Expert and SME : contribution to the analysis of the impact of the expert in the design process

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ABSTRACT
Nowadays, SMEs often require external help to complete their process of innovation. Concerning SMEs, and especially those who do not have the skills needed in-house, it is essential to note that the complexity of technology used in the products and systems make the design increasingly difficult. On its side, research offers a wide potential to help the SME in its steps to innovate. The existence of public financings for research development further enforce the links between the needs of SMEs and the resources of research. Once these results stated, it consequently appears interesting to try to evaluate the various impacts of the intervention of the research center in the company in order to be able to ensure a proper use of the financial resources.
Thus, the aim of this study is to contribute to the definition of indicators to measure the impact of an expert in a design process in a SME so that one could provide a beginning of analysis on the role played by his intervention. In addition, we will also be interested in the role played by the expert’s network.

KEY WORDS
expert - networks of competences - innovation – design –technology transfer

INTRODUCTION
For several years, France participates, by means of specifics programs, in the technological development of companies. Europe, through programs, allows the manufacturers to improve the competitiveness of their products or proceeded. The existence of technical and scientific knowledge, the missions of the university and laboratories, the technical centres, is today inextricable with the technological evolution of companies. The role played by the researcher, the expert, the scientist, is important, so well by the scientific and technical contribution which it can supply but also by the "no technical and scientific " information. This expert can be at the origin of profound alterations within the company.
The objective of the work, presented here, is to approach a little more the role of this expert in the process of innovation of the firm.

1 CONTEXT

1.1 improving value through the "building of knowledge"
One major concern of managers is to choose and build one or several strategies that allow the creation of value. More precisely, strategic and economic planning consist in elaborating, estimating and choosing strategies enabling the improvement of the company’s achievements and consequently the raise of its value.
This improvement is usually based on various actions mostly focused on strategic fields (investments, pricing policy, …), on auditing processes and on motivation policies (payments, social). However,
The technical additional constraints external to the company help in the construction of tools, allowing them to pilot the project. This know-how integration ability is called “the value of the company” by J. Perrin (2001). In this text, we will focus on one particular point of value creation through knowledge management: the case of innovative projects.

1.2 The need of external competences throughout the innovation process

The notions of process and knowledge integration are fundamental in considering innovation. They are the pillars of models implying relevant aspects of innovation considered as the transformation of technology.

For R. Durand (1998), innovation is a resolution of problems activity, constituted by a set of routines recombined in a way to create newness. Therefore, the capacity of the firm to be innovative depends partly on its routines. Innovation outcomes thus related on the previous activities of the company, its history, its evolution and its memory. Those considerations influence the global decision process. Consequently, one major risk for the company, is based on the phenomenon of technological locking, also called "dependence of the path" (David et al, 1995). It can even lead to organizational slowness where the company, being too much specialized, is not able to assimilated new technologies any more.

More recently, an additional approach implying interactions among internal and external actors of the firm was proposed (Divry and al, 1999). This approach focuses on the impact of external knowledge on the resolution of problems tasks presented as a process of technological creation and re-creation.

For Latour (1989), innovation requires the assembling of many elements such as financial, technical, administrative and legal competences. According to this author, success is correlated with the quality of the "recruitment of allies around the project". As a consequence, innovation can be described as a collective integration process of knowledge leading to newness.

The capacity to manage the various actors, to identify and to analyze the possible evolutions of the project, to take advantage of it, the capacity to imagine and to create solutions of the foreseen and not foreseen problems, become a key factor in innovation success.

Whatever the approach used (evolutionists models, technical and economic networks, groping strategy) the need of external competences seems necessary. Their role is among others: to avoid that the company lock itself into a technological dead-end, to add competences and to help it to acquire the means that are missing to properly lead the strategies of innovation and the design of a product.

In this text, we will focus on the added value of external contributor. We shall limit ourselves to some of the contributor’s aim: to facilitate the expression of problems and the modelling of complex situations. The role can thus be bound in the aspect of instrumentation: it makes complex situations understandable. The contribution is not only at the technical level. The contributor can also advise and help the actors of the company in their own construction of tools, allowing them to pilot the project.

In the specific case of SMEs, we can observe that too much time is spend on operational task, loosing the required time to consider the project globally. More generally, the overspecialization of SMEs leads them to concentrate on their core competence and forgetting the environment. This is when external contributor can be very useful. One condition is: information has to be adapted to the firm. Problems might be faced when overskilled people propose too much advanced technology or when constraints of costs, time, or quality are not taken into account. Indeed, this information, also called "additional knowledge " by P. Roqueplo (1996) is "the expression of a knowledge formulated in answer to the demand of those that have a decision to set and by knowing that this answer is intended to be integrated into the process of decision". External contribution does not have to limit itself to technical solutions. It should help to better understand the problems faced from the very beginning. The contribution of an external expert should thus be considered dynamically in the process of decision-making (Chanal 2001) and should also be associated to the project very early in the process so that to optimize its efficiency. Moreover, the external intervention help the company to reformulate the project. It has to take place as soon as possible in the process of conception, facilitating the decision of the leader.
The role of the external contributor is a source of value by the knowledge and the know-how that he provides to the firm but also by the transfer of experience that he will know how to implement within SME’s. The way the company use this new knowledge will also be of importance.

C. Schmitt and al (2000) underline that value creation through innovation generally requires:
- The co-building of the problem between the actors of the organization and the speaker.
- To bring to the foreground new scientific knowledge.
- To set up tools allowing the representation of complex problems and to facilitate the appropriation of these tools and the knowledge that ensue from it.
- To elaborate new procedures that are confronted with existing theoretical knowledge so that they may enrich them.

As a consequence, using external contributor has an organizational impact on the innovation process (Brealey Meyers, 1996).

2 OUR RESEARCH SPECIAL INTEREST: THE EXPERT AS EXTERNAL COMPETENCE
Our research team aims a better understanding of the impact of an expert in the innovation decision process. Note that our investigation only spin the field of SMEs. By now, it is common to observe external expert involved in projects and working in association with the firm’s own team (P.A Julien, 2000). At that point, it seems interesting to question the exact role undertaken by this expert in the process of innovation.

An expert is usually defined as highly qualified professionals. This professional is often renowned and approved. He should put into practice, in a given frame of work, the professional skills linked with its corporate body (Trépot J.Y., 1996). Therefore the expert has a specific knowledge that will help him to propose the answers that suit the best and to legitimise them. Both the expert and the actions he undertake are of relevant importance in the finding of solutions of a given problem. This gives the expert a key position in a process of innovation, in the design of a product or in the strategy chosen by a company.

The first step of our research program consists in proposing a model allowing a better observation of the expert practices and their impact within the innovation process. With this model, further comparisons could be done within firms panel and invariables phenomenon will be identified.

3 PROPOSITION OF A RELATIONAL MODEL BETWEEN THE COMPANY, THE EXPERT AND THE PROJECT
Our proposed model is based on the hypothesis of relationnal links between the company, the project and the expert (figure 1). The resulting diagram integrates the three following functions:
- A product design/engineering function that associates the company and its project
- A value creation function that associates the expert to the project
- A decision-taking function that associates the expert to the company.
3.1 The function of product design
Hatchuel and Masson (2001) introduced the product design function as being one of the important elements in the modelling of the growth of the firm. It integrates knowledge acquisition approaches and its use to feed a continuous dynamic of product launching. An innovative product emerges from this function. Its characteristics are influenced by the design process, the production processes and the evolution of the knowledge within the firm.

3.2 The function of value creation
This function relates to the amount of knowledge and know-how brought by the expert to the company. It refers also to the capacity of the company to introduce knowledge into its core business and to keep it. More precisely we analyse the value creation function under variables: the “utility value” of acquired knowledge (its efficiency on decision considering the long term), its cost and its rarity (the acquisition of this knowledge participating in a strategic differentiation of the company).

3.3 The function of decision taking
It can be defined as being the capacity of the firm to use as soon as possible the information available (results of the expert’s work) so that to make a decision concerning the project. This function might concern one or several people but it will always rely on the research, the exchange and the use of this information in a strategic context.

4 VALIDATION THROUGH EXPERIENCE
We have tried to confront this representation with three industrial.

Our aim was to test the relevance of our model. Through an anthropological like experimentation, the objective was to evaluate:

- Data collection: does the model really help in the description of experts practices,
- Data analysis: does the model really help in the description of related modifications on the former innovation process of the company,

To select the companies which could be interested in our experiment, we enlisted the help of professional associations. We drew up a list of about 20 candidates for the experiment. Final selection
was then made on the basis of an interview with the manager of each company. The criteria taken into account were:
- geographical proximity: as the researchers wished to be physically present as often as possible in the companies,
- industrial goals: a desire to innovate,
- involvement of top management:
- real capacity of the firm to launch a project on the basis of identified needs,
- agreement on the publication of methodological outcomes (technical information on new technology remains confidential).

Following the interviews we chose three test-sites. Two projects were observed in each company: one with an expert and one without.

4.1 Firm 1
This small firm [less than 5 peoples] produces laboratory products. His manager, a chemist, is the owner of a patent concerning an electrode allowing measure of nitrates in any liquid. In order to diversify the activity of the firm, he decides to word on an autonomous data logger to be connected to the electrode.

<table>
<thead>
<tr>
<th>function of product designing</th>
<th>function of value creation</th>
<th>function of decision taking</th>
</tr>
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<tbody>
<tr>
<td>First project: development with an external expert</td>
<td>Definition of a range of products and diversification towards a new domain of activity.</td>
<td>To bring in the company a group of competence in electronics and treatment of the signal</td>
</tr>
<tr>
<td>Second project: development without external expert</td>
<td>Due to the lack of internal competence, a lot of delays to realise the second project</td>
<td>No use of competence acquired during the previous project to favor second development</td>
</tr>
</tbody>
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4.2 Firm 2
The second firm is a three persons start up company. This one intends to develop and to commercialise a device that decrease (even to limit) the sound level when this one exceed a certain threshold. The founders decide to undertake the development of a prototype.

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<tbody>
<tr>
<td>First development with an external expert</td>
<td>Insure the activity of the company in a technological competitive domain</td>
<td>Contribution of technical, economic and normative information favoring the good progress of the project</td>
</tr>
<tr>
<td>Second development with an external expert</td>
<td>To establish a continuous development in the company facilitating the development of more and more complex versions and the recruitment of specialized staffs and the purchase of equipments</td>
<td>Use the know-how acquired during the first product to help the development of the following versions</td>
</tr>
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4.3 Firm 3
The third a company (50 employees) is specialized in the field of the industrial body. One particularity: firm 3 has its own electronic internal service. In addition to the core business, it adapts
specific systems of liftings, remote controls and safety systems on trucks and tractors. Considering its technological assets, the company wishes to diversify towards the development of appropriate products (development of safety devices for building sites vehicles).

<table>
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<tr>
<th>First development with an external expert</th>
<th>Opening a new activity towards by use a particular internally competence</th>
<th>To give a technological opportunity to the project (to present new technical solutions, constitution of a group project, to organize project in the time, …)</th>
<th>To help the company to contact the other specialists who were sources of information for the project</th>
</tr>
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<tr>
<td>Second development without external expert</td>
<td>The company did not wish to continue the development of electronics manufactured goods.</td>
<td>The company was not able to use the competence acquired in the company during the firsts projet</td>
<td>Errors in the certain technical decisions forced the company to stop the project</td>
</tr>
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**5 EXPERIMENTAL ANALYSIS**

In the first case, in spite of the will of the manager to step in an innovative process, one can notice that this dynamic was interrupted (or rather slowed down) during the second development. It seems top management was not able to make decisions as soon as possible because he did not take advantage of the first project to internally acquire the necessary competence to keep his strategy of development going.

Second example show that an innovative process can be set up if the company manages to mobilize its outside environment to help it in the decision-taking process while capitalizing on the acquired knowledge.

The third example shows that an innovative process can be set up if the company is organised so that it manages to give value to the acquired knowledge and if it is able to correctly use information for a decision-taking as soon as possible.

**5.1 A technological lever**

We have observed that the external speaker and more particularly the expert is not only "the technical contributor" any more. He also proposes solutions enabling the decision-taking process. In that case, the expert facilitate the function of product design. The expert has an effect of "technological lever": he participates directly in the rise of the technological level of the firm and provided that this one has an organization capable of acquiring knowledge and competence that are lacking to it.

**5.2 Access to new networks**

Within the three firm, experts allow the companies to be in touch with a set of competences and to mobilize them for the proper functioning of his product designing process. He facilitates interactions between the internal and external actors of the firm (Roux P., 2000). The companies (especially firm 3) were thus connected with new organised networks: others experts, specialists, centers of competences and laboratories…. (T. Loiliet and al,2002). In our experimental cases innovation networks were fluctuating by nature; their structure and the number of the actors involved can evolve throughout the process of innovation. Some can show relative importance with regard to the others. The decision on the product designing process evolve gradually according to the contribution of one or more specific competence (human and organizational) and processes. We note that interactions between the internal and the external actors are depending on a set of informal relations in which, the "power" of the actors. According to H.B. Thorelli (1986), T. Gonard and Mr. Louazel (1997) they can be measured thanks to an economic (market shares, results), technological know-how (expertise), reputation and legitimacy base.

As a result we completed our model by adding a constituent "dynamic organization and collective work" (figure 2) in which common knowledge and competences feed the process of innovation.
This collaboration between two organizational entities, the company and the external network (represented by the expert), imply the existence of deals both at the individual level and at the collective one (Roux P., on 2000). In our three cases we notices cultural connection due to geographic proximity.

More generally, this notion can take the shape of a cultural, ideological, or even social aspect. Which means that the manager of the company and the experts are key actors making the link between the project and the environment. This phenomenon is also presented by Granoveter (1982) through the so called "strong and weak links." In our cases we essentially observed weak links created by the expert with his colleagues, professional relations, clubs of companies. We notice few strong links (family links for example). Weak links gather a bigger number of individuals who, due to their membership to other networks of knowledge, amplify access to the information. As a result they seem to be more efficient (Granoveter, 1982)

It is quite obvious that this last assertion remains a departure point for deeper studies on the role of the expert and by extension on the role of the networks of competence in the firm’s capacity to keep an innovative process running.

CONCLUSION
This research aims a better understanding of the relations existing between the company and its environment and "the values" which are in transit by this relational. We focus on the added value of the intervention of an external expert. Our main objective is firstly to have a descriptive model at our disposal. The first experiments conclude that this model is consistent with our descriptive objectives. Further following research activities will be lead. One step will be to evaluate the impact of expert integration in the innovation process. To assess this impact, we propose to use the Risk Theory. More precisely we plan to invest the sciences of the danger (the “cindyniques”).

REFERENCES