



PROPOSITION OF A TOOLS SELECTION METHOD TO SUPPORT AND FAVOUR INNOVATION FOR A MANUFACTURING COMPANY

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Abstract

Nowadays, companies have to innovate in order to cope with competition, and to ensure the durability of their activities. Innovation is more and more perceived as a result. Users can be involved in this process to diversify the types of innovation. However, it can be difficult for companies which are novice at the subject to set-up an innovation process. This is especially true for manufacturing companies operating on a B2B market. As far as we know, the specific features of innovation in such companies have not been studied a lot. In this context, we will try in our paper to define which are the first steps of the innovation process that could be set up by such companies. Then, we will try to determine tools, techniques and/or methods for each step of our innovation process. After that, we will do a proposition of a tools selection method, to determine the best tools for each step. This selection of best tools will be applied in a manufacturing company operating on a B2B market. A study in a manufacturing company enables to validate the pertinence of our proposition.

Keywords: Innovation, Research methodologies and methods, Organizational processes, Innovation tools, Manufacturing company

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1 INTRODUCTION

Innovation has become a buzzword. It can be defined as an "iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention" (Freeman, 1991). It is perceived as a necessity for the majority of companies. Indeed, companies have to innovate in order to cope with competition and to make their activities sustainable (Boly, 2008). For example, a study of 13,117 companies of the EU28 member states has shown that for 63% of them, innovative goods accounted for between 1% and 25% of their 2014 turnover (Europ. Commission et al., 2015). This is even truer for manufacturing companies, where competition is strong and demand never stops evolving (Chesbrough, 2006; Midler et al., 2012). Two main families of works on innovation have emerged in the literature. Some authors have mainly worked on the types of innovation (Kleinschmidt and Cooper, 1991; Garcia and Calantone, 2002; OECD and Eurostat, 2005; Lacom et al., 2015), whereas some other authors have focused on the innovation process (Fetterhoff and Voelkel, 2006; Wallin and Krogh, 2010). In this paper, we have decided to focus on the innovation process as it could help a company to know what to do to innovate. Besides, an innovation process permits to ensure a continuous production of innovations (Yannou, 2013). The involvement of users is known to be important for companies that want to develop their innovation process (Von Hippel, 2005). In our case, we consider that the users are all the people who can be involved in the innovation process of a company (clients, employees, suppliers, etc.). According to Griffin (2012), the involvement of users in the innovation process improves innovation. However, the involvement of users in the B2B sector (Business-To-Business: companies that sell their products to other companies) still cannot be considered routine business different from B2C market (Business-To-Consumer: products are sold to private individuals) (Katsikis et al., 2016). In general, it is because companies do not know the steps to take to involve their users in their innovation process, as they are less user-oriented than B2C companies (Kotler and Pfoertsch, 2006). The design and the implementation of an innovation process could help companies to know which users it should involve. Different innovation processes have been proposed in the literature. Nevertheless, some of these processes are complicated to set up, companies encounter difficulties to put them into practice (Baer and Frese, 2003). It could be useful for companies to detail more steps of the processes, and to guide them in the roll-out of these steps. The definition of tools (physical tools, techniques and methods) linked to the steps of the innovation process of companies could help them to set up this process, and to know how to better involve their users. But companies do not always know which tools they could use to set up their innovation process, in which context, with who, etc.; as in the case of the pilot company we have studied. In our paper, we will try to answer the following questions: what should manufacturing companies positioned on a B2B market do to set up an innovation process? When should they do it? Which tools could best help these companies to set up their innovation process, and to involve their users in this process? What are the tools that are most appropriate for each type of companies? Our paper will be divided into six parts. Firstly, we will do a state of the art of the innovation process and of the tools which can help to set up this process in a company. After that, we will study the case of a manufacturing company positioned on a B2B market. Then, we will present criteria that could help a company to select the appropriate tools. After that, we will analyse the innovation process of our pilot company, which is, according to us, on the basis of our state of the art, representative of the companies positioned on a B2B market. We will apply our approach to help this company to define the tools it should set up. We will then discuss our results and conclude.

2 INNOVATION PROCESS AND TOOLS: THEORETICAL FRAMEWORK

2.1 Innovation process

The design and the implementation of an innovation process could help companies positioned on a B2B market to better innovate (Vuola and Hameri, 2006). Several models of innovation process have been proposed in the literature. For example, Fetterhoff and Voelkel (2006) have proposed an innovation process which has five main steps: (1) seeking opportunities, (2) evaluating their market potential and inventiveness, (3) recruiting potential development partners, (4) capturing value through commercialization, and (5) extending the innovation offering. The concept of an innovation process is a current issue. Indeed, even the organizations for standardization are working on it. The International

Organisation for Standardisation is working on the ISO/NP 50500 standard: management of innovation - main principles and vocabulary. The French Standardization Association (AFNOR) has published its guide "Implementation of an innovation management approach" (AFNOR, 2014). According to the AFNOR, the innovation process is divided in four steps (exploration, assessment and decision, management of projects, capitalization), and in four domains (marketing and commercial, technology, legal normative and financial, management and organization). By crossing these four steps and these four domains, a company can identify the tasks it has to do to innovate. For example, by crossing the first step (exploration) and the first domain (marketing and commercial), the first task is obtained: "Look for innovation opportunities". However, innovation processes often tell companies what they have to do to innovate in principle, but these processes do not detail how to put it into practice, and with which tool. So which tools could help companies to set up their innovation process?

2.2 Tools to set up the innovation process

Authors have identified some tools, techniques and/or methods that could help companies to innovate, and to better involve their users in the innovation process. Some examples of tools are presented here. Hidalgo and Albors (2008) have carried out a study on 426 entities (almost 50% of industries) which shows that the main techniques and tools that allow the support of innovation in firms are project management, business plan development, corporate intranets and benchmarking. Otherwise, meetings with users, such as workshops, brainstorming and focus groups are often used by companies to collect qualitative data about the opinions, feelings and views from a small group (8-12 people) on a predetermined set of topics (Van Kleef et al., 2005; Martin and Hanington, 2012). Then, companies could organize innovation contests, with internal and/or external actors. The aim is to post an innovation-related problem to a population of independent agents (the users), and to reward the person (or the group of people) who found the best solution (Terwiesch and Xu, 2008). It can also be useful for companies to set up a creative place, or an innovation room, where users could evolve and work. It is a physical environment where users could be inventive and creative, make prototypes and test them (Benoit-Cervantes, 2012). According to Iansiti and Clark (1994), one basis of the involvement of the users in the innovation process is the integration of internal and external actors during problem solving meetings. It is used by companies to identify problems, and to try to find quick ways to resolve them.

Several tools, techniques and/or methods that could help companies to innovate and to better involve their users in the innovation process have been identified by authors. However, authors generally focus less on these tools, they prefer to present in detail one or two tools. The tools are rarely linked to a step of the innovation process. Therefore, what are the tools that are most appropriate for each type of companies? When should they be set up? We will try to answer these questions in the following parts.

3 INNOVATION IN A MANUFACTURING COMPANY: CASE STUDY

To answer our problematic, we have chosen to work with a pilot company. The company is solicitous over the innovation, but does not have real experience and knowledge on the subject. We have studied a part of the innovation process of this pilot manufacturing company, and we have tried to select together the best tools that could help this company to set up its innovation process. This company is a French automobile subcontractor, existing for more than two centuries. It would like to further involve its users in its innovation process. The company has the following features:

- More than 3,200 employees: it is considered as a big business (more than 250 employees);
- About twenty plants in the world; all the plants are rather independent, with the advantages and the disadvantages it offers. It can be considered a merging of several small companies;
- It is in a hurry; it expects to see results quite quickly;
- It does not have a high budget dedicated to innovation;
- Not many people are dedicated to innovation; all the employees can be involved if they want to.

According to us, this company is quite representative of the companies positioned on a B2B market, given its size, its international positioning, and its business sector. In order to study our pilot company, we have worked in collaboration with the innovation team of the company which is composed of people in charge of the sales, research and marketing departments. The different people of the sales and research departments are in charge of different product ranges, thus enabling a wide representation of the business sectors of the company. In agreement with the company, we have decided to focus on the first task of

the innovation process of the AFNOR (2014) "Look for innovation opportunities", and to provide more detail. Indeed, it is the task where the users are most involved.

4 PROPOSITION OF SELECTION OF TOOLS TO SUPPORT AND FAVOUR INNOVATION

In the following part, we will propose a way to select tools to support and favour innovation. This proposition has been led by the study of the literature, and also by the analysis of our pilot company.

4.1 Criteria to select tools

Lots of tools could be set up in companies to support the development of innovation. However, it could be counterproductive for companies to set up too many tools (Benders and Vermeulen, 2002); the spent time - results ratio would not be good enough. This is the reason why companies should select a short-list of tools to set up, by applying some criteria to the tools. For example, Katsikis et al. (2016) have proposed a list of criteria to select the best tools which could help a B2B company to set up its innovation process. They have listed ten main criteria: (1) number of total parties involved, (2) typical total number of people involved, (3) duration from internal kick-off to completion of idea generation, (4) time spent on organization and execution of activity, (5) amount of money spent (excluding own staff), (6) complexity of legal issues, (7) average no. of business or product innovation ideas, (8) quality of ideas regarding usability either short or long term, (9) type of idea (incremental, disruptive, market current, new), (10) chance for short term new business / turnover. However, these criteria are mainly based on the step "idea generation" of the innovation process (e.g. "quality of ideas", "type of idea", etc.), which is one of the very first steps of the innovation process. It could be interesting for companies that have planned to set up different steps of the innovation process (even in the medium and/or long term), such as our pilot company, to have criteria which could be applied to each tool, whichever the step of the innovation process. To complete and diversify this list of criteria, companies could apply the "Five Ws" method to the tools. This method proposes to answer five questions to define clearly and completely a project. For example, Marchiori (2004) has applied the five Ws method to the World Wide Web. His aim was to treat information, which is more or less qualified and more or less usable, to give some order, and to help the intelligent reuse of information. This method is used in lots of different sectors, different contexts, and our pilot company was interested in applying this method for efficiency purposes. This method could be used in the different steps of the innovation process. The questions of the "Five Ws" method" are:

- Why: key features of the tool (advantages, disadvantages, etc.): why should this tool be selected?
- What: it is about describing the technical items which are required to set up the tool: what is technically necessary to set up this tool? (e.g. software, intranet, dedicated place, etc.).
- Who: people involved in setting up the tool: who is in charge of the setting up of this tool?
- When: it is about defining the date of setting up of the tool: when would be the tool set up?
- Where: it consists of defining where the tool would be set up, in the pilot company or in another company (client, supplier, partner, etc.): where would be this tool set up?

To complete this list of criteria, and at the request of the pilot company, a financial point is essential and cannot be forgotten. Indeed, the financial factor is also very important for a company, as it has been highlighted by our pilot company, and for the management of its projects, in agreement with the works of Atkinson (1999). This is why we propose to add a sixth question to the previous list:

- How much: how much would it cost to a company to set up this tool?

The six criteria, validated by our pilot company, that could help a company to select the best tools are: C1: Why - key features of the tool, C2: What - technical constraints, C3: Who - people involved, C4: When - date and time of setup, C5: Where - internal or external set-up, and C6: How much - cost.

4.2 Weighting of the criteria according to the types of companies

To define clearly what the setup of each tool consists of, a company should answer six questions. To determine which tools have to be set up as a priority, and in agreement with our company, we have assigned an average mark to each tool according to how it meets the previous six criteria. However, the importance and the weight of the different criteria may be different from one company to another,

depending on the features of each company, its culture, its size, etc. This is the reason why the average mark of a tool T could be weighted, as presented in the Equation (1) below:

$$\forall c, M(T) = \frac{1}{mc} \sum_{j=1}^{mc} cw_j(T) \quad (1)$$

where M(T) is the average mark of the tool T, mc is the number of criteria affected with the tool T, cj is the value of the criterion j (it varies between 0 and 1), and w is the weighting of each criterion (it is an integer). Two items of this equation may differ from one company to another, and modify the mark:

- The value of a criterion: the value of each criterion varies between 0 and 1. However, the value depends on the features of the company. For example, the values of the criterion C6: How much - cost of the tool could be for our pilot company, in agreement with the exchanges we had with the members of the innovation team: 0€: 1; less than 5,000€: 0.5; more than 5,000€: 0. However, the turning cost could be lower for a smaller company (less than 5,000€), or 5,000€ could be not very significant for a larger company (which could then determine a higher turning cost).
- The weighting of a criterion: some criteria may have a higher impact than others, depending on the features of each company. For example, the size of the company could affect the criteria C3 (people involved in the setup of the tool). Indeed, this criterion could be more important for a small company than for larger one, which probably has more people likely to set up the tool.

In association with the pilot company, we have tried to define some of the features of a company which could affect each criterion. This analysis is shown in the Table 1 below.

Table 1. Link between the criteria and the features of a company

Criteria	Features of a company
C1: Why: key features of the tool	This criterion is not affected by the features of a company; it is only used to inform the company
C2: What: technical constraints of the tool	- Size of the company - Technical resources of the company - Culture of the company
C3: Who: people involved	- Size of the company - Human resources involved - Culture of the company (open to innovation?)
C4: When: date and time of setup	- Is the company in a hurry?
C5: Where: internal or external setting up	- Culture of the company
C6: How much: cost of the tool	- Size of the company - Resources of the company - Culture of the company

5 METHODS AND RESULTS

We have conducted semi-structured interviews of about 45 minutes with each member of the innovation team of our pilot company (ten members in total: three people from the sales department, five people from the research department, and two people from the marketing department), in order to analyse the innovation in the company. We have chosen to use the method of the semi-structured interview which provides an environment, in agreement with Berthier (2016), for the employees to explore their thoughts and ideas regarding innovation safely while obtaining information on subjects defined in advance. Previously, we had drawn up an interview guide which defined the different subjects that had to be broached. We have interviewed all the team members separately. We have worked with this team on the definition of the innovation process of the company, and on the selection of tools. To advise our pilot company regarding tools selection, we have applied the criteria and their weights, which both have been co-constructed with the company, described in our Section 4.

5.1 Innovation process

After having presented different innovation processes to the members of the innovation team of our pilot company, these processes seemed to be too broad to be easily applied by the company. With the agreement and the help of the company, we have detailed the first steps of its innovation process. These steps are the ones where the users are the most involved, and they are derived from the first task of the

AFNOR ("Look for innovation opportunities"). Thanks to the help of the members of the innovation team, we have finally identified seven sub-tasks of the first task of the AFNOR:

1. Determine the clients' needs: identification of the expressed and non-expressed clients' needs;
2. Analyse the market: it is composed of the macro and micro environmental analyses;
3. Stimulate the creativity of the employees;
4. Stimulate the creativity of the suppliers and the distributors;
5. Stimulate the creativity of the clients;
6. Collect/select the ideas: collection of the innovative ideas, and selection of the best ideas;
7. Share the information (internally): it comprises the sharing of the clients' needs, the sharing of the market analysis, and also the communication of the best innovative ideas.

So, according to us, and thanks to the validation of the studied company, to begin to set up an innovation process, a company should set up seven tasks. These steps are not all chronologically classified. After having set up these seven tasks, the company should of course set up more classical tasks, such as prototyping, tests and validation, industrialisation, etc.

5.2 Tools to help the setting up of the innovation process

After having defined the seven first tasks of the innovation process with the pilot company, we have tried to define with the members of the innovation team of the company, the tools, methods and/or techniques they should set up. Firstly, to guide the company to do that, we have tried to classify the different tools found in the literature into the several steps of the innovation process identified. Thus, we have determined all the features, the advantages and disadvantages of each tool. For example, innovation contests are used by companies to get the best idea from internal or external actors on an innovation-related problem (Terwiesch and Xu, 2008). So, innovation contests can be used to stimulate the creativity of the employees, the suppliers and the distributors, and the clients. We did the same for all the tools found in the literature. Then, after having classified the different tools according to the first steps of the innovation process, we have tried to determine the most appropriated tools of each step. To select the best tools, we have applied the equation (1) presented in the section 3.2 of this paper, to the tools found in the literature. Before calculating the average mark of each tool, we have determined with the help of the company which of the six criteria have the highest impact. As presented in part 4, the company can be considered a merging of several small companies, the company is in a hurry and expects to have quick results, and the company does not have a high budget dedicated to innovation. So, the criteria C3 (Who: people involved), C4 (When: date and time of setup) and C6 (How much: cost) are the most important criteria. To simplify the calculation, we have decided, by joint agreement with our pilot company, to double the weight of these criteria. The application of Equation (1) to our case study would give the following Equation (2) for each tool T:

$$M(T) = \frac{1}{8} * (C2 + 2 * C3 + 2 * C4 + C5 + 2 * C6) \quad (2)$$

where M(T) is the average mark of the tool T, and C_n is the value of each criterion. Only five criteria have been used to calculate the average mark of the tools, as the criterion C1 is only used to inform the company. On the basis of the elements mentioned and analysed on our pilot company, the average mark obtained by each tool is presented in the Table 2. We have worked in collaboration with the members of our pilot company on the creation of this list of tools, techniques and/or methods, and on the marking of these tools. The Table 2 lists the tools that received the best marks for each step of the innovation process; these tools should be the most appropriate for each step of the innovation process. The tools selected have been validated by all the members of the innovation team. Besides, the method applied has also been approved by the team. This method would enable them to select new tools, if one of their criteria becomes more important.

Table 2. Classification of the tools, techniques and methods according to the steps of the innovation process, and average mark of the tools (case of the studied company)

Steps of the innovation process	Tools, techniques, methods	Tools mark	Reference of the tools
Determine the clients' needs	Sales visit report	0.938	(Jin, 1994)
	Lead user analysis	0.625	(Martin and Hanington, 2012)
	Innovation events at the client	0.438	(Cooper and Edgett, 2008)
Analyse the market	Marketing tools (SWOT, etc.)	0.938	(Lebon et al., 2012)
	Benchmarking	0.613	(Arar and Oneren, 2016)
	Participation in clusters	0.488	(Asheim and Coenen, 2005)
Stimulate the creativity of the employees	Multidisciplinary workshops	0.750	(Martin and Hanington, 2012)
	Innovation contests	0.688	(Terwiesch and Xu, 2008)
	Innovation room	0.550	(Benoit-Cervantes, 2012)
Stimulate the creativity of suppliers and distributors	Innovation contests	0.688	(Terwiesch and Xu, 2008)
	Multidisciplinary workshops	0.625	(Martin and Hanington, 2012)
Stimulate the creativity of the clients	Innovation contests	0.688	(Terwiesch and Xu, 2008)
	Brainstorming	0.563	(Martin and Hanington, 2012)
	Innovation events at the client	0.438	(Cooper and Edgett, 2008)
Collect/select the ideas	Online form	0.938	(Van Dijk and Van Den Ende, 2002)
	Paper form	0.813	
	Committee to select ideas	0.813	(Girotra et al., 2010)
Share the information (internally)	Newsletter	0.750	(Gillis, 2006)
	Poster board	0.750	(Gillis, 2006)
	Innovation exhibition	0.625	(Dahl et al., 2011)

6 DISCUSSION

Innovation is a necessity for the majority of companies. The involvement of users in innovation is useful for companies; however, manufacturing companies positioned on a B2B market may encounter difficulties in involving their users. Not many authors have focused on these specificities. The aim of our study conducted within a manufacturing company positioned on a B2B market was to determine what such companies should do to set up an innovation process, and to involve their users in this process. Our first objective was to determine the first steps of the innovation process a company should set up, in order to improve its innovation and to better involve its users. In collaboration with our pilot company, we have determined seven steps a company should set up to begin to implement its innovation process. These seven steps are: (1) Determine the clients' needs, (2) Analyse the market, (3) Stimulate the creativity of the employees, (4) Stimulate the creativity of the suppliers and the distributors, (5) Stimulate the creativity of the clients, (6) Collect/select the ideas, (7) Share the information (internally). Our pilot company concurs with the seven steps we propose, and considers that our approach is instructive and pertinent, especially because it allows them to have a broader view of the actors and their cooperation, thus confirming the works of the AFNOR (2014). Indeed, further to this definition of the seven first steps of the innovation process, our pilot company has decided to add and describe these steps in its quality handbook, and the steps will be set up in the company within the end of the year. In agreement with our pilot company, the two first steps of our innovation process are based on the study of the market and the clients. The steps 3, 4 and 5 are here to stimulate the creativity of different users. The aim of the step 6 is to collect and to select the best ideas, and the step 7 is here to share the information with the users (especially the employees). To complete this study, we had the opportunity to do a short analysis of two other manufacturing companies. The companies are also positioned on a B2B market (steel industry and aeronautic industry). We conducted informal interviews with the person in charge of the implementation of the innovation led by users of each company. Both companies have already set up tools and methods to improve their innovation. We have noticed that they have set up tools in almost all the seven steps of our innovation process. This shows that the companies have tried to set up the seven steps of our innovation process, even if it is in a less formal way. However, authors generally propose innovation processes which are divided in three or four steps. For example, Bosch-Sijtsema and Bosch (2015) have proposed an innovation process composed of three main steps after having studied eight cases of companies from the high-tech industry. Their three main steps are: pre-development phase, during development phase, and commercial deployment phase. But we consider that at the beginning of the setup of an innovation process, companies should have more information than only "set up a pre-development phase". This is why we have decided to develop more the first steps of the innovation process. Besides, Schaarschmidt and Kilian (2014) have studied the involvement of the users in the different steps of the innovation process of a telecommunication industry. After having

interviewed eleven representatives of the innovation department, they have concluded that users are mainly involved in the early phases of the innovation process. This reinforces our choice to focus on the first steps of the innovation process, as our aim is to find how to better involve the users in the innovation process of manufacturing companies.

To help companies to set up the different steps of an innovation process, tools can be implemented. This was our second objective: we consider that tools can be set up to facilitate the establishment of the steps of the innovation process, and to involve the users in this process. We have worked with our pilot company to determine which tools are the most appropriate. Thanks to the analysis of the main features, the advantages and the disadvantages of each tool, we were able to classify them in the seven steps of our innovation process. For example, to set up the first step of our innovation process (Determine the clients' needs), companies could implement lead user analysis, innovation events at the client, customer journey, participant observation, surveys, monitoring software, etc. The importance of this classification of tools to facilitate the setting up of the innovation process is shared by Bosch-Sijtsema and Bosch (2015). The authors have tried to determine which tools were the most used by companies, depending on the innovation step, to better involve the users in the innovation process. For example, their pre-development phase is enabled by tools such as user stories, dialogues, ethnographic studies, etc. To complete this analysis of the literature, we have done a short analysis of two other manufacturing companies. As already said, the companies have tried to set up the seven steps of our innovation process, and have chosen to facilitate the implementation of these steps by setting up different tools. The companies have also chosen to set up tools which have different objectives, and so which are used in different steps of the innovation process. The steps which are the most established in the two companies are "Stimulate the creativity of the employees" and "Collect/select the ideas". The step which is the less established is "Stimulate the creativity of the suppliers and the distributors" (only one company has set up one tool for this step). This shows that manufacturing companies often limit the involvement of users to the involvement of employees. By defining tools for each step of the innovation process, it can help companies to involve all the users to the innovation process.

It is important for manufacturing companies to set up tools, techniques and/or methods for each step of the innovation process. However, companies should not set up too many tools. This was our third objective: we have established a proposition of selection of tools to support and favour innovation, and to better involve the users in the innovation process, depending on the type of companies and their main features. According to us, there is no real method in the literature which enables the selection of the best tools for each step of the innovation process. This is why we have designed our own proposition of method. Our proposition is composed of six criteria (key features of the tool, technical constraints, people involved, date of setup, place of setup, and cost), and of the weighting of the criteria. Indeed, we consider that all the criteria do not have the same weight for all the companies; one criterion (e.g. the cost of the tool) can be the most important for one company, whereas another one (e.g. the date of setting up of the tool) can be more important for another company. The aim of our proposition was to give a mark to each tool, and thus to obtain a short-list of tools that received the best marks: these tools should be the ones to set up. Indeed, companies generally prefer to focus on just a few tools for each step of the innovation process. This statement is in agreement with Reichwald et al. (2004), who have analysed several companies such as 3M, Swarovski, etc. and have come to the conclusion that companies use dedicated tools for the different steps of the innovation process, but each company has only set up one or two tool(s) for each step of the process. According to the authors, the success of an initiative of involvement of the users in innovation is directly linked to the performance of the tools selected. The application of our proposal to our pilot company has allowed us to provide the company with a short-list of tools to set up for each step of the innovation process. For example, the short-list of our step "stimulate the creativity of the employees" is composed of the following tools: innovation contests, innovation room, and multidisciplinary workshops. The short-lists of all the steps of our innovation process have been validated by the company. To complete our analysis of the literature, we have done a short analysis of two other manufacturing companies. We have applied our proposal to the two companies, in the same way as we did for our pilot company. The short-lists obtained were different for the two companies, and they were also different from the one of our pilot company, because the criteria the most important are not the same for the companies. For one company, the most important criterion is the cost of the tool, for the other company, the most important criteria are the technical constraints of the tool and the people involved. This is mainly due to the main features of the companies, and especially to their culture. Our aim was to determine if the tools already set up by the companies were the same as

in our short-lists. For the first step of our innovation process, both companies have not set the tools from our proposal. This can mean that the companies feel they already know enough about the needs of their clients. For the step 2, the short lists have only been partially applied. This is probably because this step is linked to the marketing department of the company, and the people in charge of innovation are maybe not aware of the tools used. Our short-lists have been the most applied in the steps 3, 5, 6 and 7, with at least two tools which are set up. For the step 6, both companies have set up forms (paper and online), a dedicated intranet, and a dedicated committee. This is probably because these steps are mainly internally managed, they do not require the "outside world", so they are easier to set up.

7 CONCLUSION AND FUTURE WORKS

Companies have to innovate to cope with competition and to face up to the increase of demand. The involvement of users can help companies to innovate in a new way. This is also true for manufacturing companies, positioned on a B2B market. However, companies do not always know how to begin to innovate, and how to involve the users in their innovation. Firstly, to solve this problem, we have defined an innovation process, its different steps, and the actors who are involved. We have worked in collaboration with the innovation team (composed of ten people) of a manufacturing company positioned on a B2B market, to define the seven first steps of the innovation process. These steps are: (1) Determine the clients' needs, (2) Analyse the market, (3) Stimulate the creativity of the employees, (4) Stimulate the creativity of the suppliers and the distributors, (5) Stimulate the creativity of the clients, (6) Collect/select the ideas, (7) Share the information (internally). Secondly, we have tried to determine the tools, techniques and/or methods that could help manufacturing companies to set up the different steps of the innovation process, depending on the type of companies and their main features. We have worked to develop a method to select the tools required to implement the innovation process, and to better involve the users. We have proposed six criteria, and a weighting of this criteria. We have applied this proposition to our pilot company; it enables us to get a short-list of tools that should be set up. For example, to set up the step (5) Stimulate the creativity of the clients, our pilot company should implement the following tools: innovation contests, brainstorming, innovation events at the client. The company concurs with this short-list of tools, for each step of our innovation process. Indeed, further to the recommendations we have done, and the tools we have proposed, the company has decided to set up several tools and methods to favour the implementation of its innovation process. . For example, to involve more of its collaborators, and diversify the skills of the people involved (step "Stimulate the creativity of the employees"), the company will organize innovation contests.

-Our future works will consist in concretely setting up the different tools in our pilot company, for each step of our innovation process. We will then be able to analyse the results of these tools, to determine their efficiency. Our pilot company has already begun to set up some tools of our list, such as: innovation room, innovation events at the client, newsletter, etc.

REFERENCES

- AFNOR (2014), FD X50-271 : Management de l'innovation - Guide de mise en œuvre d'une démarche de management de l'innovation.
- Arar, T., Öneren, M. (2016), Factors stimulating open innovation. *Manag. Sci. Lett.* 115–126. doi:10.5267/j.msl.2016.1.001
- Asheim, B.T., Coenen, L. (2005), Knowledge bases and regional innovation systems: Comparing Nordic clusters. *Res. Policy* 34, 1173–1190.
- Atkinson, R. (1999), Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria. *Int. J. Proj. Manag.* 17, 337–342. doi:10.1016/S0263-7863(98)00069-6
- Baer, M., Frese, M. (2003), Innovation is not enough: Climates for initiative and psychological safety, process innovations, and firm performance. *J. Organ. Behav.* 24, 45–68.
- Benders, J., Vermeulen, P. (2002), Too many tools? On problem solving in NPD projects. *Int. J. Innov. Manag.* 6, 163–185.
- Benoit-Cervantes, G. (2012), *La Boîte à outils de l'innovation - 2e édition*. Dunod.
- Berthier, N. (2016), *Les techniques d'enquête en sciences sociales: méthodes et exercices corrigés*. A. Colin, Paris.
- Boly, V. (2008), *Ingénierie de l'innovation : Organisation et méthodologies des entreprises innovantes*, Édition : 2e édition revue et augmentée. ed. Hermes Science Publications, Paris.
- Bosch-Sijtsema, P., Bosch, J. (2015), User Involvement throughout the Innovation Process in High-Tech Industries. *J. Prod. Innov. Manag.* 32, 793–807. doi:10.1111/jpim.12233

- Chesbrough, H. (2006), Open innovation: a new paradigm for understanding industrial innovation. *Open Innov. Res. New Paradigm* 1–12.
- Cooper, R.G., Edgett, S.J. (2008), Maximizing productivity in product innovation. *Res.-Technol. Manag.* 51, 47–58.
- Dahl, A., Lawrence, J., Pierce, J. (2011), Building An Innovation Community. *Res.-Technol. Manag.* 54, 19–27.
- Europ. Commission, Directorate-General for Internal Market, I., Entrepreneurship and SMEs, TNS Political & Social, (2015), Innobarometer 2015 - The innovation trends at EU enterprises. Luxembourg.
- Fetterhoff, T.J., Voelkel, D. (2006), Managing Open Innovation in Biotechnology. *Res.-Technol. Manag.* 49, 14–18. doi:10.1080/08956308.2006.11657373
- Freeman, C. (1991), The nature of innovation and the evolution of the productive system, in: *Technology and Productivity: The Challenge for Economic Policy*. OECD, Paris, pp. 303–314.
- Garcia, R., Calantone, R. (2002), A critical look at technological innovation typology and innovativeness terminology: a literature review. *J. Prod. Innov. Manag.* 19, 110–132. doi:10.1016/S0737-6782(01)00132-1
- Gillis, T. (2006), *The IABC Handbook of Organizational Communication: A Guide to Internal Communication, Public Relations, Marketing and Leadership*. John Wiley & Sons.
- Girotra, K., Terwiesch, C., Ulrich, K.T. (2010), Idea generation and the quality of the best idea. *Manag. Sci.* 56, 591–605.
- Griffin, A. (2012), Qualitative research methods for investigating business-to-business marketing questions, in: *Handbook on Business to Business Marketing*. Edward Elgar Publishing, pp. 659–679.
- Hidalgo, A., Albors, J. (2008), Innovation management techniques and tools: a review from theory and practice. *RD Manag.* 38, 113–127. doi:10.1111/j.1467-9310.2008.00503.x
- Iansiti, M., Clark, K.B. (1994), Integration and Dynamic Capability: Evidence from Product Development in Automobiles and Mainframe Computers. *Ind. Corp. Change* 3, 557–605. doi:10.1093/icc/3.3.557
- Jin, J.Y. (1994), Information Sharing through Sales Report. *J. Ind. Econ.* 42, 323–333. doi:10.2307/2950574
- Katsikis, N., Lang, A., Debreczeny, C. (2016), Evaluation of Open Innovation in B2B from a Company Culture Perspective. *J. Technol. Manag. Innov.* 11, 94–100.
- Kleinschmidt, E.J., Cooper, R.G. (1991), The Impact of Product Innovativeness on Performance. *J. Prod. Innov. Manag.* 8, 240–251. doi:10.1111/1540-5885.840240
- Kotler, P., Pfoertsch, W. (2006), *B2B Brand Management*. Springer Science & Business Media.
- Lacom, P., Bazzaro, F., Sagot, J.C. (2015), Soutenir l'innovation au sein d'une entreprise industrielle internationale en s'appuyant sur les utilisateurs/clients : approche méthodologique et outils. *Presented at the 22ème Colloque des Sciences de la Conception et de l'Innovation*, Lisbonne.
- Lebon, Y., Laethem, N.V., Durand-Megret, B. (2012), *La boîte à outils du Responsable marketing*, 2e ed. Dunod.
- Marchiori, M. (2004), W5: The Five W's of the World Wide Web. *Presented at the International Conference on Trust Management*, Springer Berlin Heidelberg, pp. 27–32. doi:10.1007/978-3-540-24747-0_3
- Martin, B., Hanington, B. (2012), *Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions*. Rockport Publishers.
- Midler, C., Maniak, R., Beaume, R. (2012), *Réenchanter l'industrie par l'innovation: l'expérience des constructeurs automobiles*. Dunod, Paris.
- OECD, Eurostat (Eds.) (2005), *Oslo manual: guidelines for collecting and interpreting innovation data*. Paris.
- Reichwald, R., Seifert, S., Walcher, D. (2004), Customers as part of value Webs: towards a framework for webbed customer innovation tools, in: *System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on. Presented at the 37th Annual Hawaii International Conference on System Sciences, 2004*. Proceedings of the, IEEE, p. 10 pp.-. doi:10.1109/HICSS.2004.1265486
- Schaarschmidt, M., Kilian, T. (2014), Impediments to customer integration into the innovation process: A case study in the telecommunications industry. *Eur. Manag. J.* 32, 350–361. doi:10.1016/j.emj.2013.04.004
- Terwiesch, C., Xu, Y. (2008), Innovation Contests, Open Innovation, and Multiagent Problem Solving. *Manag. Sci.* 54, 1529–1543. doi:10.1287/mnsc.1080.0884
- Van Dijk, C., Van Den Ende, J. (2002), Suggestion systems: transferring employee creativity into practicable ideas. *RD Manag.* 32, 387–395. doi:10.1111/1467-9310.00270
- Van Kleef, E., Van Trijp, H.C.M., Luning, P. (2005), Consumer research in the early stages of new product development: a critical review of methods and techniques. *Food Qual. Prefer.* 16, 181–201. doi:10.1016/j.foodqual.2004.05.012
- Von Hippel, E. (2005), Democratizing innovation: The evolving phenomenon of user innovation. *J. Für Betriebswirtschaft* 55, 63–78. doi:10.1007/s11301-004-0002-8
- Vuola, O., Hameri, A.-P. (2006), Mutually benefiting joint innovation process between industry and big-science. *Technovation* 26, 3–12.
- Wallin, M.W., Krogh, G.V. (2010), Organizing for Open Innovation: Focus on the Integration of Knowledge. *Organ. Dyn.* 39, 145–154. doi:10.1016/j.orgdyn.2010.01.010
- Yannou, B. (2013), Which research in design creativity and innovation? Let us not forget the reality of companies. *Int. J. Des. Creat. Innov.* 1, 72–92.