

# THE WAY TOWARDS OPEN INNOVATION: AIRBUS MULTI-FUNCTIONAL TEAMS

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## Abstract

In times of crisis, innovation is a key to differentiation and thus to the survival of businesses. However, actions taken by managers to stimulate creativity are essentially within the framework of a conventional closed innovation made only internally. Yet, open innovation is a much more efficient and economical way to develop new products, new materials, new technologies and new methods. It requires that partner organizations operate in an open network in which they can work together, each bringing their expertise and talents. This is usually the purchasing function, transverse and connected to the business environment, which can best orchestrate this open innovation by selecting the best suppliers to work with them within new models of integration more or less advanced. The case study of the company Airbus, developed during a participant observation of one year, will define the role of the procurement function in this open innovation approach and the benefits, hazards and limits of this strategy. Examples of the design of the A380 and of the Technocampus EMC<sup>2</sup> environment illustrate the integrated supplier relationship management method combined with open innovation.

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**Keywords:** Open Innovation, Collaboration, Airbus, Participant observation

## Introduction

With the gradual concentration of business on their heart of business, the increased competitive pressure, the development of international trade and the current situation of deep economic crisis, companies must implement new differentiation strategies to remain competitive. The world economy is undergoing significant structural changes that are forcing companies to adapt and in particular to develop agility capabilities (Dameron & Torset, 2012). The corporate strategic intelligence allows them to reconfigure their organization and resources based on environmental changes and challenges they face (Barrand & Deglaine, 2013).

Economic instability destroyed businesses and entire industries, boosting competitiveness and creativity. The process of creative destruction described by Joseph Schumpeter (1942) seems to be accelerating in a race for innovation that produces killer technology at an unprecedented pace. Cost reduction and process optimization, while necessary, are not sufficient to provide leadership. New economic models must be implemented to create more sustainable value in collaboration with partners (Allal-Chérif et al., 2011). Groups of virtual businesses form competitive clusters that combine multiple links of the same value chain. These extended companies collectively seek to be the first movers in emerging markets. The co-makers or co-designers, clients and strategic suppliers, are combining their complementary specific talents to achieve all projects that would be inaccessible carried out separately (Allal-Chérif et al., 2011).

New forms of alliances are increasing, which allows them to work upstream of the value chain, while remaining in competition downstream. The sharing of resources promotes innovation and generates collective competitive advantages to distance competitors who are not involved in the partnership (Park & Gnyawali Srivastava, 2014). More generally, networks of actors cooperate with each other to create synergies, multiply their ability to innovate and benefit from the expertise of each other. Research and development efforts are shared among customers, suppliers, universities and public and private laboratories in ecosystems formed to stimulate creativity. These competitive clusters, financed with co-investments, are intended to facilitate and promote open innovation, based on the sharing and exchanges between different organizations (Chesbrough, 2003; Chesbrough, Vanhaverbeke & West, 2008).

The purchasing function is at the heart of these networks of innovative businesses. This function became strategic in all industrial sectors and is increasingly involved in joint innovation processes between companies and their integrated supply partners. Buyers become internal entrepreneurs, or intra-makers, in charge of making the technology watch, of identifying the most promising suppliers, of building lasting collaborative relationships, of controlling multicultural and multi-languages virtual networks, and of managing transversal projects (Allal-Chérif et al., 2011).

This article aims to explore the role of the procurement function in the open innovation approach in Airbus. It will therefore determine how buyers can initiate, encourage and orchestrate open innovation. In the first part, a literature review will associate the processes involved in the supply chain management with the creative process of research and development. A second part will explain the exploratory qualitative methodology based on in-depth case study of Airbus, which has adopted an approach of open innovation with strategic suppliers on a European scale. The third part will

present the case study and the main results of the participant observation. The fourth part will be devoted to the discussion and recommendations.

### **The relation between collaboration and open innovation**

Innovation is essential in today's economy, but this is not new as the economist Joseph Schumpeter had already put innovation at the heart of the concerns of managers through his theories of creative destruction and innovation clusters (Schumpeter, 1942, 1947). According to him, the conventional circuit of economy is broken through innovation. Once a product is launched and it generates profits, it attracts more and more entrepreneurs wishing to grab some market share. This leads to an increase in supply: greater competition means lower prices and margins. The end of the product life cycle is precipitated by the loss of profitability. To stop this phenomenon and continue to make profits, innovation can take five different forms: (1) the manufacture of a new product, (2) the introduction of new production technologies, (3) the creation of new markets, (4) the use of new materials or new technologies and (5) a reorganization of work processes. Schumpeter also says that such innovations usually occur in clusters, that is to say irregularly and grouped. They result from a creative process but they lead to a depression related to the destruction of old products, old technology or old markets, obsolete or unprofitable. This phenomenon is known today as the creative destruction.

The open innovation defined by Chesbrough (2003; 2008) positions the innovation process in the context of the current race for competitiveness, of increased risks related to the economic crisis and of companies focusing on their heart business. This implies the need to create alliances between players in the same value chain. The concept of open innovation was born from the observation of global multinational companies such as Xerox, IBM, Cisco and Intel. Chesbrough defines open innovation as cooperation between several companies that share resources, knowledge and skills in a creative goal. This collaboration is carried out within the framework of a market economy with a free flow of information, and a highly dominant technological dimension. The open innovation applies the principle of ODOSS, that is to say, open data, open source and open standards.

Chesbrough (2003) began studying some large North American companies and found that they are more efficient and have a greater capacity for innovation through new managerial practices and greater openness on their environment. Thus, the Cisco Company has outclassed Lucent because instead of investing alone in research to develop new products and services, Cisco conducted a technological and strategic watch, identified the players with the most creative potential and with a vision of the market close to their own. The group then developed many forms of relationships with these

companies: investment in joint projects, long-term partnerships, takeovers and subsidiaries. This enabled Cisco to access a considerable quantity of knowledge and expertise, as well as to conduct or take part in major projects, at a very low cost. Cisco has distanced its main rival Lucent which has spent much more money but in closed innovations that have had much less impact.

The current situation calls into question the management methods of traditional innovation. Indeed, Chesbrough notes (1) the high turnover of managers means that their knowledge is also leaving with them, (2) the life cycles of products are increasingly reduced, particularly for technology products, (3) industrial risks are higher and higher, and (4) that the product expertise is not in the business but in its suppliers and its customers. Managers are thus led both to show more humility, openness, boldness and creativity. According to Chesbrough, knowledge should no longer be considered an exclusive private property and a way to dominate competitors, but it must be shared in a network of partners involved in clusters that form an ecosystem where innovation can incubate quickly.

In this type of inter-organizational collaboration to promote open innovation, it is essential to clearly define the rules of the game ahead, especially in terms of information sharing, privacy and intellectual property, as well as to develop a common culture of innovation with partners (Saunière & Leroyer, 2012). To formalize a collaborative innovation strategy, it is advisable first (1) to make available internal resources that should not be saturated, (2) to select an area of innovation in the heart of the company's activity (3) to ensure that the research topic is mature and close to commercialization, (4) to select the actors who have complementary skills, and (5) to measure the potential for differentiation and conquest that conceals the proposed innovation (Saunière & Leroyer, 2012).

Among the various types of collaborative innovation proposed by Saunière & Leroyer (2012) is the joint innovation that is closest to the open innovation system described by Chesbrough (2003). This joint innovation can take the form of a consortium of several companies that collaborate on sustainable research programs. These same companies can also develop strategic partnerships in the form of joint ventures and invest together in companies or research laboratories that fit their target markets. They can thus prepare for the launch of new products and conquer new territories. Companies can either integrate their suppliers in design and development; either share their research teams in physical or virtual workspaces.

### **The purchasing function monitoring innovation in business**

The relationship between major clients and strategic suppliers is completely transformed, as they are now part of the extended firm, and that their future is intimately linked to its success. The bargaining relationships to

systematically reduce costs and create short-term value disappear with the pressure and destabilizing maneuvers associated. Industrial groups, whose purchasing function maturity is high enough, have understood that they had to open their environment, integrating their suppliers, establishing a partnership relationship of trust and adopting a logic of sustainable value creation through open innovation (Allal-Chérif et al., 2011).

The strategy of the purchasing function in industrial companies is to reduce the number of suppliers and to focus on long-term collaborative partnerships to collectively create patterns of differentiation and sustainable value creation. Purchasing managers use performance measure, analysis, control and coordination. They perform a technology watch to determine the strategic developments and future projects to be implemented. Their role is disconnected from the operational tasks, outsourced or entrusted for suppliers, and focused on the tactical and strategic dimensions. They must adopt a global approach, consider both customers' expectations and suppliers' expertise, involve internal and external stakeholders and build support at the highest level for their prospective vision (Allal-Chérif et al., 2011).

Chesbrough (2003) asserts that the dissemination of knowledge requires a targeted execution. You don't need the newest or the best knowledge to win. On the contrary, to win you should make the best use of internal or external knowledge, with appropriate tools, combining this knowledge creatively in new and different ways to create new products and services. The purchasing function is the function that will define the target innovation and coordinate internal and external efforts to reach it. The author also established an approach in six crucial steps to encourage open innovation. (1) First, the company must establish a strategic map that shows all existing sources of innovation in its sector. For this it is necessary to rely on traceability of past innovation, but also to consider potential future developments. (2) The second step is to establish roadmaps for analyzing how technologies are valued within the company, how they respond to the needs expressed by customers and the role they play in the sustainability of the company. (3) The company's managers must then have a prospective reflection on potential new activities to be developed. (4) The risks must be assessed and the technologies with most potential must be selected by consulting firms and internal and external research laboratories. (5) A business model in line with the proposed innovations should be built to connect the technology trends to economic outlook. (6) Finally, the company must adopt a comprehensive and long-term vision to increase the potential of innovation, scale and combine them together (Chesbrough, 2003).

### **Action research in an exploratory and prospective approach**

The objective of this research is to observe a company that practices open innovation to understand the issues involved. For this, we designed a thorough case study of open innovation at Airbus. From this case study, a number of analysis parameters will be identified and good practices will be studied. Yin (1984) explained that the number of cases was not a criterion validity of the method: it is not necessary to have a multitude of cases to identify the relevant parameters of analysis. This is less the number of cases than the methodological rigor of the construction of these cases which is decisive in the description, understanding and explanation of certain phenomena. Using multiple cases allows only reinforce the results already achieved with one.

The choice of Airbus is due to the fact that this company is the world leader in the design, production and marketing of commercial and military planes. Innovation is essential in this sector and the methods implemented at Airbus to support it have evolved since the early 2000s "In general, the case studies are the preferred strategy when the questions' how 'or' why 'arise when the researcher has little control over events and when the focus is on a contemporary phenomenon in a real life context" (Yin, 1984, 2011). That is the case here of open innovation, theory formalized by Chesbrough about ten years ago, and a very recent practice, still uncommon in most companies.

Empirical research was conducted for one year as part of an exploratory action research based on participant observation (Hatchuel & Molet, 1986). The constructivist approach focuses specifically on social interactions and processes as explanatory patterns of reality (Berger and Luckmann, 1966). The principle of "Generating theory" (Glaser & Strauss, 1967) or "building theory" (Eisenhardt, 1989) will be applied to the open innovation concept observed in the company Airbus. Grounded theory generates new theories in human and social sciences through immersion in the empirical data of existing theories regarding the observed phenomenon here open innovation. These new theories complete existing theories and explain new situations (Glaser & Strauss, 1967). Data collection has used simultaneously a wide range of complementary techniques: individual interviews, group interviews, participation in workshops, brainstorming sessions and think tanks (Miles & Huberman, 2003). The literature review was carried out gradually throughout participant observation, after an initial intensive documentation. Then, to highlight, complete and analyze the theoretical framework that has been set, interviews with two purchasing managers at Airbus were conducted.

## **Open innovation at Airbus: the A380 and the Technocampus**

Airbus is one of the four entities of Airbus Group, known as EADS between 2000 and 2013, Astrium, Cassidian and Eurocopter. Airbus represents two third of total group sales. The international origins of Airbus have been critical in its success since its creation 40 years ago by the four major industrialized countries of Europe: France, Germany, Spain and the UK. This European company has taken advantage of the best that the continent had to offer to anticipate market needs and to develop innovative products. Presented as the largest and most modern manufacturer of commercial and military aircrafts in the world on the website of Airbus Group, Airbus has more than 6,000 planes in operation. Its broad commercial range goes from small 100-seat A318 to the A380 giant of more than 800 seats in economy mode. For the military part, Airbus offers refueling and troop and equipment transport aircrafts. 90% of investments in research are related to the reduction of carbon footprint with the objectives of managing aircrafts throughout their life cycles and optimizing air traffic.

With some 69,300 employees and about 80 thousand indirect jobs, Airbus is now a global company that creates sustainable value for its customers, its suppliers, its shareholders and its employees in all countries of the world where it has invested. Airbus makes planes in France, Germany, the US, China, Japan and the Middle East. The company has branches in Hamburg, Frankfurt, Washington, Dubai, Beijing and Singapore. There are training centers in Toulouse, where is located the headquarters of the company, but also in Miami, Hamburg and Beijing, as well as offices in over 150 countries around the planet. The Airbus industrial network has expanded to include: (1) design regional offices in North America; (2) an engineering center in a joint venture in Russia; (3) other engineering centers in China and India. Airbus also relies on its partnerships and industrial cooperation with the strongest and most innovative companies in the world and a network of some 1,500 suppliers. The global dimension of Airbus and its extensive network of international suppliers pose a number of challenges in terms of sourcing and management of supply chains. The company is particularly vulnerable to unforeseen events in their environment, especially natural disasters like earthquakes. The complexity of logistics flows increase risks, communication difficulties due to the multicultural context and multi-languages and incompatibilities of data or software.

The A380 is the aircraft that can carry the most passengers. According to versions, it has a capacity of 525 to 853 passengers and has 2 complete levels of seats. It is 73 meters long, 80 meters wide, the height of a 7-storey building and is heavier, longer and taller than a Boeing 747. It is composed of revolutionary composite materials, very lightweight, very strong and very flexible, of 4 Rolls-Royce reactors 30% more powerful than

the Boeing 747, and of the most modern computerized navigation system in commercial aviation. It required an investment of 10 billion euros and represents the future of the company. Airbus anticipates a doubling of air traffic in the next 20 years and the need to carry more passengers simultaneously.

The designers who conceived the A380 were soon confronted with an obstacle: the plane was too heavy. A challenge has been organized to reduce the weight of the aircraft so that it is less than 277 tons. Other constraints were to maintain a very low rate for travelers and provide the quietest and least polluting aircraft of the world. Its 4 reactors worth 12 million euros each, the equivalent of a ton of gold, consume 1 liter of kerosene per second and are able to operate more than 13 hours. 260,000 liters of fuel are needed for the A380 to cross half the planet, or 20% more than a Boeing 747. Several technical challenges have been identified jointly by Airbus teams and its strategic suppliers to achieve performance never reached before and to perform technological prowess that seemed impossible.

Collaborative purchasing and open innovation with suppliers are controlled at the European level. The wings are made in Wales, engines in England, fuselage and the vertical part of the tail in Germany, the horizontal part of the tail in Spain, final the plane is assembled in Toulouse, France. Global coordination is also at work in the lower links of the supply chain where some suppliers apply the principles of open innovation with their own suppliers. The wings weigh 6.5 tons each and are composed of 32000 components, delivered from all continents. They are one of the most critical subassemblies of the aircraft as they must allow transporting fuel, bearing the weight of the fuselage, resisting the power of the reactors and enabling delicate and precise maneuvers of an aircraft of extraordinary dimensions.

Located near Nantes, the Airbus Technocampus EMC<sup>2</sup> is a site dedicated to R&D in which Airbus teams and several other partners, especially strategic suppliers, are involved. Their objective is the creation of new aircraft technologies to be incorporated in the different ranges of Airbus planes or integrated into the plane of the future. This research center is a leader in developing innovative technologies for the production and assembly of large parts in high performance composites. This center represented a total investment of 80 million euros and it now covers more than 19,000 square meters. Among the 160 people who worked in its creation, only 50 were employees from Airbus. The objective of the Technocampus is to create synergies and promote industrial cooperation between manufacturers and other industry members. Airbus has established 37 strategic partnerships with suppliers, SMEs and laboratories. The group has transferred €27 million in equipment and materials to Technocampus

EMC<sup>2</sup>. This collaboration between a large group of suppliers, research laboratories and local authorities is the main feature of open innovation.

Within the Technocampus EMC<sup>2</sup>, opened in September 2009, Airbus has established efficient means of research and development in technologies of pre-impregnated composites, and thermoplastic resin infusion. All these technologies have been widely used in the design of the latest long-haul aircraft of the range: the A350 XWB. Thus, Airbus develops materials for airplanes of tomorrow in collaboration with academic partners: the Ecole Centrale Nantes, the Ecole des Mines, ICAM and Polytech; industrial partners such as CETIM, Aerolia, CIMPA, Composite Tool, Daher-Socata, and Euro Engineering.

### **Discussion and recommendations**

The integration of strategic suppliers and research laboratories in new product development projects is now a recognized solution to improve the efficiency of these projects. Some suppliers are categorized as "black box": they are integrated very early and are very autonomous with a strong delegation of design, increasing the interdependence and therefore the associated level of risk. Some suppliers are "white box", integrated upstream, but with complete transparency or perceived as such in a balanced relationship, with little risk. These suppliers follow the specifications they are given and use their skills to meet the demands. The "gray box" suppliers pool their knowledge with their clients to gradually advance in the process of co-development in a context of high uncertainty.

In addition to meeting the prerequisites in terms of open innovation, we even found that through the Technocampus EMC<sup>2</sup>, the manufacturer has fully met the criteria of success of the joint innovation described by Johnsen (2009). The relevant strategic buyers have established the need to develop certain skills via external sources, adjusting the role of each supplier according to its potential and specific knowledge. These strategic suppliers were fully integrated upstream of the production chain: a common structure and transparent communication has been established. The relationship of trust created has allowed good management of the potential leak of knowledge and confidentiality of information exchanged.

Focus on managing external partnerships and supplier integration can lead to neglect internal and potential conflicts between the various departments involved in innovation. The most difficult negotiations for buyers are often conducted with other business functions. They can be very harsh as between purchasers and engineers who have very different objectives. At Airbus, the engineers wanted to buy titanium parts to withstand lightning while buyers wanted to select another height times cheaper without identifying all requirements of the design. The resolution

point was choosing not massive parts but coated titanium which reduced the material cost while meeting the safety requirements. That conflict resolution was very time consuming.

## **Conclusion**

This article has demonstrated the decisive role of the procurement function in the establishment of a process of open innovation in industrial enterprises. Buyers foster internal collaboration between the purchasing function, marketing and R&D and external collaboration with suppliers, customers and public and private research laboratories. For Airbus, this collaboration is international and spread throughout Europe in France, Great Britain, Germany and Spain. It enabled the Group to consolidate its leadership position by accumulating many decisive competitive advantages.

The involvement of suppliers in the design process allows using their expertise in materials and technologies to improve product performance while reducing development and production costs. These providers associated in the open innovation approach bring a fresh look to identify problems or potential failures before the development process is already too advanced. They make the company go out of its comfort zone and think out of the frame where it used to grow. Suppliers represent a new contribution of skills and technological knowledge needed when the priority is to develop a revolutionary innovative product or a killer technology.

When suppliers' resources are mobilized early in the design cycle, it results in a significant reduction of development costs as investments and risks are shared, as was shown in the case of the Airbus A380 and the Technocampus EMC<sup>2</sup>. The involvement of upstream suppliers also enables an earlier prototype of the product and ensures in advance the allocation of the production capacity of very busy suppliers. Open innovation helps create an ecosystem to foster creativity and inventiveness.

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