GETTING THE ACTORS ON BOARD: ACTOR-CENTERED RESEARCH ON ORGANIZATIONAL PATHS IN AIRBUS INDUSTRIES

Submitted to the

2nd International Conference on Path Dependence

March 3-4, 2011
Freie Universität Berlin
School of Business & Economics

Draft: November 15, 2009

Abstract

While many authors write about path dependence, the concept lacks empirical verification on real life phenomena. This study wants to make two contributions to the understanding of organizational path dependence: First, by conducting an in-depth case study of Airbus Industries and its development from a loose consortium of national companies to an integrated multinational company, this study can further conceptualize the approach. It provides empirical evidence for how organizational paths emerge, develop and are maintained in complex organizations. Second, by focussing on actors and their ability to influence self-reinforcing mechanisms in the path formation phase, the paper highlights the interplay of different actors and studies their possibilities of influence.

[…] if you take the organization of Airbus and put it to the London Business School, in about five minutes you can prove it can't possibly work.
Adam Brown[1]

1. Introduction: Problem Statement

Many approaches in Social Sciences emphasize that institutions undergo processes of continuity and change. The concept of path dependence has much to offer for the explanation of a lack of change in technological, institutional and organizational arrangements (David 1985; Arthur 1994; North 1990; Crouch and Farrell 2004; Sydow et al. 2009). By illustrating the persistence of certain inefficient technical, institutional or organizational solutions over time, path dependence allows for a process-orientated perspective, highlighting both time and sequence (Pierson 2000: 264). Consequently, path dependence has become one of the most widely used explanations of social sciences research (Beyer 2005).

However, the notion of path dependence is still heavily discussed within the scientific community. No consensus exists regarding its exact definition, a minimal consent being 'history matters'. This broad comprehension reveals little more than that 'the past influences the future' (Mahoney 2000: 507). Prominent scholars therefore limit their understanding of path dependence to specific trajectories caused by social mechanisms (David 1986: 41-45; Arthur 1994: 112-113; North 1990: 95; Mahoney 2000: 508; Pierson 2000: 252). Following Mayntz (2004: 241), mechanisms are 'sequences of causally linked events that occur repeatedly in reality if certain conditions are given'. This understanding seems to be widely agreed upon in literature. However, quantity and quality of stabilization mechanisms in path dependence remain controversially discussed.

Reviewing relevant literature, Beyer (2005: 18) specifies seven stabilization mechanisms. Increasing returns, sequences, functionality, complementarities, power, legitimacy and conformity are highlighted across disciplines. The number of mechanisms listed by technological approaches ranges from one 'increasing return' mechanism, triggered by high start-up costs, learning and coordination effects as well as adaptive expectations (Arthur 1994: 112ff.), to a combination of three factors:

[1] Adam Brown is a former vice president of the Airbus Customer Affairs Directorate (cited in McIntyre 1992: 63).

system scale economies, technical interrelatedness and quasi-irreversibility of investment (David 1986: 41-45). Both conceptions identify increasing return mechanisms, i.e. ‘factors that recursively intensify one another’ (Dobusch 2008: 17), as sine qua non condition for path dependence. In line with this argument researchers of organizational paths situate four self-reinforcing mechanisms at the heart of their concept. Coordination effects, complementary effects, learning effects and adaptive expectations heavily diminish the scope of action and ultimately lead an organizational process into an ‘irreversible state of total inflexibility or lock-in’ (Sydow et al. 2009: 691). Hence, increasing return mechanisms heavily limit the scope of action of actors locked to a certain path (David 1985; Arthur 1989; Pierson 2004; Sydow et al. 2005; Sydow et al. 2009). Actors are therefore conceived as being passively confronted with a limited scope of action, possessing no influence on path dependent processes (Sydow et al. 2009: 691).

This perspective is however limited to the persistence of unintended, inefficient paths. New research in this field does not limit itself to the process of path dependence, but broadens its scope to intentional influences of trajectories. Based on the idea that actors can influence paths in societal contexts (North 1990; Pierson 2000), the concept of actor-centered research was recently introduced by Botzem (2010). Framing the standardization of international accounting as a path dependent process, he argues that path formation cannot be understood without the ability of actors to shape self-reinforcing mechanisms (Botzem 2010: 210). This idea is of increasing economic relevance. However, conditions for actors to shape increasing return mechanisms have to be explored in depth. At present little is known under which circumstances different groups of actors can influence mechanisms such as complementary and learning effects. Moreover, we know very little about the ability of actors to strategically use self-reinforcing mechanisms to foster their interests, and which mechanisms may be central to such a process. A perspective highlighting the differences of actors in influencing self-reinforcing mechanisms on company level, would therefore enrich the scientific debate.

2. Theoretical Background: Bringing Actors in

Since the concept of path dependence has become one of the most widely used explanations in social sciences research, it has been modeled across disciplines (Mahoney 2000; Pierson 2000; Thelen 2003), most research focusing on technological (David 1985; Arthur 1994) and institutional paths (North 1990). Applying the concept of institutional path dependence to organizations, its development has been conceptualized by Sydow et al. (2005; 2009). The authors define organizational path dependence 'as a rigidified, potentially inefficient action pattern built up by the unintended consequences of former decisions and positive feedback processes' (Sydow et al. 2009: 696). This action pattern gradually restricts organizational flexibility in three steps. In the first pre-formation phase, the evolution of a certain trajectory is not yet determined, outcomes being unpredictable at this point. Then, following a 'critical juncture', unfolding self-reinforcing mechanisms in the second path formation phase progressively restrict the choices of actors. Due to positive feedback processes, alternative developments gradually become more and more unlikely, and the pattern ultimately locks-in (Sydow et al. 2009: 692).

In line with this argument, the authors understand organizational stability grounded on self-reinforcing mechanisms as an extreme restriction of the scope of action of actors. Accordingly, actors and the differences among them are neglected in this perspective (Dobusch 2008: 144). However, actor-centered research on organizational paths has recently shed light on the interaction and the adaptability of different groups of actors in the path formation phase (Botzem 2010). The standardization of international accounting principles has shown that competition, conflict and bargaining among actors were essential for the development of a path dependent process (Botzem 2010: 209). Depending on their capability to deploy resources (Sorge 2006), actors were able to imprint their interest on a path. Moreover, the influence actors could exert on positive feedback mechanisms still increased if they were confronted with both restricted decision options and a small number of other players (Botzem 2010: 200). Other authors argue that the capacity of (strategic) actors to influence organizational processes is due to their relevance and autonomy (Crozier and Friedberg 1995: 82-83). Emphasizing this argument, I focus on the influence (strategic) actors can exert on positive feedback mechanisms. Therefore, I raise the following research questions: *How can organizational actors*

influence coordination, complementary and learning effects in the path formation phase? In so doing, can they impact on the trajectory of a path?

3. The Case of Airbus Industries

Airbus Industries (AI) has evolved to become the civil aviation and military transport arm of the European Aeronautic Defence and Space Company (EADS). From a joint venture consortium for initially one plane (the A300), it developed into an integrated company of which EADS holds the majority of shares. It has come to offer passenger planes across the whole spectrum of civil aviation jets from about 100 seats upwards. As such, it is the major world-wide rival of Boeing, the only other company to offer more or less the full range of civil aviation jet planes. Airbus development and production sites are found mainly in France, Germany, Britain and Spain, major suppliers coming from other European countries.

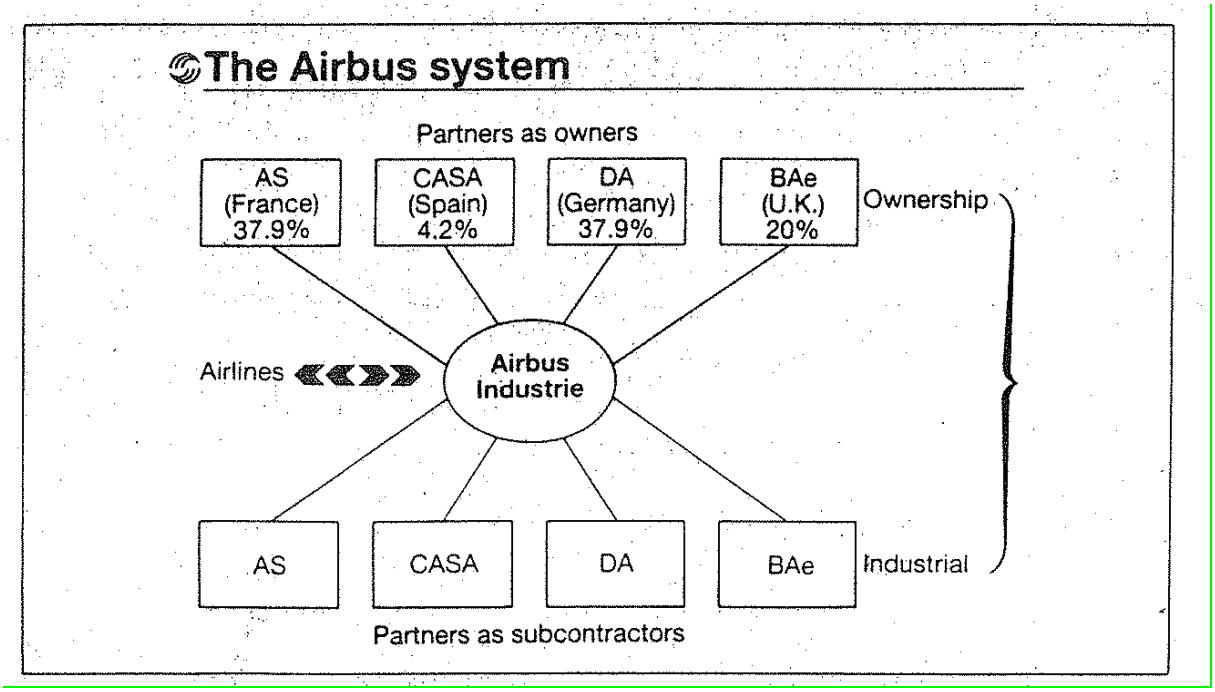
In this way, Airbus is an exemplary specimen of a transnational, federated enterprise. In addition, it is vastly more complex and governed by more stakeholders than the case investigated by Kristensen and Zeitlin (2005). It was and is subject to strong micro-politics conducted by powerful and highly dispersed actors, such as national governments, national subsidiaries and the Toulousian headquarter. If there is any practice of intermediation between different actors that Airbus does not have, it will probably not occur elsewhere, either.

Airbus was a political project from the outset (Hayward 1987: 13)[2]. State-owned French Aérospatiale and Deutsche Airbus GmbH founded the Airbus consortium in 1970. Spanish Construcciones Aeronauticas S.A. (CASA) and British Aerospace (BAe) joined in 1971 and 1979 (Hornschild 1992: 66). The organization, or Airbus system, they installed could be described as a relational network of three important groups of actors: funding National Governments, National Companies (NatCos) and the Groupement d'Intérêt Economique (GIE)[3] Airbus Industries (Muller 1989: 187). As sole interface with airlines, Airbus GIE accounted for marketing, sales and support

[2] Since Airbus' creation and survival was only due to billions of governmental loans and subsidies as well as long-term political support, political involvement is particularly high in the aerospace sector (Salot 2006: 31).

[3] The French legal form of a Groupement d'Interêt Economique (GIE) granted vast economic and technological autonomy to the parties involved and is comparable to the German BGB-Gesellschaft. All parties involved were liable as single or joint debtor (Schmidt 1997: 153).

of aircrafts. Moreover, it coordinated design, development and production (Hayward 1986: 65). Being charged with the overall program organization, Airbus GIE ordered components from the NatCos French Aérospatiale, German DASA, British BAe and Spanish CASA for previously negotiated prices (Muller 1989: 242-245). As subcontractors, NatCos were responsible for industrial and technological tasks and subordinate to GIE's arbitration. As shareholders of the consortium, they had the final say in the company's decisions. Needless to say, this organizational set, in which NatCos were both shareholders and subcontractors for development and production tasks, contained a high potential for conflicts between the main actors of the Airbus system.

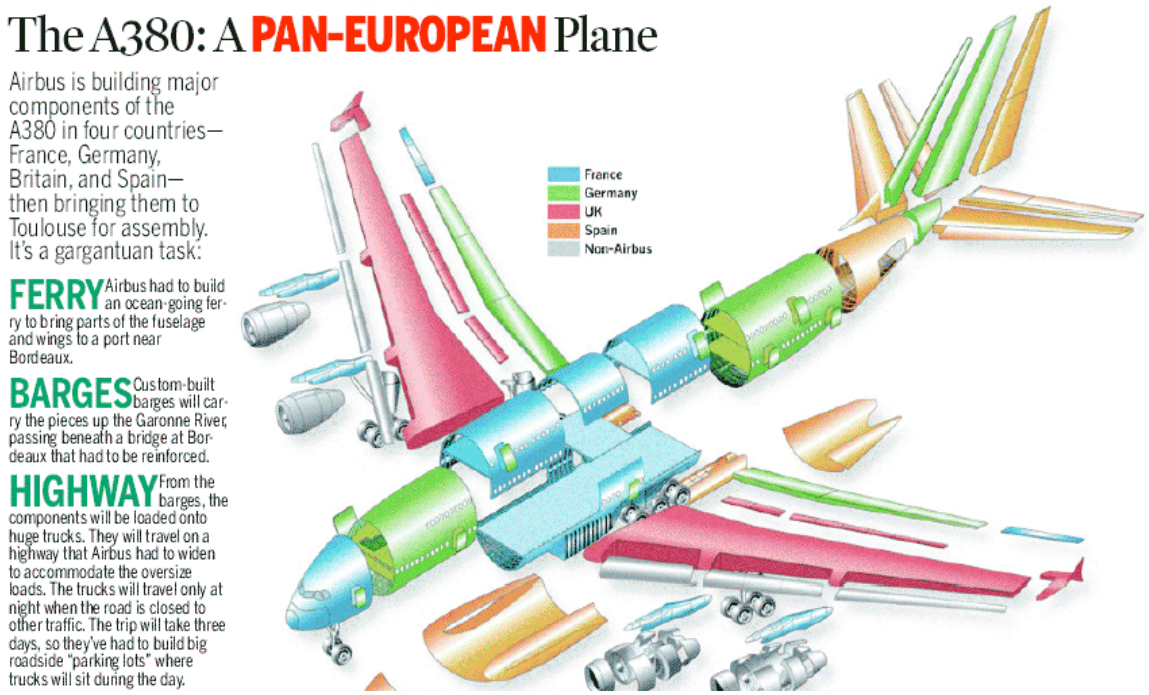


Hornschild 1992: 69

Production and development took place in the national companies. Aérospatiale, DASA, BAe and CASA produced complete modules and equipped them with important flight and cabin systems (Hornschild 1992: 70). Over time, the assignment of competencies resulted in the specialisation of nations and production sites in specific components and interrelated aircraft systems. Gradually sites developed specific material (invested capital) and immaterial assets such as knowledge and competencies assets (Schmidt 1997: 40; Wilken 2001: 334). Learning effects in production generated decreasing average costs per unit and a more efficient operation of tasks (Hartley 1965; Bletschacher and Klodt 1992: 74-75; Lagasse 2010:

49). Such benefits furthered investments in certain technologies and specially trained engineers. This again resulted in additional investments in the same technologies and competencies and led to decreasing production costs and developmental periods (Interviews with former German sites managers). Thus, over time, nations and sites accumulated a specific, non-transferable stock of investment. As a result, despite work share negotiations among the NatCos prior to the launch of each new program, sections and systems were constantly distributed in the same way: wings to Great Britain, cockpits, parts of the front and central fuselage and the nacelles to France, central and back fuselage, flaps, the vertical tails to Germany and lower fuselage parts, landing gear door and the horizontal tail to Spain. Especially German DASA wanted to alter work share allocation since the beginning of the Airbus program (Interview with Dr. Hartmut Mehdorn, former CEO of German DASA). Despite successful minor changes in work share allocation, primary decisions to the A300 development established a division of work and a distribution of expertise that still exists today:[4]

Division of work in the Airbus consortium for the A380



Alcouffe 2005: 174

[4] Unlike Boeing, Airbus has throughout its history continuously worked on innovations and has developed completely new aircraft programs (Krause-Nehring 2007: 226). Permanent technological innovation enabled the consortium to enter and stay on the market for civil wide-body aircrafts (Wilken 2001: 56). Therefore, I find it difficult to argue in favour of a technological path.

However, the distribution of functions across sites has some diseconomies. As the Airbus partners wanted to conserve their competencies on national and site level, they accepted costly logistics. As a result, whole sections of planes were transported over long distances in Europe. Big wings and fuselage parts from Broughton and Hamburg were for example flown to Toulouse for assembly, only to be returned to Finkenwerder for cabin equipment (Kiani and Bläske 2009: 62). Furthermore, Airbus partners put up with high transaction costs for decision-making and production problems in the making of the overall project. In 2006, GIE organization exposed its limits as absent coordination between national sites culminated in severe construction problems of the company's prestigious project, the A380 (Behrens and Clouet 2009: 6). GIE structures were not suitable for the production of a new generation of complex aircrafts (Interview).

4. Methods and Research Design

Single qualitative case study

Self-reinforcing mechanisms on company level are the focus of the study. As qualitative methods allow in-depth analysis of a limited number of cases within real life contexts, they are particularly apt for investigating complex social processes over time (Flick et al. 2007: 17). Because of their open approach towards empirical context and data, they are appropriate for answering questions on which little research has been conducted so far (Baur 2005: 235).

One research strategy in qualitative research is case study analysis (Baur 2005: 235). Case studies focus 'on understanding the dynamics present within single settings' (Eisenhardt 1989: 534). They can effectively answer 'how and why questions' (Yin 2003: 10) while providing a persuasive argument for causal relationships (Siggelkow 2007: 23). Therefore, a case study approach facilitates a rich and deep description of organizational processes over time (Yin 2003: 89). Hence, case studies allow researchers to closely apply the theoretical construct and test it on real life phenomena (Siggelkow 2007: 23). For further theory development both organizational path dependency and actor-centered research on organizational paths need empirical verification (Sydow et al. 2009: 705; Botzem 2010: 215).

Airbus is a one of a kind organization (Aris 2002: 59). It grew from a federated consortium of national aircraft producers to an integrated company, on an oligopoly market characterized by fierce competition. Since this organization is more complex and governed by more stakeholders than the case investigated by Kristensen and Zeitlin (2005), AI can be considered as an 'extreme' case (Eisenhardt 1989: 537). Testing theory on a unique case allows profound insights into complex developments and is therefore essential for theory generation (Yin 2009: 47). Adopting a close-up view of the Airbus organization, it seems appropriate to conduct an explorative single case study with multiple units of analysis (Yin 2003: 46).

In addition to being an exemplary specimen of a multinational company, little social science research has been done on AI[5] and even less on organizational processes within the company.[6] Insights into persistent structures will therefore enlighten knowledge on a scarcely explored case. Based on these empirical findings, quantitative studies of organizational learning or behaviour will be possible in a second step.

Design

The unravelling of path dependent processes requires a retrospective, longitudinal case study (Siggelkow 2007: 22). In order to understand how actors influence self-reinforcing mechanisms, I plan to proceed in two steps. First, I will analyse persistent processes in AI by using the concept of organization path dependency. For studying the emergence and development of a path, Sydow et al. (2009: 704) recommend a three-step procedure. After the identification of a strategic persistence on the organizational level, increasing return mechanisms have to be revealed and reconstructed. Subsequently, the event that set the path into motion ('small event'), and the event that triggered the self-reinforcing mechanisms ('critical juncture') have to be determined.

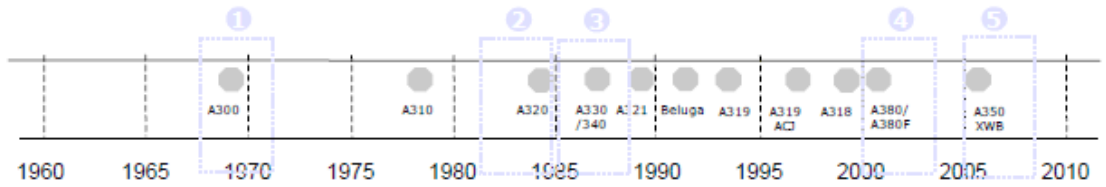
After identifying a persistent pattern of work share allocation over time, I will study how the main actors of the Airbus system influenced coordination, complementary

[5] Exceptions are a few doctoral theses and journal publications such as Hayward 1987; Neven and Seabright 1995; Schmidt 1997; Kirchner 1998; Wilken 2001; Kidess 2003; Salot 2006; Krause-Nehring 2007.

[6] Exceptions are Bugos 1992; Alcouffe and Corrégé 2004; Alcouffe 2005; Mazaud 2007; Mazaud and Lagasse 2007; Kechidi 2008.

and learning effects in the path formation phase. Self-reinforcing mechanisms will be revealed by the method of causal reconstruction introduced by Mayntz (2004). For empirical specification of increasing returns mechanisms at company level, the two main Airbus sites Toulouse Blagnac and Hamburg Finkenwerder will serve as an example. Employees of EADS confirmed the comparability of the two final assembly sites in preliminary interviews, both being very similar in size, importance and function.

Focussing on critical situations when production and R&D allocation could have changed, I consider studying a period ranging from 1967 to 2001. After recapitulation of the prehistory of Airbus, the starting point of the analysis will be 1967. At that point, a German, British and French joint venture decided to build one plane, the A300 (Muller 1989: 52). Subsequently, stakeholders negotiated the allocation of development and production of work packages. Following demands of Lufthansa and Swissair, the NatCos and respective governments agreed to build a smaller version of the A300 in the late 1970s. For production of the follow-up program, the A310, allocation of work packages for components and interrelated aircraft systems did not change (Braunberger 2006: 75). Ever since, all decisions to build new aircraft programs were preceded by long and rough negotiations about the distribution of production and R&D activities. Then actors inside the company fought for the preservation and enhancement of local activities within the overall organizational process and company organization. I will focus on work share negotiations before the launch of important Airbus programs A300 (1969), A320 (1984), A330/340 (1987), A380 (2000).



Own Illustration

The analysis will end in 2001. At that point, Airbus was turned into a joint-stock corporation in the French form of a Société par actions simplifiée (S.A.S.) and became a wholly owned subsidiary of EADS. NatCos merged to become Airbus

Integrated Company (AIC), a multinational enterprise with factories and engineering under one management with transparent accounts. In further research I will address the work share allocation of the newest program, the A350 XWB (2004).

Data Collection

As quantitative data on the organizational level is not available for a more than thirty-year period and cannot detect actors' influence, qualitative data will be collected to illustrate the evolution of production and R&D over time. The two main sources of data will be literature and press articles. In line with triangulation (Flick et al. 2007: 309), this data will be supplemented with a great variety of documents such as company reports, policy papers as well as publications from national parliaments and administrations, trade unions and industry associations.

Additionally, thirty-one problem-centered, semi-structured interviews (Meuser and Nagel 1991) have been confidentially conducted with several former CEOs of Airbus Germany and Airbus France, Airbus employees, trade union representatives, journalists and field experts. Furthermore, Interviews were held with policy officers of the European Commission (DG Enterprise and DG Research), representatives of the German Aerospace Industries Association (BDLI) as well as civil servants of the Federal Ministry of Economics and Technology (BMWI), the German Aerospace Center (DLR) and the Hamburg Ministry of Economics (BWA). Since France and Germany were the main owners of AI and shares between them were accurately balanced during all times (Schmidt 1997: 153), focusing on the two countries seems justified.

A research stay at the Deutsch-Französische Institut (DFI) in Ludwigsburg allowed me to conduct a press analysis of major French and German newspapers from 1970 until 2007[7]. To illuminate internal industry dynamics, these articles will be supplemented by an in-depth analysis of the leading industry journal 'Aviation Week and Space Technology'. Furthemore, press analysis will be complemented by Airbus (1970-2007) and DASA company reports (1989-1998) I collected during a stay at the Daimler Benz company archive and the Laboratoire d'Etude et de Recherche sur l'Economie, les Politiques et les Systèmes Sociaux (LEREPS) in Toulouse.

[7] Press analysis covers the German Frankfurter Allgemeine Zeitung, Süddeutsche Zeitung and Handelsblatt and the French Le Monde, Le Figaro and Les Echos.

Data Analysis

In order to reveal the path and its underlying self-reinforcing mechanisms, data analysis is currently being performed following Mayrings 'qualitative documentary analysis' (2008). In a first step, literal Interviews transcripts as well as literature and press articles were singled out or roughly 'paraphrased' (Meuser and Nagel 1991: 456). In order to reduce material, relevant parts of the data were selected and summarized. In a second step, ambiguous sections are currently clarified through adduction of other context material. Subsequently, patterns relating to the research question will be gathered from data. Due to the interactive process of qualitative research, data analysis is no linear processes. On the contrary, the different steps interact with one another (Flick 2006: 258), just as theory and data (Van Maanen et al. 2007).

5. First results

Following Muller (1989: 198ff.), Airbus' internal decision-making process could analytically be divided into three sequences: the commercial, the industrial and the political process. In the commercial process, Airbus GIE and several airlines defined the broad features of the aircraft. Fixing price and performance of the future program, these negotiations settled purchase agreements. In the political process, the shareholders of the Airbus program laid down total financing of the aircraft program. Having decided the financial upper limit, national governments and their respective NatCos (national companies) agreed on the amount of launch-aid and repayment. In line with the commercial and financial guidelines, the NatCos determined aircraft design and work share allocation in the industrial process. Once the NatCos had reached an agreement, national administrations verified that the overall work share corresponded to their government's objectives (Muller 1990: 36). As such, the work share contract was confirmed by the supervisory board, composed of the Airbus shareholders (Schmidt 1997: 161). Moreover, Airbus sales were repeatedly pushed by German ministers and French presidents (Interviews).

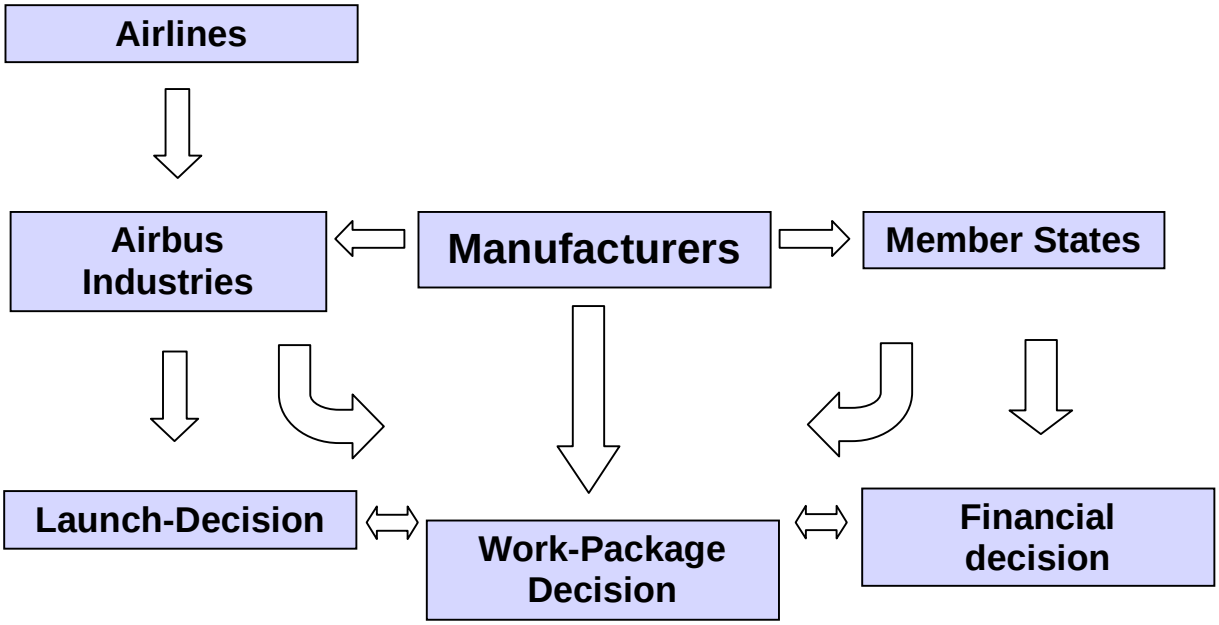


Illustration based on Muller 1989: 198ff.

Despite these various interactions, the three processes worked rather independently up to a certain extent. This ensured that the Airbus system was not blocked when negotiations in one sequence could not proceed (Muller 1990: 36). However, in order to achieve progression of the whole organization, at a certain moment in time, the different actors needed to reach a compromise. So, actors across levels had stable routines for making decisions within all the three processes indicated, and for coupling the three processes to one another. Since reconstructing all the three sequences over time would go beyond the scope of the paper, I will concentrate my analysis on the industrial process, and how it has related to the political process. Due to its position at the heart of the Airbus system, its development in interaction with the commercial and the political processes can illustrate the complex and interrelated decision-making of this particular organization.

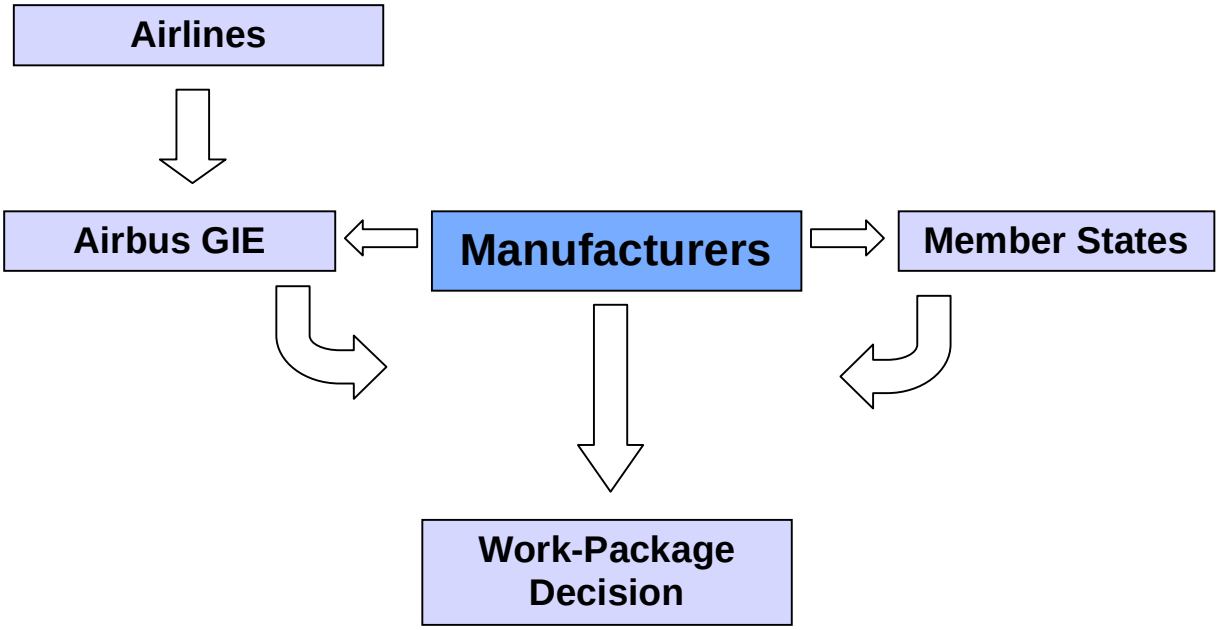


Illustration based on Muller 1989: 1989ff.

At the outset of a new program, NatCos-representatives came together to determine aircraft design (Hayward 1986: 73; Interview). After configuring the plane and its technical characteristics, they assessed the overall amount of work. Then, the work share was divided into large integrated sub-assemblies, equipped with interrelated aircraft systems (Kracht 1994: 58).[8] Partners negotiated the prices for single sub-assemblies and bargained for their allocation (Aris 2002: 123; Interview). Even though the overall volume of work share and respective R&D was allocated to the cooperating companies on the basis of their shares of the consortium ('juste retour' logic), NatCos constantly fought for the increase of their activities (Aris 2002: 58; Interview). Acceptance of a technological solution would attribute a stronger position to one partner. Hence, peer review and in-house competition were fierce, especially for high-tech components (Muller 1989: 190; Interview with Dr. Harmut Mehdorn): In changing alliances and coalitions, 'we bargained as if we were on an oriental bazaar' (Interview).[9] Especially the German engineers wanted to change their assignments in the consortium during work share negotiations (Muller 1990: 39; Interviews).

[8] As a result, the main parts of the aircraft could be independently developed and manufactured in different sites and different countries. Over time, this established a production system scattered across Europe, heavily dependent on communication, logistics and infrastructure systems.

[9] Airbus Industrie GIE did not publish accounts. It was the lack of transparency and financial accountability that allowed industrial partners to negotiate the allocation of work share in this manner (Hornschild 1992: 67).

> *"German strategy was that every time a new aircraft program came along, we could try and change the work share a little bit to increase our understanding of the building of airplanes. (…) I thought it was good to have a situation where at one time we made the wing box, the tail fin, and in the next aircraft we made the center section. It was a softly, softly approach and the aim was to be a competent Airbus partner (Dr. Hartmut Mehdorn cited in Aris 2002: 146-147).*

Work share negotiations before launching important Airbus programs would serve as critical situations of the analysis: A300 (1969), A320 (1984), A330/340 (1987), A380 (2000).

Initial decisions about the allocation of activities and the overall organizational process were taken during the prehistory of the Airbus project. The governments of Great Britain, France and Germany decided to build the A300 in 1967. In an early French-British appointment both parties distributed sophisticated components such as wings and cockpit among themselves (Kirchner 1998: 152). The West German 'junior partner' was to contribute fuselage parts and vertical tails. However, the British government withdrew from the program in 1969. The two remaining partners stayed committed and renegotiated shares and manufacturing parts. During work share negotiations, French Aérospatiale benefited greatly from the technological superiority of its aircraft industry. Unlike the West German industry, which was in a weak position after years of post-war production prohibition, French engineers were leading the design of the Caravelle and the supersonic Concorde (Muller 1990: 39; Interviews). Hence, sophisticated technical and development tasks were carried out by Aérospatiale. DASA supplied central and back fuselage, cabin equipment, wing flaps and vertical tails (Schmidt 1997: 158). The follow-up program A310 was a derivate of the A300. Apart from a new wing and a modern cockpit design, components very much resembled each other (Schmidt 1997: 157). Hence, work share distribution between the partners stayed more or less the same (Hayward 1986: 73).

The allocation of production and R&D activities for the subsequent A320 aircraft was more difficult. It took Airbus over a year to settle the broad outline of work sharing (Hayward 1986: 74). As a completely new program, the A320 required a new production line. Also, it introduced new flight control systems ('fly-by-wire') and a new smaller, lighter wing. Newly joined British BAe wanted major areas of responsibility to

rotate among the industrial partners (Hayward 1986: 73). However, Airbus Industries GIE heavily objected to the additional costs and inefficiency entailed in duplicating facilities for the A320. As they were skeptical of its commercial success, German DASA did not assume their full amount of production volume, and BAe took on the remaining German work share (Aris 2002: 123; Interview). Apart from these changes, A320 work share allocation confirmed the original division of research, development and production responsibility established in the first Airbus program.

The first evident change in the work share division between the industrial partners came with the next programs. For the A330/340 program, German DASA claimed final assembly, but could not assert its position. As compensation they were given a larger piece of the A320 fuselage. But final assembly of the A320 was given to Toulouse, and Hamburg got the final assembly for the A321, a slightly extended version (Interviews).[10] In return for ceding the A321 final assembly to Hamburg, Toulousian Aérospatiale provided cabin interior for the A330/340 wide-bodies (Kracht 1994: 74). With the exception of final assembly, the A330/340 and the A321 thus followed the original work-sharing pattern (Hayward 1986: 74).

Subsequent negotiations over the location of final assembly and wing production of the A380 program were long and rough. However, in the end, the original work share pattern also applied to the companies' biggest project (Aris 2002: 211; Interview). Even if the exact national work share differed with each aircraft type, the broad pattern established by the A300 was maintained in all the following programs (Interviews). Over time, learning and coordination effects led to the specialization of nations and production sites in specific components and interrelated aircraft systems (Schmidt 1997: 40). Bringing savings to the program as a whole, the 'key to Airbus success lay in specialization' (Roger Béteille, former CEO of Airbus Industries GIE, cited in Hayward 1986: 74).

[10] The use of large integrated sub-assemblies in Airbus' production system reduced the importance of final assembly to 4% of total work (Kracht 1994: 58; Interviews). Getting assembly responsibility for the A321 was obviously 'about prestige, not money' (Dr. Hartmut Mehdorn, cited in Aris 2002: 147).

6. Interpretation and further research challenge

In line with these first findings, I argue that over time an organizational path of production and developmental allocation emerged within the Airbus consortium and still exists today. It was the relative importance of national stakeholders, both funding and shareholding governments, linked with the relative importance of the NatCos, that constituted the main mechanism of path continuity. Industrial and governmental partners needed one another to such an extent that it was inconceivable to break up the consortium, and this meant that work shares were continued from one model to another (Arnold and Sorge 2010).

Further research needs to address self-reinforcing mechanisms and the influence actors have on them. Analysis of company reports and interviews will shed light on the influence of actors on learning, coordination and complementary effects. This will also enlighten the question if actors can impact on the trajectory of a path. Further press and interview analysis will reveal if the A350 allocation went against existing development and production shares. This is all the more important as company organization changed substantially in 2000, moving from the federated GIE to an integrated company structure. Since then, work share is no longer collectively decided upon, but allocated from the headquarters at Toulouse. With this empirical evidence, I hope to provide a deeper understanding of the role different types of actors have in influencing self-reinforcing processes.

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