

**The role of the first customers in radical innovations :
the software case.**

Competitive Paper for the 2009 IMP Conference, Marseilles

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Abstract

This paper is about the role and the involvement of the customer in the development of radical software innovation. Von Hippel and Katz (2002) consider that the customers play a decisive role in the emergence and direction that the innovation takes. More specifically, in software innovation, it is taking the customers' needs into consideration that seems critical (Cusumano 2004). Fichman and Kemerer (1997) suggest involving the users in the phases prior to the conception and development of the innovations. Based on two case studies (PressPro project and Exinis project) we propose a classification of 4 different roles played by members within the customer organisation: Innovation Architect, Project Manager, Expert Users, Users.

Keywords:

Radical innovation, user innovation, lead user, key user, software industry

Introduction

The type of customer involvement in exchanges with the supplier has generated considerable work in marketing. For 'traditional' marketing management the customer is passive ; he has given needs that the supplier is going to try and understand so as to conceive an offer. This conception has been the subject of criticism by different research streams for the last thirty or so years. For researchers in industrial marketing, like those in the IMP Group (Hakansson, 1982) the customer is active in the transaction. For innovation specialists, the way that the customer is involved has been identified as a key factor in the innovation process since the work carried out by Freeman (1982). Von Hippel and Katz, (2002) even consider that the customers play a decisive role in the emergence and direction that the innovation takes. More specifically, in software innovation, it is taking the customers' needs into consideration that seems critical (Cusumano 2004). Fichman and Kemerer (1997) suggest involving the users in the phases prior to the conception and development of the innovations so as to take their needs into consideration. In a more general way, one can note that for marketing, the idea of an active customer in relationships with the supplier and other parties concerned is widely shared. Thus, Vargo and Lusch (2004) affirm that the dominant logic based on the exchange of goods has evolved towards a logic centred on intangible resources, value co-creation and relationships (customer/supplier). Blazevic and Lievens (2007) put forward that marketing theory and practice recognise the growing importance of customer collaboration in the conception and development of innovation .

Beyond the affirmation that the customer is active and a co-constructer of value it is important to understand more precisely how its involvement takes place in the muddling through process of innovation. To achieve this, we focus on the way the first customers take part of the radical software innovation process.

In the first part of this paper, which is devoted to the literature review, we concentrate on the innovation characteristics in the software industry. We then go on to cover the questions concerning the involvement of the customer in the innovation processes: user innovation and management methods when information systems are deployed. After setting out our research methodology, we present two case studies concerning radical innovation projects (the PressPro project and the Exinis project) developed by two independent software publishers (Temis and Mondeca). In the last part, which is devoted to discussing the results, we identify the integration methods of the first customers in the innovation process. We show the implications of this integration on the organisation of the

innovation project. We highlight the roles played by the various actors within the customer organisation in a radical multi-actor innovation process.

This literature highlights the role of the customer, considered as an organisation, in the innovation process. But it only marginally takes into account the intra-organisational and inter-organisational mechanisms related to the customer participation to this process : most research works, in that field, regard the customer as a “black box”.

Literature review

Characteristics of innovation in the software industry :

The software industry is characterised by a regular flow of innovations, some of which are radical : a new type of software application (e.g. ERP), Business Intelligence software or even Internet search engines. This software is usually the result of research work carried out in university or big company laboratories. The innovations regularly experience high failure rates which lead the innovating software companies to think about conditions for a better association between the first customers and the first projects that apply the innovation they have designed.

These innovations are usually developed by independent technology start-ups that specialise in a given technology. For example, in the research that we present in this paper, the technology in action is text mining (or data sorting) which aims at extracting and classifying information contained in texts of every type (newspaper articles, patents, legal texts...). These start-ups are placed in a market creation process for a type of software on a given application and are confronted with a scarcity of resources in terms of time and manpower. Their objective is to be among the few publishers for whom the software has a commercial success in a new market segment. In fact, the software industry follows a course of « winner takes all », (Cusumano, 2004): for a given application type, only one or a few pieces of software survive, become standards and finish by completely occupying their market segment. One can quote Microsoft Office for office automation or SAP among ERP type software. Thus a concentration phenomenon occurs that sees the disappearance of a multitude of small software publishers. Software publishing, therefore, experiences the regular creation of new companies and new applications followed by a rapid concentration phenomenon.

Software publishers are subjected to a double gamble. On the one hand they have to be extremely focused on their own technology and on a market segment that they are helping to develop. On the

other hand, they have to integrate their software with that of other software publishers so as to be in a position of being able to offer customers complete application solutions. These integrated solutions then become innovations in their own right in the form of platform software. These software platforms can receive other software to be connected according to «plug and play» logic. Thus the platform notion is fundamental in the software industry. The software that plays the platform role plays a central role and benefits from a strong strategic position. Only a few application platforms become standards and can remain in the market. It is the case, for example of the Microsoft Windows operating system. According to Cusumano (2004), software publishers are led to develop either platforms or complementary software that becomes part of a platform. Under these conditions one can understand the importance of the issue at stake, which for the publisher of innovative software is to be one of the actors that offers a standard platform and, in doing so, joins forces with other publishers to propose a common offer.

Customer involvement: lead user and key user

We are going to tackle two aspects of the literature, one relating to user innovation and another concerning customer involvement when information systems are deployed. These two areas of literature enable us to highlight two important concepts : lead user and key user.

Literature concerning user innovation : Von Hippel (1986) suggests that firms should generate innovative concepts in partnership with *lead users*. The notion of *lead user* is defined as follows: it is about 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 user* customers 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. It is the case for 80% of products in the scientific instrumentation industry (Von Hippel, 1994). Hence, some firms go even further by choosing to equip their customers with tools which enable them to design and develop themselves the products that suit them. Von Hippel (2001) suggests an approach whereby the user receives the tools (“a user toolkit” or user toolbox) which allows the user to completely take in hand the design of the product, any possible industrialisation remaining the producers’ responsibility. The objective is then to package developments made by these lead users in standard products which will subsequently interest more users (Thomke and von Hippel, 2002). *Toolkits* also allow customers to develop their own solution in accordance with their specific needs. The *toolkit* approach leads to an innovation process being broken down into sub-projects where tasks are assigned to either the user or the producer (von Hippel and Katz, 2002). Such task distribution can entail radical changes to the architecture of a product, and generally leads to the development of a modular architecture, as is the case in free software (von Hippel and von Krogh, 2003).

Literature concerning information systems management : Literature on information systems management focuses particularly on the question of software deployment (especially ERP) in big companies, on its human and organisational impact as well as on the conditions for optimising this deployment by taking account of the users and uses (Markus, 2001). However, this literature is not interested in the design of the innovative software in itself. The notion of *key user* is used in the literature to qualify the users with whom the innovative software publisher and/or service provider responsible for the deployment and integration of the solution is going to work on the needs specification and the personalised adaptation of the solution to the users’ precise needs. The notion of key user is frequently used in information systems management and should be distinguished between that of lead user even though these two notions can present certain similarities. The key user is a user who is going to take part actively in the deployment of a software solution in their company, like for example an ERP. He does not take part in the innovation design process, but works closely

with one or more software publishers or with the service provider responsible for integrating the solution. He therefore transfers part of the information linked to the uses of the solution in the company where it is to be deployed.

The common points between key users and lead users can arise from what both perceive as benefits to be taken from the innovation which leads them to be favourable to its development and/or its deployment. It can also arise when both user types are equipped with special skills that distinguish them from other users. Key users are also intensive system users (cf. Open source office software : report on the methods used by Bristol City Council for Deployment and Migration to StarOffice – www.opensourceacademy.gov.uk, 2006). The lead user is likely to contribute actively to the innovation design process while the key user is likely to take part in the deployment of an innovation that has already been designed. The key user can carry out software fine tuning and provide guidance on how to take full advantage of the best practices enabled by the solution”. (SAP Solution Brief : SAP Solutions for Small Businesses and Midsize Companies : www.sme.sap.com, 2008). Therefore they are not necessarily users that are likely to really conceive the innovation, unlike lead users.

Research method

Research question

The study of the literature leads us to highlight customers’ different ways of involvement in innovation. We feel that software represents an innovation application field preferred by users. Also, our research question is the following :

What role do the first customers play in the radical multi-actor software innovation process ?

Sample characteristics:

We have studied the case of a software innovation, an “automated knowledge base creation system”, aimed at companies. This innovation forms part of the development framework that specialists call the “semantic web” and more specifically « document processing ». The innovation aims at solving the administration problem (indexation, categorization, research, availability for various users) of a large number of textual documents (press articles, scientific articles, legal texts, patents, agency stories...).

Two projects are studied : PressPro and Exinis.

- the PressPro project concerns the creation of a knowledge base for PressPro, a leading French newspaper group. It was designed to facilitate the creation of theme based news files for journalists.
- the Exinis Project is based on the creation of a knowledge base for an international publishing house (Exinis). Its aim was to compile legal summaries sold to firms of corporate lawyers.

These projects combine, for the first time, different independent software bricks enabling:

- the extraction of information using an IDE information extraction engine offered by Temis. Temis, one of the two software companies where we carried out our research, produces innovative software packages: especially *text mining* software which allows the extraction, categorisation and cartography of information contained in any body of text (newspaper articles, legal texts, patents...).
- the knowledge management using an ITM knowledge management system offered by Mondeca, a software publisher. Those systems are based on ontologies (i.e. representation of a domain's knowledge, that have to be defined precisely for each customer. Both Mondeca systems and Temis text mining software are radically innovative. Mondeca knowledge management system (ITM) enables customers to automatically extract and gather (in knowledge base) information contained in different types of text (pressarticles, patents, laws, etc.),in order to retrieve it and to use it later.

For each customer, specific development is required both on Mondeca software and Temis software, and on the coupling between the two software (software bridge).

This type of innovation can be considered as a radical innovation. On the one hand it is based on a combination of innovative algorithms of semantic analysis and statistical analysis. On the other hand it introduces a huge change in practices. In fact, the offer proposed by Temis to their customers modifies the working habits of the firms that adopt it, by enabling the automation of text analysis: automatic (or semi-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).

Given the complexity of the two projects we explain them in summary chart form .

Table 1 : Characteristics of PressPro Project description :

- **Object** : Automation of information extraction from press articles, concerning celebrities.
- **End users** : 40 documentalists.
- **Duration**: 3,5 years (June 2003 – December 2006).
- **Budget** : 630 k€.

Table 2 : Characteristics of Exinis Project:

- **Object** : Automation of tag insertion in text (concerning legal references).
- **End users** : 50 writers specialized in legal synthesis.
- **Duration**: 4 years (April 2004 – June 2008).
- **Budget** : 600 k€.

Méthod :

We used a longitudinal analysis of the two ongoing projects PressPro et Exinis. Throughout the projects we interviewed on a regular basis, on average once every two months, the people working for Temis and Mondeca in contact with the customer (project managers, technical managers, account manager) using semi-directive interviews, as well as the project managers at PressPro and Exinis. We also participated in internal project meetings. Between June 2003 and June 2008 we were involved in 59 meetings and interviews:

- 18 interviews with people involved at Temis in the PressPro project,
- 6 interviews with people involved at Mondeca in the PressPro project,
- 19 interviews with people involved at Temis in the Exinis project,
- 10 interviews with people involved at Temis in the Exinis project,
- 3 in-house meetings at Temis, two on the PressPro project and one on the Exinis project,
- 3 interviews with the customer's project managers (one at PressPro, two at Exinis)

In monitoring the two ongoing projects, our observation concentrated on the type of actors involved, their role, the interactions between them (software publishers, customers, computer service companies responsible for the integration of the solution) during the different phases of each project, the gradual emergence of the innovation and the methodology needed for its implementation.

Case study

To make the case studies easier to understand, it is important to point out that the 2 projects presented concern applications at two customers (PressPro and Exinis) that need the coupling between Temis IDE information extraction software and Mondeca ITM knowledge based software. This IDE/ITM coupling results in the completion of a software platform. For each specific application (PressPro or Exinis), the personalisation concerns both information extraction (IDE), the knowledge management system (ITM), and the software bridge (between IDE and ITM). The chronological account of these two projects shows how all the actors involved interact in the innovation process and the coupling between Temis IDE information extraction software and Mondeca ITM knowledge representation software.

The PressPro project:

The PressPro project was started in June 2003 by the manager of the PressPro documentation department, after having met at *i-expo* exhibit (french “strategic information and business intelligence” exhibit). He wanted to create a solution to couple the extraction of information found in press articles and then to categorise this information in a knowledge base. The goal was to automate a task carried out on a daily basis by fifty or so archivists for whom the task took up most of their working time. The idea of a coupling between Temis IDE information extraction software and the Mondeca ITM knowledge based software had already been envisaged in 2002 by an international pharmaceutical laboratory. The laboratory had encouraged Temis and Mondeca to work together on this application. The laboratory did not go any further but it was at that time that Temis and Mondeca had realized their complementary aspects. PressPro’s request encouraged Mondeca to take on somebody dedicated to the design and development of a software gateway that could link the ITM and IDE software. This IDE/IDM connection demanded a lot of work on the part relating to information extraction.

At the beginning, PressPro had to work solely with Mondeca who on their side had to work with Temis. However, Mondeca did not have the skills needed to be able to speak to PressPro on behalf of

Temis on the question of information extraction. As a result Temis set up a direct contact with PressPro. In addition, PressPro insisted on joining forces with Xyleme on the project. Xyleme is a software publisher that offers an archival solution of documents in XML format. Temis and Mondeca were initially extremely doubtful about Xyleme's participation which they perceived as a weakness for a start-up that did not yet have any customers.

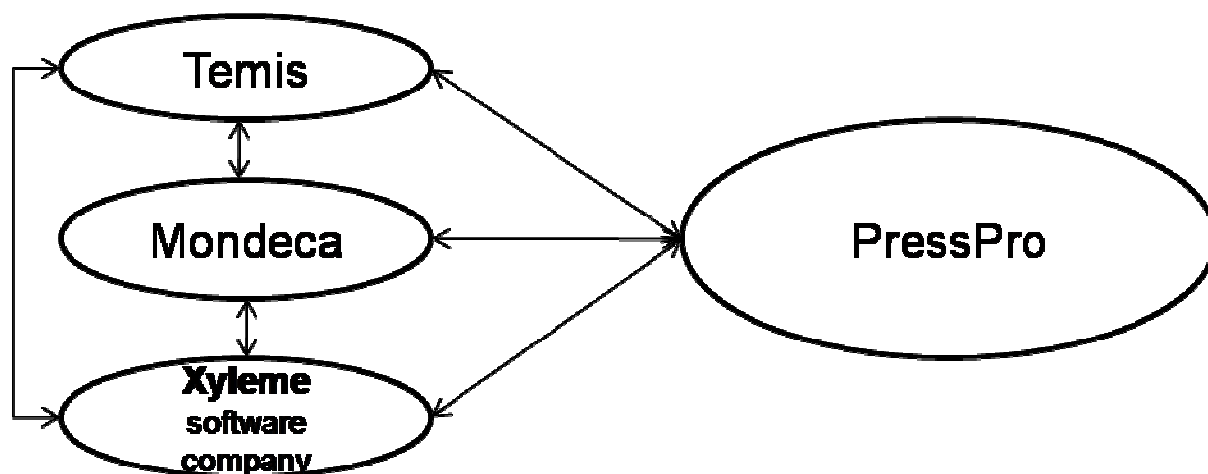


Fig.1: Actors involved in the PressPro Project.

The work aimed at defining the functional specifications of the solution then began. As the IDE/ITM coupling was still only at the design stage, it was impossible to define a prototype, in other words a simplified version of the projected solution that would generate customer reaction and make it easier and quicker to lay out the specifications. In spite of this, a very inaccurate list of specifications in terms of the expected performance level was finally drawn up. In fact, for the customer, it was implicit to achieve the best level of information extraction and the most relevant categorization of the latter in a knowledge base. The final objective was to search for and supply information and articles that corresponded exactly to the needs of the PressPro journalists.

The next step was to set up several user workshops. Those workshops brought together on given themes PressPro user groups, the project manager from the software publisher concerned (Temis, Mondeca or Xyleme), and the manager of the PressPro documentation department.

- In the case of the development of the user interfaces, the PressPro project manager, who was the IT manager of the documentation department, was present at the meetings. .

- As to the IDE/ITM coupling, the work was carried out by the Mondeca coupling project manager, in collaboration with the experts from Temis and Mondeca.

These workshops brought together over a period of several months all the PressPro archivists who prior to this did not have the skills required.

The task of defining the user interfaces was first allocated to two computer analysts from the PressPro IT department, under the supervision of the PressPro project manager. The latter was responsible for developing the interface while Xyleme had to take on the coordination between the three software publishers involved, Temis, Mondeca and Xyleme.

After six months, the user workshops were suspended as the archivists refused to collaborate on the implementation that they felt sure would lead to a reduction in their number. In fact automation of some of the archivists' tasks reduced the staff requirement. The work then continued with two PressPro archivists allocated to the project who worked in the Mondeca premises. These two archivists worked with the appropriate project managers at Mondeca and Xyleme on the ontology and user interfaces definition. These project managers also worked together regularly on the definition of the user interfaces and the data base. During this period, Temis only worked, from time to time, with the PressPro documentation manager on the creation of the "celebrities" knowledge base. On the other hand, at about the same time, responsibility for the user interface development was entrusted to Xyleme who do not normally carry out this type of work (for it is a task that is usually given to *service providers*) : in fact the PressPro project manager and computer analysts did not manage to appropriate this task and their work did not advance. At the same time the Mondeca coupling project manager was working on the development of the OntoPop platform that linked IDE and ITM.

Thus the project progressed, organised into three sections :

- design of the user interfaces,
- design of the "celebrities" knowledge base,
- design of the OntoPop platform (IDE/ITM coupling).

The coordination between these three sections was not really provided by the PressPro documentation department manager who had an implicit duty to do so. He lacked both skills in the technology being used as well as an overall vision of the project to enable him to redirect it according to the constraints and difficulties encountered. Indeed, the three software publishers involved (Temis, Mondeca and Xyleme) complained about the lack of leadership but did not want to

take it on. The various tasks progressed in this way but problems came up with the Mondeca ITM and Xyleme XML software. These problems took up the entire attention of Mondeca, Xyleme and PressPro through the PressPro documentation department manager, two dedicated archivist users and also a recently formed user group responsible for testing this part of the solution.

This part of the solution was finally improved and judged as satisfactory. However, the knowledge base had not been able to be tested or finalised. As a result, the IDE/ITM could not be tested either. The initial deadlines set up had, by then, already been considerably exceeded. The archivists rejected certain parts of the solution, considering them unsuitable, which was logical given the little time that had been allocated to their finalisation.

Temis and Mondeca drew the following lessons from this failure:

- The need to have clear leadership from the customer on the project, through a player equipped with an overall vision and skills relating to the technology and software being used.
- The need to define a methodology that makes it possible to manage the interactions between the software publishers in their entirety so as to have a personalised definition of the solution (« OntoPop methodology »),
- The need to have recourse to a service provider specialised in the development of user interfaces.
- The need for continuous involvement of the user groups in the different tasks.

The Exinis project :

The Exinis project started while the PressPro project was still in progress, and while the coupling between the Temis IDE software and the Mondeca ITM software had been defined by the Mondeca coupling project manager but had not been able to be implemented at PressPro.

Exinis is a publishing house that specialises in legal publications. Their customers are legal professionals such as business lawyers whom they provide with legal information needed for their work. This legal information is compiled by sub-editors at Exinis. It is accessible on line. It has been the responsibility of the Exinis France IT department manager to put the information on line. This manager had the idea of turning to Temis and Mondeca to make it easier to tag the information.

Thus the Exinis project got underway in June 2005, with, as main actors on the software publishing side (see fig. 2):

- Temis, in charge of developing a module specialised in legal information extraction (“legal skill cartridge”): the Temis project manager and a language expert .
- Mondeca, in charge of developing a knowledge base for the legal domain : the Mondeca project manager and a knowledge management expert as well as the coupling project manager.
- 4D Concept, a small service provider specialising in document processing, that does not command text mining technology or knowledge representation systems but that has already worked for Exinis. 4D Concept was responsible for the development of the user interfaces.

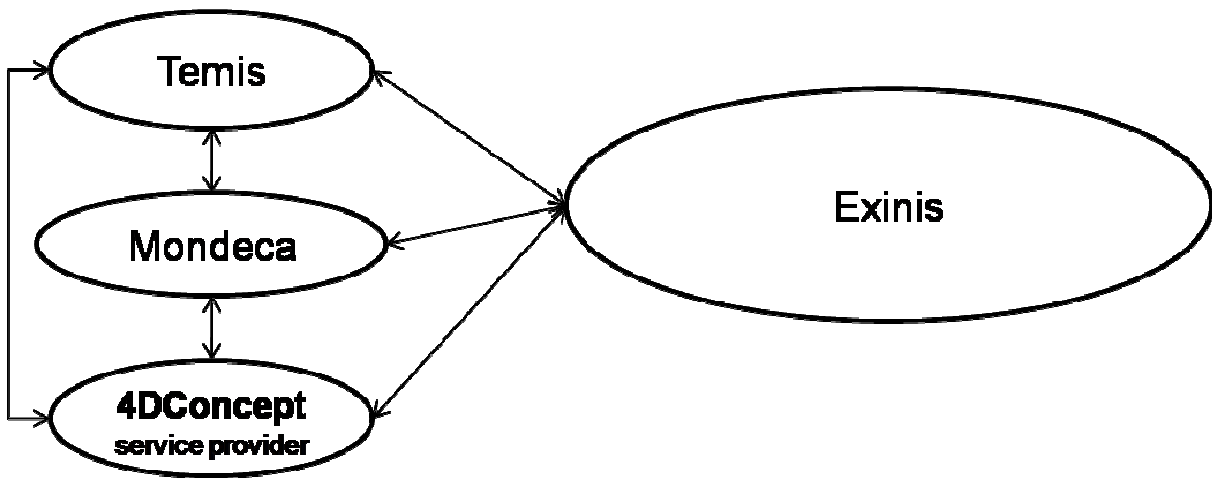


Fig.2: Actors involved in the Exinis Project.

At Exinis, the organisation was as follows :

- The IT department manager on the project initiative, known internally as the « innovation architect »,
- A project manager dedicated to the daily administration of the project and to monitoring the various tasks, a computer analyst specialising in databases,
- Two users, legal sub-editors trained in knowledge management and qualified as « competent users ».
- Users whose usage was observed from time to time in the user workshops.

To begin with, a prototype was developed by Temis and Mondeca, to make Exinis react through the innovation architect and the two user experts. Then, user workshops were set up. The people involved were :

- At Exinis, users, the innovation architect, the expert users and the project manager.
- At the suppliers, the Temis, Mondeca and 4D Concept project managers..

After this, the expert users worked continuously on the various tasks with the supplier actors concerned : Temis project managers, the IDE/ITM coupling manager and the Mondeca and 4D Concept project managers. Their support proved to be decisive in terms of the precise uses that the Exinis sub-editors would put the solution to. In addition, their initial skills and interest in the solution enabled them to develop new skills. The acquisition of these new skills made it possible to make suggestions about the IDE/ITM coupling that in turn required new developments on the part of Mondeca.

The innovation architect supervised the group of tasks and the project manager coordinated them and monitored their daily progress in close collaboration with the innovation architect. This innovation architect took a number of initiatives into account throughout the project :

- At the beginning of the project, leading developments on the IDE/ITM coupling. These developments made it possible to highlight problems linked to the access time to the ITM knowledge base and the slow transfer of information between IDE and ITM. This led to Mondeca updating the ITM software.
- To have specific modifications made to the knowledge bases, solely for pedagogic reasons. The objective was to demonstrate to the people at Exinis the future benefits from the adoption of the new software platform.
- Redirecting the project and redefining the tasks to be carried out within the framework of the project as it progressed. Some tasks turned out to be longer or more complex than initially envisaged which led to reconsidering what had been allowed for in the contract : a reduction in the number of tasks to be carried out by the suppliers, an increase in the budget allocated to the project.

The involvement of the users occurred in three phases :

1. First phase : user workshops enabled suppliers to understand their way of working.

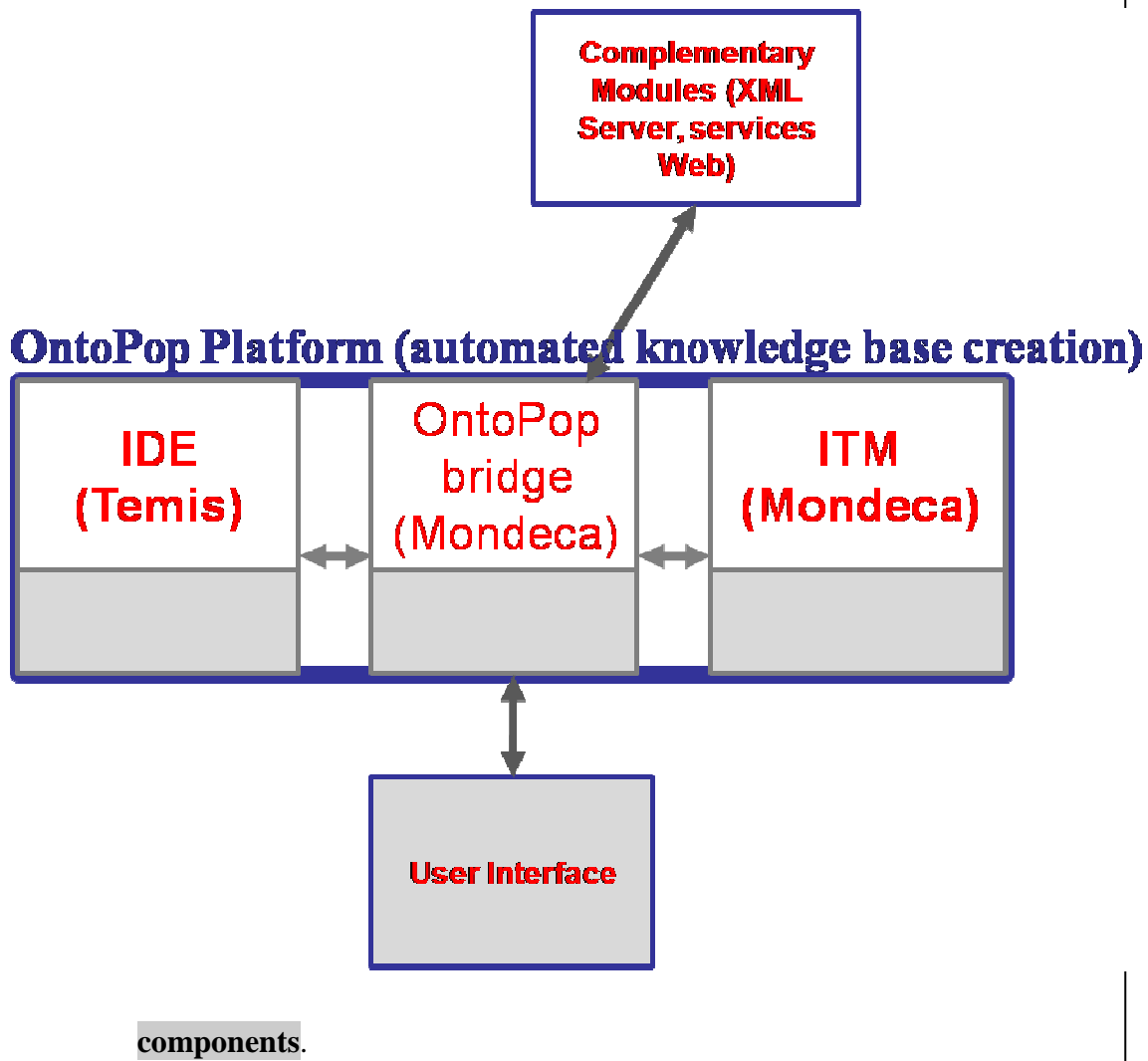
2. Second phase : several users took part in user workshops where only the two competent users, the innovation architect and the Exinis project manager were taking part. Two or three alternative proposals concerning choices of solution design were put to the users.
3. Finally, in the pre-production phase, user groups tested the complete solution and created some feedback for the project actors.

As for the Exinis project manager, his role was also judged by the project actors as being essential. He directed the coordination between the different software publishers: Temis, Mondeca and 4D Concept. He effected the link between the software publishers, who were not coordinating well between themselves, and the project actors at Exinis through a permanent link with the innovation architect. His database skills enabled him to work with the Mondeca actors and those actors responsible for the 4D Concept user interface.

Finally, the coordination between Temis and Mondeca concerning the personalisation of the OntoPop platform integrating IDE and ITM software was improved in terms of the PressPro project by adopting the « OntoPop » methodology. This methodology, set up during the second part of the Exinis project, defines and plans the different tasks and interaction methods between actors (between Temis, Mondeca and the customer) so as to achieve such a personalisation.

A new software platform resulting from the two projects :

A platform called “automated knowledge base creation platform” (OntoPop platform) was designed and developed during the PressPro project, by Mondeca, in collaboration with Temis, but this platform has not been implemented. However, the platform has been adapted and successfully implemented in the Exinis project. On this new platform, other software can be plugged in : for example, the XML server for the PressPro project, and web services for the Exinis Project. But the platform gathers components that require cooperation between Temis and Mondeca, to be adapted to the needs of each customer .



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Fig.3 : “OntoPop platform” and connected modules.

Discussion

In this radical innovation process several actors are involved. They play different roles corresponding to different kinds of knowledge mobilized in the process. The case study analysis enables us to isolate four main roles played within the organization of the first customers.

1. Design of the innovation architecture :

For the PressPro project, the design of this architecture is up to the documentation department manager. This manager intervenes on the innovation architecture and its implementation in a very demanding context. We suggest calling the person who takes on this role at the customer, the « **lead user architect** ». This « *lead user architect* » is in place to take on the function of a « heavyweight project manager » (HWPM) (Clark and Fujimoto, 1991 ; Clark and Wheelwright, 1992). This role of « HWPM » has, in the framework of the Exinis project, been for the most part taken on by the innovation architect (manager of the IT department) who was given considerable authority by head office and had much more power than the project manager. The innovation architect is ideally placed to take on the responsibility of HWPM for various reasons :

- he has internal and external legitimacy,
- he created the innovation architecture,
- he knew how to convince his own management of the importance of this innovation.

This legitimacy and capacity to create a new architecture lead him quite logically to taking on the role, essential here, of HWPM, who directs, supervises and assumes the internal and external project coordination and reports to his management on the progress of the project. This task needs both cross-disciplinary skills, resources and time. In the two case studies presented, the Exinis innovation architect is in a much more favourable position to take on this role than the PressPro innovation architect.

2. The operational management of the project :

In the Exinis project, the Exinis computer integration project manager has managed the project in an operational sense and has therefore been obliged to allocate, monitor and control the various tasks. For the most part he plays the role of « project completion manager » (Charue-Duboc, 1997), who is responsible for completing the work and who has to implement the necessary technical means defined beforehand. His role is essential for the smooth daily operation of the project, he is a project manager who has a much weaker status than that of the HWPM. It is logical for him to be located at the customer's premises, for various reasons. The different software suppliers are not strongly interlinked and in addition they are more focused on their technology dedicated to specific applications. As a result, the customer is, a priori, the best placed to interact with each of the suppliers, to coordinate their actions and ensure coherence in the different contributions..

We can therefore make the point that the essential role of « operational project manager», should be taken on by the *lead user* customer. We have chosen to call this actor « **lead user project manager** ». The skills required for such a role are less extensive than those of the « lead user architect », in that here, it is not a question of creating new solutions or directing the project but of understanding it and ensuring its good progress under the supervision of the project director. The lead user project manager has to have the ability to be able to interact with every actor in the project, which in turn implies having cross-disciplinary skills as well as operational skills in information system project management.

3. Development of personalised components with lead user « individuals » :

During the Exinis project, development took place through the collaboration between the Temis or Mondeca experts and users with a certain level of expertise in the technology being used. This collaboration was steady and consistent and the users who took part were dedicated to the task. In the Exinis project it was a question of users who already had knowledge management skills which made their collaboration easier with Temis, Mondeca or 4D Concept, in terms of the design of different personalised components. In addition it was about users presenting *lead user* characteristics, for they were in some way “in the forefront” of the text mining trend, in part because of their interest and training and also because they realised what this technology could contribute to their activity. In the PressPro project the collaboration involved two users (after the user workshops were suspended) who initially had neither experience nor specific skills. Their regular collaboration with the Mondeca and Xyleme participants represented an apprenticeship for them, which in turn gradually enabled them to interact better with the suppliers .

We would therefore emphasise the major role of these users who have skills and motivation that distinguish them from ordinary users in the innovation process. These skills facilitate the transmission of « sticky » information to the actors responsible for the innovation development and more generally enable a fruitful dialogue to be established between the users and the actors. We suggest calling the users who have skills relating to the technology used by the innovation and who have *lead user* characteristics : « **lead users experts** ». These competent users can also play the interface role between the actors and the ordinary users. The « lead user experts » can be compared with *key users* described in information system management literature but their role is different because they contribute to the innovation design process.

4. User contribution : taking account of the multiplicity of uses.

At the start of both projects studied there were user workshops, during which the Temis and Mondeca participants tried to understand how the « ordinary » users worked, those who had neither a specific skill nor motivation concerning the innovation, and how they could adapt to the software solution that had been created. It was a question of making quite a large number of users contribute, mainly with the aim of observing the maximum number of uses, and to make them react to concrete proposals about the application being developed. By using the analysis of these uses and reactions, personalised software components were developed and the software parametering was completed. This vital contribution from the users goes back to the « sticky » nature of the information they had about their own activity, an « sticky » nature shown by the projects we have studied to what extent it is marked, thus confirming one of the founding hypotheses of the *user innovation* approach (von Hippel, 1994). We simply suggest calling these users of a customer with *lead user* characteristics « **lead users** ». The contribution of these users involved in the user workshops seems therefore to be essential. The role played by the lead users in the design process studied cannot be taken on completely by a few users who have the profile of expert users. In fact, during such developments it is first a question of observing the maximum number of uses possible. As a result, having a large number of users involved is a key element, particularly in order to convince as many users as possible of the importance of the innovation. The first point (taking account of a maximum number of uses) refers in part to the role of user communities, whether in the area of proprietary software or Open Source software (Raymond, 1999 ; Franke and von Hippel, 2003 ; von Krogh and von Hippel, 2003). The second point refers to the doubts of users when faced with uses being questioned by the adoption of a new software system (Markus and Keil, 1994 ; Markus and Mao, 2004). However, this interaction with the users is more difficult for the software publishers involved to manage, as was shown by the failure of the PressPro user workshops. Likewise, the absence of this type of

interaction for the entire second half of the Exinis project can be explained by the Exinis innovation architect's fear that the software publishers did not know how to manage it. This is why the plan he sets up consists above all in making the users interact with the *lead user experts*, who in fact play an interface role, facilitating the understanding and appropriation of the innovation by the majority of users.

V. Conclusion on the customer contribution to the innovation process :

In this paper, we have tried to highlight how the customer was involved in radical innovation processes by using the software case. Von Hippel (2005) shows that some customers are lead users upon whom the company can rely to the extent that they are capable of supplying an initial description of their needs and of collaborating with the supplier to develop solutions. Hence the search for these lead users as first customers who will enable the innovation to be designed. We have, in this paper, detailed the roles of the various participants with these first customers. Our work has succeeded in an enrichment of the notion of the *lead user* , by crediting him with a multi-dimensional character while literature on innovation by the users describes a *lead user* as mono-dimensional. In fact, different customer participants play different roles in the innovation process : innovation architect, project manager, expert users or lead users. No participant is in a position to hold all these roles at the same time. The contribution of the lead user customers appears for the duration, which is in contrast to a more limited vision both of this contribution and the supplier/customer interaction developed by literature on innovation by users (von Hippel, 2005).

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