similarly, the *service providers* did not show interest in the development of these *cartridges*, judging that the market of *text mining* was still in its infancy and balking at investing in this. Consequently, SoftCo had to ensure these developments themselves. SoftCo therefore based a considerable amounts of their hopes on its *toolkit* called *STDK* (*skill cartridge development toolkit*). This is a development environment aiming to facilitate the development of the personalised part of the solution which is to be carried out by the customer. The people in charge at SoftCo thought the customers could develop their own *skill cartridge* after having defined the concepts and the terms that they wished to extract automatically. But four years after the launch of the first software offers, *STDK* is no longer a priority. In fact, rapidly, SoftCo concluded that the customers did not want to or could not use this *toolkit* which was not particularly user-friendly. SoftCo made up their minds that this situation should remain unaltered in the short term. Nevertheless, the *STDK* was not abandoned and an engineer continues to work regularly on this project alongside his other projects: the strategy of SoftCo being that the partners (*VARs*, *service providers*) develop a *skill cartridge* for their customer. On the middle term, for the final customer to themselves ensure the development of their *STDK*, the man-machine interface and the navigation interface would need to be improved, documentation would need to exist and the developer of SoftCo would need to take stock of its use, given that for the moment this *toolkit* is only used in-house. In the spirit of the people in charge at SoftCo, the *STDK* should be the last step in the development of their offer, which should enable this vendor to limit their service activities to concentrate on sales of *off the shelf* software which is conceived as being more profitable. Moreover, the personalised development being carried out by the service provider or the customer, would resolve a critical problem for SoftCo which is the follow-up and the maintenance of the personalised software which have been developed in this way.

Hence, the concept of the *toolkit* enabling the customer to develop their own solution, if it seems in the long run to be pertinent to the innovative software vendors, it does not seem to be operationalisable in the initial phase of the offer, which seems to contradict the results of certain works (von Hippel, 2002). We propose to study this point in more detail in the continuation of our work.

#### **IV-3. The notion of *user community* and *open source*:**

*User communities* represent for von Hippel (2001), a unique means of sharing information and of creating an innovation. Does this notion, which we find again in the *open source* universe, have any sense when the innovation is radically new and commercialised by a private start-up? In the case studies, there is no *user community* because there are naturally few users, and because the latter do not yet possess the expertise necessary to participate actively in the design and the development of the innovation. Nevertheless, as the number of users and the capacity to carry out their own developments are increasing, this situation could well evolve in the future. As we have said, *text mining* is a new concept and as a result is difficult for firms to apprehend. Launching a *text mining* offer entails the diffusion of this new concept and the construction of a new market, and can therefore not boil down to the resolution of technical problems. The question is therefore to know if the *open source* community is capable of taking up such challenges, by ensuring all the functions of the innovation process, as von Hippel (2001) affirms, as it concerns intangible goods. This is why in the future we will endeavour to study how *open source* solutions are positioned in this new market niche.

#### **IV-4. A modular architecture results from the decomposition of the offer and from multiple partners:**

The verticalisation of firms, which are often small, developing innovative software (Horn, 1999) leads to the offer being split up. This renders the global solutions; that the customers are supposedly seeking, more complex. In the case of PressCo, the customer certainly asked SoftCo and KnowCo to draw up a common offer, but initially PressCo should have been liaising with KnowCo alone: this was impossible because the skills of KnowCo were insufficient in terms of terminological extraction.. This is why the two vendors came to work directly with their customer and why a third vendor, XLMCo, came into play for the solution of archiving press articles. SoftCo, KnowCo and XLMCo know each other, but before the specific demand of the customer had not thought to work

together to propose an offer. Next, we can observe that this project led to a formal association and led to SoftCo and KnowCo proposing a joint software offer for the creation and management of a knowledge-based system using *text mining* technologies.

The solution developed for PressCo is broken down into two software bricks from SoftCo, one from KnowCo and one from XLMCo. On top of this is they join together for the *documentary application* and the *specific skill cartridge*: altogether totalling six distinct software modules plus the bridges between these modules. One of the advantages of this modularity lies in the fact that this allows users to test and to give feedback on the innovative parts: therefore, in the case of PressCo, documentalists could test a solution containing only the modules of KnowCo and XLMCo, before the modules of SoftCo had been finalised.

The case studies seem to show that the specialisation of innovative software vendors implies the direct intervention of several actors with customers at the same time. This complicates the task of the customer, swept up in a process of interaction with several actors in parallel and also complicates the task of the software vendors who must coordinate their work and their collaboration with their customer. This is why, at the beginning in the PressCo project, neither the customer nor the software vendors concerned wanted to work in this way. Such an organisation also blurs the global vision of the project, which seems to justify the intervention of a *service provider* uniquely in charge of the integration of the solution. Inversely, this decomposition of the offer presents a certain number of advantages: it brings about the multiplication of interactions between the customer and the software vendors and among the software vendors themselves. These permanent interactions create a dynamic favouring the evolution of software bricks and the evolution of their associations, in order to find the solution which is sought after. These interactions also enable the new concept to be “sold” to users, after it has been tested and reformulated dialectically.

All in all, it seems that the *modularity* of the proposed offer favours the assimilation of the innovation by the customer as it permits multiple interactions between the customer and each vendor of a software module and as it facilitates the tests and feedback on the sub-parts of the solution.

#### **IV-5. A complex but flexible process:**

The naturally modular structure of an offer made up of software developed by firms which are independent from each other, allows the offer to evolve without challenging its architecture, nor challenging each of the modules it is made up of. This naturally contributes to the flexibility of the innovation process. Additionally, we can observe a great flexibility in the organisation of projects, notably the PressCo project, without leading to major problems of lead-times (*only* several months behind the initial schedule): the number of actors changes (one then two, then three vendors in relationship with the customer), the responsibility of the development of the *documentary application* is transferred from PressCo to XLMCo, and the users groups end up refusing to participate in project meetings at the beginning of 2005, but this does not block the process. Moreover, we can remark that the “theoretical” project manager of the global solution, who is also the project manager of the “XLMCo” part, only exerts a very slight control. This also contributes to the great adaptability of the global project while generating a haziness which irritates the SoftCo project team.

Furthermore, the flexibility of the process is also linked to the flexibility shown by the software vendors. This flexibility is due to their small size as well as their motivation in bringing projects to a successful conclusion which could become benchmarks and therefore they think that they constitute a unique means of learning and of realising their innovative offer. This flexibility is very well illustrated by the work of SoftCo: XLMCo are slow to develop the filter allowing archives stored in PressCo’s former knowledge-base and it is SoftCo who carries out this task so as to not slow down their part of the project, and this with no opposition from XLMCo. Similarly, when there is a problem with manpower, SoftCo does not hesitate to redeploy their developers of standard software or *core products*.

## **V Conclusion:**

### **V-1. The role of first customers:**

The first customers play a fundamental role in the conception of the innovative offer of automatic creation of a knowledge-based system:

- one, PressCo, has the idea to combine software bricks of different vendors and leads them to become associates,

- the other, EditCo, creates a virtual base and draws attention to the insufficiencies of certain performances that SoftCo and KnowCo have not detected.
- for each of the two customers, groups of users transfer information which is relative to their profession and to the context of use of the future solution to software vendors. These users, after a test phase, also have an idea of the supplementary functionalities.

Nevertheless, these customers do not behave like *lead users* because they do not themselves develop their solution, despite the existence of a *toolkit*. First of all, the newness of *text mining* means it is improbable the first users will be able to assimilate this software immediately. Next, it is concretely very difficult for users to integrate by themselves the software bricks; developed by different vendors, that construct the solution. Nevertheless, the progressive development of skills of the customers (in particular linguistic skills), combined with the improvement of the *toolkit* proposed by SoftCo, can lead them to become real developers of new solutions, as could be the case of EditCo who has this target. Therefore, after a discovery phase of the radical innovation, certain first users could become real *lead users*, along the same lines as von Hippel (1986). Similarly, once the number of customers have increased and their skills have also increased, the notion of user community could become pertinent and this community could become the source of innovation.

In these conditions, it is no longer question of knowing if the development of an offer which competes with the SoftCo/KnowCo offer, originating from the work of free software or *open source*, is possible or if it would be better to hang fire, for example, until the concept and the diffusion of proprietary solutions of *text mining* are more widely spread.

## **V-2. Modularity of the architecture and interactions with users:**

We remark that the architecture of the innovative solutions studied is modular in so far as it is made up of different interfaceable software which are independent from one another. This multiplicity of modules leads to a multiplicity of interactions between software vendors and users. We remark that these interactions, which mobilise many resources at SoftCo and KnowCo, stimulate the development process of the innovative product, facilitating the feedback of information in relation to the sub-parts of the solution.. This last point is a one of the principal

factors which contribute to making the development process more flexible and therefore to improving its performances (McCormack, Verganti and Iansiti, 2001). Nevertheless, it seems that from one project to another, we can observe a smaller number of interactions, this perhaps being due to a greater proficiency of the projects by the software vendors.

### **V-3. The progressive maturation of the offer:**

The evolution observed between the first and the second project incites us to put forward the hypothesis of a progressive maturation of the offer through the enrichment of the different projects, in parallel to a maturation of the interaction between the vendor of the innovative software and the first users. The first projects go through a phase during which the customers, who are motivated but who do not yet master the innovation, contribute to bringing out an offer. This involves collaboration with the software vendors who should construct a modular offer, and place the offer into a context to make it more operational. Next, once this offer has become stable, the conditions are assembled to allow the development of a toolkit which can be used by customers or service providers. We intend to follow up our research work with an analysis of the structure, architecture, modularity, flexibility of the offer and also the way in which the customers allow it to evolve, possibly through a *toolkit*, in parallel to the evolution of the interaction between software vendors and customers.

After the detailed analysis of the on-going projects, it would be interesting to see a vendor with an offer which is more mature than the one of SoftCo/KnowCo. This hypothesis can be validated by studying a software vendor who, after having gone through a phase of direct interaction with his first customers, proposes now an offer sold via integrators without any direct contact with the final customers: this is the case of the firm SearchCo and its software IntSoft. This case can bring a counter-point to the cases studied on the notions of *modularity*, *lead-users* and *tool-kits*. This is why, in parallel to our work on the *text mining* projects, we are seeking to reconstitute a posteriori the way in which SearchCo has progressively built, with some of their first customers, their offer of *search* software (searching information in the intranets of large firms, for example) to end up, after several years, with a standardised offer sold by *service providers*. We will therefore try to reconstitute this innovation process to be able to compare it with the one of SoftCo/KnowCo.



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