iPROD - Integrated management of product heterogeneous data

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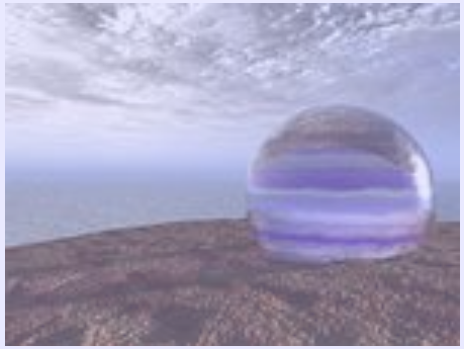
Address REAL Industry business aims…

Conquer the domestic market

Reduce time to market



Be market leader

Export to foreign markets

Deliver the best quality

Create and maintain brand name and brand image

Answering Real Industry Necessities…

Launch a **COMPETITIVE PRODUCT**

With **GOOD PERFORMANCE**

At **REASONABLE COST**

On **TIME**

- What does my customer expect?
- What is the competition doing?
- Translate customer expectations into engineering process
- Shorten time to market

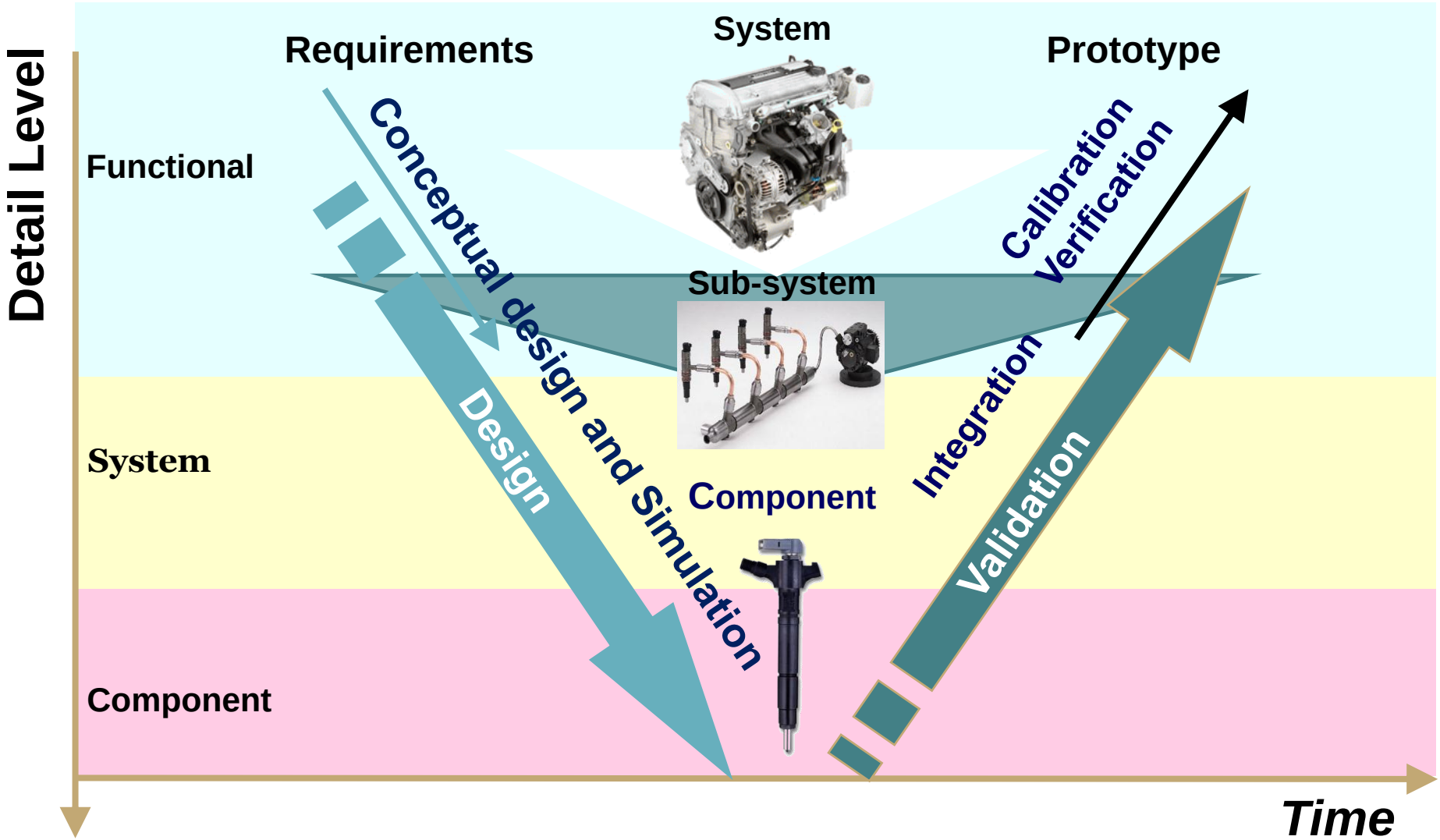
Market-driven

- Engineer the quality of the product
- Set up an efficient development process
- Increase engineering know-how
- Implement the right tools
- Manage risk
- Reduce/avoid late fixes

Company-driven

PRODUCT HETEROGENEOUS DATA

Formulated on the Product Development Process [PDP]



Mission Need Statement

"To develop a **flexible** and **service-oriented** software framework that, **reasoning** and **operating** on well-structured knowledge, will be the **backbone** of the computer systems associated with current and new **product development processes**"

Key Innovations

- **Ontology-based** storage of PDP knowledge
- Ready-to-use PDP **standards**
- Knowledge **re-use** (reasoners / intelligent software)
- **Inferencing** (discovery process)
- **Single source** of PDP knowledge
- **Single access point** throughout PDP of:
  - Knowledge
  - Tools & methods
- **Federation** (not: centralization) of:
  - Legacy data sources: PLM/PDM, RDBMS, Office, etc.
  - Software services: reasoning tasks, KBE tools, CAD/CAE tools

iProd

Integrated management of product heterogeneous data

The need in manufacturing product development process:

- **Reduce** drastically product development *costs and time* by means of an optimised testing process with a higher and more intelligent use and integration of virtual testing models and reduced design iterations loops
- **Support knowledge** dissemination in the company and competencies extraction, structuring and sharing also with suppliers
- **Make** decisions more reliable by means of structured information and indicators along product development activities
- **Strengthen** the supplier network management and integration by means of result and performance monitoring
- **Improve** focus of new product development with a fast and structured management of competitor and market analysis data

iProd – Problems addressed

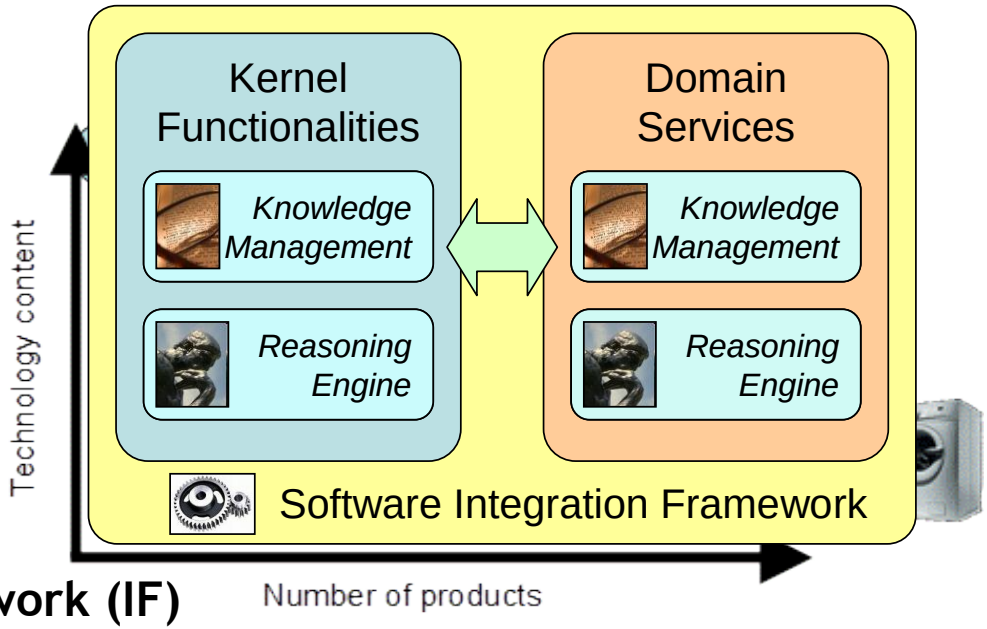
- PDP is currently one of the less structured and formalized processes
- During the PDP a huge amount of data from different sources has to be managed efficiently and integrated in the sub processes of engineering
- **The methodological product development** isn't integrated in present ICT solutions, only particular solutions are realised (CAD and PDM for design data, legacy systems for physical testing, virtual tools for virtual analysis)
- An integrated approach that includes data and services required for the whole Product development process is not yet existing
- **The knowledge for the product development is present in the head of experts, but not structured and available on demand**
- > 50% of product development costs are still currently related to experimentation

iProd – Objective

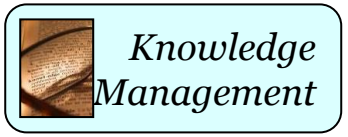
- iProd aim is to **improve the efficiency and quality of the Product Development Process of innovative products by developing a flexible and service oriented software framework that, reasoning and operating on a well-structured knowledge, will be the backbone of the computer systems associated with current and new product development processes.**

- **Markets addressed:**
  - **Aerospace**
  - **Automotive**
  - **Home Appliances**

- **Building blocks:**
  - **Knowledge Base (KB)**
  - **Reasoning Engine (RE)**
  - **Software Integration Framework (IF)**

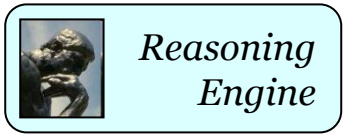


iProd - Building blocks



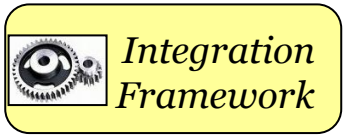
- **A distributed Knowledge Base (KB), where relevant product and process knowledge for product design can be captured and formalized by means of a dedicated Knowledge Management tool.**
- **The KB will contain:**
  - customer expectations, classified and structured on a flexible performance tree
  - Subjective, objectives and a relative definition of technical objectives (target setting);
  - a link between subjective objectives and technical objectives (target deployment) at the product level (product technical specification) and the sub-system level;
  - knowledge about physical tests on the product/systems/components as defined for the product structure (standard functional structure)
  - knowledge about virtual testing plans and support to testing execution, parameters settings and result management;
  - knowledge needed for the integration of tests results with CAD design loops

iProd - Building blocks



- **A reasoning engine which will compose data and knowledge to achieve the following functions:**
  - Design new products according to customer needs
  - Plan and balance physical and virtual testing
  - Support virtual testing and CAD design iteration loops by means of a decision support tool
  - Release of the test plan and dispatch to testing organisations for the generation of results;
  - Monitoring of test plan up until final approval and progress indicator support.
  - Automation of the various product design tasks starting from the CAD definition of the components using Knowledge Based Engineering (KBE)

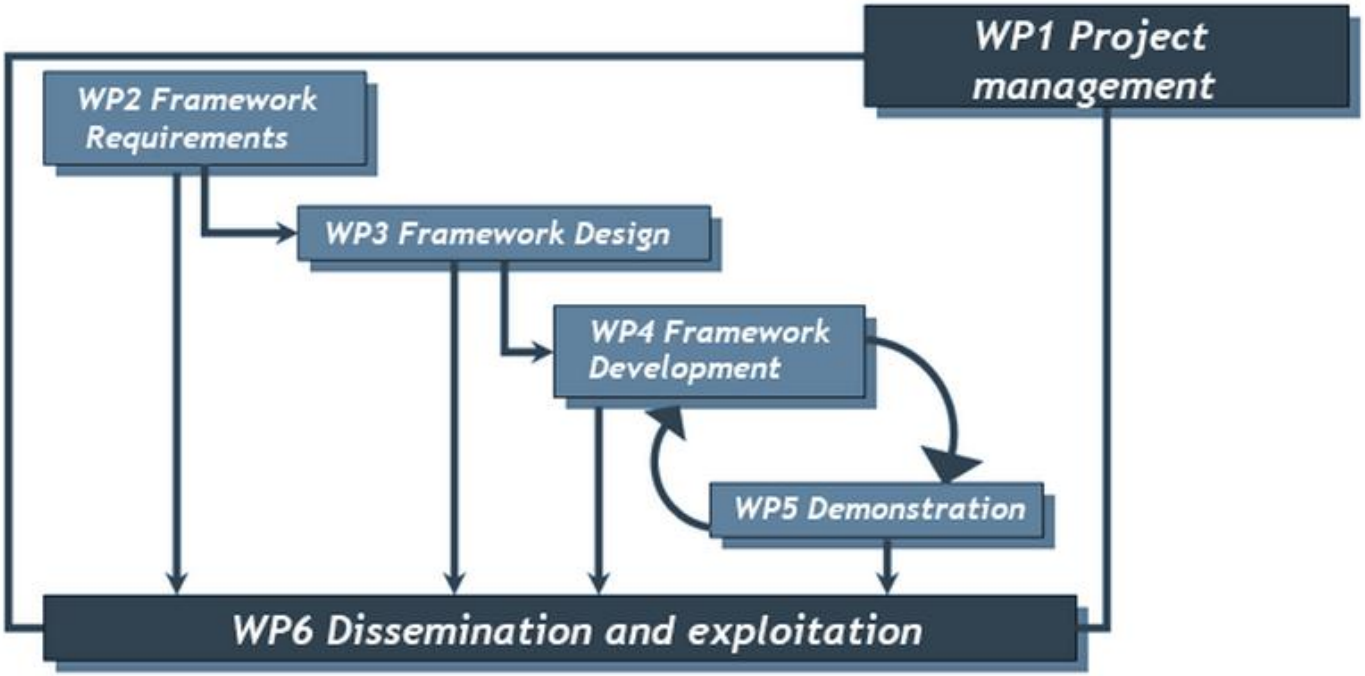
iProd - Building blocks



- **A software integration framework to link the KB and reasoning engine with the various analysis tools into one distributed and seamless design, analysis and optimisation process in order to:**
  - allow a number of concepts and customized variants to be quickly elaborated and evaluated in terms of hours or days instead of weeks or months
  - Increase reliability of the evaluation and the success rate of the product development process
  - Include more concepts and more aspects (tooling design, material processing, cost, environmental impact, etc.) in the evaluation
  - Realise the integration in the domain specific PDP and methodology

iProd - Structure

LMS International (Belgium) is coordinating the iProd Project. The project is organized in 6 work-packages. The work packages structure is as follows:



WP 2 – Framework Requirements – Achievements

Seven main steps (according to iProd focus areas):
- *product development process* (process knowledge)
- *knowledge and data* (product knowledge)
- *correlation matrix* (reasoning engine)
- *testing management, optimisation and planning* (reasoning engine)
- *virtual execution* (reasoning engine)
- *performance indicators*, and
- *IT landscape and system interfaces* relevant for KB and RE support

for the **relevant PDP activities*** related to:
- *target setting* (capture the "voice of the customer")
- *target deployment* (breakdown requirements into technical specifications)
- *test plan management* (generate & optimise test plans, virtual vs. physical tests)
- *virtual & physical test execution* (conduct tests, allocate parameters & models etc.)
- *target achievement* (analyse the test results and target fulfillment)
- *system validation* (validate performance, specifications & customer requirements)

* in the course of WP 2, the terminology was adapted to ISO 15288

End-user challenges: socio-economics

- Lead **time**, **cost** and **quality**
- Huge **amount** of data to generate, analyze, manage
- Limited **amount** of (future) resources
- Knowledge **retention**?

Consequence:

- do more in less time and with less people
- effectively manage knowledge

End-user challenges: ICT environment

- **Silos**
  - Distributed, heterogeneous tools / data sources
- **PLM/PDM** "Integrated" approach
  - Big investments
  - Vendor lock-in
  - Difficult to extend (one more silo)
- **Desktop** software
  - Cost (licensing, maintenance, management, hardware)
- **Manual**, GUI-driven software

Consequence:

- Difficult to retrieve, combine and safeguard knowledge
- Rigid, costly ICT environment
- Too much time spent on repetitive work

End-user needs

- **Fast retrieval** of integrated information
  - requirements -> design targets
  - virtual & physical verifications -> customer satisfaction
  - product structure -> performances & tasks
- **Availability** of up-to-date information
- **Awareness** of information
- **Integrated, standardized** ways to **capture** knowledge
  - Engineering aspects for new project
  - Lessons learned / experience previous project
  - Single source of truth
- Decision / collaboration **support**:
  - planning and re-planning verifications after design loops
  - Support team working and decisions by means of efficient process indicators
- PDP **automation**

Differences between iProd and PDM/PLM

- RDBMS approach vs. **semantics**
- Static vs. re-use in the form of **Reasoning / Automation**
- PDM/PLM systems operate on explicit data, iProd can **infer** new knowledge.
- PDM/PLM systems stores all data in one place, iProd **federates** data from heterogeneous data sources.
- PDM/PLM vendors provide all-in-one-solutions, iProd supports a **best-of-breed** approach.
- iProd doesn't replace PDM/PLM systems, but **federates** them with other systems.