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Vertical sub-contracting relationships strategy, the Airbus First-tier suppliers' coordination

(with authorization of Airbus France)

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Stratégie des relations verticales, la coordination par Airbus des sous-traitants de premier rang

Résumé

Cet article analyse les transformations des relations verticales et plus particulièrement la dualité des modes de coordination au sein des nouvelles architectures industrielles. L'objectif est de caractériser le rapport entre l'architecte et les sous-traitants de premier rang, en fonction du degré stratégique des compétences maîtrisées par ces derniers. Deux modèles de coordination "arm's length" et "intégration de systèmes", coexistent au sein de la même architecture industrielle. Le recours à l'un ou l'autre varie selon la politique d'achat et le degré stratégique des sous-ensembles délégués. Ainsi nous analyserons le système de sous-traitance d'Airbus en nous focalisant sur l'importance de la politique d'achat. L'argumentation s'articule autour de deux parties. La première appréhende les relations verticales dans le cadre de productions complexes, en insistant sur les aspects organisationnels. La seconde analyse la transformation du système productif Airbus en s'axant sur le processus d'achat et l'émergence d'une coordination duale des sous-traitants de premier rang.

Mots-clés: Modularité – Intégration systèmes – Compétences stratégiques – Stratégie d'achat – Sous-traitants de premier rang – Airbus

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Abstract

This paper analyzes the transformations of industrial vertical relationships, and more particularly the duality of the coordination modes within new industrial architectures. The paper aims to characterize relationship between the architect and the first-tier suppliers according to the strategic degree of their competence. Two models of coordination arm's length and systems integration coexist within the same industrial architecture. The recourse to one or the other varies according to the policy of purchase and the strategic degree of the sub-contracted subsystems. Thus we will analyze the system of subcontracting of Airbus by focusing to the importance of the purchasing policy. The argumentation articulates in two parts. The first one considers the vertical subcontracting relationships in the framework of complex productions, by insisting on organizational aspects. The second one analyses the transformation of the "Airbus" productive system by focusing on purchasing process and the emergence of new First-tier supplier's coordination modes.

Key words: Modularity – Systems Integration – Strategic competences – Purchasing Strategy – First Tier Suppliers – Airbus

JEL : L2, L23, L62

Introduction

The 1980s and 90s were characterized by a tendency by firms to re-focus on their core business activities (Paulré, 2000; Batsch, 2002). This movement gave rise to “strategic alliances”, based on the look for complementary competences, which in turn modified traditional subcontracting relationships. Given that the increase of global competition, a new stake becomes essential: a fall of procurement cost.

In this new context, Airbus has implemented a purchasing rationalization to achieve the goal to match costs and competences. The latter scales up proportionally to global, structural and financial changes.

The traditional subcontracting function no longer corresponds to modern industrial practices. Henceforth, the first-tier suppliers work with wide specifications and are responsible for their own products.

Therefore, given the growing complexity of the products and systems produced (*Complex Product Systems or CoPS*, Simon, 1962 ; Hobday, 1998; Brusoni and Prencipe, 1999)¹, the Orderer becomes an industrial architect, breaking down his product (considered as a system) into an integrated and coherent group of sub-assemblies, the design and production (and responsibility) of which are entrusted to a restricted number of direct equipment suppliers which in turn are responsible for organising their own subcontracting network.

In this configuration, we shall go on to emphasize the link between vertical subcontracting relationships and purchasing strategy.

To do this, we will analyse (1) the vertical subcontracting relationships in the framework of complex productions, by insisting on organizational aspects. Then (2), we will show the transformation of the "Airbus" productive system by focusing on purchasing process and the emergence of a new First-tier supplier's coordination modes.

I. Vertical subcontracting relationships, modularization and purchasing strategy

After having analyzed on a theoretical level the complexification phenomenon and its incidences on subcontracting relationships, we will clarify the impact of the purchasing strategy on an emergent duality of coordination modes.

¹ According to Simon (1962), "A complex system is made up of a large number of parts that interact in a nonsimple way. In such systems, the whole is more than the sum of the parts, not in an ultimate, metaphysical sense but in the important pragmatic sense that, given the properties of the parts and the laws of their interaction, it is not a trivial matter to infer the properties of the whole". Hobday, 1998 (p. 690) defines complex products and systems (Complex Product Systems or CoPS) as "products with a high value, requiring a lot of engineering, for the sub-systems or constructions provided by production units". Brusoni & Prencipe (1999) summarize CoPS, with a high value (high cost), made up of numerous interacting personalized elements. Their design, development and production involve several firms, they display emerging properties and there is a high degree of user involvement. Thus, a modular approach is required in order to understand the industries which produce such CoPS.

1.1. A complex industrial organization

1.1.1. The Network-Firm

Traditional analyses of vertical relationships characterize the network-firm as a vertical network structured around the pivot firm (assimilated to a head of network) coordinating the activities of a group of small and medium-sized companies, with the aim of carrying out a specific project (Guilhon, 1992; Baudry 1995 & 2003).

These relationships between this Head of network et these different partners or co-contractors are called/said cooperations (Butera, 1991; Paché and Paraponaris, 1993). Inter-firm cooperation, means a durable commitment, between legally independent partners, in a common project (in which profits will be share), fairly, with a right & duty balance (Rullière & Torre, 1995).

Empirically, partnership of vertical sub-contracting relationships will be progressively remise en cause (Altersohn, 1997). From now on, the Orderer gives unilaterally the price, wants a cost and delays decrease, and involves financially its partners. But in the same time, the Orderer sets strict quality standards.

Billaudot & Julien (2003) sort out the sub-contracting relationships on a scale from fulfillment of generic product which entails a low intelligence degree (technical division of labour based on price) to fulfillment of dedicated product (achieved specifically for the customer), which generates a relationship of high intelligence degree (cognitive division of labor based on competences) (Moati & Mouhoud, 2005).

1.1.2. The Pivot-Firm²

1.1.2.1. Emergence process

In this analysis framework, the first-tier supplier, seems to have a large range of responsibilities (conception, production, financing). It has the responsibility to organize its own sub-contracting.

In this sense, Baudry (1995) considers that, this coordinator is localised to an intersection between a speciality sub-contracting relationship (upstream and partnerial) and capacity sub-contracting relationship (downstrrem and a classic arm's lenght type relationship).

Although they recognize the complexity and the interweaving nature of subcontracting relationships (Mariotti, Reverdy and Segrestin, 2001), economists define the pivot-firm as the "formal regulatory organ" of the vertical network, i.e. the main player (Billaudot and Julien, 2003; Abdul-Nour and al. 2003) rather than the intermediary. Thus, since it adheres to the traditional analysis of the "network-firm", the economic notion of "pivot-firm" remains assimilated to that of an architect of network (Billaudot and Julien, 2003; Abdul-Nour and al., 2003; Baudry 2004).

However, we suggest that this traditional classification now needs to evolve, in order to constitute a truer reflection of current practices. Indeed, this pivot function has been from now

² For fuller developments to see Mazaud (2006)

on delegated sometimes to a first-tier supplier, which are a real hinge of vertical network (Mazaud, 2006).

1.1.2.2. An indispensable re-definition

The pivot function, assimilated to a "*Hub firm*" (Jarillo, 1988), or Strategic Center (Lorenzoini and Baden Fuller, 1995), refers to the central nodal of a network.

Miles and Snow (1986) refer to the player in charge of the intermediary function as a "broker". This player fulfils three distinctive roles within the network: the role of "*architect*" (constitutes the network), that of "*lead operator*" (coordinates the companies) and that of "*caretaker*" (maintains the network and ensures its long-term survival) (Miles and al. 1992). These functions are part of a horizontal relationship (cooperation), and can be carried out by one or more entities.

For this reason, in a hierarchical organisational configuration, Fréry (1997) prefers to use the concept of nodal, the formal organ for regulating transactional structures. This nodal – a single player – is responsible for three simultaneous functions: design (major strategic orientations and selection of other players involved), coordination (optimisation of links with the aim of limiting the costs inherent to the hierarchy), and control (dissuading opportunistic behaviour that could disrupt the overall effectiveness of the structure).

The 1980s and 90s were characterized by a tendency by firms to re-focus on their core business activities (Batsch, 2002). This movement gave rise to a "cooperative" relationship network, based on the need to engage the services of external suppliers, which in turn modified traditional subcontracting relationships. Thus this enables the development of intermediation function of the first-tier supplier.

By re-focusing on its core business activities, the architect has given up some of its key knowledge and is no longer able – for certain strategic sub-systems – to determine the interfaces and specifications unilaterally (Pavitt, 2005). Bearing in mind all these elements, we can describe some first-tier supplier as Pivot-Firm.

A Pivot-Firm is a "*strategic partner which, on the one hand, co-designs the sub-system under its responsibility with the Integrator, co-specifying the required interfaces, and, on the other hand, develops strategic and combinatory competences, in the framework of a hierarchical network.*" (Mazaud, 2006)³.

1.1.3. A key concept : the strategic competence

Competence concept is based on a "*resources-based view*", which considers firms as collections of resources of various types (Penrose 1959; Wernerfelt, 1984).

This theory emphasizes the firms' heterogeneousness, due to the specific resources possession that is to say asset, capabilities, process and knowledge (Barney, 1991). The nature of these resources can lead to get a lasting competitive advantage, in generating rents (Peteraf, 1993).

³ p.52

The difficult imitation (feature) of a resource fits into the knowledge's tacit dimension of the resource (Polanyi, 1966; Colletis, Pecqueur, 2005). As the tangible resources are easy to imitate the intangible dimension is a differentiation factor. That is why, resources have a strong cognitive dimension (Kogut and Zander, 1992; Conner and Prahalad, 1996; Grant 1996; Spender, 1996).

By comparison, the organizational capabilities, that is to say ability to coordinate and integrate whole firm's resources (Chandler, 1990), is going to increase. What gives a firm's competitive advantage are not resources but rather than abilities to implement (Grant, 1991). Inspired by evolutionist analysis, the "dynamic capabilities" characterize the firm's ability "*to integrate, build, and recon figure internal and external competences to address rapidly changing environments*" (Teece and al. 1997)⁴.

It seems appropriate to underline the adaptative and even defensive feature (Dierickx and Cool, 1989), of these capabilities. The latter are as routine repertoire, enabling a firm adaptation to environmental evolutions (Teece and al., 1997), by the technological and/or organizational problem resolution (Teece, 1988).

From then on, approach in terms of competence (Foss, 1996) set up a proactive vision of resources. Firm would have ability to change their own environment (Hamel and Prahalad, 1990). The core competences show the organization's collective learning, which are essential to "*coordinate diverse productions skills and integrate multiple streams of technologies*" (Hamel and Prahalad, 1990)⁵.

Accordingly Sanchez and al. (1996), having a coherent theoretical corpus, they consider firm as a system open on its environment. The firm competence means its ability to durably coordinate the use of its resources, in adapting itself and acting on its environment, according to previously determining objectives (Sanchez, 2000 & 2004; Durand, 2006). Therefore, the strategic feature of competence consists of identifying, extending and using business opportunities (Carlsson and Eliasson, 1994), which based on industrial strategic factors (Amit and Schoemaker, 1993), and on environment.

The strategic competence covers three key dimensions: contribution in value creation, scarcity (Rumelt, 1987) and lastly opacity, which means less or more easy to non-imitate (Meschi, 1997). Therefore, it appears obvious that the first-tier suppliers, as Pivot-firms, which control a strategic competence, have an undeniable advantage.

1.2. Modularisation of vertical relationships

1.2.1. A move towards modularisation of complex industrial architectures?

Modularity is a strategy to effectively organize complex products and processes (Starr, 1965; Baldwin and Clark 1997). The approach involves dividing a complex system into independently designed and produced units or modules, which are linked together via interfaces, i.e. "*visible design rules*", defining the place, the function and the interactive modes of each module (Baldwin and Clark, 1997 and 2000).

⁴ p.516

⁵ p.82

Ulrich (1995) defines product-architecture as the system via which "*a product's function is allocated to physical components*"⁶. Thus, the product architecture is an arrangement of functional elements, which contribute to the performance of the overall product.

This product architecture is described as modular when the interfaces are linked, i.e. when there is an identity between the product's physical components and the functional elements of the system. The modification of one component does not lead to any modification of the linked component, nor of the system as a whole.

However, the product architecture is said to be integral when the interfaces are not linked, i.e. there is no identity between the product's physical components and the functional elements of the system. Each component can carry out several functions and each function can be carried out by several components (Foss K., 1998).

Thus, a productive modular organization is orchestrated by an architect-firm, making up the firm network that it needs to create the overall system (Baldwin and Clark, 1997, 2000).

The architect role becomes essential in the interface definition (Frigant and Talbot, 2002 and Frigant 2004). The interfaces can be assimilated to information. According to Baldwin and Clark (2000), in a modular perspective, the interface characterizes all the information – the "*visible design rules*" - which define the place, function and interaction modes of each of the modules, bearing in mind that other, invisible, information is specific to the design and production of each of the modules. This underlines the importance of the interface specification.

Modularisation is becoming the dominant model in complex vertical relationships (Langlois, 2003). It enables the manufacturing process to be reorganized, based around standardized interfaces. This leads to increased flexibility (Brusoni and Prencipe 1999), reduced production costs and lead times (Fujimoto and Takeishi, 2001).

Finally, organisational modularity necessarily involves an organisational architecture based on the autonomous technological design of each module (Sanchez and Mahoney, 1996).

1.2.2. The nature of the interface determines the nature of the relationship

According to Baldwin and Clark (2000), in a modular perspective, the interface characterizes all the information – the "*visible design rules*" - which define the place, function and interaction modes of each of the modules, bearing in mind that other, invisible, information is specific to the design and production of each of the modules.

The interface is considered as "pivot" between the producer's resources and the user's resources (Loasby, 1998), which raises the question of the customer's access to the supplier's resources (Araujo, Dubois, Gadde, 1999).

In the framework of subcontracting relationships, the notion of interface goes beyond the mere work specification and addresses the question of complementarity in terms of

⁶ p. 419

competences, i.e. the knowledge, experience and know-how of the individuals who make up the firm (Richardson, 1972).

The interface between customer and supplier - more specifically, that between the Orderer and the Subcontractor – is crucial since, on the one hand, it depends on the nature of the modules exchanged and, on the other hand, it characterizes the relationship between the two firms (Asanuma, 1989).

Araujo, Dubois and Gadde (1999) have identified several types of interface, from the standardized interfaces to interactive interfaces, via specified interfaces and translation interfaces.

When the interface is standardized, it is a simple "buy and sell" interfaces, corresponding to standard products which have already been designed and produced by the subcontractor, and which are sold in the latter's "catalogue". The resulting relationship is therefore of the commercial type – a classic "*arm's length*" type relationship.

Opposed to the standardized interfaces, we find the interactive interfaces, when the specifications are drawn up jointly by the supplier and its customer. This leads to a common learning process, since the two entities interact, developing the ability to use the other's resources.

More the interfaces are standardized; more the organizational configuration of customer-supplier relationship will be of modular type, giving space to flexibility, as well as to reduced cost and shorter lead-time.

Conversely, more the interfaces trend towards interaction, more organizational configuration will be of integral type. Thus, the customer-supplier relationships will be characterized by a lower flexibility and stepped-up production costs.

1.3. Purchasing policy and dual coordination modes of sub-contracting relationship

1.3.1. Purchasing strategy and strategic segmentation

The firm has split up into function parts (Research & Development, Production, Finance, Procurement, etc.). Each functions has to reach the goal, which a global and long-term strategy. For each of these functions, particular strategy has implemented.

The purchasing strategy uses purchasing to express itself, accompanied with available means and their instructions for use instructions leaflet (Gauchet, 1996; Bruel, 2005). Some constraints (suppliers, competitors' purchasing strategy, general firm's strategy) and some means (purchasing budget) impose upon it.

This purchasing strategy comes in a variety of purchasing policy in accordance with a strategic segmentation of purchases. This segmentation is often based on the technological nature of the component families, integrating analysis of the technological competences controlled by the suppliers, or even the risks linked to competitors.

Next, the key success factors for each segment have to be determined (costs, quality, lead time, related services, etc.). An individual strategy is then developed for each segment, ensuring that each strategy remains strictly consistent with the firm's general strategy (Loubère and Perrotin, 2005).

For each homogeneous family of purchasing, a specific policy will be implemented by the objective fixing (growth rate, profitability) and means determining (financial and human).

In a modular approach, the product is divided into sub-systems, classed according to their strategic importance.

According to Venkatesan (1992), there is a strategic difference between these segments, according to the specific impact they have on the firm's competitiveness.

The strategic sub-systems have a direct influence on the main attributes (including cost) of the final product. They are inputs with the highest added value, linked to the selling firm's main area of competence, and can be useful for differentiating the final product (Dyer, Cho and Chu, 1998). They require a highly specialized design, and therefore, very specific competences and assets.

On the other hand, non-strategic sub-systems mainly develop mature technology. They are relatively standardized inputs, and only require a slight degree of inter-dependency between supplier and customer: the need for coordination is therefore low (Dyer, Cho and Chu, 1998). Their specialized design does not have a very strong impact on the final product in terms of differentiation.

1.3.2. Supplier strategy, a dual coordination mode of vertical sub-contracting relationships

Each purchasing strategy leads to the setting up of a supplier policy. That means a segmentation of potential supplier range, in homogeneous family according to diverse criteria (price, product, supply, etc.).

The strategic degree of the subcontracted segments influences the choice between a single or multi-source policy, bearing in mind that for the most strategic segments, there are very few independent suppliers with the competences required for their design and development.

In accordance with the opposition between the Japanese and American models (Clark, 1989; Dyer, 1996; Dyer, Cho and Chu, 1998), we can distinguish two types of supplier relationships.

The traditional approach, known as *Arm's Length*, which dominated until the late 1980s, gives absolute priority to cost. The architect "steers operations", in a balance-of-power relationship, maintaining technical control over the product and providing itself with the means to modify its choice of suppliers (multi-source procurement), depending on the cost factor. The architect acts as a real Orderer, ensuring that interfaces are as standardized as possible in order to obtain a flexible supplier network and reduce its costs (Sako, 2005). Since the late 1980s, the fact that firms have tended to re-focus on their core business, and the vertical disintegration of activities, have given rise to the development of strategic alliances (Jarillo, 1988; Prencipe, 2005).

Indeed, for the most strategic segments, partnerships (almost hierarchical) have been set up. Cost is no longer a decisive factor – it has been replaced by the notion of "total acquisition cost", covering all the costs incurred by the procurement (cost, quality, lead times, after-sales service, problems) (Dyer and al., 1998).

This duality in terms of coordination modes for vertical relationships is at the centre of the distinction we make between modularisation and systems integration (Frigant 2005).

The Vanishing Hand model (Langlois, 2003) considers the architect firm as an Orderer, defining *ex ante* the parameters of each of the delegated modules, standardizing the interfaces as far as possible, in order to reduce the costs linked to coordination and production of the final product. This organisational configuration corresponds to a technical division of the work, combined with the strive to reduce costs to a minimum (the modules are interchangeable).

Langlois (2003) defines the coordination mode relative to modular-type decentralized production observed in the 1990s as "vanishing hand." This is an intermediary coordination situation – not entirely free but not entirely integrated – with the established domination of the commercial relationship, and it is therefore similar to an *Arm's Length* type strategy.

The approach in terms of systems integration (Dosi, and al. 2005) focuses on firms, which produce complex products (CoPS).

Prencipe (2005) defines the systems integrator as an "*organisation that builds up the network and controls it from an organisational and technological point of view*". The integrator develops partnerships with the suppliers of the most strategic sub-assemblies: it corresponds therefore to a strategic-type alliance (Dyer and al. 2001).

According to Prencipe (2005), this model is based on a resources-based view, which considers firms as collections of resources of various types (Penrose, 1959). Firms are thus considered as integrators of internal or external information and knowledge (Moati, 2001). From a strategic point of view, the systems integrator configures the network as regards the number, type (direct or indirect) and intensity of relationships (Brusoni, Prencipe & Pawitt, 2001). In practice, this distinction between coordination modes is not always easy to make: the architect can be the Orderer or the Systems Integrator, depending on the type of sub-assembly delegated.

II. Airbus-France First-Tier suppliers strategy⁷

In this part, we will illustrate, thanks to a practical analysis focus on Airbus, the previous theoretical contributions described above. The two main principles which are modularisation and purchasing process involve dual relationships and coordination mode with Airbus first-tier suppliers.

⁷ This study was produced in the form of monographs between 2005 and 2006.

A series of interviews were conducted with all the Airbus SAS and Airbus France Procurement Managers. Airbus' main equipment suppliers were also questioned.

2.1. Airbus, a modular-type production focused on purchasing process

2.1.1. A rationalization of purchases

In the late 1980s, Airbus re-focused on its core business as an aircraft manufacturer – general design, cockpit, avionics, engine pylons, final assembly, certification, etc., and proceeded to outsource those activities which it judged non-strategic (Frigant and al. 2006).

In order to remedy a certain lack of consistency and efficiency regarding its subcontracting policy, Airbus elected, in 1993, to rationalize its purchasing, the objective being to reduce the number of direct subcontractors from six hundred ninety to around one hundred by the year 2000 (Alcouffe and Corrége, 2004).

This movement occurred at the same time as the setting up of a pyramid-shaped industrial architecture, with the development of "general subcontracting" (Larré, 1994), which consisted in a transfer of responsibility to the equipment supplier as regards financing (*risk sharing*, Alcouffe, 2002)⁸, development, production and responsibility for the complete sub-assemblies (including the organization of its own sub-contracting network) (Colletis, Lung, 2006).

From 1995, cross-functional progress measures known as CAP (growth and adaptation through processes) and CAP 2001 were implemented, with the aim of reducing procurement costs by 12 to 15% by 2001 (Talbot, 2001). These measures continue to the present day through the Road 06 and the latest Power 8 programme⁹. This rationalization has led Airbus to modify its organization and divide its purchasing into five categories:

- "Aerostructures", organized into Centres of Excellence spread over the various production sites¹⁰, and specialized in the production of a particular section. Each Centre delegates "*Work Packages*" to Aerostructure suppliers, i.e. complete sub-assemblies (80% of aerostructure subcontracting), while the rest (detail parts, electrical assemblies and interiors) is outsourced to a variety of subcontractors.

- "Equipment items" are line replacement units that have a function within the aircraft structure. This category covers "traditional" mechanical equipment items (hydraulics, air conditioning, landing gear, etc.) produced by equipment suppliers, and all avionics systems (on-board electronics, computers) produced by system suppliers.

⁸ The most common form of *risk sharing* is the "*Non Recuring Costs*" (NRC) : the physical interface provides financial support for the development and industrialization of the module under its responsibility. These costs are passed on to the sale price of the module; however, they are based on forecast sales (expenditure to be recovered over x-number of aircraft). If sales do not reach the level of the forecasts, the intermediary bears the resulting losses.

⁹ Louis Gallois, CEO of Airbus, confirmed the maintenance of "Power 8", i.e. the reduction of the number of the suppliers of Airbus of 80% (from 3000 to 500) since 2010.

¹⁰ Wings in the UK (Bristol and Chester-Broughton), rear fuselages, customisation and assembly of single-aisle Airbus aircraft in Germany (Hamburg, Bremen and Brunswick), stabilizers and belly fairings in Spain (Madrid, Cadix) and, in France, machining of the nose and forward fuselage section in Méaultes, center fuselages in Nantes and Saint-Nazaire, and final assembly, flight testing and certification in Toulouse.

Embedded system: computer systems that form an integral part of a product (hardware) with software etc. Avionics is an application of an embedded system for the navigation and control of aircraft. The onboard electronics used for piloting an aircraft are called avionics (aviation electronics). Avionics include communications and navigation systems, autopilots, and electronic Flight Management Systems (FMS). Onboard electronics that are unrelated to piloting tasks, such as video systems for passengers, are sometimes considered avionics as well. Many of these devices include embedded computers. The term is also used to define the electronics units fitted to a spacecraft.

So, in accordance with this distinction between embedded systems, the competition between aircraft manufacturers is increasingly based on the differentiation power related to the embedded systems.

- "General Procurement" is difficult to outsource in a general way – however, the current trend is to outsource complete assemblies, transport, communication, etc.

- *Engine: this equipment category involves a particular & specific relationships between engine manufacturers and Airbus. This relationship cannot be called sub-contracting, because of the engine manufacturer power.*

- « *Materials* » in this case, it is a traditional / classic procurement. Nevertheless, many strategic materials entails international cooperations (like Titanium, composite,...).

2.1.2. The supply-chain management: the example of Equipments and Systems Purchases Department

2.1.2.1. Supplier selection process

The Airbus supplier selection process is applicable to any supplier willing to do business with Airbus. The Airbus supplier selection process comprises the following steps:

- The signature of the Non Disclosure Agreement (NDA) between Airbus and suppliers initiates the supplier selection process to protect the data exchanged.
- Potential suppliers data is collected via the launch of Airbus Request of Information (RFI) and/or Request for Technical Information (RFTI).
- A short list is then created based on market analysis, offset requirements and previous experience with the supply base. The short-listed suppliers are then sent an Airbus request for Proposal (RFP).
- Responses from suppliers to the RFP are evaluated against specific criteria based on the technical, quality, contractual and commercial requirements of Airbus.

2.1.2.2. Concurrent engineering process

As one of the leading manufacturers in the aerospace industry, Airbus continually strives to increase the efficiency and scope of collaboration with its suppliers. Recognizing the need to implement an integrated electronic procurement management program, Airbus

developed Sup@irWorld¹¹, which enables a more efficient procurement practices and effective management of supplier relationships.

Sup@irWorld consists of four Web-based domains that cover the entire aircraft life-cycle and procurement process:

- Sup@irWorld Sourcing: Allows for a paperless process where buyers and suppliers collaborate by exchanging technical requirements and proposals.

- Sup@irWorld BuySide: Provides an automated and harmonized order fulfillment process via the implementation of an e-procurement software package.

- Sup@irWorld eSupplyChain: Covers the entire supply chain cycle, including ordering and logistics through an integrated online workplace.

- Sup@irWorld Found@tion: Provides an overview of all suppliers and their products and a set of reporting tools to support decision-making.

Thus, Sup@irWorld helps to decrease deadlines & cut coordination costs, as well as expand worldwide sub-contracting.

2.1.2.3. Transversality of purchasing

In this framework, cross-functional teams - the Multi-Functional Teams (MFT) - manage the purchasing activities of a given segment in a flexible way, their main objectives being to increase efficiency and reduce procurement costs.

These MFTs are divided firstly into Project Management Groups (PMG), responsible for steering an even more specific segment of the project, then into Integrated Project Teams (IPT), responsible for the development and production of specific items.

These IPTs meet on design platforms and integrate both Airbus personnel and equipment suppliers. This is a "concurrent engineering" process aimed at the collaborative development of products. Their perimeter varies depending on the stage of the project or the difficulties encountered.

However, it would clearly appear that the purchasing segments do not all have the same strategic importance for Airbus, depending on their added value and respective ability to differentiate the final product.

2.2. First-tier suppliers strategic segmentation, a dual organization

In this very hierarchical organization, Airbus has ensured that the most strategic competences remain internal (wing, vertical and horizontal stabilizers, engine integration, fuselage sections, on-board electronics, flight control computers, avionics, etc.) – such competences constitute its "*Core Business*". Nevertheless, 70% of the cost of an aircraft is purchased externally.

¹¹ This entails a fruitful cooperation with advantages like lower overhead, enhanced performance, increased visibility across the enterprise, a uniform way of working with suppliers, and the ability to make more accurate decisions. Airbus has met its key objectives of improved business processes, increased automation, better integration and enhanced reporting capabilities.

As the Architect, and in order to rationalize procurements, the aircraft manufacturer deals almost exclusively with first-tier full suppliers, which are responsible for the development, financing and production of complete sub-systems.

The strategic segmentation of its purchasing activities has led Airbus to apply a similar segmentation as far as its suppliers are concerned (Zuliani, Jalabert, 2005).

2.2.1. Systems Integration relationships

This kind of relationship is a matter of the most strategic first-tier supplier.

They manufacture strategic equipments & systems of which Airbus owns a competence in design conception. The major equipments and systems suppliers produce strategic sub-assemblies such as avionics systems, with Thales Avionics or Rockwell Collins, for example, or certain sensitive equipment items (aerostructures or mechanical equipment), such as fuselage parts, with Latécoère, or air conditioning systems with Liebherr Aerospace, in particular.

Thales Avionics, thanks to these competences in avionics, is the best example of strategic first-tier supplier. The typical example of a strategic partner is Thales Avionics, which has developed perfect technical control of on-board systems. Indeed, Thales Avionics disposes of complementary competences to aircraft manufacturer that enable a value added to the Airbus final product.

These first-tier suppliers, in possession of real strategic competence with a high added value, are pivot-firms¹² (Mazaud, 2006). Airbus develops strategic partnerships with them.

In this relationship Airbus acts as systems integrator. Production of the most strategic systems and equipment items (on-board electronics, air conditioning, certain parts of the structure, etc.) leads Airbus to work with pivot-firms in order to jointly specify the interfaces and determine the work specifications, the conditions required to ensure correct integration of these sub-systems in the overall product as well as their interconnection. This gives rise to a genuine strategic partnership.

Airbus maintains its general design and control prerogatives, but relinquishes its coordination function in favor of pivot-firms, which are the only entities capable of combining the competences required for the design and development of the sub-assemblies under their responsibility. The systems integration relationships are mainly based on the first-tier supplier possession of strategic competences.

2.2.2. Arm's length relationships

The Arm's length relationships are described by Dyer et Singh (1998, p.661). According to them "*Arm's length market relationships are characterized by:*

- *non specific asset investments*

¹² In general, pivot-firms have developed competences that are both strategic – in the sense that they have few competitors throughout the world – and combinatory, since they are capable of mobilizing the resources required to produce idiosyncratic sub-systems which are specific to a given programme. In other words, these firms have succeeded in ensuring that the competences they possess are essential to Airbus, which consequently ensures the long-term duration of the relationship between the two companies.

- *minimal information exchange (i.e., prices act as coordinating devices by signaling all relevant information to buyers and sellers),*
- *seperable technological and fucnctional systems within each firm that are characterized by low levels of interdependence (i.e., the two organizations have only a sales-to-purchasing interface and do not jointly create new products through multifunctional interfaces), and*
- *low transaction costs and minimal investment in governance mechanisms (Williamson, 1985)".*

This kind of relationships is relevant to the less strategic first-tier supplier. Airbus acts as an Orderer, providing a very precise description of the interfaces (which may be specified or translation interfaces) and the work specification, and leaving little room for maneuver for its subcontractors, which are mainly selected on a cost basis.

Furthermore, they are frequently forced into competition with one another, through a benchmarking system¹³.

As regards less strategic equipments suppliers, Airbus aims to reduce its coordination costs and therefore limits its role to simply being aware of the lower tier subcontractors who have been selected in order to reduce its costs.

2.2.2. Airbus, a dual firm

According to Cohendet & Llerena (2005), the two preceding approaches are more complementary than opposite. A same firm can simultaneously create and allocate resources i.e. manage competences and transaction.

"In this "dual" vision..., first [the firm] focused on the bulding of the domain of core competence...giving full priority to the creation of resources. Then, ... the firm tends to allocate resources and to adapt to the environment in accordance with governance mechanisms that are well analysed by the transaction cost approach" (Cohendet & Llerena, 2005, p. 176-77).

Airbus can be apprehended like a dual firm because of its dual management of procurement. In spite of a dual management of relationships with first-tier supplier, ambition to reduce cost of purchasing is omnipresent.

However it has to respond to important requirements in terms of quality and environment. In addition to the international quality standards in force, the reliability of sub-assemblies is ensured by a very strict supplier evaluation system, known as "*rating*", which is managed by the various "*Purchasing*" divisions within Airbus.

The equipment suppliers are rated according to total quality criteria (quality, costs, lead times and control over industrial risks) further to annual audits.

¹³ Benchmarking shall consist of "finding, at international level, the company(s) that perform a given task or process in the most efficient way, going to study the way they perform such task or process, for as long as its prices remain competitive. Price benchmarking is relatively common, and is necessary to maintain a healthy level of competition between two or three suppliers.

Conclusion

Competition and financial profitability constraints the Orderers to only solicit a limited number of suppliers, which must cover a larger area of responsibility. The structure of production organization becomes more hierarchical and coordination modes seem to move towards a single model for the transaction costs' reduction.

While on a theoretical level it allows for greater visibility, in practice, a modular approach cannot guarantee a sufficient insight into the coordination modes with first-tier suppliers.

By integrating purchasing strategy into our analysis, we have shown the diversity and continuity in coordination modes. This relational mixing is at the core of Airbus' segmentation.

The emergence of more and more strategic stakes involves a new structuring of vertical sub-contracting relationships.

Procurement in Airbus, and particularly equipments & systems' purchases has a major importance by becoming a key competence.

The strategic dimension inherent in purchasing, leads to a fine a more differentiated management of the supply chain. This key competence lies at the crossroads of two aspects:

- A significant reduction in transaction cost for non-strategic market segments (a relationship based on cost for non strategic equipments and systems).
- The development of mutual learning, founded on cognitive coordination on strategic segments (a relationship based on competence for strategic equipments and systems).

These significant changes, which are both cognitive and organizational, are occurring in parallel to other global transformations of the capitalist system. Thus, the movement of international sub-contracting gains in importance/momentum with supplier being located in different areas depending on the nature of their production.

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