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LEARNING PLATFORMS AND INNOVATION IN CAR INDUSTRY: THE CASE OF AN AUTOMOTIVE POWERTRAIN SUBSIDIARY IN BRAZIL

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Abstract

Innovation is a major concern in most automotive companies, either car makers or suppliers. Specifically in the case of powertrain system suppliers, capacity and ability to innovate may signify a strategy to survive in a world where environmental and market concerns constantly put automotive industry – and the way their products work – into question. In order to verify how a company may enhance its innovative capacity through organizational changes, a case study is being conducted in a Powertrain subsidiary, located in an emergent country. This supplier is part of a major European automotive group, and had split from the car assembler unit in 2001. Since then, it has been struggling for more independence from the headquarters as well as from the car maker unit (its major captive customer), and has being building in a more strong way its capacity to create new products. Conquering new markets is a strategic issue in this sense. The main objective of the research is to investigate how this firm can build a "learning platform", that is, an organizational structure designed to improve individual and collective competences, related to research, development, engineering and production, so as to promote innovation.

1. Introduction

Innovation is considered a strategic issue to many automotive car makers and suppliers. Creating new technologies, new products and processes may lead to competitive advantages; in the case of powertrain suppliers, being able to develop alternative technologies may be the key to the very survival of the industry as a whole. Given these aspects, this paper will present some findings of a study which is being conducted in a powertrain company in Brazil. The aim of the study is to understand which conditions may support the process of building a "learning platform" inside the company, and whether these conditions can be found in the company. A "learning platform", as it is called in this paper, is an organizational structure designed to improve individual and collective competences, related to research, development, engineering and production. The presence of a learning platform thus indicates that the company is engaged in a long term strategy for innovation.

The paper is structured as follows: in the next section, a conceptual discussion is proposed, concerning organization for innovation, competences and learning, as well as the issue of sharing innovation among different unities in a transnational company. Section 3 will present Company A and its strategy for innovation. Our preliminary findings will be discussed in Section 4.

2. Organizing for innovation: conceptual background

2.1. Innovation, competences and learning platforms

One of the conditions for a company to innovate is to create an organizational structure which supports and enhances this strategy. Since innovating is to create (a new product or process), an organizational structure aiming at innovation must allow people to create new products and processes. In one of his classic studies, Mintzberg (1983) showed that companies who were willing to innovate should choose organic structures, named as adhocracies, which is a flexible structure, based on mutual adjustment as the main coordination mechanism. Therefore one of the main characteristics of an organization for innovation is the existence of mechanisms that promote communication across functional departments, such as light or heavy-weight managers, multifunctional teams, etc (CLARK AND WHEELWRIGHT, 1993; CLARK AND FUJIMOTO, 1991). McCosh et al (1998) state that one important aspect of a kind of "guideline for innovation" is an innovative culture, which means considerable levels of autonomy, an education effort across all ranks in the firm and the use of teams of multi-skilled workers; in addition, employees who innovate must be rewarded as an incentive mechanism. Tidd et al (1997) also emphasize the need of an appropriate organizational structure for innovation: the organization design should enable creativity through some key features such as top management commitment, definition of innovation "champions" or "promoters", use of cross-functional teams, extensive communication, high involvement of workers in continuous improvement activities etc. According to the authors, rigid hierarchies and an organization based extensively on top-down communication makes innovation more difficult.

Another key feature is the promotion of "processes, structures and cultures which help institutionalize individual learning", that is, the promotion of a "learning organization" (TIDD ET AL, 1997:307). Indeed, other authors point that the structure aiming at innovation must also promote the continuous development of competences of individuals. One of the most interesting definitions of "competence" is that proposed by Zarifian (2001; 1999), which was adopted in this research. Zarifian defines competence as a practical understanding of situations, an understanding based on tacit and explicit knowledge previously built by the individual. This knowledge is itself transformed as competence is put into practice. According to Zarifian, competence is also linked to autonomy, since, as a practical understanding of real situations, it can only be effective if the individual may exercise it in his actual work. Therefore, competence is not (only) a personal attribute; it is, above all, an organizational issue.

In this research, we will try to argue a concept of learning platform for innovation, which involves skills and organizational structure. The concept of learning that we use differs from the academic mainstream, which studies the learning process of individuals on a

large scale, affecting the organization as a "learning organization". This model considers the study of regulatory processes and methodologies to promote changes towards the improvement of learning processes (GARVIN, 1993; KOLB, 1997; KIM, 1993, 1996).

In contrast, our proposal suggests that individuals have no fixed mental structures, so the study of the subject and the organization cannot be disassociated from the context, preventing an analogy between individual and organizational learning (AMIN & COHENDET, 2003). The focus is the process of learning in organizations (organizational learning) and not its outcome. In this approach we believe that knowledge can be disseminated when put into practice, in social interactions (knowledge is socially constructed) (VON KROGH, 1998). Organizational learning is a process that emerges from social interactions, situated in the practices of employment (BLACKLER ET AL, 1999), a perspective which is similar to that found in Zarifian (1999). Formal instructions about work are insufficient. Therefore taking into account only the explicit forms, characterized as explicit knowledge, does not assist an analysis of the learning process. We must pay attention to the analysis of the practice of workers, specialists and managers in making decisions. Building the capacity for innovation and learning platforms at work should consider the particularities of the organizational architecture, technology, industry and communities of practice (DUGUID & BROWN, 1991; BROWN & DUGUID, 1998). Thus, the concept of learning platform for innovation can be understood as creating a dynamic environment in which the dissemination of knowledge in the organization is expanded and led to the development of individual skills, organizational structures in context, and focused on innovation activities.

2.2. Innovation in a transnational company

Many studies have recently focused on the split of innovation activities across the different units of a transnational company (HARVEY AND GRIFFITH, 2007; MUDAMBI ET AL., 2007; IWATA ET AL, 2006; MCDONOUGH ET AL., 2001; CHIESA, 2000; GASSMANN AND VON ZEDTWITZ, 1999; DUNNING, 1993; for the specific case of the automobile, see, among others, DIAS AND SALERNO, 2004; CONSONI, 2003; CALABRESE, 2001). Although during the late 1990s and the 2000s a strong debate had taken place concerning the diverse forms of R&D decentralization (the “global”, “multinational”, “transnational”, “multidomestic” company) and the reasons why a firm should spread its R&D among its unities (market or technological reasons), there is no consensus about an “optimal” configuration of global innovation networks. Indeed, such an “optimal” situation, if it exists, may be particular to each organization, since issues such as firm’s strategies and technological path, the relationship between the subsidiaries and the headquarters, the differences among the markets, the search for local technology, the existence of local incentives to innovation, etc. seem to matter.

In the case of the Brazilian automotive industry, one may affirm that some Brazilian subsidiaries stand as “intermediate technological leaders” (BAGNO ET AL, 2008; BAGNO, 2007), that is, even if not capable of conducting complete basic research locally, they may act as important development centers, typically devoted to understand emerging markets idiosyncrasies and to adapt or develop new products aiming at these markets. These subsidiaries eventually build up a research

competence which may turn them into leaders in some technologies, more related to their idiosyncrasies (as it is the case of ethanol in Brazil). In this sense, it is possible to say that Brazil is a peripheral product development center (DIAS AND SALERNO, 2004).

It is important to stress that this current condition does not result from a unidirectional decision, that is, the assignment of innovation activities *to* Brazilian subsidiaries *by* the headquarters. Actually, subsidiaries themselves struggle – and have struggle for years – for these activities, which are considerable more "noble" than manufacturing activities, since being a competence center increases the importance – and the possibilities of survival – of the unit (DIAS AND SALERNO, 2004). Being able to accomplish local R&D activities is important to local government too, since this leads to an increase in socioeconomic development (SALERNO ET AL., 2004; BRASIL, 2008); therefore subsidiary's effort to attract R&D activities may be supported by local public policies as well. Subsidiaries then develop "bottom-up" strategies, that is, they try to modify more centralized strategies defined by the headquarters. These emergent strategies (MINTZBERG, 1994; 1987), when aiming at innovation, may imply setting up a learning platform, as defined previously: to establish an organization which enhances innovation and the constant building of workers' competences.

2.3. Variables as indicators of a "learning platform"

In order to investigate if the company is concerned with innovation, and, if it is the case, how the company deals with this issue, some variables were defined as indicators of the building of an "innovation and learning platform", based on the literature review presented above. Variables were established according to three dimensions of innovation: i) innovation in processes, ii) flow of information and knowledge, iii) development of new products and technologies. The variables are divided into i) tracking of formal and informal competences for innovation: training and formal qualifications, practical experience in work activities; shared perception of the job, ability to work in a team, familiarity with the product and with market needs, ability to share and disseminate creative thinking, and ii) organizational strategies for innovation: knowledge of suppliers' processes in order to maintain quality partnerships, partnerships with organizations specialized in technology management and information such as universities and research centers; organizational architecture that allows the streaming of knowledge and teamwork; incentive for emerging strategies in product development, partnerships with local community and ability to identify strategic partners.

Next section will present the preliminary findings of this study. Research is being conducted since November 2009, though document analysis and field interviews carried out with five product engineers, four Product Engineering managers (belonging to Platform, Product Planning and Product Engineering departments) and also with two manufacture managers, two manufacture technicians and two manufacture team leaders. Interviews were based on semi-structured questionnaires and all the interviews performed at Product Engineering were recorded.

3. Case study: the powertrain supplier

3.1. The company: from a powertrain department to an independent company

Company A, which was previously a powertrain department inside the organizational structure of a European car assembler, named here as Company X, was created in the beginning of the 2000s. The decision of splitting the company and creating a new firm, dedicated to the development and production of powertrain systems, came after a period when Company X had an agreement with one of its competitors, concerning the development and production of engines in a shared way. When the agreement came to an end, Company X's headquarters decided to keep the activities related to powertrain systems separated from the car assembler activities, therefore leading to the setting up of Company A as another firm, subordinated to its own headquarters, located in the same European country as Company X's headquarters. Although Company X still is Company A's main client at present, the strategy is to decrease its participation while broadening the market by selling powertrain systems to other car assemblers or any other company which needs internal combustion engines (truck, buses, boats etc) – "non-captive" customers.

Company X, by its turn, is established in Brazil for more than 30 years, and in the last decade it consolidated a leadership position concerning passenger vehicles Brazilian market. Concerning its relationship with its headquarters, Brazilian subsidiary occupies an important position within the group, since, during the 2000s, when the company suffered from financial problems in the European units, the Brazilian had constantly generated profits. Company X is also recognized as one of the companies which first profited from Brazilian government incentives related to small (1000 cc) and ethanol engines, in the 1970s. In the 2000s, it also profited from Brazilian incentives to innovation activities: new laboratories and a local design center were inaugurated as a result of these incentives.

As Company A was created, innovation activities went on more strongly. Product development and engineering activities were carried out based on a structured product development process created by another company with which Company A had had a partnership. Inside Company A's corporation, there are twelve Technical Centers spread around the world – among these, only three are located in emerging countries, one in Brazil and the other two, much smaller and more recent ones, located in China and India. The explicit strategy of the corporation concerning R&D activities is to develop a global engineering, that is, to share innovations and engineering standardized procedures all over the world and to profit from the "design around the clock" practice. Company A's headquarters assigned the Brazilian subsidiary the global mandate to develop alternative fueled engines – it is formally considered a competence center concerning these products. Company A must also adapt products developed at other R&D centers, aiming at local and regional (Latin America) markets. At present, Product Engineering at Company A has approximately 300 workers, among engineers and technicians.

An example of local innovation is an improvement of the system of cold start-up for ethanol and flex-fuel engines, which development began when Company A was still part of Company X. Until the present date (April 2010), this is the only patent assigned to the Brazilian subsidiary in the European Patent Office database. This innovation was completely developed in the Brazilian unit, from the concept to the prototypes and final

product. The idea emerged from the observation of a real problem – the difficulties during the cold start-up for a ethanol engine – which could not be observed and treated at the headquarters, since it relates to a local product. Concept of the new system was developed by a team of Brazilian engineers that was grouped in an informal way: product development only became formalized – that is, with a formal budget, team and schedule assigned to it – after the first prototypes were presented by the Product Engineering direction.

Although this example showed that Brazilian powertrain engineering from Company X, and, after, Company A had enough competence to develop a new product from concept to final product, it also demonstrated that the first steps of innovation, that is, idea generation and concept definition (HANSEN AND BIRKINSHAW, 2007; CLARK AND FUJIMOTO, 1991) were carried out in a completely informal, non-structured way. The lack of financial and managerial support or incentives might kill new ideas or, at least, hold back innovation (HANSEN AND BIRKINSHAW, 2007). In order to begin to transform this reality, Company A introduced a change in its product development process, including, before the development process, a stage of "idea generation". These ideas could be developed independently of a specific product, that is, there is no need to be an improvement on a current product, and they could also emerge away from any pre-approved project; therefore formalizing and legitimating work involved in the development of these completely new ideas could stimulate major innovation. A specific budget should be assigned to this new stage of product development process.

Another local innovation, the development of an electronic locker differential integrated to a front transversal transmission of a small passenger vehicle, benefited from the "idea generation" new stage. Idea was born after a demand of Company X, that wanted a system which could improve the performance of its small "off-road" passenger vehicle. Since final product price could not be increased, given the characteristics of the Brazilian emerging market, it was necessary to think up a low cost solution. Engineers from the Transmission team of Company A and from a supplier worked on an idea of a device which could "lock" the differential of the car, therefore preventing the wheels from spinning freely on slippery surfaces or soft ground, such as mud (BAGNO ET AL, 2008). Inspiration came from locker devices already used in off-road vehicles and bigger vehicles, but it was necessary to develop a new device due to the previously mentioned cost problem. Material and engineering hours related to the scanning of possible solutions and development of the first prototype were debited from the "idea generation" budget. After the first prototype was presented and tested, the idea was approved by the direction and entered the new product development process.

The constitution of the "idea generation" stage was a first step towards a strategy of promoting innovation. This strategy became explicit with another attitude, a formalized project involving major organizational and management changes which will be called, in this paper, by the fictional name of "Innovation Plan". This "Innovation Plan" has started in 2009 and, at present, it is still being implemented. Some important aspects of this plan will be described in next section.

3.2. A strategy for innovation

The Innovation Plan intends to promote innovation inside the company in a broad sense. In this perspective, innovation should not be dependent exclusively on individual initiatives – in the words of one of the engineers most involved in the constitution of the innovation plan, the company should not "*count on heroes*" to innovate. According to the same engineer, if a "culture for innovation" was not encouraged, innovation would always be seen as "a matter of engineers" and would not be spread beyond the frontiers of Product Engineering department. The plan also aims at promoting major innovations, since the actual structure tends to favor short term, low risk innovation, as well as product development linked to Company X's – which is still the main client - demands.

Therefore, some of the main issues of the Innovation Plan are: (a) to guarantee appropriate degrees of formalization to the innovation process, so that innovation will not be based on individual "sacrifices" such as developing a new idea outside regular worktime; (b) to formalize the process of searching for external financial resources to innovation; (c) to promote a systematic method (e.g. Technological Road Mapping – TRM) to define technological routes, so as to encourage not only low but also some high risk and long term innovation; (d) to build internal competences for innovation; (e) to improve the relationship with universities, research centers and companies out of the regular supply chain; (f) to enhance an internal culture for innovation across all functions.

In order to accomplish these objectives, ten committees were created, each one responsible for: (a) innovation strategy; (b) scanning for new technologies and opportunities; (c) managing the portfolio of new management technologies; (d) managing the portfolio of new product technologies; (e) managing the portfolio of new process technologies; (f) building the culture for innovation; (g) managing internal competences; (h) partnership with universities; (i) partnership with other external agents, including suppliers, government and institutions from the national/regional systems of innovation; (j) managing the Innovation Plan itself (a sort of "meta-committee"). Hence five committees are responsible for aspects directly related to innovation (portfolio of new product, process and management technology, scanning for new opportunities, innovation strategy); two committees are responsible for external support for innovation (partnership with universities and other actors); and three are responsible for internal support (internal competences, culture for innovation and the management of the plan).

Each committee is sponsored by a member of Company A's direction, so as to guarantee the plan has high management support (which, according to the literature, is a necessary condition for innovation to be promoted). Workers from different areas, such as Engineering, Manufacture and HR are responsible for the committees. All these workers as well as the sponsors constitute the so-called "innovation committee".

In addition to performing several actions related to the specific committee they are responsible for, members of the "innovation committee" must also evaluate the "radical innovation" suggestions that may arise from any part of the company in order to decide whether they will be implemented (and therefore enter a formal development process) or not. Indeed, any worker – or group of workers – at Company A may submit a suggestion to an internal program. Suggestions are classified into: cost reduction;

incremental innovation; or radical innovation ones. At the end of the year, the best idea among all those, of the same category (cost reduction, incremental or radical innovation), that were implemented will guarantee his or her creator a prize (not monetary). This suggestion program was introduced at Company A prior to the Innovation Plan project, but it was slightly modified with the introduction of the Innovation Plan: the three different suggestion categories were created and the innovation committee became responsible for the evaluation of ideas classified as "radical innovation". Cost reduction suggestions are evaluated by the Cost and Financial areas and incremental innovation ones are evaluated by the supervisor or manager from the area related to the idea.

4. Preliminary findings

The existence of the Innovation Plan, even if it is recent, is undoubtedly an indication that Company A has a strategy towards innovation. In parallel with the Innovation Plan, Company A is undertaking other actions that can enhance innovation. As already stated, the definition of a formal "idea generation" stage in the product development process, with a specific budget, is an important decision which supports innovation.

One of these is the systematic mapping of formal competences of workers. Every year, each manager must present the competence gaps and consequently training needs, concerning each worker under his or her responsibility, to the HR area, which will then design a training plan for each sector, considering budget limitations. Of course this practice can only scan what we are calling "formal" competences, that is, those that can be achieved through formal training. More "tacit" or informal competences, that is, those achieved during daily work, when confronting new situations or problems, learning new procedures or developing new problem solutions with co-workers (ZARIFIAN, 1999) are not fulfilled by formal training. These competences can only be built if the firm presents an appropriate organizational structure – as discussed before, a structure that enhances workers' autonomy and communication across functions.

In this sense, it is unlikely that Company A's general organizational structure will sustain or promote innovation. In fact, Company A may be characterized, at present, as a "machine bureaucracy" (MINTZBERG, 1983), although, in its Product Engineering department, evidences of an adhocracy – such as the existence of multidisciplinary or interfunctional problem-solving or product development teams – can be found. It is worth to remember that one of the aims of the Innovation Plan project is to create and disseminate a "culture for innovation" all over the company. In order to achieve this, it will be necessary to transform Company A's organizational structure. It remains to be seen whether this change will be accomplished. By now, it is possible to affirm that Company A's attempt to achieve a work organization based on the Toyota Production System (TPS) – which is a corporative goal for all unities of Company A and Company X – may not be a helpful way to enhance innovation, since TPS is characterized as productive model which aims at "permanent cost reduction", not at innovation (BOYER AND FREYSSENET, 2000).

When confronting the variables we have defined in order to investigate whether Company A has the requirements to be a "learning platform" (see Section 2.3), we are

able to recognize the presence of some of the characteristics of a learning platform. As presented before, Company A is starting to track its workers' competences – not the informal but the formal ones. Training and formal qualifications are registered and, when absent, formal training plans are created, but practical experience in work activities is not well registered. Until now, the research (which is still in progress) could not investigate Company A workers' ability to work in a team, nor their ability to share and disseminate creative thinking. Concerning variables related to organizational strategies for innovation, we could already find that: in Product Engineering, the existence of multidisciplinary product development teams – which involve not only product engineers but also purchase engineers and even suppliers' workers, as the two product development examples showed before – leads this area to the knowledge of suppliers' processes, although this is not the common case in manufacture, where knowledge of key suppliers' processes is restricted to some managers. Company A is engaged in starting or strengthening partnerships with universities, research centers and other innovation institutes, especially with the Innovation Plan. In fact, this is a major issue of the Plan. Another important variable is the organizational architecture able to allow the streaming of knowledge and teamwork. As stated in the previous paragraphs, this seems to be a critical point to Company A's innovation strategy. Finally, in which relates to incentives for emerging strategies in product development, we can affirm that Company A is starting to formally recognize emerging strategies, through the suggestion program (which now also considers radical innovation beside incremental one) and the definition of a specific budget for the "idea generation" product development stage.

5. Conclusion

The case study presented in this paper has shown how a subsidiary company is promoting organizational and management changes with a view to upgrade its local innovative capacity. Some practices seem to support the building of a local "learning platform", such as: improving the relation with local universities, research centers and institutes; setting up a systematic procedure for mapping formal workers' competences all over the company; systematically rewarding radical and incremental innovation which emerges from the employees. But, from our perspective, there is still a long way to go, and one of the major challengers Company A will face is the potential incoherence between its productive model (based on Toyota Production System) and its explicit strategy to innovation. This will be the object of our research for the months to come.

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