

Strategies of Roofing Contractors who Develop New Equipments

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Abstract

The aim of this paper is to analyse the strategies of roofing contractors who were awarded for developing new equipments. The case studies confirm that the owners of small enterprises are at the core of the innovation process. Each of the four managers developed products to improve safety on the building site but they followed different development and commercial strategies. One cooperated at the development stage, another at the production level and a third one established a commercial agreement based on trust. The last manager who runs the subsidiary of a large group did not market the innovation. The implication for policy aiming at stimulating the diffusion of innovation in the construction industry is that initiatives should focus more on the commercial stage. Indeed many small enterprises lack human and financial resources to promote innovation at a larger scale.

Keywords : Innovation, construction, small firms, contractors

1. Introduction

The building and construction industry is characterised by a high number of very small firms. In France, in 2000, among the 276 721 firms of the industry, 269 585 (more than 99.9%) employed less than 200 employees and contributed to 79% of the production [1]. Among these enterprises, there is a bulk of very small enterprise. As in countries such as Canada [2] and Australia [3], the majority tends to show little or no innovation. The advantages of large firms are usually ascribed to their greater financial resources and their ability to benefit from complementary resources (technical, financial and commercial).

Firms' positions along the value-added supply chain affect their innovative behaviour. For example, contractors and manufacturers adopt different innovative strategies:

- Contractors tend to innovate by focusing their resources on the effective management of the building site which is considered as their core activity. Most innovations aim at circumventing bottlenecks which, once corrected, enable improvements in productivity and safety of the building site.
- Manufacturers of building components undertake applied research tasks. They focus mainly on extending the range and the performances of existing components. Many innovations are introduced to respond to problems which appear in the implementation

process. Contractors who are their clients want to have products less expensive and easier to install to improve their productivity on the building site.

The fragmentation of the building and construction industry is supposed to inhibit innovation. The use of subcontracting prevents the continuity of teams that is essential to learning and innovation [4]. Because of the fragmented markets, it is also difficult to identify all innovations since most are developed at a local level and result from personal initiatives.

To circumvent this problem and to promote innovations at a larger scale some initiatives have been launched.

Most large French companies created internal contests to promote the best approaches developed within subsidiaries. Their aim is to codify the learning from problem-solving on projects and to disseminate these approaches on future projects [5].

Small to medium enterprises (SMEs) cannot benefit from similar networks and be aware of innovations introduced by similar companies. So national institutions such as the national federation of contractors, the federation of small contractors and the French innovation agency have initiated a national contest to award the most innovative contractors. The aim is to promote the image of the construction industry and the diffusion of innovative approaches and products within the industry.

The aim of this paper will be to analyse the strategies of roofing contractors who were awarded at the national level for their innovative approaches. To fulfil this goal, we will recall some facts about innovation within SMEs. Some elements concerning strategic management will be discussed. This conceptual framework will help us to analyse four case studies of contractors recently awarded. The findings will allow some recommendations concerning the role of institutional networks aimed at supporting the innovation activity.

1. Innovation in small construction firms

1.1. Definitions of innovation

In their paper about innovation in small construction firms, Sexton and Barrett [6, p.626] define innovation "*as the effective generation and **implementation** of a new idea, which enhances overall **organizational** performance*".

- The implementation aspect shows that innovation differs from invention. "*The invention concerns the creation of a new equipment. The innovation also requires a commercial or practical application of this new equipment*" [7, p.41]. According to its effects, innovation is usually categorized as radical or incremental. However this distinction appears sometimes artificial and arbitrary. For example, the performance improvements caused by the accumulation of minor technological changes may be stronger than the changes caused by radical innovation. Moreover, the difference between incremental and radical innovation is sometimes just a matter of perspective. Certain innovations may be considered as radical from an economic point of view but they rest on minor technical improvements [8].
- The organizational aspect indicates that the innovation concerns either the individual firm or the other elements of the supply chain. This shows that to appreciate the real impact of an innovation, a systematic approach is necessary. It widens the scope of the

analysis by focusing on the firm and its competitive environment. Relationships between the components of the system appear important to understand how actors “generate, diffuse, and utilize technologies (physical artefacts as well as technical know-how) that have economic value” [9, p.235].

One way to integrate the links between the components of the building and construction innovative system is to classify innovations according to their impacts on “core concepts” and on “linkages between core concepts and components” [10, p.12]:

- Innovations are incremental when the core concepts are reinforced and the linkages unchanged.
- On the opposite, innovations are radical when the core concepts are overturned and the linkages are changed.
- Modular and architectural innovations are intermediary. When there is no change in the linkages but a reversal of core concepts, innovation is modular. “The essence of an architectural innovation is the reconfiguration of an established system to link together existing components in a new way” [10, p.12).

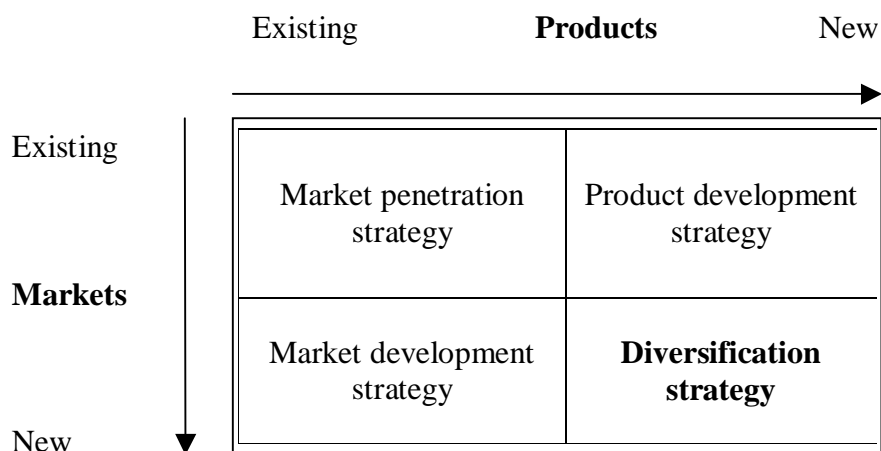
The approach shows that an innovation that is incremental to the innovator may be radical to other members of the building site. This means that the implementation and diffusion of the innovation will require defining appropriate commercial and marketing strategies to circumvent the resistance of the users.

1.2. Innovation and strategic management

We will use Ansoff' growth vector' matrix [11] as a framework to describe the position of contractors who developed new roofing equipments.

According to Ansoff matrix, companies can adopt four different strategies:

- maintain their market share without innovation,
- develop new products for their actual markets,
- create new products for unknown markets,
- develop their existing products on new markets.



A contractor, who develops and markets new products for the building site, adopts a diversification strategy which is the most risky among the four. He moves away from his position within the production chain by producing goods "*for an anonymous market*"¹ where the production depends on the client. This means that the price and performances of his product will be compared with competitive solutions. This change of business orientation raises several issues. This company needs to define an appropriate strategy and to balance the site activity and the industrial activity.

To mitigate the commercial risks associated with a diversification strategy and a new market, enterprises may cooperate with a commercial partner who has already built an appropriate network. Generally, co-operation is sought when activities are closely complementary and dissimilar. Conversely market forces are chosen when "*there is no attempt to match complementary activities ex ante by deliberately co-ordinating the corresponding plans*" [13, p.891].

1.3. The dominant role of the manager during the innovation activity

In SMEs, the manager bears the responsibility of taking the decisions regarding all aspects of technical change. Thus risk adversity may impede the innovation process. Two types of behaviour are usually applicable to managers [14]:

- In the first category, one finds managers who look for the stability and independence of their company and consider that innovation represents a large financial risk. So they only innovate under the pressure of their environment. They limit their contacts with the external environment to suppliers and clients. The management style is centralised.
- The second kind of entrepreneurial managers encourage rapid growth of their company. They accept risk and try to take advantages of every new opportunity. To enhance the performance and the growth of their company, they forge external technical and scientific linkages with educational establishments, research associations and other public agencies. They know that the success of their company is based on the quality of their employees and on their commitments to networks of innovators. In this prospect the managers' educational level influences the scope of the network. Highly educated managers tend to rely more on research and advisory agencies and less on informal contacts. Networks allow SMEs to decode and appropriate flows of information. They reinforce SMEs' competitiveness by providing them with a window on technological change, sources of technical assistance, market requirements and strategic choices made by other firms.

The dominant role of the owner in small construction firms is a source of flexibility and adaptability to any changes in market conditions and client demands. But it "*can constrain innovation activity if the owner does not have the necessary vision and systemic thinking when diagnosing and progressing innovation activity*" [6, p.631-632].

¹ "*One of the peculiarities of the construction industry as compared to the manufacturing industry, which produces goods for an anonymous market, is that in construction industry the production is depending on the client*" [12].

2. The case studies

2.1. Characteristics of the national award scheme for innovative construction companies

The national Innovation Award dedicated to firms working on the building site was launched in 2000. Since this date, every two years, companies are invited to present innovations that have been successfully implemented. Applications are judged by a jury of people working for the Ministry of Housing, the national federation of contractors, the federation of small contractors, the French innovation agency, CSTB, a journal dedicated to the building and construction industry, regional delegation of the Ministry of Construction...

About 200 applications were submitted in 2000 and 2002. Most came from small construction firms. The most promising innovations were awarded (less than 30 in 2000 and about 40 in 2002). The aim of the organizing committee was not to be elitist but to promote the image of the construction industry and the diffusion of innovative approaches.

Four types of innovations have been identified by the organizing committee:

- Building techniques,
- Safety and work conditions,
- Methods and organizational schemes,
- Environmental approaches.

In 2002, among the innovations awarded, 40% of them aimed at improving safety on the building site; 25% were technical innovations elaborated on the building site, 22.5% concerned the methods and 12.5% were related to environmental matters.

We selected four firms which won the Innovation Awards in 2000 or 2002. The enterprises will be called A, B, C and D to keep them anonymous. This was not a random selection. The four of them developed roofing equipment that improves safety and work conditions of the building site. The interest of such a selection is also to examine the impact of the internal organizational capabilities on the innovative and commercial strategy.

2.2. The cases of four roofing contractors developing new equipments

Company A is a roofer employing about 35 people. The innovation concerns a new scaffolding with different anchorage devices. The goal of the manager was twofold: Firstly, it was to follow the evolution of the regulation concerning anchorage point set-up and safety rules. Secondly, it was to develop a new system to increase the productivity of the working site. After designing the prototype, the enterprise collaborated with a supplier of roofing equipment. The manager considered that his enterprise did not have any human and financial resources to develop the product. Moreover the development of the new scaffolding system would have lead to a risky diversification. Both products and markets would have been new. So the owner and manager of

company A preferred to concentrate his resources on his core business and to cooperate with a manufacturer of equipment.

His partner, a supplier of roofing equipment employs 210 people. At that time, he did not have a collective scaffolding system in his range of products. So he was interested in developing this product designed to improve the efficiency on the building site and to ensure a maximum of safety for craftsmen. This company was able to rely on its R&D laboratory and extended the partnership to organisations promoting safety and health on the building sites. The aim was to develop a standardised system that could be used on any kind of roof.

Once the product developed, it was patented in Europe, Canada and the United-States. But the market is still reluctant to adopt the product because it modifies the behaviour of the craftsmen who use the scaffolding. This prevents its diffusion. To reduce the reluctance of potential users, the company created a subsidiary to rent, transport and erect/dismantle on site the scaffolding. By providing this new service, the manufacturer shows that the skills required to erect the product are not so specific. The installation also leads to an increase of the productivity of the building site. The new service helps the roofers to concentrate on their business and not on the erection/dismantling of the scaffolding. Moreover the subsidiary brings its professional approach to building site. Despite the success of the subsidiary, the innovation is a failure. About 1 million euros have been invested by the manufacturer to develop and sell the product. Almost no sales have been recorded. This failure recently led to the development of a new range of scaffoldings with no permanent anchorage. Its installation goes along with the habits of the roofers. Until now the product is quite successful and the sales are even higher than expected by the business plan.

Company B employs 15 people. The innovation concerns a new anchorage system. The regulation was at the origin of the innovation introduced by the manager. Company B used to work on the building site with contractors. One site being closed for not complying with the legal framework, a solution had to be found. The involvement of the manager in the project was very strong. It took him about six month to find an appropriate solution. This research phase required frequent interactions with the contractor. Once the first prototype was operational, cooperation with the Technical Centre for Mechanical Industry was established to reduce the weight of the product. Then the manager received some financial subsidies to patent his product. His brother, who is responsible of the design office of the company, was in charge of the development of the product.

To commercialise the anchorage system, the manager made several demonstration during local professional fairs. After taking out the patent and launching these first commercial initiatives, he decided to look for a trader. He was able to find a sole agent after receiving the Innovation Award. His agent is the world's largest manufacturer of concrete mixers as well as the largest French manufacturer of scaffolding and tubular structures for local councils. To market his products in France, he relies on a large network of sixty salesmen. His interest in the innovation was due to the award. It reinforced his trust in the product.

There is no written agreement between enterprise B and the sole agent. Trust is the cement of the commercial collaboration. The products developed by the innovator are displayed in the

catalogue of the manufacturer. Salesmen, who are in touch with the clients, represent the manager of company B and provide him with feedbacks. Then company B sends the products to the enterprises that order them. But the prices are established by the manufacturer (trader) who receives first the cash. At the end of each month, company B sends an invoice to his sole agent (the manufacturer). As mentioned by Richardson, in this case, there is no technological cooperation between the two partners because there is no requirement to match complementary activities. Their commercial relationship is based on market principles and trust.

This first success led the manager of company B to develop other roofing equipments. Anchorage devices and scaffoldings designed to prevent falls from height represent at the beginning of 2005 about one third of the turnover of the company (this business activity did not exist before 2000). This diversification which is very successful, became necessary in 1999 when the traditional business collapsed (the turnover of the three first months of 1999 were equal to the first month of 1998). The risks associated to the distribution have been mitigated. The product is new but the commercialisation of the products is assumed by the largest French manufacturer of scaffolding and tubular structures for local councils who had already built a large and sound commercial network.

Company C is a carpenter and a roofer employing 20 people. The manager developed a new product to comply with the legal framework and to improve the safety of its employees. The collective safety equipment on roof edges was tested within the company. The product was regularly improved thanks to the remarks of the roofers. After patenting it and registering the trade-mark, the manager subcontracted the manufacturing of the product to a small company with whom he already worked. He used the services of a sale agent in the Alps. He also invested some financial resources and dedicated lots of its personal time to commercialize the product on its own. To spur the sales of the product, he opened an exhibition stand at the main professional fairs concerning the building and construction industry. Before the Innovation Award, he was not aware of the quality of his product. But the award gave him some self-confidence. He even used it as a mean to convince the potential users. One organisation promoting safety and health on the building sites provides roofers who buy the products, with subsidies and contributes to the diffusion of the product.

However the sales have been quite limited and they represent today about 7% of the turnover of company C. After spending some of his time to launch the product, the manager decided to focus again on his core business: carpentry and roofing works. He was a little bit disappointed not to receive more assistance during the diffusion of the product.

Company D is the regional subsidiary of a corporation operating in the building and construction company with 2500 people worldwide. In France, 29 subsidiaries cover the territory and employ about 1500 people. The manager who developed the innovation, run a subsidiary employing 120 people specialized in roofing, insulating cladding and waterproofing works. An operative of the building site was at the origin of the innovation. The new system provided an anchorage point set-up on roof edges. It reduced the risks for people working on the roof who were previously anchored on the wall (because it was not possible to make a hole in the aluminium standing seam roofing). Once the product designed, it was produced by an ironsmith who regularly works with the company. The new safety system was used within the

company. No patent was taken out because there was no intention to adopt a diversification strategy and to market the new product. The core business of the group was not to sell safety roofing equipment but to work on the building site and to develop new waterproof materials. At the level of the group, 3% of the turnover is dedicated to R&D. But research works, are oriented towards the improvement of waterproof materials. Consequently, it was the supplier of the company who took the idea and integrated the safety system to its aluminium products (the supplier is an international metal company, providing steel and aluminium products to customers worldwide. One of its divisions produces steel and aluminium products for the building industry including roof & wall cladding).

2.3. Synthesis of the case studies

Despite the small sample of our analysis, our results confirm that builders are an important source of innovation. They may even be more innovative than the manufacturer when their business is concerned. A similar result was put forward Slaughter [15] who found that residential builders were the primary sources of innovation relating to stressed-skin panels.

In three cases, the innovations introduced were incremental. They keep the habits of the user by improving their safety. These innovations aimed at circumventing bottlenecks which, once corrected, enable improvements in productivity and safety of the building site. In the three cases (Companies B, C and D), the innovations were an ad hoc response to problems encountered in the course of a construction project. The innovations were solving problems which disrupt the daily activity. The research approach was more by trials and errors than by formal R&D.

The failure concerns the architectural innovation (innovation introduced by company A and developed by a manufacturer). The final output of the manufacturer was not a radical innovation. Basically, the scaffolding was providing the same service as other products (the protection of people working on roofs). But it required roofers to develop different skills to erect and dismantle the scaffolding on site. From their perspective, it could be considered as a radical innovation. The material supplier did not realise the impact of his product on the habits of the roofers.² To solve this problem, he created a subsidiary that installs the scaffoldings. The links between the existing components of the system that were disrupted by the innovation, have been reconfigured thanks to this new service. In the long run the diffusion of the product will depend on the strengthening of the statutory requirements concerning roofing equipments (the manufacturer renews every year the patent because he expects a “positive” evolution of the regulation).

These case studies also show that the owners of small firms are at the core of the innovation process³. Owners of B and C innovated and developed the innovations (the owner of company A decided to collaborate with a supplier who had technical, financial and commercial resources). Because of the limited number of executives within the enterprise, these two

² “Manufacturers and suppliers who are unaware of the changes required to implement their innovations, either in the links to other components, processes, or systems or in the product itself are likely to meet resistance in the spread of their products” [16, p.15].

³ The case of company D slightly differs because it is a subsidiary of a large group. One operative was at the origin of the innovation. But the manager contributed to its implementation within the subsidiary.

managers were in charge of marketing and developing their product. The limited size of these enterprises allows the owner to find quick answers to respond to evolving client demands.

Finally it is interesting to note that the development of a similar product lead to four different commercial strategies:

- Company A collaborated with a supplier and focused on its core business.
- Company B developed the product but left the commercialisation of the innovation to a large manufacturer who had already invested resources to build a large commercial network.
- Company C designed the product but subcontracted its manufacturing and took most of the commercialisation in charge.
- Company D (the subsidiary of an international company) used the innovation for its own sake but did not develop it because it was out of its core business.

3. Conclusions : Implications for national policy aimed at supporting innovative construction companies

These four case studies indicate that regulations are one of the main drivers for innovation on the building site. The four innovations presented in the aforementioned cases were launched to comply with the legal requirements established to prevent falls from height. Enterprises innovated to adapt their organisation to regulations. This result is confirmed by a recent report by SPRU (quoted by [17], p.734). According to this report, "*the most important sources for the construction firms are its suppliers, health and safety regulations, and clients.*" Studying energy efficiency in housing, Gann and al. [18, p.291] also considered that "*prescriptive regulations have forced firms to innovate, particularly at the component level, in order to comply with more stringent standards of energy efficiency.*"

The failure of the architectural innovation seems to indicate that building companies lack technical capabilities to understand innovation. According to Cohen and Levinthal [19], firms' ability to exploit external knowledge depends on their absorptive capacity. The reluctance of roofers to adapt the new scaffolding that leads to a change of the way they work, can be due to a lack of qualification. If roofers do not have the absorptive capacity to understand an innovation, then they will not implement it. One way to promote innovation within building enterprises would be to develop training programmes to increase the qualification of employees.

Most enterprises did not realise before launching their products that the commercialisation would be so expensive. It appears that the development costs are smaller than the commercialisation costs. This is particularly striking for company C. The manager would have expected more commercial assistance during the diffusion of his product. The commercialisation of a new product for a new market (to this given firm) appears more complex than technical matters. It also requires more financial resources.

These results indicate that national innovation policies dedicated to building companies should also focus on commercial issues. The creation of a product is just the beginning of the innovation process. Most small firms may think after receiving an Innovation Award that sales

will follow. Most of them are not aware of the difficulties associated to the commercialisation of a product. They need to identify the leading customers who could promote the innovative products. They have either to invest their financial and human resources to develop a commercial network or to cooperate with a firm which already knows how to market a new product.

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