8th. World Congress on Computational Mechanics (WCCM8)
5th. European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2008)
June 30 – July 5, 2008
Venice, Italy

PROCESSES & METHODOLOGIES FOR MULTIDISCIPLINARY DESIGN IN AERONAUTICS

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Key Words: *Design, Product LifeCycle Management, Extended enterprise, Virtual prototyping, Product simulation*

ABSTRACT

In order to satisfy the industry needs of reducing development costs and time to market, the new trends within the design process are driven by the integration between disciplines and management of external collaborations within a PLM strategy.
The business model of modern companies is evolving from vertically integrated silos to extended use of external resources and collaboration to ensure innovation and growth**.** This evolution is possible through: strategic make or buy decisions; development and focalisation of internal competencies; rationalizing supply chain through few strongly connected partners**;** definition of standard processes, methods, procedures and tools; increase collaboration with scientific community in order to develop technological know-how. This has to be inserted within a PLM (Product Lifecycle Management) strategy, that support the collaborative creation, management, dissemination, and use product definition information across the extended enterprise from concept to end of life of a product, integrating people, processes, business systems and information.
Within this company transformation scenario, the development of a new methodology for Virtual and Physical Prototyping and Simulation (VPPS) is playing an important role. It defines the processes and the functional requirements that are necessary to develop the activities related to the product simulation and prototyping and implements the hardware and software services that are requested in order to develop an integrated framework in relation with the Product Life Cycle. This includes virtual and physical prototyping and simulation activities during the life cycle of the product, of the manufacturing process and of the logistic support.
The VPPS conceptual environment is schematised in Fig. 1. It emphasizes a new way to work based on an improved collaborative strategy that takes advantage of virtualisation and simulation tools in order to reduce onerous re-working activities. This results in addition in a reduction of product development costs and of the time-to-market. This can be obtained by parallelizing as much as possible the product development activities through the use of virtualisation paradigms.
This can be achieved through

1. Increase of the use of virtual technology to the detriment of physical one (prototyping & testing) complemented by a deeper integration between those technologies;

2. Intensification of the interaction between the actors involves in the product development (improved collaboration within the company and with suppliers);
3. Processes rationalisation and standardisation, multidisciplinary integration, more sophisticated analysis in order to better predict product behaviour, performances and integrity;
4. Knowledge capture and its implementation within product development tools;
5. Analysis based test strategy, planning & correlation to reduce the need for repeat testing; improved traceability and repeatability of analysis and experimentation;
6. Certification based on analysis, simulation & modelling; promotion of pure virtual certification;
7. Improvement of the use of computational resources (HPC, Grid Computing, …);
8. Efficient management of huge amount of data (analysis and testing inputs and outputs);
9. Fixed design, probabilistic analysis for service and aftermarket assessment of maintenance /cost; virtual testing validated model will be used to support/predict aftermarket behaviour;
10. Integration of design and testing processes with manufacturing and operations processes.

The final aim is to build new methodologies and tools in order to enforce collaboration/integration between the different disciplines that are involved along all the product life cycle, in particular at the early stage of the product development. They can be supported by or support a new organisation model.

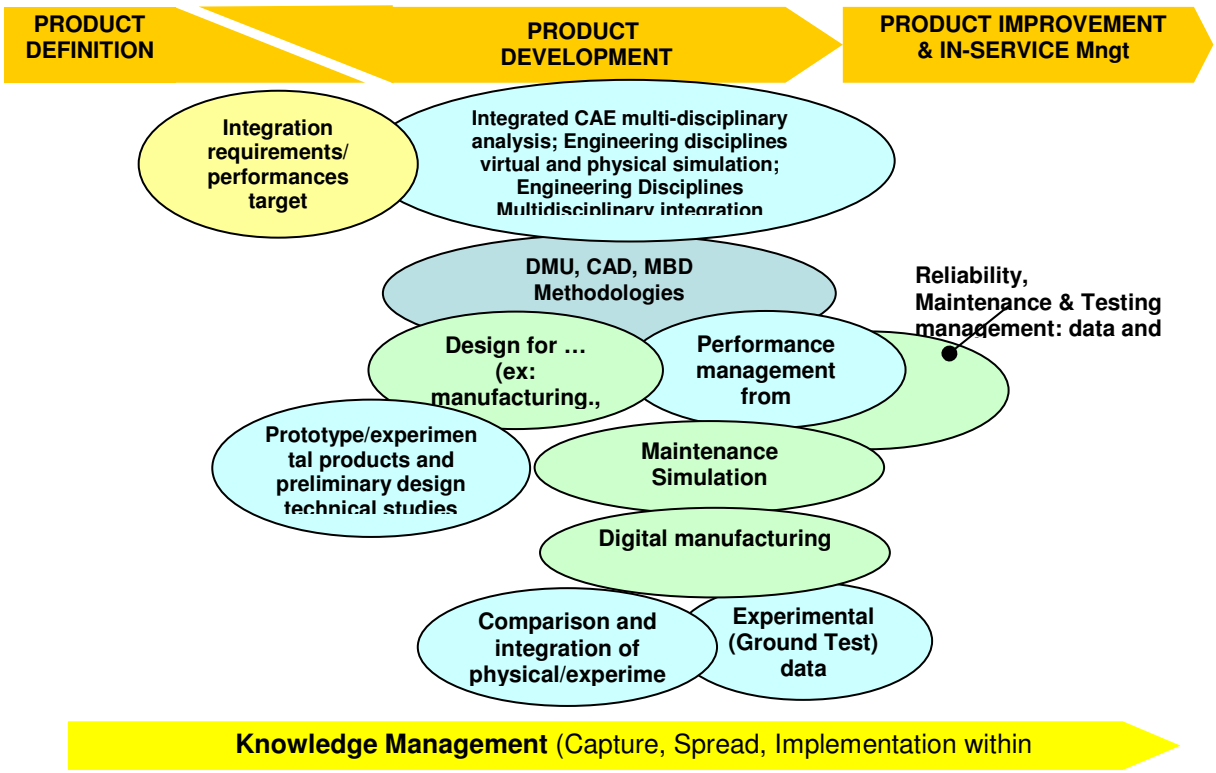

Figure 1: VPPS Conceptual Environment