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Fiat:

Open Innovation in a Downturn (1993-2003)

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In the midst of a worse than expected economic downturn, Italy suddenly discovered that one of its companies had reached the status of worldwide excellence. Fiat Group Automobiles SpA (Fiat), the well-known Italian carmaker, was able to weather the economic storm and astounded the world with its expansion plans and its partnership with Chrysler during such a climate. President Obama and his auto industry task force claimed on March 30, 2009, that “Chrysler’s best hope for revival lies in a proposed partnership with Italy’s Fiat SpA.” One month later, on April 30, President Obama announced that “Chrysler and Fiat have formed a partnership that has strong chances of success. It’s a partnership that will save more than 30,000 jobs at Chrysler, and tens of thousands of jobs at suppliers, dealers, and other businesses that rely on this company.”¹ Although the future prospects of Chrysler are still far from clear,² the deal unquestionably testifies to the reputation that Fiat has gained on an international level.

What is remarkable is that Fiat was not appointed by President Obama as Chrysler’s ideal partner because of its abundant cash flows or the cost-efficiency of its production system. One of the main driving factors behind the deal was the superiority of the Italian carmaker’s clean, fuel-efficient engine technologies. As Mr. Obama stated on April 30, “Fiat has demonstrated that it can build the clean, fuel-efficient cars that are the future of the industry, and as part of this agreement, Fiat has already agreed to transfer billions of dollars in cutting-edge technologies to Chrysler to help them do the same. Fiat is also committed to

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working with Chrysler to build new fuel-efficient cars and engines right here in America.”

In the late 1980s, Fiat initiated projects in these technologies focused on diesel engines. Their most valuable outcome was the Common Rail direct fuel injection system. Common Rail brought about a revolution in diesel engine technology as it significantly reduced fuel consumption and energy emissions, while simultaneously improving performance and the driving experience. In the early 1990s, Fiat started working on petrol engines and developed a new family of VVA (Variable Valve Actuation) technologies (Uniair), which offered a range of benefits including increased power (+10%), improved low-end torque characteristics, lower CO₂ emissions (-20%), and cost reduction through sheer design simplicity. In the second half of the 1990s, a new generation of the Common Rail system (known as Multijet) was also engineered, which significantly reduced fuel consumption and improved performance with respect to traditional Common Rail engines.

These technologies, which lay at the very heart of the Fiat-Chrysler deal, were mostly developed during the 1990s by Centro Ricerche Fiat (CRF), the Fiat Group company in charge of R&D and technology development, under the visionary leadership of Gian Carlo Michellone, CRF’s CEO from 1989 to 2005. Mr. Michellone radically turned around CRF’s organization and innovation strategy in the early 1990s when the Italian carmaker—along with many other players in the automotive industry—was going through troubling times. This revolution allowed the Fiat Group to keep its “innovation engine” running despite the heavy downturn in the industry and to: maintain and reinforce its in-house R&D activities; build and enlarge its networking capabilities within the automotive sector and across different industries; and complete and advance the development of the fuel-efficient engine technologies.

As a recent article suggests,³ Fiat’s excellence today is the result of an “extreme makeover” engineered and steered by Sergio Marchionne since his appointment as CEO of the Fiat Group in 2004. This was the first time that a Fiat Group CEO came from outside the automotive industry (Marchionne was CEO of SGS—Société Générale de Surveillance when he came on board) and this domain change helped him challenge existing routines and practices. Fiat’s brand identity was effectively restored and brought back to the long forgotten glory years. This was the result of a combination of a variety of internal factors, management capabilities, external circumstances and perhaps luck. What is unquestionable is that the fuel-efficient engine technologies developed by CRF under Mr. Michellone’s tenure were one of the essential ingredients of the success of the new car models launched in the Marchionne era.⁴

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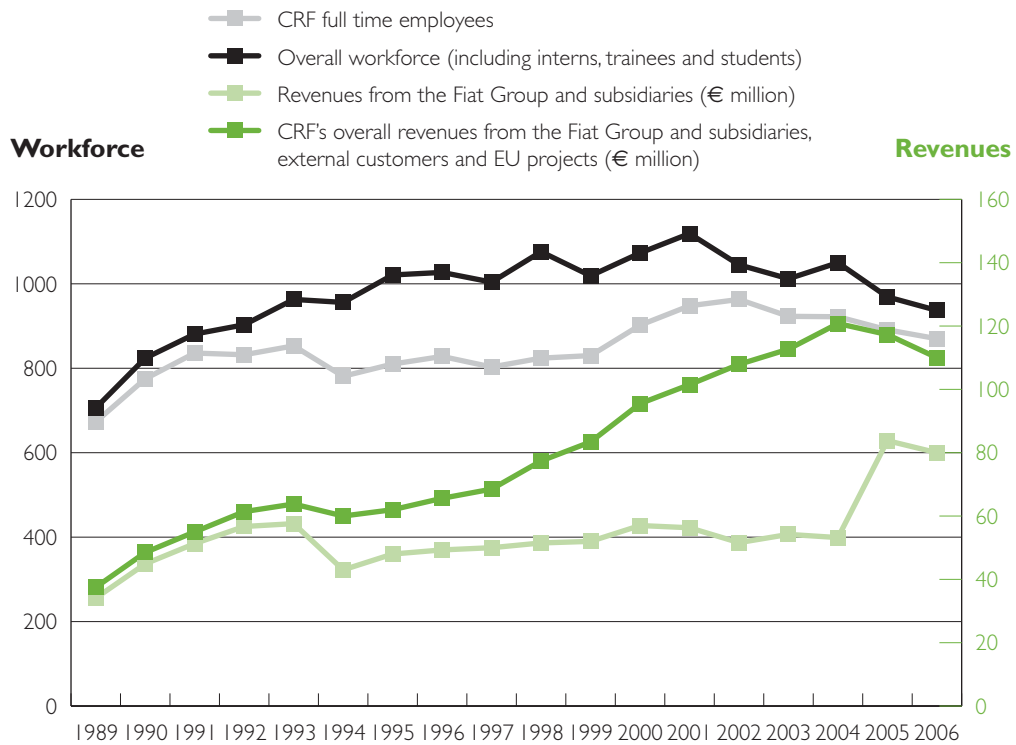
This article focuses on the organization and innovation strategy devised by Gian Carlo Michellone for CRF during the 1990s, which resembled and anticipated most of the underpinnings of what would become known as the open innovation paradigm⁵ that originated from Henry Chesbrough's work. The CRF case is interesting because it demonstrates how open innovation can provide a strategic approach that enables a firm to protect its innovation capabilities from the risk of severe resource rationalizations during periods of crisis, and to confer a starting point to replicate them once the downturn is over. A recent article by Chesbrough and Garman thoroughly explored this aspect.⁶ Starting from the premise that companies that continue to nurture their innovation capabilities during economic downturns are better positioned when growth returns, Chesbrough and Garman illustrate how an open innovation strategy can help firms reduce the costs required to support their R&D activities while, at the same time, preserving future growth opportunities. Furthermore, the history of CRF allows us to discuss a number of organizational solutions a firm might adopt in order to implement an open approach to innovation. This topic is currently being debated in the wealth of literature on open innovation, where an increasing number of authors are studying the organizational implications and the adoption process of open innovation.⁷

The Origins of CRF and the 1992-1993 Global Auto Industry Crisis

Fiat is a leading Italian industrial group, with a total workforce of over 198,000 employees, involved in the following business areas: Automobiles (with Fiat Group Automobiles SpA, Maserati, and Ferrari), Agricultural and Construction Equipment (with CNH), Trucks and Commercial Vehicles (with Iveco), and Components and Production Systems (with Fiat Powertrain Technologies, Magneti Marelli, Teksid, and Comau). Its 2008 revenues were almost €59 billion, 3.4% of which were invested in R&D. Fiat's Research Center (CRF) can be appropriately defined as the "innovation engine" of the Fiat Group, as it is responsible for the applied research and technology development activities of all its controlled companies. CRF currently employs more than 850 professionals and collaborates with 150 universities and 1,000 industrial partners worldwide. At the end of 2008, it had more than 2,300 registered patents, with another 600 pending.

CRF was founded in 1976 and was established as a consortium in 1985 (under the Italian legal form "Società Consortile per Azioni") whose partners were the Fiat Group subsidiaries (with Fiat holding the largest stake in its equity). Throughout the 1980s, CRF enjoyed significant independence from the Fiat Group and its subsidiaries even though they funded the largest part of its R&D activities. In 1990, CRF had a total workforce of around 700 employees and overall revenues of €32.5 million, 92.5% of which came from the Fiat Group or its subsidiaries. Figure 1 illustrates the evolution of CRF's workforce and revenues.

FIGURE I. CRF's Workforce and Revenues



Source: Adapted from internal documents.

In the early 1990s, the health of the global auto industry significantly worsened, with all major carmakers enduring terrible results. As a consequence of the general economic decline, sales of new vehicles sharply decreased. For most carmakers, sales plummeted by 20-30% between 1992 and 1993. In Europe, Italian and Spanish auto markets were struck especially hard by the recession. This affected Fiat in particular, which had a 43% share of the internal market and 12% of the European market. As a consequence of very negative results in the first half of 1993, the Fiat Group prepared itself to lay off around 12,000 employees in Italy and to significantly restructure worldwide.

In accordance with these rationalization plans, the Fiat Group's CEO asked Gian Carlo Michellone, who became CEO of CRF in 1989 after many years with Fiat Group Automobiles, to lay off 30% of the overall workforce and to restructure its activities to correspond with the foreseen reduction in R&D investments. Michellone understood that, in this scenario, the survival of CRF would be severely challenged if not entirely compromised. He feared that the impact of these cuts would be the loss of most of CRF's state-of-the-art competencies and technologies, with significant effects on the competitiveness of

BOX 1: CRF's Traditional Closed Innovation Model

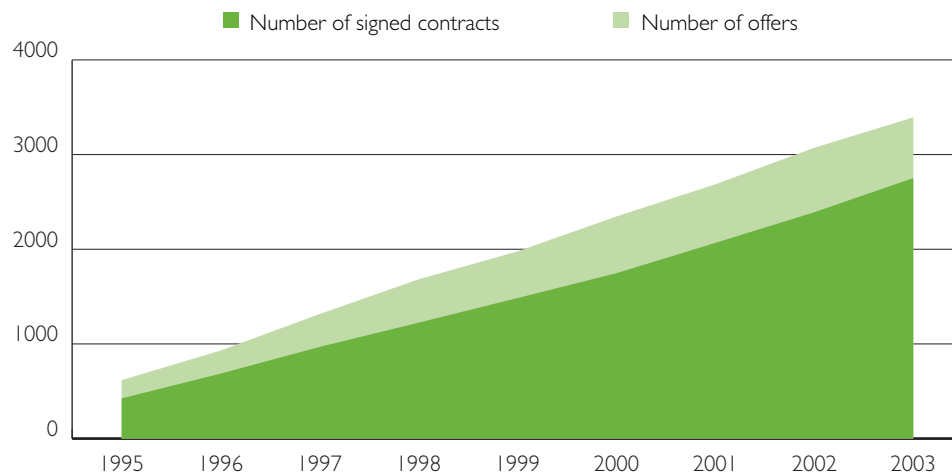
Traditionally, technologies developed by CRF were exclusively transferred to the Fiat Group's subsidiaries and used to improve their products and processes. If any CRF's technologies were deemed useless for the subsidiaries, they typically remained on the shelf, without generating any cash flows for CRF. As a consequence, the funding of CRF activities derived almost entirely from the corporate level and the Fiat Group subsidiaries (as is clear in Figure 1, for the years 1989-1993). CRF's approach to intellectual property had always been very defensive, with the firm pursuing out-licensing opportunities for proprietary technologies only on an ad-hoc and occasional basis. Furthermore, CRF was not used at participating in European or other public funded research projects; relationships with universities and other firms for in-sourcing competencies and technologies were very sporadic.

the Fiat Group's subsidiaries once the crisis came to an end. Michellone fiercely opposed the decisions made by the Group management and instead devised an ambitious industrial plan. According to his plan, CRF would open up to external partners and clients in order to better exploit its technologies and obtain significant financing from external resources. Furthermore, CRF would establish an extensive network of relationships with leading firms, universities, and research centers with the aim of streamlining its participation in EU or government-funded research projects and to enter into a network of inter-organizational relationships, which were key to command platform and cross-industry innovation processes in the automotive sector. This new strategic approach represented a radical departure from the traditional "closed innovation" model that CRF had employed since its founding in 1976 (see Box 1).

An "Ante Litteram" Open Innovation Paradigm: CRF's Innovation Strategy 1993-2003

The Group's stakeholders supported Mr. Michellone and gave his plan a chance. What followed was months of intensive work to build a solid shelter against the approaching typhoon. Indeed, in 1994, the storm hit hard: the Fiat Group's subsidiaries cut their expenses in CRF by around 30% and corporate R&D was sliced by 70%. In response, CRF saved on anything possible, even on mundane items such as office supplies and electricity.

What is important to consider from the open innovation perspective is the influx of resources that started flowing into CRF from outside the Fiat Group, secured through projects to jointly develop know-how and to transfer technologies to industries other than the automotive. As Chesbrough and Garman noted, in periods of recession it is the "outbound" dimension of open innovation (i.e., "the processes whereby a business places some of its assets or projects outside its own walls")⁸ that can especially help a firm protect its innovation capabilities. The data in Figure 2, which shows the growth of external customers involved in technology transfer activities with CRF, underscore the

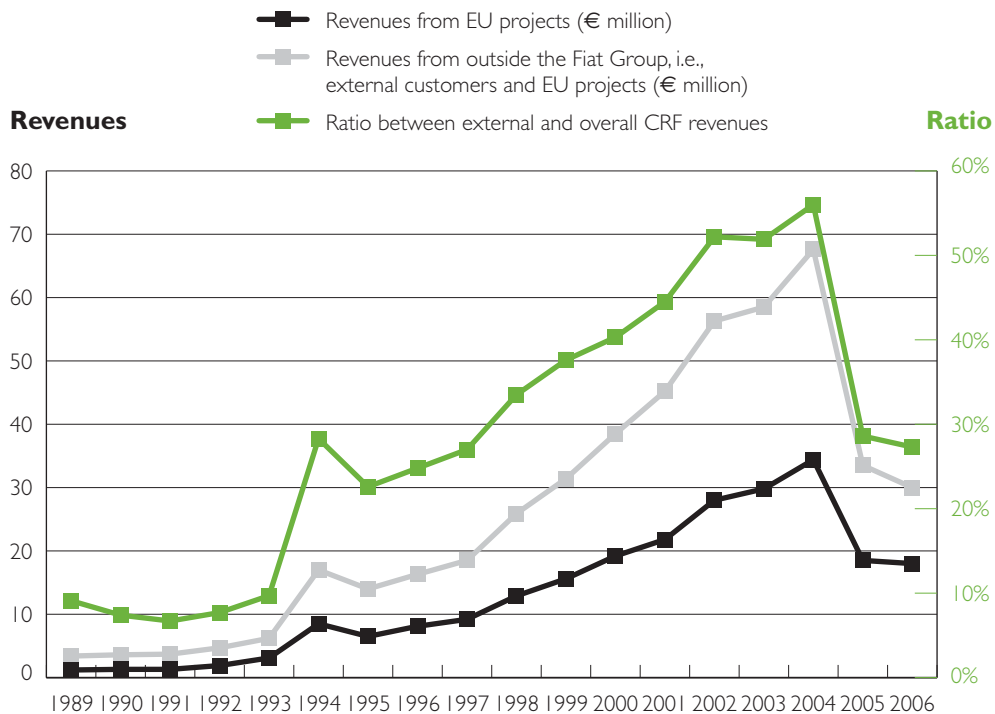
FIGURE 2. Volume of External Transfer of Technologies

Source: Adapted from internal documents.

success of CRF with this approach that insulated it from Fiat's turbulences. Furthermore, Figure 3 depicts the evolution over time of the financial resources coming from outside the Fiat Group, i.e., revenues from the transfer of CRF technologies to external customers and cash flows resulting from CRF's participation in public-funded research projects. Aside from the growth of external revenues in absolute terms, the constant increase in the ratio between external and overall CRF revenues is interesting to note. Given that the financial resources deriving from the Fiat Group and its subsidiaries remained largely constant after 1994 (see Figure 1), the growth of external revenues allowed CRF to continue investing in increasingly costly development projects and expand its capabilities in the area of fuel-efficient engine technologies.⁹

Securing these huge inflows of financial resources from outside CRF, especially in the years immediately following the Fiat Group's funding cuts in 1994,¹⁰ was neither quick nor easy to achieve. Indeed, it takes years to negotiate the details of an industrial collaboration and technology transfer project, to build up the network that allows a firm to successfully respond to EU calls, or to train researchers on how relationships with external customers should be managed and organized. CRF's ability to realize such a significant increase in external revenues between 1993 and 1994 (also see Figure 3) was the result of the hard work undertaken by Mr. Michellone and his team. He was well aware that resources from the Fiat Group's subsidiaries were destined to shrink in the future due to the approaching industry recession and he thus worked intensely to prepare the ground for a change towards a more open approach to innovation. Mr. Michellone dedicated the first four years of his tenure to building and nurturing extensive relationships with firms working in very heterogeneous

FIGURE 3. CRF's Revenues from Outside the Fiat Group



Source: Adapted from internal documents.

industries, to exploring opportunities to transfer CRF technologies to them to improve their competitiveness, and to negotiating partnerships for EU project participation. This intense effort bore fruit when Michellone’s plan to revolutionize CRF’s innovation strategy was approved by the Group’s executives as the only viable response to the unavoidable corporate funding cuts, and it underlines the importance of visionary leadership in making open innovation work.

Obsessed with Transferring Competitiveness

In order to orient its R&D and innovation activities towards the market and seek technology exploitation opportunities, CRF radically changed its mission: “Instead of simply selling research, CRF is dedicated to providing competitiveness to its customers as a matter of principle.” Transferring competitiveness became CRF’s “obsession” during the 1990s. Such orientation was lacking in the closed innovation system that existed before the revolution promoted by Michellone when resources could be taken for granted and there was no reason to confront researchers and scientists with the question: “What is the real value of your work here?”

Mr. Michellone described the new strategic approach devised for CRF with the acronym CCCP: “Competitiveness for Customers at Competitive Prices.” In this mission statement, which regularly appeared in internal presentations during the 1990s, an orientation to the market and to its incentives and rules was clearly evident. In particular, transferring competitiveness required CRF to understand the points of view and specific needs of the clients and partners that would eventually become the recipients of CRF technologies. Mr. Michellone introduced the concept of “micro-clients” to indicate those individuals in recipient organizations (not only the Fiat Group’s subsidiaries but also independent companies) who would be affected by, or involved in, the transfer of a CRF technology (e.g., CAD designers resisting a new virtual prototyping technology that requires them to develop new competencies and change work habits). Their resistance to change and the Not-Invented-Here syndrome could have undermined the success of the technology transfer process: ad-hoc methods and practices were introduced to identify micro-clients at the outset of each innovation project, to analyze their needs and attitudes, and ultimately to ease the acceptance of CRF technologies and enhance their impact on client competitiveness.

Selecting the “Right” Technologies to be Transferred

CRF’s decision to strongly commit itself to transferring technologies to its external customers could have had potential drawbacks, i.e., a reduction of CRF’s capability to gain value from its technologies and an undesired loss of control over the development of critical know-how. CRF experienced these negative effects in 1994, when the Fiat Group decided, despite fierce opposition from CRF and Michellone, to sell critical patents related to diesel direct injection technology to Bosch for an undisclosed amount, which, according to some sources, was at least €14.3 million.¹¹ At the time, the Fiat Group considered it to be a good return, but as it turned out it was an incredibly low price for technologies that would enable the development of the Common Rail diesel injection technology. This system outperformed any alternative designs (particularly the existing PDE injector pump technology developed by various competitors) and gave Bosch an enviable technological position in the automotive industry. CRF patents allowed the German company to enjoy a monopoly in direct injection diesel engines for years. The industry press later commented that “Fiat lost out on billions in potential revenue by selling the technology.”¹² It was not Bosch’s market success as much as Fiat’s negotiation of the deal that was the source of the problem, namely, the Fiat Group managers’ inability to properly anticipate, on the one hand, the steady diffusion that diesel engines would experience in the following years in comparison with gasoline engines and, on the other, the magnitude of the advantage of the Common Rail technology over the PDE system. This resulted in a significant underestimation of the value of the Common Rail patents for the Fiat Group and their usefulness for the development of future CRF technologies. The consequences of this disagreement between the Fiat Group’s headquarters and CRF had grave consequences because the ultimate decision on whether or not to license the technology—developed by CRF—was in the hands of the headquarters. Indeed, in 1994, CRF lacked any formal authority over

strategic decisions related to patent filings and out-licensing. This gap between R&D and Intellectual Property (IP) management ultimately prevented the Fiat Group from fully incorporating the correct potential value of Common Rail into its licensing strategy.

In order to prevent these events from occurring in the future, Mr. Michellone acted on two levels: he introduced a taxonomy for the strategic planning of CRF technologies; and he negotiated with headquarters for more autonomy on IP management and out-licensing decisions to ensure a proper use of this taxonomy.

The taxonomy introduced by Mr. Michellone was inspired by the work of Hamel and Prahalad.¹³ Accordingly, CRF technologies were differentiated into:

- *distinctive*, those that created unique value for CRF and the Fiat Group in the long term;
- *standard*, those that could be easily acquired or contracted from outside of CRF or the Fiat Group and were not critical for their future competitive advantage; and
- *actual*, those that protected or improved the competitiveness of the technologies and outputs currently produced by CRF and the Fiat Group, but were not critical for their medium- or long-term competitive advantage (these competencies were destined to become obsolete for CRF in the future, and would consequently be dismissed or reconverted; however, they could be of value to potential external customers, perhaps operating in other industries).

CRF was to focus on the transfer to external customers of actual and standard technologies only: the lack of appropriability of standard technologies was very limited indeed, as these could easily be contracted on the market, whereas losing control over actual technologies as a result of undesired spillovers was not detrimental to CRF and the Fiat Group's competitive advantage. To the contrary, distinctive technologies needed be carefully protected by CRF and not become the subject of technology transfer activities.

The Bosch case demonstrates the difficulty of properly allocating a technology in the above-mentioned taxonomy, especially for managers that are too distant from the R&D process. Common Rail was in fact evaluated by headquarters as a "standard" technology, whereas CRF immediately realized that it was indeed a "distinctive" technology. Mr. Michellone therefore set to work to facilitate the correct use of the taxonomy. On the one hand, he improved the IP management capabilities of CRF. Internal documents dating back to 1996 emphasized the importance of patents for CRF not only as a competitive tool, but also as a source of information on the competencies and activities of partners and competitors and as a bargaining chip to play when negotiating alliances. R&D managers began receiving clear guidelines on how to closely coordinate themselves with the Fiat Group's legal offices and started implementing patenting and IP management activities by themselves.¹⁴ In leveraging CRF's increased competencies in IP management, Mr. Michellone also struggled to obtain more authority from the Fiat Group over decisions on the allocation of the technologies in the

“standard vs. actual vs. distinctive” taxonomy and, as a result, over the choice on which technologies should be transferred to external customers. Since determining which technologies were distinctive, actual, or standard was not a straightforward task, Michellone also devised a structured, continuous, and distributed competence assessment process across the various CRF technological areas that directly involved the top management. In particular, a thorough appraisal of CRF technologies was carried out every two years, using questionnaires and direct interviews, which provided the inputs for the allocation of technologies in the taxonomy.

These organizational and managerial arrangements significantly increased CRF’s capabilities to take advantage of technology transfer without enduring low appropriability and competence spillovers. Interestingly, after the tremendous wake-up call of the Common Rail deal,¹⁵ no other failures in the assessment of the potential of CRF technologies took place in Michellone’s era.

Transferring Competitiveness Starts with Careful Planning

Transferring competitiveness also required negotiating with customers to determine the offer of CRF’s innovation projects from the outset. CRF’s managers were aware that: clients do not always know what they really want; and they are more likely to pay for a technology if its direct impact on their competitive advantage is highly visible. One of the pivotal tools used for planning and making the value of transferred technologies explicit to CRF clients was the so-called “Output Sheet.” CRF researchers were supposed to fill in this document at the outset of the R&D project. A project could have more than a single technology as output, which could take the form of a product (prototype and specifications for a new product), a process technology, or a methodology. Each of these expected outputs had to be recorded in the corresponding output sheet, which contained a “synthesis of business,” i.e., a representation of the “business model” through which the technology would create value for its intended client. It included and defined the technical aspects of the output, but also its effect on the client’s business and competitive advantage, the expected impact on its organization and business processes (e.g., operations, logistics, and purchasing), and the extent to which it would contribute to the development of the client’s competence base and its future products and technologies. This process forced CRF researchers to consider the impact of the transferred technology on the entire set of variables (technical, economic, and organizational) that influenced the client’s ability to extract value from it. The document was also the foundation of the collaborative-interactive development process with customers and, following a model developed by Levitt,¹⁶ mirrored the four levels on which CRF’s outputs should be conceived (see Figure 4).

Mr. Michellone described these levels with an elegant culinary analogy.¹⁷ Imagine having friends over for dinner. You want to impress them with juicy and tender roast beef:

- the “generic product” is the shopping list with the right amount of ingredients;

FIGURE 4. The Four Levels of CRF's Outputs:—The “Product Chain” Model



Source: Adapted from internal documents.

- the “expected product” is the meat, cooked to perfection, with no side dishes and no presentation;
- the “integrated product” is the main course with the right selection of wines and side dishes; and
- the “potential product” is a full dinner, with the beef now part of a complete menu that considers the guests’ personal tastes.

Managers confronted with Mr. Michellone’s analogy understood that improving client competitiveness required not only the selection of the right ingredients (i.e., securing an adequate budget), but also a clear definition of the details and outcome of the potential product. Securing the right resources for the project was the goal of R&D planning under the traditional CRF closed innovation model, when CRF had to only deal with internal customers. In the open innovation approach, this was merely the starting point of the planning process. In the “full dinner menu” experience, CRF researchers were urged to take into account how the new technologies under development would interface and benefit the client’s current and future product portfolio, competence base, and business strategy.

The application of this model was not straightforward. CRF experienced difficulties, particularly when confronting Fiat's internal Business Units, which were familiar with CRF's cost structure and were not willing to recognize a higher internal price than the direct costs, as this challenged largely established organizational routines and practices: "We acted like an unappreciated Santa Claus," Mr. Michellone noted.

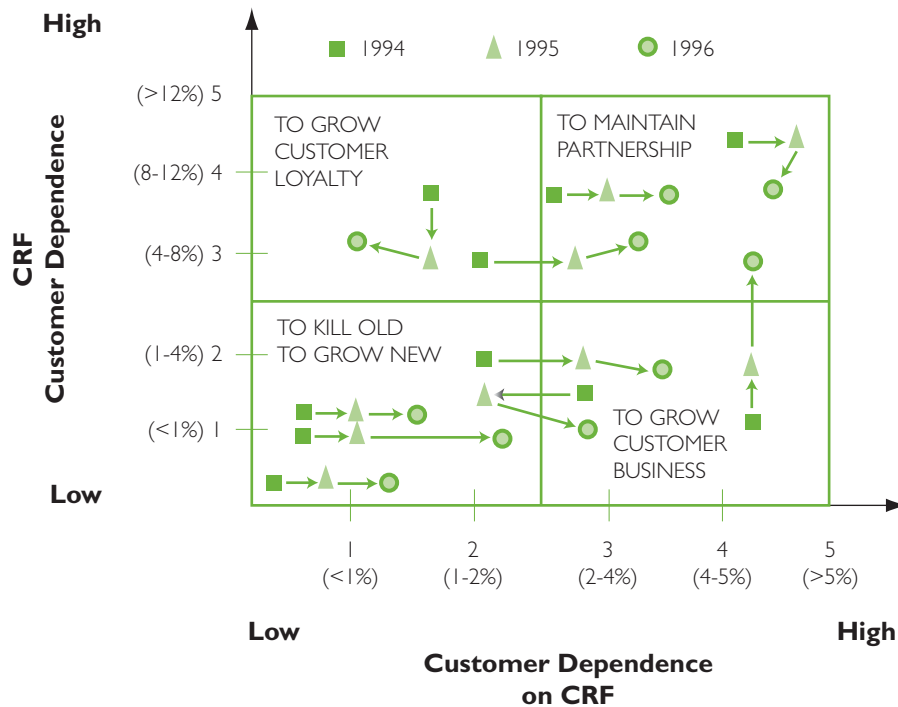
Turning Customers into Partners for Long-Term Strategic Projects

One of the main challenges for an R&D center working under an open innovation approach is to balance the exploitation of its current technologies with the exploration of future developments and the pursuit of strategic R&D projects that are key to the company's long-term technological capabilities. CRF soon realized that it had to stay focused on the development of its distinctive core competencies—those technologies that would be key for the future competitiveness of the Fiat Group—without being exclusively driven by the requests from its current and established customer base. The risk of losing focus of its core competencies was much lower under the CRF traditional closed innovation model since funding of its activities came exclusively from the Fiat Group and its subsidiaries.

The matrix portrayed in Figure 5 was used by CRF to map and plan its engagement with current customers. The "right customers," a label that was often used in internal documents, are those located in the northeast quadrant of the matrix, characterized by high mutual co-dependence with CRF. In this quadrant, providing competitiveness to assist the customers' business also contributed to CRF's long-term technological goals. While bringing customer request into that quadrant was a clear objective for CRF management, dealing with customers located in all four quadrants was a challenging necessity. The challenge in this respect was twofold: to generate enough cash flow from the exploitation of current technologies and from market-oriented R&D projects to finance long-term strategic developments; and to continuously and proactively search for the right customers, i.e., those external organizations that, besides the Fiat Group, could benefit today from CRF's future technologies and therefore should be targeted as ideal partners. Each year CRF scanned several "potential right customers," both new and within its current customer portfolio, and it planned specific actions to involve them as soon as possible in development activities (thus turning them into "real right customers").

The scanning and evaluation of new potential customers and the identification of opportunities to transfer CRF technologies relied heavily on the personal relationships of Mr. Michellone and CRF senior researchers. In other words, while current customers were carefully managed and monitored (see Figure 5), no systematic and structured market analyses, methods, or scorecards were used for new potential clients. Because of the imperfections that characterize markets for technologies,¹⁸ CRF managers believed that the costs associated with the use of these formal methods for new customers could not be counterbalanced by tangible results. However, they promoted some interesting

FIGURE 5. Potential Customers and Level of Engagement with CRF



Note:

CRF Customer Dependence = Customer R&D expenditure with CRF ÷ Total CRF R&D expenditure (expressed as percentage).

Customer Dependence on CRF = Customer R&D expenditure with CRF ÷ Total customer R&D expenditure (expressed as percentage).

Source: Adapted from internal documents.

approaches to favor “gate keeping” and “brokering” behavior among researchers and hence improve CRF’s network of informal ties and, as a result, its capability to duly identify and scan opportunities for technology transfer. For instance, a “researcher with a briefcase” program was launched, which rewarded researchers who devoted part of their time to approaching new potential customers, visiting their production sites, scanning their competence base and technological needs, and visiting partners of EU projects .¹⁹

The Role of EU Projects in Financing CRF Research

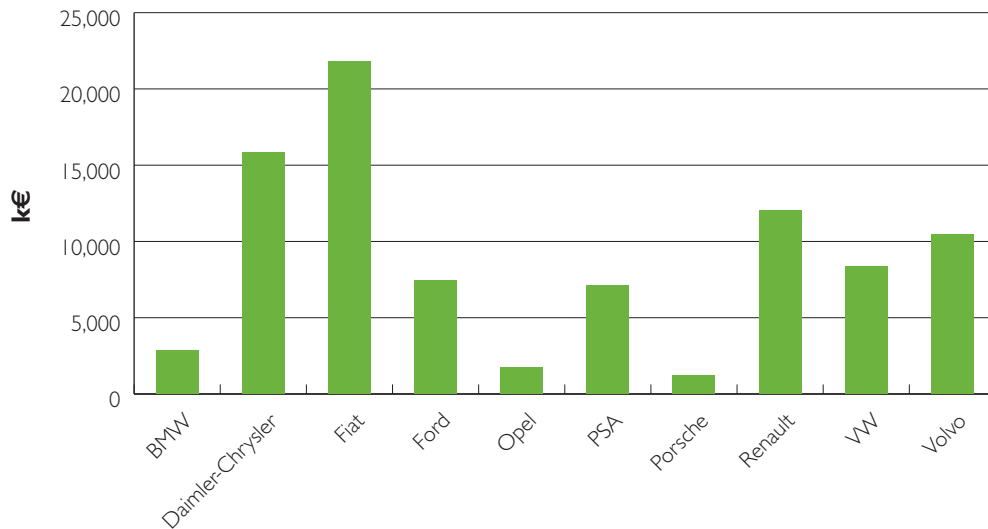
The financial resources needed to nurture the long-term strategic development projects also resulted from CRF’s deliberate strategy to take part in EU- or government-funded research projects. These projects often have dozens of partners with conflicting research goals and a firm can scarcely rely on an EU project for the development of a specific and strategic technological competence. The sheer difficulties in steering these programs were well known to the CRF management. However, a key aspect to emphasize is that CRF worked for all Fiat

Group subsidiaries, not only for Fiat Automobiles SpA; and, more importantly, its mission during Michellone's era consisted of the transfer of technologies and competitiveness to companies from very diverse industries. As a result, the competencies base it had to nurture was wide and heterogeneous and, although often departing from its original goals, the likelihood that research carried out in the scope of EU projects bore fruit for one of CRF's distinctive technologies was especially high. Moreover, although EU project results were made available to all participants, CRF was able to transfer them to the Fiat Group's subsidiaries or external customers more rapidly and more effectively than its competitors, thanks to its orientation towards transferring competitiveness. In other words, the benefits/costs ratio from participation in EU projects seemed to be higher for a research center working under an open innovation approach. This is the first reason why CRF relied so much on EU projects to finance its long-term, non-market-related research. Figure 3 shows that in 1992, revenues from EU projects were around €2 million, increasing to over €20 million in 2000. CRF managers identified three further major advantages resulting from participation in these research projects:

- encouraging junior researchers to prepare and submit EU proposals had a beneficial training effect and represented a unique opportunity to introduce them to the international research community;
- negotiation and preparation of EU projects allowed CRF to carry out free benchmark exercises with leading research institutions, competitors working on similar projects and technologies, as well as firms from other industries (in this way partners shared a great deal of valuable information on the state of the art of promising technologies); and
- participation in these projects allowed Fiat to establish an unprecedented network of relationships with European Universities, carmakers, and firms from other industries with which CRF had traditionally maintained very weak and occasional relationships.

This turned out to be a fundamental asset in the 2000s as platform-based and cross-industry innovation processes became a standard in the automotive industry.²⁰ Fiat was perhaps one of the most successful OEMs in mastering modular and platform-based innovation dynamics, leveraging the capabilities and experiences developed by CRF through the 1990s.²¹ This is paradigmatic of an advantage resulting from practicing open innovation in a downturn, as discussed in an article by Chesbrough and Garman where they state that outbound open innovation can be particularly useful to nurture new supplier and partner relationships, which can be successfully exploited once the downturn is over.²²

Although the ex-post evaluation of the V Framework Program (1998-2002) by the European Commission underlined that one of the most disappointing results was the “declining industrial interest,”²³ there is evidence that other European carmakers did respond to these EU calls (see Figure 6). However, CRF was more effective in securing research grants, perhaps as a result of perceiving a more demanding need to acquire resources from external sources and therefore giving higher priority to the preparation of proposals (this claim is

FIGURE 6. European Carmakers' Participation in the EU EUCAR V Framework Program

Source: Adapted from internal documents.

also supported by the comparison of R&D expenditure by the Fiat Group and its main competitors reported in Box 2). CRF also reorganized internally to improve its ability to participate in these collaborative projects. This approach was very successful: if we consider the money distributed through the EU EUCAR V Framework Program, Fiat ranked first in terms of funds received when compared to other automakers (see Figure 6). The number of EU-funded projects in which Fiat participated grew from 3 in 1990 to over 280 in 2000 and to 542 in 2008. Overall, under the EU V FP, CRF established more than 700 partnerships with external organizations (about 80 universities and 670 firms). “If CRF were a country,” Michellone likes to emphasize when looking back at the results of this deliberate effort, “we would have ranked fifth in Europe in terms of number of projects won, after the UK, Germany, France, and Italy!”

Adopting an Open Approach to Innovation: Organizational Implications

As noted by recent research on the organizational implications of open innovation,²⁴ moving from a closed to an open approach to technological innovation entails a radical change in the firm’s organization, to the point that “open innovation can be considered an organizational innovation” in itself.²⁵ The case reported in this article is exemplary in this respect since it illustrates the major changes in CRF’s organization during the 1990s, which were a necessary prerequisite for the adoption and implementation of the open innovation approach.

BOX 2: The Success of Mr. Michellone's Open Innovation Model in a Time of Shrinking R&D Budgets

It was during the 1990s that CRF developed the fuel-efficient petrol engine technologies that allowed Fiat to carry forward the partnership with Chrysler. CRF's continuous search for external exploitation opportunities, which ultimately compensated for the declining resources from within the Fiat Group, allowed the Center to maintain the vitality of its R&D activities even when compared to competitors, in a time of shrinking budgets.

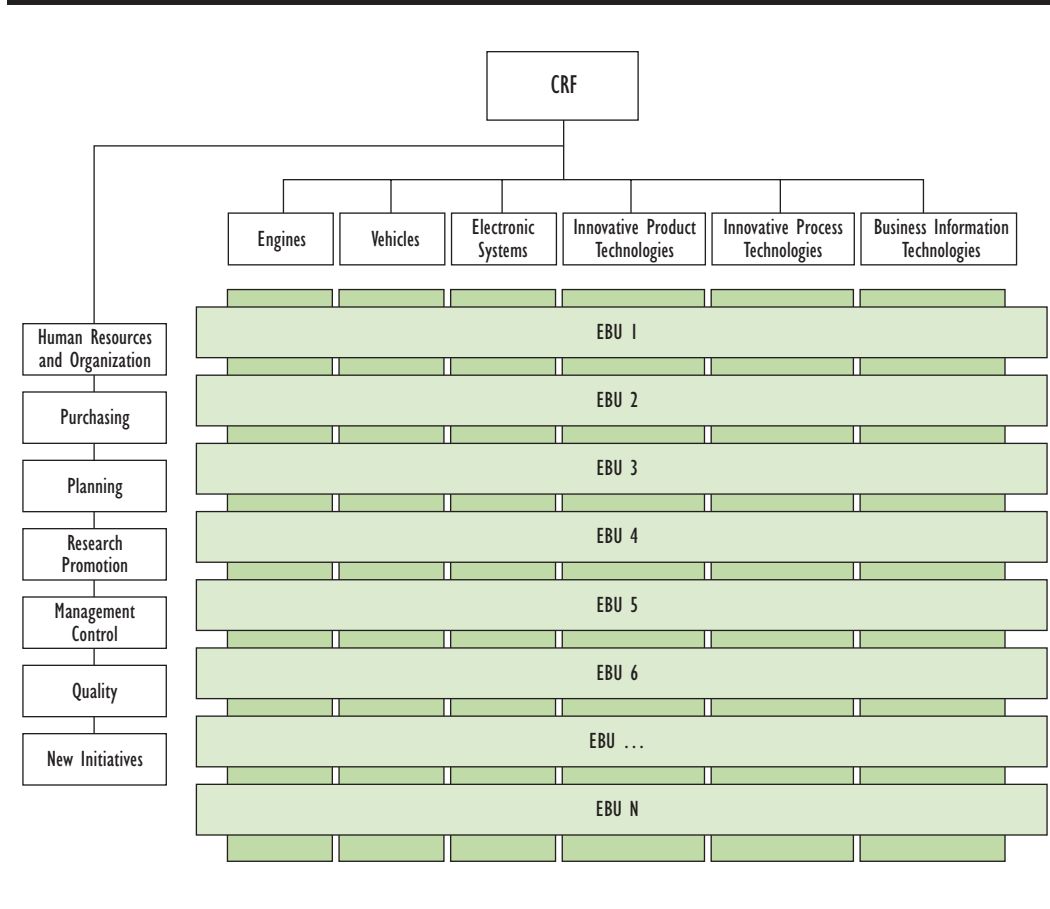
According to the UK DTI R&D Scoreboard, in 1991 the Fiat Group was ranked 15th worldwide in terms of absolute R&D budget and 5th in the automotive industry (behind GM, Daimler-Benz, Ford, and Toyota). Its R&D spending was 3.93% of total sales and not far from the industry's average (GM was spending 4.82%, Ford: 4.22%, and Toyota: 4.36%. The main exception was Daimler-Benz with 8.84%). By 1997, Fiat had reduced its R&D expenditures to 2.5% of sales. In the same year, GM was spending 5.1%, DaimlerChrysler 3.8%, Ford 4.4%, Toyota 3.8%. In the 2004 DTI R&D Scoreboard (based on 2003 data), Fiat dropped to 44th place in terms of worldwide R&D spend and to the 10th position in the automotive sector. It was overtaken by competitors such as Volkswagen, Honda, BMW, Nissan, and Peugeot. It was spending 3.3% of total sales in R&D, while its main competitors (with the exception of GM, with 3.3% R&D spending of total sales) were significantly above the 4% threshold. Despite this sharp reduction in corporate and Fiat Group subsidiaries R&D expenditures, also when compared with several major competitors, CRF was able to advance and complete the development of promising fuel-efficient engine technologies leveraging the revenues it managed to secure from outside the Group. In July 1994, *Business Week* recognized the work done at CRF, featuring Fiat's best practice in restructuring R&D operations. In 2002, CRF reached a total workforce of around 1,000 full-time employees and achieved €108 million in revenues, only 47% of which came from the Fiat Group and its subsidiaries. Business scholars started to take note of the new exploitation practices put in place by the new CRF's management.^a

a. F. Cesaroni, A. Di Minin, and A. Piccaluga, "New Strategic Goals and Organizational Solutions in Large R&D Labs: Lessons from Centro Ricerche Fiat and Telecom Italia Lab," *R&D Management*, 34/1 (January 2004): 45-56.

The Organizational Structure

Throughout the 1990s, CRF was organized according to a matrix structure, which was designed for the purpose of ensuring a profound specialization in key technological areas, together with high flexibility, ability to effectively coordinate innovation projects and client orientation. After restructuring in 1998, the matrix came to comprise (see Figure 7) six technology areas (Engines, Vehicles, Electronic Systems, Innovative Product Technologies, Innovative Process Technologies, and Business Information Technologies) and seven support functions (Human Resources and Organization, Purchasing, Planning, Research Promotion, Management Control, Quality, New Initiatives). Horizontally, 16 external business units (EBUs) intersected the six technological areas. The EBUs had responsibility over external client acquisition and retention for a precise

FIGURE 7. CRF Organizational Structure Matrix



Source: Adapted from internal documents.

market segment. Each EBU could count on several professionals from different technical areas and the EBU's Director could rely on a tremendous level of autonomy, as if he were the entrepreneur of a small business, with full responsibility for the year's end results. Most of the innovation projects for the development of new products, processes, or methodologies were carried out within each EBU.

Traditionally, CRF had a functional- (or input-) oriented organizational structure, which proved to be too rigid and distant from the needs of CRF external clients under the open innovation model. Introducing a horizontal dimension (i.e., the EBUs) in CRF's organization had the main advantage of improving the research center's ability to quickly and effectively respond to heterogeneous external client requests, which were necessarily problem-specific and not technology-specific, through enhanced coordination and integration of the competencies of different technology areas. This became especially critical with the dramatic increase in the number of contracts with external clients that CRF had

BOX 3: The Partnership with Beghelli and the Early Uniair Projects

The establishment of a partnership between CRF and Beghelli, a firm specialized in emergency lights and remote assistance, is often quoted as an example of engagement with “potential right customers.” For three years, CRF co-developed and advanced optical technologies, thanks to an internal group working on led chips and optics. When the project was launched in the mid-1990s, this technology was not as relevant as it is today for the automotive industry. The Beghelli partnership enabled CRF to find an immediate application for the technology CRF did not want to abandon, not to mention the substantial resources that were transferred to other strategic but underfunded projects. Through this partnership, CRF was able to develop technologies that are very important for today’s integrated automotive systems.

Other examples of such long-term strategic endeavors are the first exploratory projects on Uniair engine technologies that today play a very important role in Fiat’s new models, but which the Fiat Group and external partners in the early 1990s considered irrelevant, too basic and distant from current markets. Through market-oriented projects, CRF was however able to generate enough resources to fund these activities. Looking back today, CRF managers comment that keeping the early, applied research projects for the Uniair technologies alive in 1993-1994 did not require a huge investment, and shutting them down would not only have been a terrible mistake, but would have led to insignificant savings. It should be noted that after the first exploratory research projects that disclosed the feasibility and advantages of using the Variable Valve Actuation (VVA) technology on petrol engines, since the end of the 1990s, the development of the Uniair system entered the more resource-intensive and time-consuming engineering and prototyping stages of the innovation process, receiving formal support from the Fiat Group and requiring CRF to leverage its core competencies in engine design, engineering, and manufacturing technologies.

to manage (they soared from 424 in 1995 to 2,067 in 2001), with the growth of average budgets and the heterogeneity of the industries of CRF’s external clients. Indeed, in the second half of the 1990s, the size of research contracts ranged from between a few hundred to several million Euros. The largest projects (those with a seven-figure budget), such as the above-mentioned contract with Beghelli (Box 3), involved clients in the defense (technologies for unmanned vehicles), machinery (packaging technologies), appliances (technologies for distributing air conditioning), and other industries. They all lasted for over a year and were critical to fund research that advanced CRF’s competencies in some technology areas. As is typical of matrix structures, these advantages were derived at the cost of difficulties in coordinating and overseeing the entire set of relationships between CRF and its external customers, which was necessary to identify and exploit synergies and cross-fertilization opportunities. In order to reduce the impact of this drawback, a dedicated unit within the Research Promotion staff function was established.

The Research Promotion function played a particularly critical role in enabling CRF to pursue its open innovation strategy. No similar division

existed before the changes promoted by Mr. Michellone. Research Promotion had responsibility over a whole set of activities required to establish, nurture, and manage relationships with external organizations, which were considered key in both the external transfer of technologies and the establishment of a European network of technological collaborations. On average, the Research Promotion Department employed 15 people and was structured into three subdivisions: External Diffusion of Innovation (DEI), the Office of Public Funded Projects, and the Office of Marketing and Communication.

The creation of the DEI function was one of the first changes implemented during the turnaround and worked on scouting, scanning, and identifying in-house technologies that could be transferred to clients in new industries. DEI also functioned as an interface between clients and CRF, favoring and streamlining the transfer of innovation project outputs and to ensure coordination and integration across multiple technology transfer projects. DEI coordinated the activities of those employees and researchers working as Coordinators of External and Interfunctional Activities (CAEI). CAEI positions were created within each technology area (e.g., Engines, Vehicles, or Electronic Systems) to support this interaction between CRF and potential external partners. A CAEI was typically a senior researcher with over 10 years experience, responsible for assisting DEI in the creation of marketing plans for the technologies to be transferred. The CAEIs also served in the role of overseers to ensure the smooth and effective integration of experts coming from different technical areas and working on different technology transfer projects.

The Marketing and Communication function was created with the aim of managing the communication and advertising activities that CRF systematically undertook, using traditional means (such as brochure mailings and presentations, organization of specialist clubs in new areas, and customer visits to CRF) to keep its current and potential client base informed on the present and prospective innovation projects and technology developments. Reaching a very wide audience of new potential clients is a priority when considering the low percentage of prospective clients that ultimately sign a deal in the technologies market.²⁶

DEI, CAEI, and the Office of Marketing and Communication worked primarily to support and integrate the different horizontal EBUs, providing the required competencies (marketing, legal, and technical) that are key to improving the chances of success of the EBUs' innovation projects.²⁷ CRF managers believed that the costs and organizational complexity associated with the introduction and use of the matrix structure were largely outweighed by the differential revenues from external customers that the matrix structure allowed CRF to benefit from.

Finally, the Office for Public Funded Projects (staffed on average with three people and established in 1991 under the name "EC-Promotion" division) served the purpose of creating and nurturing a European network of relationships and collaborations with leading universities, research institutes, and

companies and easing CRF's access and participation in EU- and government-funded R&D projects.

Planning & Control and Performance Management

The CRF case highlights the proactive role that the management control system plays in promoting and institutionalizing change in the firm's innovation strategy, a concept that has been widely debated in management and accounting research.²⁸ In 1991, CRF introduced a radically new planning and control system with the aim of encouraging an organization-wide orientation to technology transfer and to the sale of competitiveness to both internal and external clients.

The focus of the planning system was the output of the innovation projects: i.e., the product, process, or methodology transferred to other companies of the Fiat Group or to external clients. A project sheet accompanied each new innovation project and was organized into: general characteristics of the project; outputs; phases and economics; resource consumption; and costs. This sheet had various functions:

- to allow traditional, in-progress project control;
- to allocate human resources to projects; and
- to provide an input for the operation of the corporate-level management control system.

An output sheet accompanied each expected output identified in the project sheet. A junior researcher normally had responsibility for each output (while senior researchers presided over the entire innovation project). This person had to explicitly formalize and explicate the business model through which the output improved client competitiveness and, consequently, created value for CRF. The assumptions and information included in this sheet were the objects of continuous discussions with the client and formed the basis of in-progress control of the output development. This system made researchers think in terms of the impact that the output could have on the client's competitiveness, rather than on the client's technical characteristics, as they might have tended to do in function of their competencies and professional experience.

Top managers also used output sheets as a basis for the development of a multi-year system of performance objectives (which satisfied the requirements of being inter-functional, measurable, and acceptable). These objectives were then passed on to the output manager, the project manager, and the company functions that contributed to the development of the output. As a consequence, an evaluation of project managers and their teams started with the analysis of their contribution to the output and therefore the extent to which they contributed to the competitiveness of their clients.

A system of indicators constantly monitored the effectiveness of CRF's external activity and innovation network. In addition to outlining the economic prospects of CRF's external activity in terms of number of offers and orders in progress, number of external companies contacted, and quantity of offers sent out, these indicators also measured the level of cross-functionality of the EBUs

and the reputation built with different classes of customers and external partners. Indicators were updated on a weekly basis and distributed within CRF. They decidedly contributed to reinforcing the importance of open innovation, as well as being a form of intrinsic reward for researchers.

A New Profile for CRF Researchers

CRF's experience with open innovation underlines the impact that a change in the firm's strategic orientation in technological innovation has on human resources. The need to sell competitiveness to CRF's clients—offering a potential product and helping micro-clients overcome their inertia and the Not-Invented-Here syndrome—required a significant change in the attitude, competencies, and capabilities of CRF researchers in the early 1990s.

First, CRF worked hard to encourage researchers to adopt greater risk-taking entrepreneurial behavior. This disposition was necessary to find new external clients, perhaps in new market segments interested in CRF technologies, and to transform these technologies into something that could be understood by the external client and smoothly integrated into his processes and business. The above-mentioned “researcher with a briefcase” program launched in 1991 was very successful in stimulating this type of outward-looking orientation and had an impact on the daily work of CRF researchers, who started spending more time outside the laboratory, visiting firms potentially interested in CRF technologies and taking part in international workshops and conferences.

Aside from their daily work, changes became necessary in the training of junior researchers, who were required to develop not only technical and scientific competencies, but also an integrated body of know-how on production processes and methods, financial and economic evaluations, and market analysis. Beyond formal training programs, which started to focus much more on business-related and IP management issues, CRF strongly promoted informal, in-the-field training. For instance, responsibility over a project's output was assigned to most of the newly recruited researchers from the very beginning of their career in CRF. This forced them to work with the aim of satisfying clear-cut milestones and goals, which is a necessary capability in transferring technologies to an external client on the basis of a formal agreement. Furthermore, strong commitment from all levels of the organization created the right incentives (and sense of urgency) to switch from a closed to an open innovation mindset. Project managers frequently met with researchers responsible for the different project outputs to discuss commercialization objectives and outputs, resulting in high-level peer pressure.

Finally, changes in recruitment criteria for new researchers were implemented to evaluate not only technical and scientific competencies, but also entrepreneurial attitudes and trial-and-error disposition.

Researchers as a Vehicle of Technology Transfer

CRF learned through experience that “transferring competitiveness” to a client is easier said than done. It involves the capacity to make a technology's

potential highly visible in order to improve the entire product portfolio, business model, and body of competencies of recipient organizations. CRF understood that the tacit know-how embedded in the minds of researchers who contributed to developing a technology is a key element for achieving this objective.²⁹

As a result, during the 1990s, CRF systematically transferred its researchers to the internal and external clients of its technologies. This transfer was often planned together with customers and at times researchers recruited for a new innovation project were hired directly by the client to whom they would be transferred once the output had been released. This approach also helped researchers and managers overcome the Not-Invented-Here syndrome that often affects micro-clients, especially those working for CRF's external customers. Moreover, these people represented a privileged point of contact in the recipient organization that could facilitate future relationships with CRF. This type of networking advantage associated with the transfer of researchers and knowledge workers in outbound open innovation has also been acknowledged in recent studies.³⁰

The systematic transfer of researchers had a significant impact on turnover. If we consider only people with a technical background—approximately 90% of the CRF workforce—turnover was around 2% per year in 1990 (it fluctuated around the same level before 1990), climbed to 10% between 1994 and 1996, and later stabilized at around 5%-7% per year. Managing these levels of turnover required significant flexibility in the organization, which was pursued in part through a “virtual” expansion of the CRF researcher workforce (also see Figure 1). Indeed, every year during the 1990s, CRF hosted more than 100 students working on their bachelor thesis and more than 100 post-graduate trainees, all of whom received scholarships from CRF. They typically collaborated on the development of embryonic but strategically important technologies and the best were hired as full-time employees.

Solid relationships with universities were essential to take advantage of this vast flow of students and trainees at reasonable levels of complexity and cost. During the 1990s, Michellone worked hard to improve CRF's network of ties with Italian and European technical schools. He was aware, on the one hand, that building trusted and informal relationships with university professors was of paramount importance, more so than any type of structured agreements. CRF was part of ATA (the Italian Automotive Technical Association) and Michellone regularly invited professors and deans of technical schools to chair the local ATA committees with the aim of strengthening these kinds of relationships. On the other hand, Michellone believed that selecting the right universities with which to collaborate was also important. To this end, CRF developed a scorecard that ranked university departments and technical schools on the basis of both the measurable outputs of their research in the areas of interest to CRF and the qualitative feedback gathered from CRF's scientists and technicians. The influx of students and trainees was necessary to ensure the virtual expansion of CRF's workforce, but the improvement of university partnerships pursued by Michellone was also valuable to: rapidly identify the right partners to respond to EU

project calls; and access the specific competencies that CRF lacked, e.g., through research contracts.

The high staff turnover also required substantial investments in training. Every year, CRF spent 4% of its revenues on training activities for entrant engineers and on continuous education programs for more experienced staff. CRF relied on ISFOR (Institute for the Development of Employees' Professional Training), the Fiat Group's internal training unit, but researchers were also invited to join the Massachusetts Institute of Technology and other well-ranked university internships programs and summer schools. It is interesting to note that R&D managers were asked to explicitly include junior researcher training among the project objectives reported in the "project sheet" and were also evaluated on the basis of their ability to meet this goal.

Discussion and Conclusions

Ever since Henry Chesbrough's early works, open innovation has been presented and discussed as an emerging strategic approach to innovation management. It has been demonstrated that, on its outbound side, open innovation allows a firm to find new markets and exploit opportunities for those proprietary technologies that do not fit its current business model, thereby avoiding the risk of obsolescence and improving the return on the firm's investments in R&D and technology development. On the inbound side, open innovation allows a company to profoundly specialize in a narrow base of technologies and competencies while simultaneously relying on external sources of technologies to complete its competence base and to master cross-sectoral innovation dynamics. Researchers have clearly shown that open innovation does not merely entail outsourcing R&D and technological innovation; rather, it entails that the firm be willing to move from a closed to an open innovation approach to heavily invest, or at least maintain, the human and financial resources internally devoted to R&D and innovation. This is required to build the level of absorptive capacity³¹ necessary for the integration of externally acquired knowledge and technologies.

Noteworthy, however, is that CRF and other well-known early adopters of open innovation (e.g., IBM and Procter & Gamble) conformed to it in response to a major economic recession or crisis that determined substantial rationalization and cuts in R&D and innovation expenditure. This suggests that open innovation can be a strategic approach to protect a firm's technology base from the risk of severe resource rationalizations during periods of crisis, and in conferring it technological and networking capabilities that are likely to become key determinants of its competitive advantage once the downturn is over. Fiat and CRF's history throughout the 1990s has clearly indicated this.

The CRF case, under the leadership of Mr. Michellone, also suggests that the most important driver of the successful transformation from a closed to an open approach to innovation is perhaps a committed, visionary, and passionate champion. As noted by Chesbrough and Garman,³² the critical role played by the senior executive leadership in promoting the transformation of the firm's

BOX 4: Year 2005—New Challenges, New Management

The new millennium started with yet another setback for Fiat, with the Group posting its last net profits in 2001. After 2001, losses stemming particularly from the automotive business started to accumulate. The same company that in the 1980s and 1990s was a candidate for the number one car manufacturer in Europe, in 2004 it held only a 7% share of the continental market.

In that year, however, a dramatic shift in management took place. Chairman Umberto Agnelli, brother of the Fiat Group's patriarch Gianni Agnelli, passed away in May and the CEO Giuseppe Morchio suddenly left. A new Chairman, Luca Cordero di Montezemolo, was called in from the Ferrari subsidiary, and Sergio Marchionne was appointed as new CEO. The same business press that today salutes Marchionne's incredible turnaround in those days saw no future for Fiat as an independent car manufacturer.

As for Centro Ricerche Fiat, the internal crisis of the new millennium put Gian Carlo Michellone's safety nets to the test. CRF had clearly insulated itself from the Group's destiny, since less than 50% of CRF's total budget was covered by the Fiat Group or its subsidiaries in 2002. CRF was therefore able to confront such uncertain times with less anxiety and many of the technologies developed during the 1990s have contributed to Fiat's comeback.

Under Mr. Marchionne's tenure, a new management was called to guide CRF through yet another transition. The automotive business started to perceive a new centrality for its investments in innovation, and the strategic indication for CRF was to focus more on the requests from the Fiat Group. As a result, in 2006, corporate orders were back to over 70% of the R&D center's budget. In the same year, Mr. Michellone resigned to become the President of AREA Science Park, the largest public Italian R&D center. It is today too early to say whether this new approach will ensure CRF the same energy that the strategic orientation adopted during the 1990s did, or whether it will enable them to get through the current generalized economic downturn without losing control of critical technologies and bodies of knowledge. Nevio Di Giusto, the current CRF Chief Executive Officer, explains: "The early 1990s downturn severely struck Fiat and the automotive industry, but it was not a generalized, global recession. The overall economic context was much more favorable in comparison with today's downturn and thus pursuing an open innovation strategy was feasible since CRF's technologies could find applications in industries others than the automotive. Today's crisis hits many industries and geographical markets, this explaining the rationale underlying Fiat's choice to reorient CRF's innovation activities toward the Group's needs." How much R&D an automotive OEM should conduct in house remains an open question. The decision to re-focus CRF on the needs of the Fiat Group and its subsidiaries requires monitoring and paying particular attention to the magnitude of the payoffs Fiat will be able to reap from its R&D investments in the years to come.

innovation strategy towards open innovation becomes essential during tough economic times.

A successful transition to open innovation seems to go hand in hand with the need to assign the responsibility of managing and nurturing external relationships to a dedicated function (which is permanently staffed with people

who combine technical, legal, and marketing competencies) and/or establishing specific brokering and gate-keeping organizational roles. This took place in CRF with the creation of the DEI division and with the introduction of the CAEIs, which served the purpose of better focusing CRF's resources and efforts toward the achievement of external innovation goals and preventing a lack of commitment as a result of everyday activities.

The CRF case also exemplifies the importance of using the business model lens with which a technology can be converted into value when applying the open innovation approach.³³ In order to improve CRF's competitiveness in external technology commercialization, each researcher was urged to think of the production, business, and intellectual property implications that the transfer of a technology was likely to have. This was achieved through the introduction of a management control system that required each researcher to formalize the dimensions of the technology's business model in the Output Sheet.

The experience of CRF also suggests that the effectiveness of external technology exploitation can be enhanced through the transfer of researchers who worked on the innovation project that ultimately resulted in the technology being sold. This appears to be an effective means to smoothly transfer the tacit dimensions of the technology and to lessen the Not-Invented-Here syndrome that often prevents the recipient organization from making the most of it. However, systematically using individuals as a vehicle for the external commercialization of innovation is likely to have significant drawbacks on the firm's ability to fully appropriate its technologies. This risk could be avoided, however, with careful planning and management of staff turnover to reduce the undesired and potentially critical leakages of distinctive competencies.

This article has demonstrated how the strategic and organizational change undertaken by CRF in the 1990s, which anticipated many of the underpinnings of the open innovation paradigm, allowed the R&D center and the Fiat Group as a whole to go through a major downturn without losing control over critical bodies of knowledge and without interrupting the development of very promising technologies. It also prepared Fiat for the changes in the R&D and innovation processes that ultimately occurred in the 2000s in the automotive industry, placing it at the center of a huge network of inter-organizational relationships that have become key for the rapid and efficient development of new automotive platforms.

After his appointment to CEO in 2004 (see Box 4), Sergio Marchionne was able to capitalize on Mr. Michellone's work during the 1990s. First, he was able to take the fuel-efficient engine technologies developed by CRF off the shelf (they had remained almost unnoticed by the Fiat Group's top management between 2000 and 2004, during the years of the GM partnership) and to extract value from them for the high-volume, low-segment carmaker that Fiat is, focusing on forward-facing activities such as design and creating strong brand identity. Second, he leveraged on the network of inter-organizational relationships established by CRF to create new alliances and reinforce old ones, with the aim of developing platforms for new car models and achieve significant scale effects in a timely and cost-efficient way.

In conclusion, while Fiat's dramatic turnaround during the second half of the 2000s is the result of a complex combination of strategy, leadership, brave choices, and favorable conditions, in the entire story of Fiat's recent comeback, R&D and open innovation have played a remarkable role. Moreover, the following major implications can be inferred and generalized from the CRF case:

- *Open Innovation as a Bifocal Strategy during Tough Times*—Open innovation is a strategy that balances the need to stay focused when only meager resources are available and continue investing in the company's future. "Short-termism" during a downturn may allow a company to survive through tough times but also leads to a weaker recovery and ultimately undermines a company's fundamental sources of competitive advantage. Open innovation is a bifocal strategy, in the sense that it can strengthen operational efficiency and also preserve and enhance R&D effectiveness.
- *Tough Times Require Tough Leadership and Anticipation*—Consistent with that suggested by literature on strategic change, external circumstances—even dramatic ones—can trigger fundamental reforms and furnish leaders with the blank checks they need to operate. As Giancarlo Michellone loves to state, "As Italians, we do better when we are cornered with no other way to go than up!" Nevertheless, good leaders need time to accomplish what they set out to do. As Jim Collins suggests,³⁴ the "wake up call" might come too late for companies to act. The CRF case is consistent with this notion: open innovation is not a firefighting strategy. The seeds of the transition from a closed to an open innovation process were planted long before internal resources started to decline. Time is necessary to build up reputation and a network of external customers and partners, to negotiate research contracts, and to implement reforms.
- *Micro-Tuning and Adaptation for Macro-Change*—Implementing the transition to open innovation is a shift resulting from changes in human resource management, project planning and administration, marketing of technology, and organization layout. In spite of detailed planning, a struggle is implicit in implementing open innovation, and in particular to re-defining priorities for change. Managers have to master various new dimensions that previously were not part of the set of competences needed to run an R&D lab and are now central to planning and allocating resources and to redefining the way forward.

Notes

1. According to the agreement, the U.S. Treasury Department committed itself to immediately contributing \$3.3 billion to the plan, with an additional \$4.76 billion in future loans to keep Chrysler running for years. Fiat, under the agreement, has acquired a 20% stake in Chrysler (with the option to acquire up to 51% in 2013, after the largest parts of the Treasury debt have been refunded).
2. A recent report from a congressional panel raised doubts on whether all loans made to Chrysler by the Treasury Department will be fully repaid and said it is likely that it will take years for Chrysler to turn into profitability. M. Thiruvengadam, "Auto Makers Unlikely to Repay Loans Fully," *Wall Street Journal*, September, 10, 2009.

3. S. Marchionne, "Fiat's Extreme Makeover: My job as CEO is not to make business decisions—it's to push managers to be leaders," *Harvard Business Review*, 86/12 (December 2008): 45-48.
4. The 1.3 Multijet diesel engine is acknowledged by industry analysts as one of the main factors underlying the market success of the new car models launched since Sergio Marchionne's appointment as CEO of the Fiat Group. Introduced for the first time in the city car Punto in 2003, the 1.3 Multijet was awarded the "Engine of the Year" prize in 2005. The Multijet engine also powers a very large portion of the new Fiat Cinquecento, the best-selling city car launched by the Italian automaker in July 2007. Of the 93,270 Cinquecento sold in Italy in 2008, more than 25,000 featured a Multijet engine. The 1.3 Multijet already complied with the Euro 5 standard in 2007, two years before it became compulsory at the European level. As a sign of its commitment to improve fuel efficiency and reduce energy emissions, Fiat was the European carmaker whose product range was characterized by the lowest average CO₂ emissions in both 2007—with 137.3 g/km—and 2008—with 133.7 g/km. A. Michaels, "Technology to the Rescue," *Financial Times*, March 4, 2008; ANFIA, "Studies and Statistics, Italian Market—2009," October 22, 2009; JATO Dynamics, "JATO Consult CO₂ Report—2009," October 22, 2009.
5. H. Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from Technology* (Cambridge, MA: Harvard Business School Press, 2003).
6. H. Chesbrough and A.R. Garman, "Use Open Innovation to Cope in a Downturn," *Harvard Business Review*, Web Exclusive (June 2009): 1-9.
7. O. Gassmann, "Opening up the Innovation Process: Towards and Agenda," *R&D Management*, 36/3 (2006): 223-226. J. West, W. Vanhaverbeke, and H. Chesbrough, "Open Innovation: A Research Agenda," in H. Chesbrough, W. Vanhaverbeke, and J. West, eds., *Open Innovation: Researching a New Paradigm* (Oxford: Oxford University Press).
8. Chesbrough and Garman (2009), op. cit., p. 2.
9. The ratio between external and overall CRF revenues in 2001-2004 would be as high as 70% if we consider that a substantial share of the revenues classified as resources from the Fiat Group and subsidiaries (about €30 million per year) in fact came from GM (Fiat's partner at the time) but had to be negotiated by CRF at market conditions with the U.S. automotive player.
10. See Figure 3, which shows that from 1993 to 1994 the annual revenues from external customers and EU projects increased by a factor of three, from €6 million to about €17 million, which almost totally compensated for the declining resources coming from the Fiat Group (see Figure 1).
11. L. Ciferri, "Common-Rail Diesel for Everybody," *Automotive News Europe*, February 12, 2001, pp. 14. Mr. Michellone resigned to express his disappointment with the Bosch deal (his resignation was not accepted). Before signing with Bosch, Fiat Group's senior executives talked with the controlled automobile, industrial vehicle, and component subsidiaries, and they all recommended selling the Common Rail system on the grounds that either the technology was at a too early stage, or that Fiat did not have (and could not build) the complementary knowledge to apply this technology internally. While CRF and Mr. Michellone strongly opposed this view, the corporate level decided to give the green light to the technology transfer project.
12. "Fiat Aims High with Powertrain," *Ward's Auto World*, 41/5 (May 2005).
13. G. Hamel and C.K. Prahalad, *Competing for the Future* (Cambridge, MA: Harvard Business School Press, 1994).
14. Traditionally, corporate legal departments managed the largest part of the Fiat Group's patenting activity. In 1993, CRF held less than 100 international patent families, whereas in 2003 this number rose to 500. In 2006, CRF was the first company in Italy in terms of patent filings presented at the European Patent Office. During the period 1999-2006, CRF ranked 2nd in Italy for the number of patents (461) filed at the European Patent Office (Telecom Italia SpA ranked 6th with 150 patents and Pirelli Pneumatici SpA 4th with 252 patents). Since 2005, CRF has also been the second largest Italian assignee of U.S. patents, with approximately 40 patents granted per year.
15. J.L. Davis and S.S. Harrison, *Edison in the Boardroom* (New York, NY: John Wiley & Sons, 2001).
16. T. Levitt, *The Marketing Imagination* (New York, NY: The Free Press, 1983).
17. G.C. Michellone, "Scienza dell'organizzazione: Limiti e Nuove Sfide," *ATA—Ingegneria Automotoristica*, 48/12 (1995): 675-684.

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