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## [Abstract] Mobilizing an aerospace corporation on design practices: PHENIX at EADS (2007-2010)

*[Résumé de la journée d'étude] Mobiliser un groupe industriel autour de ses pratiques de conception : Le programme PHENIX d'EADS (2007-2010)*

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## PLAN

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### 1. Contributions

1. 1. The EADS group when Phenix is launched
1. 2. Harmonizing design tools: why the Phenix programme and how?
1. 3. ACE, a previous programme in the 1990s within the Aircraft business unit
1. 4. Thinking knowledge over half a century: Phenix and the helicopter business unit
1. 5. Sorting out a wealth of data, sharing their use and property: Phenix at Astrium
1. 6. Benchmark, untangling informatics and business: a tool selection process
1. 7. Round table: Harmonizing the design of different products

### 2. Conclusion

## TEXTE

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- 1 In 2007, the EADS group top management launches a large internal mobilization program aimed at dramatically improve the coordination of aerospace design practices. The programme's acronym, Phenix for PLM Harmonization Enhanced Integration & eXcellence, deserves some explanations. PLM (Product Lifecycle Management) is a set of methods and tools that help define an industrial product throughout its life, then from its initial inception to final recycling when it is removed from market. For complex products, such as airplanes, helicopters, launchers and satellites, PLM is an essential process to control the time to market, product quality and optimization, cost reduction. Harmonization, the second word, is a big challenge in a context where the design phases of each of the four types of products mentioned differ significantly because of their specificity. Enhanced In-

tegration & eXcellence is another big challenge because we are in a time where EADS is still working hard to put together the various European companies constituting the group while to vigorously improve its productivity.

- 2 The seminar held on the October 11 at *Maison de la Recherche, Université Toulouse-Jean-Jaurès*, aimed at reconstructing how Phenix was led between 2007 and 2010. It looked into how it impacted industrial and technological processes. It addressed its chronology and actors, also the kind of convergence between divisions it reached despite their quite different businesses (aircraft, helicopters, space); it sought the hurdles this convergence met and the efforts the Phenix proxies from each division had to make.

## 1. Contributions

### 1. 1. The EADS group when Phenix is launched

- 3 Amaury Soubeyran, deputy director of Phenix and member of the technical direction, recalled that the EADS birth stems from a series of mergers that have occurred over time in Germany, Spain and France. Despite a turnover that increases by about 60% in 7 years, 2006 was a difficult year because of delays on the A380 programme and issues related to the group's governance. Louis Gallois was appointed co-chairman July 2, 2006. One year later he became CEO of EADS making an end to the two-headed company structure. If he manages to overcome the French-German hurdles and unify the group although he could not convince Angela Merkel to agree on a merger with the British BAE.
- 4 The speech continued with details about employee numbers whose amount grows to about 116.000 people, mainly in Germany and France (over 70% for the two of them), followed by Spain, the United Kingdom and other countries marginally. The organization is based on a double tree. The first one includes support functions like Finance led by Hans Peter Ring, Strategy & Marketing with Marwan Lahoud, Jean Botti as Chief Technical Officer, a North American department led by Ralph Crosby, Human Resources led by Jussi Itävuori,

and the Operational Performance supervised by Fabrice Brégier. In parallel, a second tree structures large industrial divisions led by bosses from the three partner countries: Airbus managed by Tom Enders as CEO and Fabrice Bregier as COO (chief operating officer); Carlos Suárez for Military Transport Aircraft, Lutz Bertling for Eurocopter; François Auque for Astrium, Stefan Zoller for Defence & Security.

## **1. 2. Harmonizing design tools: why the Phenix programme and how?**

- 5 Jean-Yves Mondon, vice-president and director of Phenix, reminded the attendance the context of the of the program launch whose he was responsible for, reporting directly to Jean Botti, CTO of EADS. A380 delivery undergoes delays and cost overruns, company shares fall down because of a suspicion of insider trading involving EADS management. The atmosphere is going heavy. Louis Gallois thinks that sending a strong signal to the market is urgent and mandatory. From this perspective Phenix is a part of the signal; that is why the mission statement puts an emphasis on cost reduction and quality requirements. Many details were given on the launch of Phenix and the growth of its fame which spread like a wave on the water, by circles wider and wider.
- 6 Following on the first assignment letter, business units appoint experts to get involved in the common work. Some reluctance comes up, for the simple reason that each of the units has its own business, its own experience, so is not keen to discuss them with people from outside, people having no comparable knowledge of their activity. This is in fact a classic problem of large multi-business companies; they are not unified by essence. As head of Phenix, Jean-Yves Mondon leaves many degrees of freedom to the business units. However, the information systems have to operate with each other and working in isolation has to be minimized. According to him, that objective fully complies with the Louis Gallois mindset. Indeed, during his management of Aerospatiale as CEO from 1992 to 1996, Gallois had already expressed its willingness to reduce organizational silos.
- 7 The fame of Phenix comes true when articles are published in newspapers and reviews, when interviews with Mondon are arranged. Phenix becomes very observed. It probably pushes the people in-

volvement and helps write the thousands of pages which are produced as part of the programme. This likely contributes to create an enterprise culture.

### **1. 3. ACE, a previous programme in the 1990s within the Aircraft business unit**

- 8 Francesco Sperandio developed an important aspect of the Phenix birth. As a member of the Management team of ACE (Airbus Concurrent Engineering), he was responsible for the ACE development on behalf of Airbus Central Entity. The ACE programme starts in 1995 within the Aircraft BU and continues until 2005. Its purpose is initially meant to help design the FLA (Future Large Aircraft, later A400M), but because of the endless negotiations between ministers of Defence of the countries involved in the FLA project, the teams moves to the A340-600 programme.
- 9 The goals of the concurrent engineering in general and ACE are to reduce development time and costs along the aircraft lifecycle. Enabling this reduction needs putting together in a multidisciplinary way of working all the relevant skills contributing to product engineering, and managing the operational conditions for working in parallel. Therefore, this is mainly a question of changing business processes and ways of working. Both required a strong sponsorship at top level to define and fully apply common processes and common methods, supported by common tools. Although the aircraft program management is still difficult to harmonize between Natcos (country partners of Airbus Industrie) an agreement is signed early 1995 by BAE (Ray Wilson), DASA (Gustav Humbert) and Aerospatiale (Gérard Blanc) to provide strategy “for common team working, tools development implementation, control and guidance for hardware and software suppliers”. Sharing responsibilities between the different industrial partners is recognized as necessary to parallelize works and improve the development efficiency.
- 10 So, ACE points out the close relationship between process and design tools. This orientation comes more and more true through the decade, as the number of programs is increasing and the complexity of products like the A380 (then A3XX) is growing. This led to a gradual reduction of physical models which allows engineering to focus on

digital models easily modifiable, improvable much faster and at a much lower cost. This is made possible as sophisticated software packages come up to market. They offer functions having reached a certain maturity and meeting needs of aircraft industry having to speed up their development phases.

## **1. 4. Thinking knowledge over half a century: Phenix and the helicopter business unit**

- 11 Maurice Narayanin was the Deputy Programme Director of EPP (Eurocopter Phenix Program) and member of the Engineering direction. Eurocopter is today known as Airbus Helicopters. Before Phenix, several methods were practiced in France and in Germany, also in each of the helicopter programs. The design phase is possibly documented in 2D or 3D, the exchanges sometimes utilize paper, some electronics. IT tools are naturally heterogeneous and poorly communicating, which makes data exchange very hard to achieve. In October 2008, Lutz Bertling, CEO of Eurocopter, asks his management to adapt Phenix to the Helicopter industry and to define a deployment plan. The programme is caught up at its benchmark phase (see below). The same procedures are applied although with a slight delay. The same three suppliers are involved and each of them gets an isolated workspace.
- 12 Meetings between the EPP team and suppliers, as well as debriefs to Jean-Yves Mondon, are arranged on a daily basis. Tests businesses rely on data featuring Tiger configurations, one being issued from French data management method and another coming from the German method. In May 2009, EPP is launched to deploy the choices made at the EADS group and in October a deployment plan on the TIGER is presented to management. Yet it is not until 2015 that Airbus Helicopters officially launches data migration of the TIGER. This deferring is linked to operational security requirements plus the time needed to reach a consensus about common data and their use. New skills are needed like DMU manager or Configuration manager to improve significantly the business processes. To summarize, Maurice Narayanin explained how the Phenix project is deployed and finally is understood as an opportunity to reduce the data management costs,

also to improve traceability throughout the quite long helicopter life-cycle.

## **1. 5. Sorting out a wealth of data, sharing their use and property: Phenix at Astrium**

- 13 Philippe Mussat was responsible for managing the Phenix business requirements in the context of earth observation satellites. His intervention started by recalling the Astrium history. The company was born 7 years before Phenix and stems from an integration of the Aerospatiale Launchers unit, MBB (German satellites) and Matra-Marconi Space. The later is a merger between the French Matra-Espace and the English Marconi Space in the early 90s. Phenix in the space business area comes true through a three-phase process. It starts by a rapid prototyping aimed to demonstrate that the principles and tools selected by Phenix fit in with the features of a satellite programme. Practically, it aims to show the relevance of a catalogue of components shared by different satellite programmes. It is led during summer 2008 and puts together experts from both observation and telecommunication satellites. An actual data set is built up. Data come from different satellite payloads and catalogues. On this basis, late 2008 starts a pilot project named Aspire. Its purpose is to come up with a catalogue sharable by telecom payload project and an earth observation satellite. Swarm is chosen for practical reasons. Swarm is a programme following how the earth geomagnetic field evolve. It is based on a constellation of three identical satellites developed for the European Space Agency. The three countries involved in Astrium bring contributions to the “pilot” catalogue. Also do the two business units Earth observation and Telecom.
- 14 Finally, the last phase of Phenix for space business is the PLM Connect project. It consists in defining a digital tooling both compliant with Phenix principles and covering space PLM needs. In other words, the goal is to structure an information system able to describe satellite products through functional and production trees as well as keeping track of successive versions of components. Compared with the traditional information management (basically based on text documents), this change that may seem minimal is in fact very important.

In less than a year, an operational proof of a common data management becomes available.

## **1. 6. Benchmark, untangling informatics and business: a tool selection process**

- 15 Frédéric Féru was the head of the Phenix working group “PLM architecture”. As such, he drove the benchmark (evaluation) aimed at selecting a software platform capable of meeting the new organizational and technical needs. Only four software editors can meet the needs, worldwide. One of them withdraws immediately, not believing in its product ability to meet the Phenix expectations. Work needed to achieve the benchmark is hard for both sides. Suppliers have to demonstrate their flexibility and ability to address the Airbus requirements very quickly. Airbus has to mobilize many skills to specify the tests and translating business requirements into IT (Information Technology) aspects is far from easy. Defining tests (therefore requirements as well) reveals many ambiguities among Natcos and business units. To fix them Jean-Yves Mondon involved Frédéric Féru in an architectural work which must be seen as a way to share knowledge by structuring concepts, language and methodology. He was in charge of clarifying relations between processes and tasks, data, software, hardware.
- 16 Tests are organized according to a growing complexity which started from the more technical requirements to end up with the most transverse business needs, then involving a number of different actors. The challenge, Frédéric Féru said, was to develop tests reflecting the day-to-day reality of business units, although quite different, while finding areas of common interest and common definitions.

## **1. 7. Round table: Harmonizing the design of different products**

- 17 A dialogue between Frédéric Féru, Maurice Narayanin and Philippe Mussat brought details on the business characteristics of aircraft, helicopter, satellite and launcher industries. Each of the three participants was asked to explain at what extend other products were different from the one he was looking after. This set off an exchange



both joyful and rich about the differences (beyond the obvious opposition of forms and missions) between industries grouped within only one company and however quite different.

- 18 Let us quote some pieces of information brought in. Lifetime of satellites is less than of airplanes. A launcher life lasts a few minutes. Planes and helicopters return to earth! They rely on common materials while satellite must keep performances in vacuum, extreme temperatures, through intense radiation flux. Helicopters arise very particular engineering problems and their dynamic is far from easy to be digitally validated. Economically, 8/10 of customers have 3 or 4 helicopters. It is far from the airlines' fleets made of dozens of airplanes. These few examples are just to highlight the differences and to introduce the second part of the round table, namely: what, despite the many differences, can be shared by the business units?
- 19 The three participants found terms of agreement quickly. Among commonalities is first the final product itself. Designing, producing, maintaining a product draw a cultural perimeter which is shared by all the business units. Also, exchanging data and drawings, the growing role of simulation, working in a collaborative environment, needing to interact better all over many countries are additional common behaviours. Besides, the ecosystem getting together subcontractors, partners, Natcos, needs a high level of clarity. At stake is the ability to be successful as the ecosystem domain becomes larger and larger. And what the PLM harmonization program reached was basically an alignment of skills, language and methods, a stage mandatory to get further into the ecosystem consolidation.

## 2. Conclusion

- 20 The first benefit of the workshop was probably the meeting of human sciences researchers and managers, the discussion on a large enterprise transformation, one of those usually leaving no traces. A transformation initiated as a top-down process then rapidly amplified by bottom-up initiatives, contributions and dialogues. Driven by a very tightly controlled team, a chemistry between businesses as diverse as aircraft, helicopter or spacecraft industries, an alchemy desired by Louis Gallois, came true thanks to a mobilization of skills coming from the whole EADS group.

- 21 A second benefit was to point out tangible issues like integration versus assimilation, resistances that come up as different European organizations and cultures have to find ways to harmonization. During the middle of the 1990s with ACE, then during the transformation led by Phenix, the industrial environment meets several challenges: production growth, complexity of products, extended organisations. Moreover, choosing a PLM software solution is a matter of millions of euros, which is not a negligible financial stake. All these considerations explain why Phenix was not a long calm river.
- 22 Some echoes of social habits were interestingly exposed. For example, the absolute transparency on which the benchmark process relied, reminds the general transparency demanded by Western societies. The programme was under the spotlight, under the control of the top management, the decision had to be crystal clear. The role of its highly developed technical aspect may probably be explained by the will of an indisputable process. Another social trend was echoed by the way of speaking about openness to the world as an obvious prerequisite. Present is globalization. Our time needs extended enterprises. The interior is no longer enough. EADS units must streamline their practices and data management to successfully involve their partners in a consistent ecosystem.
- 23 Finally, a stimulating “think over time” refuted simplistic views of enterprises undergoing a kind of day-to-day law, unable to forecast far into the future. The longevity of civil and military programmes requires anticipation of technology trends, maintenance needs and environmental problems, requires means sustainable over decades. By portraying the EADS group with a lot of nuances and details, the Phenix workshop was an event rich of information for social sciences.

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