

Profiling readiness to Virtual Enterprises in Aeronautical Supply Chains

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Abstract

This paper provides the scope of activities and findings of work performed within the scope of the VIVACE Research Project in the area of lower level suppliers for the European Aeronautical Supply Chains.

The objectives and frame of work are described, together with main results and with the methodology used to identify characteristic profiles of smaller aeronautical companies and to define a set of related needs and requirements, to be made available across Europe to improve effectiveness in supply chain management and efficiency in the deployment of results from research and development projects aimed at innovating the business model and operation mechanisms for the aeronautic sector .

Keywords

Aeronautics, Virtual Enterprise, 3rd tier Suppliers, SMEs, requirements, business profile, supply strategy, knowledge, VIVACE, EU FP6

1 Introduction

The evolution of Aeronautical industry in Europe is driven by the Vision 2020 of the Advisory Council for Aeronautics Research in Europe (ACARE), stating a specific focus on “More affordable, cleaner, safer, quieter”.

To pursue such vision, the largest Integrated RTD Project was launched in 2003, named “VIVACE – Value Improvement through a Virtual Aeronautical Collaborative Enterprise”, an Aeronautical Collaborative Design Environment with associated Processes, Models and Methods. This environment will help to design an aircraft and its engines as a whole, providing to the aeronautics supply chain in an extended enterprise, virtual products with all requested functionality and components in each phase of the product engineering life cycle.

The main objectives for the VIVACE project, which includes more than 60 European partners, are aimed at significant reductions in costs, and time-to-market. Within VIVACE specific attention is made to lower tier suppliers, generically identified as “Third tier Suppliers”, which have dimensions ranging from few employed units to more than 1000 employees, and which represent more than 20% of cost for the final aeronautical product.

To that end, a specific study was launched, to collect and analyse global needs and views of smaller aeronautical suppliers, with particular attention to the disciplines of system simulation, knowledge enabled design, life cycle costing, design to decision and supply chain simulation.

This paper discusses main study results, focusing both on actually identified needs and requirements, and on methodological issues. The paper is structured into three main chapters, containing:

- The discussion of motivation mechanisms for smaller enterprises in participating to innovative research;
- The presentation of major needs and concerns of smaller suppliers;

- The evaluated needs with respect to disciplines of knowledge management, logistics, strategic and operations planning, and supply chain management.

2 Innovation appetite in smaller aeronautical Enterprises

The ACARE (Advisory Council for Aeronautics Research in Europe) objectives of More Affordable, Safer, Cleaner and Quieter aircrafts constitute the drivers for research and technological development in the first decades of this century.

Those objectives are defined at the level of larger enterprises, as they address architectural level issues, and have been the basis for identifying the objectives of the VIVACE integrated project within the European 6th Framework Programme.

To achieve those objectives, several innovations are required, not only in technology, but also at organisational level, where the Virtual Enterprising paradigm is becoming the reference approach for European Aeronautics.

There is no doubt that large enterprises must be the drivers of the innovation, yet the achievement of the RTD objectives depends on the capability of extending new technologies and organisational principles to the whole aeronautical supply chain, where third tier suppliers do account for more than 20% of final cost of product.

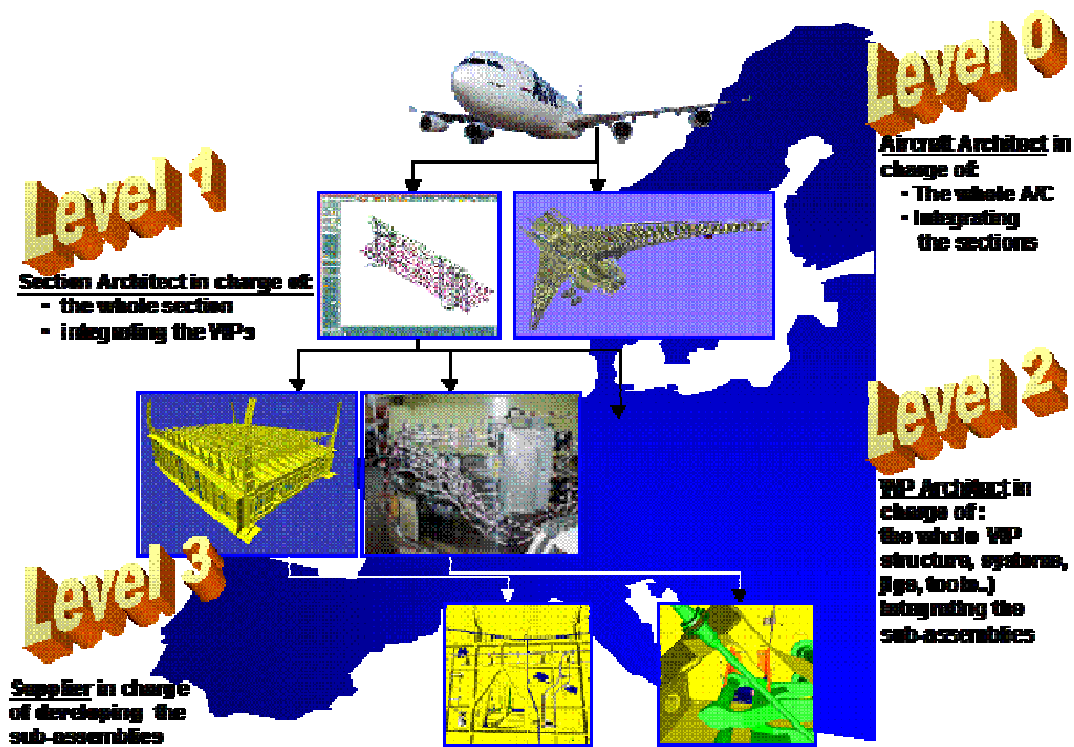


Fig. 1 - Aeronautical reference WBS

Third tier suppliers have been identified as companies that cover activities up to the Work Breakdown Structure (WBS) level corresponding to the development of sub-assemblies, and are characterised by:

- Smaller size, typically in the range of SMEs and rarely over 1000 employees;
- Most often do not participate in the sharing of programme risks;

How to account for the needs and requirements of those suppliers with respect to the themes addressed within VIVACE, driven by the challenge of Virtual Product through Virtual Enterprising, constituted an important challenge for the project, and a dedicated task was devoted to the subject, with the aim of building a reference set of requirements relevant to the innovation

attitude and sensitivity of smaller enterprises, and to identify the ones impacting the research themes for the project, and the expected readiness to take up the achieved results with the support of dedicated training actions.

3 Approach taken

Smaller aeronautical companies have been the subject of several studies and initiatives in the last few years [1], [2],[3] , with results capable of offering an interesting base for identifying the needs and requirements of those companies.

Within the project, the idea pursued was to focus on the identification of company characteristics which are expected to have the greatest influence on the attitude toward research and innovation, in terms of willingness to participate in RTD and the adoption of results with respect to sensitivity to specific themes, and in particular the ones addressed by VIVACE.

To that end, a taxonomy of subjects designed to indicate the innovation ‘appetite’ of 3rd tier suppliers was developed (Fig. 2), to be used as guidance for:

- Re-visiting the results of previous RTD projects and initiatives to extract relevant needs and requirements;
- Conducting a dedicated workshop during ICE conference in 2005;
- Developing a questionnaire for collecting information from suppliers identified by large Companies.

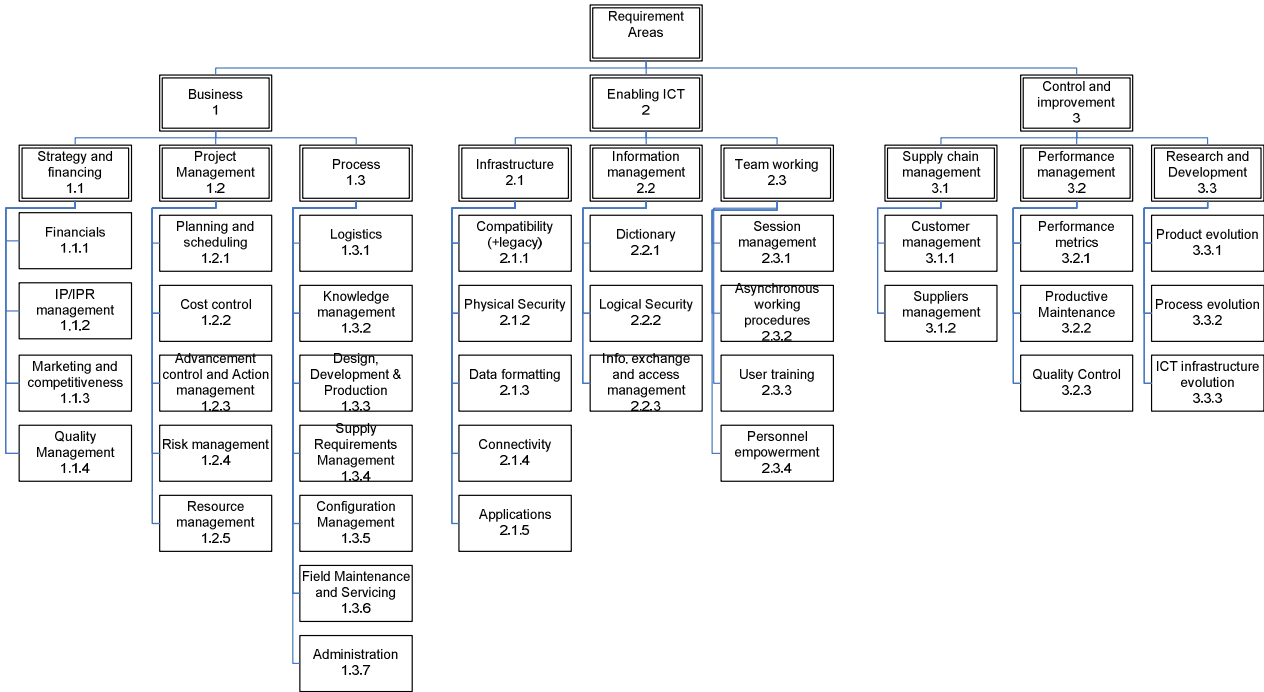


Fig. 2 - Taxonomy for requirements identification

Main areas addressed in the taxonomy were:

- The business strategy and the operational environment for the execution of normal company activities; the business area includes all items that define the way a supplier is operating in the market and is therefore addressing the industrial view of the Company, including its policies and its operational environment.
- The enabling ICT environment to support company operations in accordance with the stakeholders’ expectations;

within the vision of the new aeronautical supply chain, ICT plays a major role, through its relevance for the efficient deployment of advanced interactions and working methods;

- The business process control mechanisms and the management of its evolution; with an increasing focus on knowledge and on supply chain integration, control on and evolution of the business approach and environment are necessary to the continued competitiveness of suppliers.

The taxonomy driven questionnaire [4] was developed to be disseminated through the sponsoring by large enterprises participating to the project, and was directly delivered in its full version to 148 companies, and 7 replies have been received, 5 from Italian companies, 1 from France and 1 from UK. The substantially larger participation of Italian suppliers (more than 15% of invited companies) was considered to be due to the active sponsoring by Alenia Aeronautica, that made a specific effort to solicit their suppliers.

A simplified questionnaire was then developed, and proposed to 13 Aerospace dedicated local enterprise associations throughout Europe for promotion among members, and some additional 3 answers were received from aeronautical SMEs in Spain.

Despite the very low dimension of response, yet the coverage of main supply areas, as identified in the standard classification used by Airbus and Alenia Aeronautica, is quite significant, as more than 60% of the supply categories were covered.

4 3rd tier suppliers profiling

For companies responding to the questionnaire, the range of company dimension goes between 70 and more than 1.000 people, even though 90% of companies have less than 500 employees, with 50% having no significant participation of large enterprises.

EBIT is often well below 5% of revenues, and the rate of productive to total personnel ranges between 60 and 90%, with higher rates in service companies. Those value are quite lower than average sector data, as shown in fig. 3 [5]

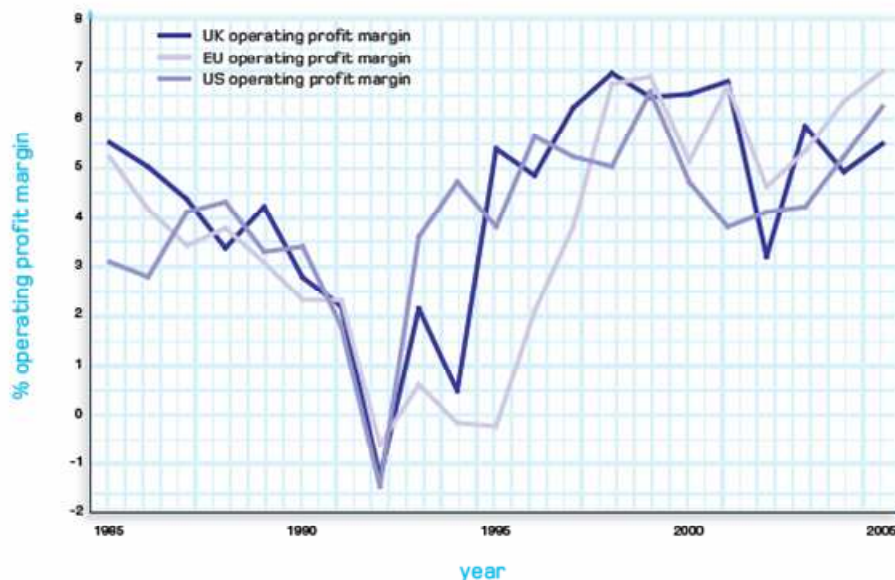


Fig. 3 - operating profit margin for aerospace companies

The small dimension of profit, particularly for suppliers that do not show a capital participation of large enterprises is considered to be an important source of risk for the whole chain, as the strategies of large companies pushing for committing larger project responsibility to lower tiers may call for significant investments, which cannot be sustained by actual profits.

It is interesting that company growth rate ranges between 0 and 26 %, with an apparently important negative correlation with dimension.

Within VIVACE four specific types of third tier supplier have been considered, 1. Design and make companies, 2. Design or Technical analysis companies 3. Consultancy and software businesses that offer specific capabilities and develop their own software to enable them, 4. Production service companies. The most frequent role performed by third tier suppliers is the stand-alone supplier, though several companies are looking for taking responsibility over integration of supply chain segments, or possibly through mutual partnerships where synergies exist. In particular, evolution in offering is expected by most manufacturing companies to be focused on the capability of achieving a more complete/integrated supply. This is sometimes seen as an internal technical capability evolution, and more often as the opportunity of widening a companies own capacity through the creation and efficient management of their specific supply chain.

The concerns for lower tier suppliers in accepting risk as a means of achieving higher levels of profit can often result in a preference for leveraging own supply chain against the widening of the companies own internal capacity and capability.

Most companies assessed have a strong dominance of aeronautical market in their target marketshare, with 60% over 80% in revenues, and several ones with a single dominant customer; market differentiation is typically increasing with dimension; larger companies tend to address different markets or to show a significant rate of internationalisation.

Changes over time in customer and supplier base for aeronautics are apparently negligible. This may be a factor of the sample size, which does not reflect the growing impact of globalization, and is becoming an increasingly significant factor for third tier suppliers, as they must face two issues which tend to balance the positive return of a globally growing market:

- the increasing availability of qualified suppliers from Countries with low manpower costs; typically in Asia, and some in Eastern Europe
- the growth of new aeronautic markets in developing Countries is often associated to offset agreements for technical, production, and support work to be undertaken within the country acquiring the aircraft, or engines.

When combining the low dynamics of the supply chain for lower tier companies and the strong focus on aeronautic market, the risk could be identified as creating in the suppliers a reduced appetite and capability to evaluate and exploit technological and scientific advancements created within markets other than aeronautics. In addition where the Aeronautics market requires continual investment in new technology and techniques whilst providing low returns lower tier suppliers may be forced out of business or to move away from the sector.

A stable and consolidated supply chain may on the other hand offer a better environment to promote inter-company knowledge sharing, mostly in the interface areas of suppliers, even though from a supply chain management point of view the promotion of improved links among suppliers might reduce the governance capability of procurement entities.

The rate of yearly investments for research and innovation ranges between 3% and 10%, with some exceptions associated to companies strongly seeking to offer innovation, mainly in the “new technologies” area as a major part of their business offering in the marketplace..

Internal Organisation is typically functional, and tends to move toward the matrix or project oriented when increasing the relevance of services, with typically project oriented structure for consulting companies. This is well in line with solutions adopted in other markets.

Processes are typically well formalised for all, but process dynamics, as witnessed by the yearly rate of change in procedures varies substantially, from as low as 5% to 40-50%.

Decisions are rarely managed by boards, and top management tends to play a very important role.

At this level Project Management is often partial and not formalized, with relevant procedures imposed by customers. More formalized processes are often used where businesses develop, or where the products and services are more complex, primarily driven by the need to manage risk and cost.

Technological environment tends to be a mix of popular systems for office activities, and customer driven for technical areas. Legacy tools have a very limited presence.

Reuse of non-administrative tools is apparently low, with specific consequences on the ease for single market companies to open up new markets, and increased relevance of tools cost on price of supply.

Personnel average experience ranges between 4-5 years and 15. For production companies the number of graduates can be as low as 10%, services and software companies range between 60 and 90% of graduates. Motivation is achieved through monetary rewarding, responsibility and hierarchical/technical growth opportunities.

Most companies assessed show a very low yearly turnover for personnel, with figures well below 5%, which is compatible with a frequent condition of a “one company for life” attitude for employees.

The overall high average experience and the very low rate of personnel turnover might lead to personnel attitude to overprotect own know-how as positioning and hierarchical growth mechanism. That may prevent a positive attitude to the sharing of own knowledge with colleagues, and in particular to the formalisation of know how. However this retention and management of the knowledge within a company is critical to its long term survival.

5 Identified requirements

By integrating the results of previous RTD projects, the results of the dedicated workshop held at the 2005 ICE Conference and the information collected through the suppliers profiling questionnaire, a set of 184 requirements was defined, highlighting the expected needs of smaller suppliers in the aeronautical supply chain, which was used to provide feedback to other RTD activities within the project.

The requirements are structured in accordance to the general taxonomy described earlier in this paper, and provide a general view on 3rd tier suppliers expectations and constraints over new research initiatives, and the way these may be considered for deployment within the business.

The full set of requirements has been made available to all European aeronautical companies and regional associations contacted during the questionnaire collection phase, and can be downloaded from the VIVACE project site through a registration process. Project dissemination will allow the supply of additional comments and suggestions, to be integrated into the requirements set, to improve its effectiveness and re-usability across new industrial and RTD initiatives.

The VIVACE website is VIVACEproject.com

6 Concluding Remarks

Aeronautic supply chain is impacted by the global economy the same as other industrial sectors. As an example recent data [5] shows for the UK a sharp decrease in sales by aeronautic SMEs, which are exposed to a condition of low visibility on evolution and procurement strategies by big players, while being called to face raising competition from low cost Countries.

As large companies plan their evolutionary strategies affecting the global market reach of European Aeronautic Industry, the effectiveness in transferring new technologies and methods along the supply chain, while taking profit from competencies available at lower tier suppliers

needs to be developed further. By doing so, this can substantially improve the capability, and effectively improve the performance and competitiveness of the European business environment. The collection of requirements developed within the VIVACE project can be considered an important step to promote better understanding by large companies on actual needs of lower level suppliers, which constitute an important asset for global competitiveness of European Industry and a growing source of knowledge and know how.

7 References

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