KEYWORDS alliances | innovation ecosystem | project management skunkworks

From the management of innovative projects to the INNOVATIVE MANAGEMENT OF INNOVATIVE PROJECTS: AN ANALYSIS WITHIN THE AUTOMOTIVE INDUSTRY

Sylvie Mira Bonnardel
Assistant Professor,
Ecole Centrale Lyon
sylvie.mira-bonnardel@ec-lyon.fr

Danielle Attias
Professor Ecole Centrale Paris
danielle.attias@ecp.fr

Carole Donada
Professor Essec Business School
donada@essec.edu

ABSTRACT

Embedded in technological, economic, and social transformations, project management has had to cope with a palpable extension of its perimeter. Until recently, project management was centralized within a single organization. It is now, however, opening towards a moving business ecosystem framed with more or less successful partnerships linking cooperative and competing companies. Consequently, project management needs to be renewed. Our research aims at explaining some of the mutations of project management by considering current practices in the automotive industry. The automotive industry is facing the most challenging technological and strategic changes ever experienced since Ford, which leads us to believe that understanding the nature of project management in this industry may be a great asset for other sectors as well.

INTRODUCTION

The automotive industry has always been an industry that has fostered the emergence of new industrial management models, including the productive system innovations introduced through Fordism at the beginning of the twentieth century; the innovations introduced by Toyota's Total Quality Management in the 1980s; or the project management innovations leading to concurrent innovations popularized by Renault with the Twingo project in the 1990s. In these early years of the twenty-first century, project management in the automotive industry finds itself shaped by two major and dominant trends. On the one hand, the management of innovative projects is no longer couched within one single company or within its supply chain, but rather is part of a set of industrial partnerships within an increasingly broader ecosystem. On the other hand, this expansion of the scope requires a different type of project management, which, because it is based on the logic of open innovation, raises the issue of how automotive manufacturers can capture the value they create.

Whether it be for connected cars or electromobilty, a significant number of flourishing collaborations are being set up. Such collaborations bring together a wide range of diversified partners *(i.e., car manufacturers, car equipment manufacturers, telecommunication manufacturers, mobile phone operators or even digital companies, local governments and public authorities, etc.)* in a constantly evolving ecosystem.

According to a report published by KPMG[1] *(2010)*, 68% of the major actors in the automotive sector focus on developing innovation through strategic alliances or through the establishment of joint ventures between car manufacturers and car equipment manufacturers. Car manufacturers are already familiar with the specificities of managing projects outside their usual field of activities, and have been for decades, but this is because they have understood the need to mobilize the resources and skills that their car equipment manufacturers already possess. What is now happening is that innovation strategies are being set up within a patchwork of diverse and open systems, built around schemes of cooperation and partnerships involving multiple stakeholders. Such stakeholders include suppliers, distributors, research centers, public authorities and local governments, regulatory authorities, and, of course, competitors. All of these stakeholders operate under a competition-cooperation dynamic, which Bradenburger and Nalebuff *(1996)* have described with the neologism "co-opetition." Co-opetition gives to its members both the benefits of competition, such as stimulation or team motivation, and of cooperation, such as

1 KPMG Study (2010) on the 200 major car manufacturers, car equipment manufacturers, and automotive distributors worldwide.

access to resources, skills, and extended markets *(Brandenburger and Nalebuff, 1996; Bengtsson and Kock, 2000)*.

Co-opetition strategies, which first came into being in high-tech industries *(i.e., Apple and Samsung, Sonny and Ericsson, etc.)*, have now spread to most industries *(Yami and Leroy, 2010)*. The spread of co-opetition strategies is evident, for example, in the Global Hybrid Cooperation, a co-opetition agreement between General Motors, Daimler/Chrysler, and BMW for the development of a joint hybrid system, or the Hybrid Synergy Drive ecosystem, a co-opetition between Toyota and Renault/Nissan.

Today, the successful co-opetitions are those based on strategic communities, which are usually referred to as business ecosystems *(Moore, 1993)* or innovation ecosystems *(Iyer and Davenport, 2008)*.

Studies concur that cooperations can be beneficial to participating strategic communities, insofar as they are drivers for cross-fertilized product/service innovations *(Julien, 2000)*. However, the implementation of project management strategies adapted to innovative projects remains very restricted by both the political and economic climate and the strategic goals of each stakeholder in terms of retaining the value that is created.

This is why the alliance between PSA Peugeot Citroën and General Motors, which was announced as a "Global Strategic Alliance," had to face a significant range of challenges and pressures that ultimately prevented the cooperation from growing into a lasting, sustainable collaboration. Numerous other experiences of co-opetition illustrate just how challenging it can be to implement this kind of joint synergy, and the extent to which it is subject to the evolving contexts of the partnering firms.

In fact, in an environment that is undergoing challenging technological and social transformations, original equipment manufacturers, like automobile manufacturers, are faced with key disruptive strategic choices to maintain their position as major players in innovation ecosystems and to recoup a large part of the value for themselves. One possibility available to them is to refocus their projects on key radical innovations, with a limited number of partners and project-based management modes. In this context, the skunk management mode opens new opportunities. This mode consists in entrusting the project to a fully independent team, who are all sworn to absolute secrecy for the full duration of the project, as is the case for Google X Lab, Apple, and a few units of General Motors US, for example.

The aim of the present document is to offer a better understanding of the new approaches to project management that are being implemented in today's changing automotive industry. We will explore the characteristics of these profound changes in order to reshape existing practices and define modernized project management modes that are aligned with the strategic configurations of the firms involved.

The first section will offer an overview of the body of theoretical work that has helped provide a better understanding of the transformation of the strategic contexts stemming from the development of inter-organizational networks. In section two, we will explore the configurations specific to the automotive industry, the management of partnerships, and the evolution of project management practices in these new strategic contexts. Finally, we will discuss the impact of these changes on a modernized project management mode.

1. Business ecosystems and innovation dynamics

1.1 From partnerships to ecosystems

As early as 1986, in a seminal article titled "Networks: between Markets and Hierarchies," Thorelli underlined the benefits of network-based structures, describing them as governance modes that are at the crossroads between market and hierarchy. Network-based organizations and their less formalized structure, with less strictly defined borders than traditional structures, are better suited to the modern conditions of competitiveness thanks to their flexibility and reactivity. Livian *(1998)* saw them as new "ideal type," of governance echoing Fréry *(1997)* who argued "the large, capitalist and integrated organization was only an episode in history *(...)* which now seems to be over."

The supremacy of networks as governance modes was reinforced by the re-composition of the value chains and the externalization of activities to increase the flexibility and reactivity of companies *(Rugman and D'Cruz, 1997)*. It has not taken much time for networks to be considered the best organizational structures to create the conditions that foster the emergence of a collective intelligence, thereby creating learning crucibles that foster innovation *(Jacob, Julien, and Raymond, 1996)*. At the same time, Moore offered another theoretical view on inter-organizational relations by introducing the notion of the "business ecosystem," drawing from a biological metaphor in two major publications: "Predators and Preys: a new Ecology of Competition" in 1993 *(for which he was awarded the McKinsey Award for the best article)* and then his book "The Death of Competition" in 1996.

The notion of business ecosystems has since become the subject of empirical research. For example, Brasseur and Pick *(2000)* examined Silicon Valley companies; Gueguen, Pellegrin-Boucher, and Torrès *(2004)* studied the software sector; Pellegrin-Boucher and Gueguen *(2005)* analyzed SAP; and Isckia *(2006)* described Amazon's ecosystem. These different examples show the extent to which the notion of business ecosystems is now firmly anchored in management and represents an empirical reality, i.e., the proliferation of relationships, interactions, and business networks in the global economy *(Word, 2009)*. Business ecosystems are generally seen by the scientific and economic community as the set of relations between heterogeneous actors *(companies, public, and/or private organizations)*, motivated by a desire or need to pool resources, and driven by a joint vision that entails the development of shared skills *(Moore, 1996; Torrès, 1998)*.

Most publications on business ecosystems offer a similar definition:

> An economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world. The economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders. Over time, they coevolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments, and to find mutually supportive roles (Moore, 1996; p26).

The notion of ecosystem is used in reference to an enlarged environment, in which heterogeneous actors equipped with specific skills are likely to be involved—to a greater or lesser extent—in a collective process of value creation conducted by one of them.

Therefore, the strategies implemented within business ecosystems vary depending on the position occupied by the stakeholders. Iansiti and Levien *(2004)* identified the following four types of actors: "niche players," who are specialized in specific skills; "dominators," whose primary goal is to control the network; "hub landlords," who act as liaison actors, foster extensions, and generate communication nodes; and "keystones," leading stakeholders who orchestrate the cooperation and who "must constantly manage the tension between creating and capturing value" *(Isckia, 2010)*.

The notions of ecosystem and competition are not opposed because above and beyond the notion of cooperation strategy that is consubstantial with business networks, there is always competition between the actors to lead the network and a high level of inter-ecosystem competitiveness *(Gueguen and Torrès, 2004)*.

Many studies agree on the benefits of ecosystems for the added value, learning, and innovation outputs *(Iansiti and Levien, 2004)*, and national economic performance. For example, French authorities have officially acknowledged that the establishment of specific business ecosystems, namely "competitiveness clusters," directly contributed to the creation of companies and jobs in the country *(Dambron, 2008; Blanc, 2004)*.

Through their work on electromobility, Donada and Attias *(2013, 2015)* and Donada and Fournier *(2014)* showed that the automotive industry has entered a new era, where the creation of value is fully part of the dynamic of relations within an innovative ecosystem that is open to mobile borders in long-term relationships. These contributions discussed the complexity of the organization and management of innovation processes in such a context, and the need to design new governance modes that are both innovative and suited to the realities of the industry.

When the development of innovation is inscribed in an open-innovation logic *(Chesbrough, 2003)*, innovative projects are anchored in a different context that calls for new game rules. Such development also raises new strategic questions pertaining to industrial property, value creation strategies, market differentiation, and, ultimately, capturing added value. Consequently, the success of project teams depends primarily on

the organizational and operational management of the cooperation: "each partner must adapt to be able to benefit fully from the pooled resources and skills while ensuring the partner is not helped to an extent that would be to their own detriment" *(Fernandez and Le Roy, 2013)*. While co-opetition does offer many of the benefits of cooperation, it is also characterized by a significant number of risks *(Park and Russo, 1996)*, including the imbalance in capturing the created value.

1.2 Business ecosystems: a breeding ground for open innovation

An increasing number of actors see the dynamic of ecosystems not only as an essential breeding ground for innovation, but also as the *raison d'être* for ecosystem-based networks; in fact, in many cases such actors no longer refer to "business ecosystems," but rather to "innovation ecosystems" *(Iyer and Davenport, 2008; Miller and Olleros, 2008)*.

To support this assertion, Iyer and Davenport analyzed Google's innovation ecosystem, in which Google plays the role of the keystone company *(Iansiti and Livien, 2004)*. In this case, the innovation capacity is multiplied n times by the n number of stakeholders of the ecosystem, each of which generates value to their own benefit and to that of the ecosystem and its leader.

Understanding Google's ecosystem-based strategy is key for automotive manufacturers. The issue of a driverless, connected car on the one hand, and the role that Google can play in the automotive industry on the other hand, is the cornerstone of new strategies. Clearly, Google hopes to revolutionize the mobility industry, both through its command of software and 3D mapping—which required massive investments on its part with the development of Google Maps and its more recent purchase of Skybox Imaging, the only company in the world with several 3A imagery satellites—and its ambitious business model, which is based on the provision of free, driverless cars and rooted in the concept of car-sharing. This strategy is destructive for today's automotive sector, and

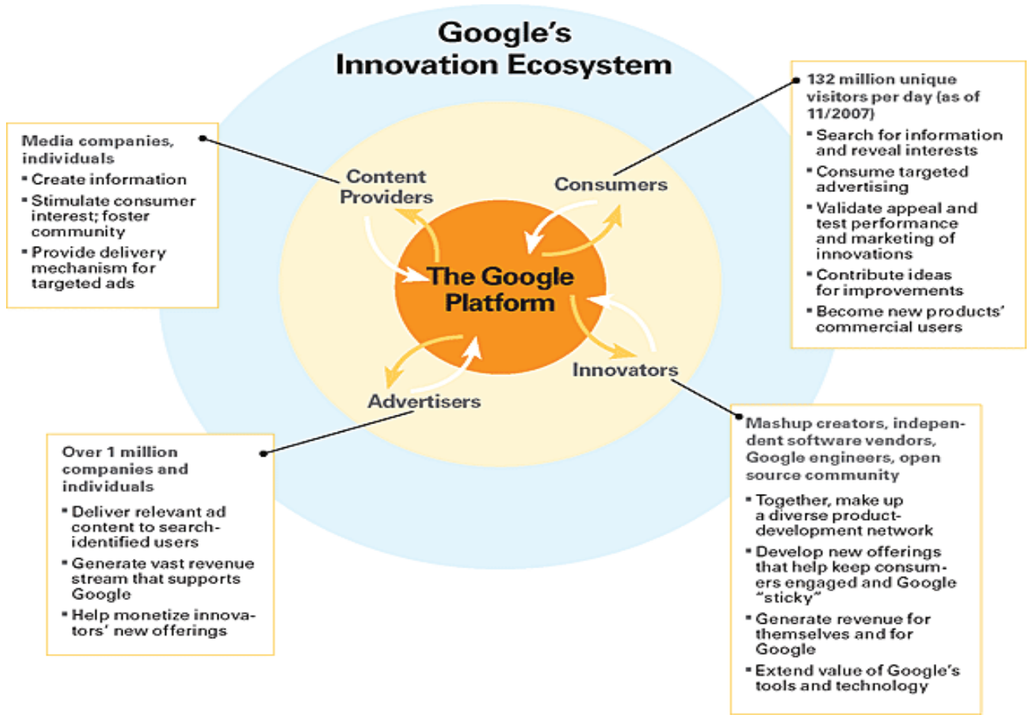


FIGURE 1 . *Google's Innovation Ecosystem - Source: Iyer and Davenport (2008)*

the American giant Google does have the financial resources to find the necessary investments to launch the industrialization of its project. With the announcement that its 25 Google Cars have traveled one million kilometers, Google has already demonstrated it is ahead of its competitors *(Cazenave, 2014)*.

A study of the ten largest car manufacturers in the world[2] conducted by Ramirez-Portilla, Brown, and Cagno *(2014)* demonstrated that these companies have all considerably increased their open-innovation practices since 2005 by developing a multiplicity of partnerships in order to innovate. Vertical relations, namely between customers and particularly innovation-prolific suppliers in the automotive sector or equipment manufacturers, have long engendered partnerships characterized by a strong innovation capacity. Vertical relations are now being complemented with horizontal relations with co-opetitors *(GM and PSA, Renault and Fiat, PSA and BMW, etc.)* and with complementors *(such as Tesla or Google or even Spotify, which has partnered with Ford, for example)*.

Studies carried out on Italian *(Di Minin et al., 2010)* and German manufacturers *(Ili et al., 2010)* underline the considerable impact of open innovation on the performances of the companies under study. Open innovation can take different forms, including joint research, an online portal for ideas, virtual market shares, and sourcing innovative technologies.

Open innovation operates by bringing different actors closer together so that they are interacting on the basis of a partial convergence of interests and goals within a labile ecosystem, where each actor also follows their own individual strategy. This increased closeness in relationships does not make for a tension-free context. While the need to work together in order to generate more value is the motor of this type of cooperation, the possibility of capturing value can entail major tensions that are likely to undermine the success of the cooperation *(Bengtsson and Kock, 2000)*. Iyer and Davenport *(2008)* also underline the existence of tensions:

- ecosystem-oriented innovators strive to avoid the appearance of competition by claiming to help everyone. For example, Google executives seldom miss an opportunity to remind the world that they don't compete with media and content companies. Instead, they characterize media companies as their partners. Not everyone is so sure.

In fact, ecosystems, including both business ecosystems or innovation ecosystems, are not the fruit of a communitarian dream because they often bring together companies who are competitors: they are competitors at least in terms of markets, if not also in terms of the position of leader within the ecosystem *(as is the case, for example, between Google and Microsoft, Apple and Samsung, or even Microsoft and Linux)*.

Business ecosystems raise the question of control and leadership within the cooperation, with the underlining challenge of constantly balancing competitiveness and cooperation. Today, companies have created co-opetition spaces, combining both collaboration and competition, in configurations ranging from a simple or complex dyadic co-opetition to co-opetition within a complex network *(Le Roy, Yami and Dagnino, 2010)*. This new type of partnership requires a fresh look at project management structures, organization, and modes in order to adapt them to this dual situation.

1.3 From open project management to skunk project management

Analyzing the tensions between competition and cooperation in the light of game theory enabled Nalebuff and Bradenburger *(1996)* to popularize the notion of "co-opetition," which, according to these authors, was initially coined by the founder of Novell, Ray Noorda, in the 1980s. This new co-opetive configuration raises a number of issues: for example, the adaptation of innovation strategies of large firms *(Baumard, 2007)*; the management of collective skills *(Prévot, 2007)* or the management of processes within co-opetition structures *(Pellegrin-Boucher and Fenneteau, 2007)*; and the issues of project management in particular.

The competition-cooperation dialectic depends on one of the founding principles of the notion of 'system' and the issue of balance. Business ecosystems are not stable systems. Through a wide range of modalities, including balance, reproduction, and learning, they develop an ability to resist entropy. As a result, rather than being dictated by programming, this ability to resist entropy enables flexibility, adaptation, and goal-based management. Organizations that are at the heart of these business ecosystems "must maintain their ability to alternate collective and competitive strategies *(...)* Implementing and

2 Car manufacturers in this study are as follows: Ford, Toyota, Renault, Scandia, Daimler, Hyundai, Dong Feng Motor, Tata, BMW, and Fiat

maintaining a specific strategy can only help stabilize the environment of the firm for a very limited time" *(Pellegrin-Boucher and Guegen, 2005)*.

Motivations for cooperating with a competitor are unambiguous and are driven by a resource-based logic: the goal is to benefit from positive externalities by gaining access to resources that are not available in the company but which have been fully mastered by another company. If this company is not a competitor, then this leads to the establishment of customer-supplier or complementor-type relationships. However, quite often, the more complementary a company is, the more of a competitor it is. Partnering with a competitor through a co-opetition strategy comes with the underlying risk of resource pillaging, thereby leading to a high-risk paradox: the more committed a company is to a partnership with a competitor, the more it benefits from what the latter brings to the table; however, it also runs a higher risk of seeing its own resources and skills being pillaged *(Fernandez and Le Roy, 2010)*.

As a consequence, cooperating with a competitor requires rethinking the structure and management modes of projects by devising schemes designed to protect strategic resources. Furthermore, managerial schemes that can integrate the paradox of co-opetition, and turn cooperation with a competitor into a true lever of performance for the project, are also required.

Fernandez and Le Roy *(2013)* developed the Équipe Projet Coopétitive *(EPC)* concept, translated as "Co-opetive Project Team". Their analysis of a joint innovation program between Astium *(a subsidiary of Airbus)* and Thales Alenia Space *(a subsidiary of Thales)* explored how two competing companies managed co-opetition through the operational management of the project by doubling critical positions: with a joint project management and a joint project leadership. However, the management of the team by the EPC with double positions and redundant resources does not constitute an optimal situation in terms of efficiency, nor is it applicable to contexts where resources are limited.

Given the inherent challenges of partnerships based on co-opetition, another project management mode for innovative projects is becoming increasingly widespread within innovative companies: the skunk mode, also known as skunkworks.

Roger *(2003)* defines skunkworks as an environment that is intended to help a small group of individuals to design a new idea by escaping routine organizational procedures and managing their own budget, and where the single mission is to innovate. Such a team comprises the most competent, handpicked individuals and is equipped with specific resources. Any progress achieved is kept secret, and is only unveiled when the innovation objective has been reached. This skunk-based project management logic, which is an extension of the work initiated by the advanced project team of the American firm Lockheed during World War Two, is now very widespread in high-tech companies, such as Google or Apple. Today, good examples of skunkworks are those managed by Google X, Google's ultra-secret research lab that has generated innovations such as Google Glass or the Google car.

By using the skunk-based project management mode, companies seek to design new products that not only position them far ahead of their competitors, but also focus intensely on design and customer orientation *(Bennis and Biederman, 1997)*. This skunk mode removes teams from regulations and organizational routines, disrupts hierarchies, and fosters the development of an intrapreneurial logic, which in turn generates a considerable level of stakeholders' commitment *(Hisrich and Peters, 2002)*. The rapid execution of the Lockheed project *(43 days to design a prototype for a new, very innovative plane)* demonstrates how skunk-based project management implies a willingness to accelerate the pace of the development of innovations.

This means that innovative project management is now at the crossroads of the following two primary innovation trends:

- on the one hand, they are embedded within inter-organizational and multi-layered networks within dynamic ecosystems that bring together a variety of actors on increasingly open digital platforms;
- on the other hand, the setting up of project teams comprised of people with selected competence profiles based on specific expertise, which are managed secretly, independently, and with dedicated resources, based on the skunkworks mode.

Based on these considerations, we wanted to further understand how companies integrate these two trends into their project management practices for innovative projects, and in the automotive sector in particular. This sector is undergoing important transitions with the introduction of new technologies that will radically reconfigure the ecosystem, as is the case, for example, with Toyota's hydrogen motor or Google's driverless car.

The next section will focus more specifically on the analysis of the choices made by two emblematic French car manufacturers, Renault and PSA Peugeot Citroën, both in the management of their respective major alliances and of their innovative projects.

2. Strategic choices and project management by French car manufacturers

2.1. Methodology

In terms of methodology, as Head of the Armand Peugeot Research Chair, established in 2011 jointly with the PSA Peugeot Citroën group, we were granted direct access to the firm. The Armand Peugeot Research Chair is a member of the group's StelLab network. The Science Technologies Exploratory Lean Laboratory *(StelLab)* was founded in 2010 to oversee scientific partnerships and coordinate the group's research OpenLabs. StelLab is responsible for leading an interdisciplinary network that fosters discussion and dialogue among scientists and experts from PSA Peugeot Citroën. Its task is to identify and develop the new technologies and innovative business models of the vehicle of the future.

Over the last three years, together with StelLab, we have organized research seminars, workshops, and international conferences on the economy of electromobility and hybrid technologies. This enabled us to hold several interviews at different times with the executive managers, who oversee the skunkwork Hybrid Air project, and with the executive scientific directors of the group, who provided information on a number of partnerships established by PSA over the years, such as the alliance between PSA Peugeot Citroën and IBM. We were also able to benefit from other exchanges during conferences organized in the context of research seminars *(February and June 2013)* and the StelLab *(November 2013 and 2014)*.

In addition, we referred to a series of recorded interviews on the genesis, development, and success of the Hybrid Air project carried out by a student working on his Masters thesis.

Finally, we also examined secondary sources, such as activity reports and press articles on the marking events of the alliances under study.

2.2 Strategic alliances for innovation: between opportunities and constraints

When discussing the successful alliances between car manufacturers, the Renault-Nissan alliance is often referred to as an efficient and sustainable co-opetition model. This alliance, established in 1999 amidst general skepticism, is still prosperous and strong, when other cooperation frameworks from that same period failed. There is a long list of attempted partnerships or unions that have failed, including the Daimler-Chrysler partnership, Fiat and Chrysler, Fiat and General Motors, Volkswagen and Suzuki, etc.

When questioned about the success of the Renault-Nissan cooperation, Carlos Ghosn, the founding member of this alliance and currently the CEO of both car manufacturers, shared some of the factors that contributed to the success of the construction of a sustainable cooperation-competition relationship[3]. In his opinion, mutual trust among partners is primordial, whereas mergers and acquisitions, which supposes the predation of one strong partner over another, weaker one, act as a foil. The coming together of personalities who shared a desire and willingness to develop this closer relationship played a major role in the success of the co-petition.

Another element that needs to be underlined is the respect of cultural differences and of the diversity of the identities that make up the French and Japanese carmakers. In the book Citoyen du monde, Ghosn and Ries *(2003)* promote a complementary cultural approach, which enabled the co-construction of a shared identity. They also underline the importance of the mutual respect of cultures and a fortiori of management modes, which might be implemented in different ways on either side of the alliance. Beyond the multicultural dimension of the project management, the alliance also called for project management that was "innovative in its methods." In fact, as early as 2005, Ghosn advocated for the commitment and consensus of all the people involved throughout the company, which

3 French weekly magazine L'Usine Nouvelle, 28 février 2012

he believed was critical to the partnership's success. This required a commitment that would be concretely expressed and communicated within both Nissan and Renault. Furthermore, the head of the company should lead by example and be as committed as his employees[4].

Moreover, whether it was out of precaution, intuition, or pure strategic rationality, it was decided that the alliance would be implemented step by step. So, in the Renault-Nissan case, the strategy was initially based on a balanced distribution of world markets, with Renault focusing on Europe and Latin America, and Nissan on Asia and the US. Subsequently, it focused on developing strong synergies through joint procurement by pooling platforms, parts, and techniques; this was later extended to logistics and marketing. Fifteen years later, no other alliance in the automotive sector has survived so long.

With the establishment of the "Global Strategic Alliance" in 2012 by General Motors and PSA Peugeot-Citroën, it was described as a strategic Franco-American cooperation to work on joint programs for the development of vehicles. It foreshadowed the reshaping of the global automotive industry. An alliance between an American and a French market leader had the potential to disrupt the European automotive market and, by extension, force other carmakers worldwide to adopt a different positioning. The initial idea for this alliance was similar to that of the Renault-Nissan alliance. It was based on cross manufacturing cars and joint purchasing and logistics. The previous attempt to form a major strategic alliance between PSA and the Japanese firm Mitsubishi had failed, so this new alliance was eagerly awaited by the French firm, hoping it would create a new commercial synergy and provide financial support. A year and a half later, the alliance was sidelining to pave the way to another alliance between PSA and the Chinese group Dong Feng[5].

What lessons can be learned from these successes and failures? Why do car manufacturers initiate new partnerships immediately upon the death of their previous ones? Ultimately, do these strategies pay off?

In order to answer these questions, we will first analyze what differentiates these strategies from one another, as well as what differentiates the economic and financial contexts in which they evolved. The PSA-GM alliance was set up in a very difficult economic and social context. The European automotive market was suffering a severe downfall in 2012 *(-6 % sales)*. During that year, PSA's sales dropped by 7.7% and GM's dropped by 15.6%. Both manufacturers suffered substantial operating deficits following the decreased sales in the European market and faced an overall declining profitability. Furthermore, both had over-capacity problems that weakened the alliance; this was the case for the Aulnay factory in France for PSA and the Bochum factory for Opel *(a GM subsidiary)* in Germany[6].

Moreover, the recession in Europe at this time with a GDP between 0.4 % and 1%, had a direct impact on private demand, which in turn accentuated the decline in sales of vehicles and led to a postponement of decisions. Structurally, new modes of mobility began to emerge, creating new vehicle uses, such as car sharing and carpooling, which were becoming increasingly popular. The growth of alternative forms of transport and the restrictions imposed on vehicles in large cities also had an impact on the European market, which was already rather weak.

So how, in such a context, could a scale alliance on volumes be successful? Too many elements point to the shortcomings of the co-construction of this type of alliance. First of all, the recessionary economic environment forced both manufacturers to rethink their global commercial strategy. Secondly, their fragile financial situations, albeit different for PSA than for GM, led to defensive and restrictive choices. PSA thought it could improve its financial flexibility by raising one billion euros in 2012, 300 million of which were thanks to the 7% of PSA shares bought by GM. However, in 2013, PSA publicly announced it needed an emergency financial rescue plan to face a deficit of 4.5 billion euros, which precipitated the arrival of the Chinese group, who bought 30% of PSA's capital[7].

Finally, the constraints of the alliance, far from creating development opportunities, were added to shortfalls because PSA was forced to abandon markets. The French manufacturer pulled out of Iran, which was its second-largest market after France, even though this market represented 472,000 cars in 2010. Similarly, PSA's sales in Brazil dropped, because it could no longer challenge a powerful competitor in that same market: none other than its ally, GM.

However, the financial strategy underlying these partnerships meant that some members gained by withdrawing. GM, which had bought 7% of the shares of the PSA group at 8.27 euros per share, made a profit of 90 million euros by selling these same shares two years later at 10.62 euros.[8]

At the same time as the alliance between PSA and GM was gradually being "deconstructed," another experiment was playing out, bringing together the French manufacturer and its primary German supplier, Bosch, in a skunk innovative project. The uniqueness of this project is such that it merits exploration in the following section.

2.3 The innovative management of an innovative project: PSA Peugeot Citroën Group's Hybrid Air

Among the strategies deployed by car manufacturers in order to implement flexible project management schemes, a novel experiment in terms of innovation management conducted by PSA Peugeot Citroën proved very successful for the group and generated surprise among field experts and executives. The project, titled Hybrid Air, was developed and managed in skunk mode, and was validated by the PSA Group Innovation Committee in 2010. It is worth noting that from day one, Hybrid Air received strong support from the PSA Peugeot Citroën's Scientific Research Department.

In 2010, the car manufacturers were experiencing significant difficulty, urban vehicles were generating only low profitability margins, and the global demand for this type of car in Europe was dwindling. The automotive industry was also facing an increasing number of ecological constraints, such as the 2020 European regulation *(reducing CO2 emissions to 95 g/km)*.

The task assigned to Hybrid Air was clear: build a profitable, innovative, and disruptive urban car, at odds with the current projects of other manufacturers, such as Toyota or Renault, which were all focusing on electric vehicles. As early as 2010, the technical phase of the project was already very advanced: they were exploring how to feed a traditional thermal motor with compressed air in order to considerably reduce its CO2 impact. The technology is based on the same technology used for hybrid motors, but unlike traditional hybrid motors, i.e., petrol, diesel, or petrol-electric, the thermal motor exploits a compressed air cylinder as a 'relay'. This technology stocks compressed air whenever the vehicle decelerates and brakes to use it later as a supplement to the thermal motor, or to be used independently. This design was said to lower CO2 emissions to 69 g/km for B-type vehicles *(Citroën C3 and Peugeot 208)*. By the time it reaches the market, with a launch scheduled for 2016, it could offer up to 40% fuel savings in urban cycles. According to the executive manager of the project Hybrid Air, nearly 80% of a one-hour urban journey could be done on air mode.

Although the executive vice president for R&D at PSA fully supports the project, he is adamant about preserving secrecy: "I believe in this project, and I want to keep the secret. It will be a level 4 project *(a level traditionally reserved for design)* and I want to give our teams the time they need to complete it." He adds that he wants to avoid "nipping the project in the bud."[9] The objective is to unveil the project only when it is finalized, and thus when the teams are fully capable of addressing all the issues raised by this innovation.

The originality of Hybrid Air resides primarily in the very innovative management mode that is implemented. The technological aspect of the project itself is already very advanced. What remained, from a project management perspective, was bringing together the necessary skills, already recognized outside of the scope of this specific innovation. The needs were clearly identified: engineers in hydraulics, pneumatics, engineering, energy storage, drive chain, design, etc., all of whom were to be "recruited" internally by PSA. Those responsible for the Hybrid Air project wanted to go further, and sought authorization from the Research Department to "poach" the best engineers, meaning those who had been unanimously recognized in their respective fields of expertise and would be sworn to absolute secrecy. A human resources coordinator was appointed to fulfill this difficult task: he conducted an internal search for the engineers with the best skills and convinced them to join the project without revealing too much about it. For him, "mutual trust and believing in an ambitious project" are the foundations of the contract, which will establish a connection between the initial

4 "Portrait d'un communicant", Review Stratégies, April 21, 2005
5 Newspaper La Tribune, December 14, 2013
6 Bernard Julien, Gerpisa Seminar, Ecole Normale Supérieure de Cachan, December 17, 2013
7 PSA Peugeot Citroën 2013 activity and sustainable development report, published on 25/04/2014
8 Newspaper *Le Monde*, December 12 2013
9 Interview conducted on January 27, 2015.

team *(approximately 15 people)* and the "new" team members, who together will gradually grow and involve about 180 people after two years.

This internal recruitment was paralleled by the car manufacturer's external collaboration with Bosch, which is recognized as the hydraulics specialist in the automotive industry. This tier-1 supplier joined the project in 2011 after the production of an initial prototype. At that moment, the need for their specific skill became necessary to further the project. The Hybrid Air team chose Bosch as their partner to build this new alliance. However, this alliance came with very strict conditions: Bosch engineers were to work from their location in Germany, and were also to be sworn to secrecy. On either side of the alliance, the skunk mode was imposed, which does not prevent PSA and Bosch managers from meeting on a regular basis.

Something that is important to underline at this stage, which could explain the flexibility and the cross-fertilization of ideas as well as the team's inventiveness and dynamism, is that from the beginning, the Hybrid Air project adopted a start-up structure. The team makes its own decisions concerning recruiting new people and benefits from a direct relationship with the Research Department. "We were fortunate to be able to bypass hierarchies and to quickly get whatever we needed to move forward."[10]

A site was made available, including a dedicated design office, a workshop, and a test track. This geographical and functional unity is what enabled them to address all the problems raised in a very short time, which thus enabled them to achieve optimal efficiency in terms of lead times. The team has total organizational freedom, and this has paid off: while the lead time for innovative projects managed more traditionally ranges from one year to 18 months, this team was able to present a new prototype every six months. In Germany, Bosch set up an identical start-up organizational structure, which works on the same skunk-based managerial model. The parallelism between both organizational structures also contributed to the success of the project.

This management mode was characterized as agile by managers, who want to protect the independence and flexibility of their teams. The most interesting example is how short-term issues *(the word 'issue' is preferred over the word 'problem')* are handled. They are always the priority, and affect all teams, even those working on more long-term issues. The head engineer for the project tells us "everything is dealt with at the same time." This means that short-term issues are not secluded or compartmentalized, but rather are always discussed collectively.

The flexibility of the teams is the result, on the one hand, of the way in which very diverse skills are brought together progressively throughout the project. On the other hand, such flexibility owes to the way in which this innovative project is managed, which unlike more traditional approaches is linear. In practical terms, certain technical issues are dealt with at the same time as industrialization or design issues. Teams see the value chain as something global and work accordingly. This is where we see the real meaning of innovative management of an innovative project.

At the end of the project, when all the engineers were invited to rejoin their initial departments, the head engineer said he "felt he had been a part of a unique experience, and how very fortunate I was to have been a part of it!"[11]

Discussion: new challenges in the management of innovative projects

The partnerships among car manufacturers described in this communication are already a part of the "history" of the automotive industry. Today, manufacturers are facing new challenges and are adapting to a new ecosystem that is being defined by the emergence of connected cars. Not only do car manufacturers have to redefine a new global strategy, but they must also rethink the management of innovative projects. This raises a number of questions. For example, how should they manage new cooperation frameworks with actors who, until recently, did not belong to this sector? How can added value be generated in constantly evolving productive modes? What positioning should dedicated project teams adopt in this context?

This is exactly the challenge that PSA Peugeot Citroën is setting out to explore with the establishment of the Smart Car Business Unit in September 2013. This manufacturer, who already innovated in terms of connected services ten years ago with the launch of the emergency call feature, decided to capitalize on its know-how and develop a new service-based approach for its clients. When explaining the goal of this Business Unit, the head of strategy explained that it consists in "developing services based on connected and digital cars which will better address emerging mobility needs and uses, and most importantly, create an experience which reinforces customer loyalty." The managing director of PSA Peugeot Citroën's connected vehicles and Services Business Unit, who conducted the PSA Peugeot Citroën-IBM alliance, shares this opinion. These partners joined forces to take a step forward in the launch of the "connected services" of the car of the future. Their goal is to accelerate the development of personalized services for its customers: "We want to be able to collect the data from our connected car in order to offer our drivers services that are both innovative and tailored." *(dixit Director of PSA's connected vehicles projects)*.

Thanks to big data and analytics solutions and IBM's[12] MobileFirst, customer relationships are changing, and this is paving the way to a completely new, transformed, mobility framework. However, Courtehoux reminds us that "what is important with Big Data is knowing what we want to look for." She further adds that "real know-how resides in human intelligence, our data scientists' ability to model the application and identify the information to be extracted from the large volume of data." This is the primary task of the project teams who are responsible internally for improving the design and quality of the vehicles. All the business units involved in this project *(development, production, quality)*, which mobilizes some fifty people at PSA Peugeot Citroën, are stakeholders in the project. The project also involves IT departments and other business units. Depending on needs, the team could comprise up to 100 people.

In this context, the management of innovative projects is a permanent challenge for both the managing team and for the teams involved. In fact, there is overlap between very different trades/cultures, including IT, design, production, and connected services. Another difficulty lies in the management of knowledge, which must constantly integrate massive and diversified volumes of collected data. This is a major challenge for car manufacturers: integrating the added value provided by the processing and the real-time analysis of the big data provided by these connected cars.

Brigitte Courtehoux observed that "by analyzing the collected data, we will gain insight into the vehicle's defects and driver behavior. We will know which features are most used by our customers, which ones they never use, or for example, how many times a year they open their panoramic roof. This will help us optimize the design of our cars and adjust the prices accordingly".[13]

Every connected car offers the potential for several thousand datasets to be collected thanks to around a hundred on-board sensors. One example, out of many, is the meteorological precision now possible thanks to the on-board temperature, anti-fog, and wiper sensors. This raises the issue of how project teams should leverage this knowledge, as well as their ability and/or adaptability to integrate this mass of knowledge into ecodesign innovations.

The implementation of a new form of management for innovative projects inevitably implies new forms of governance. The success of innovative projects depends on the existence of a "moral community," of trusting relationships and of mutual understanding, which all echo the notion of 'embeddedness'. This notion was first coined by Granovetter in 1985, and was further developed by Donada and Attias *(2015)* to describe the characteristic governance modes of the new project management of innovative projects. In the field of electromobility, embedded governance *(Donada, Nogatchewsky, and Nogatchewsky, 2012)* could solve the contradictions between local and global concerns and between short-term and long-term, objectives which are characteristic of new forms of projects *(Donada and Attias, 2015)*

3. Conclusion

In the automotive sector, we observe that innovative projects are embedded within an increasingly diversified innovation ecosystem. Our analysis started by exploring the management of innovative projects within the context of alliances between car manufacturers, as well as their sustainability and performance. Alliances between car manufacturers who share the same core business are often subject to socioeconomic

10 Interview conducted on January 27, 2015.

11 Conference from research seminar of the ESSEC's Armand Peugeot Chair, Paris, February 2013.

12 IBM wesbite: www.ibmbigdatahub.com

13 Interview with B. Courtehoux, published in French weekly magazine L'Usine Nouvelle on March 26, 2014

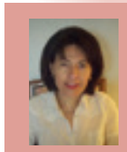
conditions that can foster or hinder their joint development *(as is the case for the PSA Peugeot-Citroën-General Motors alliance in 2012)*. These cooperations are built on a contract that entails constraints—transparency, value distribution, and joint operations—which can be detrimental to one of the parties. This means that the ideal context remains to be defined for open-innovation co-opetition alliances, which are not always successful and, in certain cases, weaken the position of all actors involved. For instance, this is what happened to PSA Peugeot-Citroën, forced by General Motors to abandon market shares in 2012.

Paradoxically, a secret or "closed" project management mode, as was the case with the alliance between PSA Peugeot-Citroën and Bosch for the Hybrid Air project, can work remarkably well and offer high levels of performance. This specific project achieved its objectives within the established timeframe, and both actors contributed to the success of the project by providing complementary expertise. Moreover, adopting the unique skunk-mode management helped highlight innovative project management modes. We would like to raise the question as to whether these two innovative project management modes, i.e., open and closed, should not co-exist in the traditional automotive value chain.

What is undeniable is that today, the question of the best suited co-opetition forms within the automotive industry resides more in the analysis of alliances between companies whose culture, context, references, and value creation are in two altogether different fields of expertise. In summary, we are facing new kinds of alliances between companies who are specialized in radically different core businesses. This is the case, for example, of the cooperation we described between PSA Peugeot-Citroën and IBM. The automotive industry is undergoing transformations and is opening itself up to new fields, including IT, telecommunications, and networking experts. This raises new questions regarding value creation and distribution, as well as the intercultural management of innovative projects. Cars are being completely reinvented. Therefore, project management is also obliged to adapt constantly and reinvent new approaches to project management.

Acknowledgements This paper arises benefited from the support of Armand Peugeot Chair on hybrid technologies and economy of electromobility (led by Ecole Centrale Paris, ESSEC Business School, Supélec, and sponsored by Peugeot Citroën Automobile).

authors



Sylvie Mira Bonnardel Lecturer in Management Sciences, she holds a PhD in Managementl and a Master of Science in Management from EMLYON Business School. She mainly teaches Strategic Management and Corporate Finance at École centrale de Lyon and École Centrale Paris. Previously, she was Manager of the French University Center in Ho Chi Minh City, Vietnam. Her research mainly deals with innovation strategy linked with networking process leading to open innovation and entrepreneurial dynamics.

Danielle Attias is a Professor of Management at École Centrale Paris. She began her research in 1998 in the Laboratory of Industrial Engineering. She teaches Finance and Management of Innovation. She has been working on innovation and her main areas of research are Economy of the Electromobility. She regularly contributes research articles in her field and organizes workshops within her capacity has Armand Peugeot Chairholder.

Carole Donada holds a Ph.D. in management studies from HEC. She is currently Professor and Head of the Chair Armand Peugeot at ESSEC Business School, where she teaches Business Policy and Corporate Strategy. Carole has conducted research into outsourcing strategies and alliance management. She currently studies supplier-buyer relationships in the automotive and business models in emerging sectors such as electromobility industry.

references

Baumard P., *(2007)*, Les stratégies d'innovation des grandes firmes face à la coopétition, Revue française de gestion, vol.7, n°176, p.87-98.

Bengtsson M. S., Kock S., *(2000)*, Coopetition in Business Networks – to Cooperate and Compete Simultaneously, Industrial Marketing Management, vol.29, n°5, p.411-426.

Bennis, W., Biederman, P.W., *(1997)*, Organising Genius: The Secrets of Creative Collaboration, Addison-Wesley.

Blanc C., *(2004)*, Pour un écosystème de la croissance, La Documentation française.

Brandeburger A., Nalebuff B., *(1996)*, Coopetition, New York: Doubleday Currency.

Brasseur M., Picq T., *(2000)*, La Silicon Valley : modèle précurseur ou marginal ?, Revue Française de Gestion, janvier-février, p.131-136.

Cazenave F., *(2014)*, Stop Google, Pearson.

Chesbrough H.W, *(2003)*, Open Innovation: The New Imperative for Creating and Profiting from Technology, HBS Press.

Dambron P., *(2008)*, Les clusters en France, pourquoi les pôles de compétitivité ? l'Harmattan.

Di Minin, A., Frattini, F. and Piccaluga, A. *(2010)*, Fiat: Open Innovation in a Downturn *(1993-2003)*, California Management Review, Vol. 52*(3)*, p. 132–159.

Donada C., Attias D., *(2013)*, Innovative Project Management in the Automotive Industry, The journal of modern project management, vol. 1, n°1, p.44-49.

Donada C. Attias D., *(2015)*, Food for thought: which organisation and ecosystem governance to boost radical innovation in the electromobility 2.0 industry?, Int. J. Automotive Technology and Management, vol.15, n°2, p.105-125.

Donada C., Fournier G., *(2014)*, Stratégie industrielle pour un écosystème en émergence : le cas de la mobilité 2.0, décarbonée, intermodale et collaborative, Revue d'Economie Industrielle, vol.148, n°4, p.318-348.

Donada C., Nogachewsky G, Nogachewsky S., *(2012)*, Gouvernance inter-organisationnelle imbriquée et stratégie orientée client, Comptabilité Contrôle Audit, vol.19, n°2, p.41-66.

Fernandez A.S., Le Roy F., *(2013)*, Comment coopérer avec ses concurrents ? , Revue Française de Gestion, vol.3, n° 232, p.61-80.

Fréry F., *(1997)*, La Chaîne et le réseau, in : Besson P. *(coordonné par)*, Dedans-dehors, les nouvelles frontières de l'organisation, Vuibert, Paris, p.23-53.

Ghosn C., Ries P., *(2003)*, Citoyen du Monde, Ed. Grasset, Paris.

Gueguen G., Pellegrin-Boucher E., Torrès O., *(2004)*, Des stratégies collectives aux écosystèmes d'affaires: le secteur des logiciels comme illustration, Actes de la journée AIMS sur les stratégies collectives : vers de nouvelles formes de concurrence, Montpellier.

Gueguen G., Torrès O., *(2004)*, La dynamique concurrentielle des écosystèmes d'affaires : l'exemple de Linux contre Microsoft, Revue Française de Gestion, janvier-février, vol.30, n°148, p.227-248.

Hisrich R., Peters M., *(2002)*, Entrepreneurship, 5th edition, McGraw Hill.

Iansiti M., Levien R., *(2004)*, The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability, Harvard Business School Press.

Ili, S., Albers, A. and Miller, S. *(2010)*, Open innovation in the automotive industry, R&D Management, Vol. 40 *(3)*, p. 246–255.

Isckia T., *(2006)*, L'écosystème d'Amazon.com : la stratégie d'Amazon revisitée, Atelier AIMS Stratégies d'Entreprises dans les Technologies de l'Information, Juin Université Montpellier.

Isckia T., *(2010)*, Ecosystèmes d'affaires, stratégies de plateformes et open innovation, 19ème conférence de l'AIMS, Luxembourg Juin.

Iyer B., Davenport T.H., *(2008)*, Reverse Engineering Google's Innovation Machine, Harvard Business Review, vol.86, n°4, Avril, p.58-68.

Jacob R., Julien P.A., Raymond L., *(1996)*, L'organisation apprenante ou apprendre à apprendre en réseau, WP GREPME 1996/15, Université du Québec.

Julien P.A., *(2000)*, L'entrepreneuriat au Québec, Editions Transcontinental – Editions de la Fondation de l'entrepreneurship, Québec.

Le Roy F., Yami S., Dagnino G., *(2010)*, La coopétition : une stratégie pour le vingt-et-unième siècle, in Yami S. et Le Roy F. *(eds.)*, Les stratégies de coopétition : rivaliser et coopérer simultanément, DeBoeck, Collection Méthodes et Recherches, Bruxelles, p. 17-28

Livian Y.F., *(1998)*, Organisation, Théories et Pratiques, Dunod, Paris.

Magee D. *(2005)*, Comment Carlos Ghosn a sauvé Nissan, Ed. Dunod, Paris.

Miller R., Xavier O., *(2008)*, To manage innovation, learn the architecture, Research-Technology Management, vol.51, n°3, May-June, p.17-27.

Moore J.F., *(1993)*, Prédators and Preys : A New ecology of competition, Harvard Business Review, May-June, p.75-86.

Moore J.F., *(1996)*, The Death of Competition, Leadership and Strategy in the Age of Business Ecosystems, Harper Business

Pellegrin-Boucher E., Gueguen G., *(2005)*, Stratégie de coopétition au sein d'un écosystème d'affaires: une illustration à travers le cas de SAP, Revue Finance Contrôle Stratégie, vol.8, n°1, p.109-130.

Pellegrin-Boucher E., Fenneteau H., *(2007)*, Management de la coopétition: le cas du secteur des ERP, Revue Française de Gestion, vol.33 n°176, Août- Septembre, p.111-134.

Park S.H., Russo M.V., *(1996)*, When compétition eclipses collaboration : an event history analysis of joint-venture failure, Management Science, vol.42, n°6, p.875-890.

Prévot F., *(2007)*, Coopétition et management des compétences, Revue française de gestion, vol.7, n°176, p.183-202.

Ramirez-Portilla A., Brown, T., Cagno, E., *(2014)*, Open Innovation in the Automotive Industry: What can carmakers' annual reports tell us?, Proceedings of the 8th International Conference on Industrial Engineering and Industrial Management - CIO-ICIEOM-IIIE, Malaga *(Spain)*, 23rd – 25th July.

Rogers E., *(2003)*, Diffusion of Innovations, 5th ed., The Free Press.

Rugman AM, D'Cruz JR., *(2000)*, Multinationals as Flag-ship Firms: A New Theory of Regional Business Network, Oxford University Press: Oxford.

Thorelli H., *(1986)*, Networks, between Markets and Hierarchy, Strategic Management Journal, vol.7, n°1, p.37-51.

Torrès O., *(1998)*, PME : De nouvelles approches, Economica.

Word J., *(2009)*, Business Network Transformation: Strategies to Reconfigure Your Business Relationships for Competitive Advantage, Jossey Bass Wiley.

Yami S., Le Roy F. *(eds.) (2010)*, Les stratégies de coopétition : rivaliser et coopérer simultanément, DeBoeck, Collection Méthodes et Recherches, Bruxelles