



High Quality technical documentation
for large industrial plants
using an enterprise engineering and
conceptual modeling software solution



Engineering contractors, plants & technical documentation

- Engineering contractors design & build very large and complex installations such as nuclear power plants, airports, oil refineries etc; engineering artefacts
- Technical documentation is as important as the plant, an engineering artefact, a truthful and appropriate representation of the plant.
- Technical documentation controls plant production
- Technical documentation and the plant closely related

How to produce technical documentation?



Technical documentation (1)

- Technical documentation controls plant production, plant maintenance, upgrading and demolition time
- Technical documentation should deliver a high quality truthful representation of the plant during life time:
- Legal compliance
- Proof of functional compliance, performance as agreed
- Validation, compliance of plant versus documentation
- Verification, proof of internal consistence, proper execution of all business processes
- Ability to reconstruct doc state at any time (roll back)



Technical documentation (2)

- A perfect plant without perfect technical docs may not go into production for legal reason
- A BoM is not the solution, inadequate:
- A BoM does not manage or support “communication”, “assignment of tasks”, “authorities” and “responsibilities” between humans at production time
- Many BoM problems identified; versions, format, conversion, correctness, consistency, completeness
- A BoM does not support validation and verification
- Much fire fighting, waiting queus



Technical documentation requirements

- Technical docs should support many functions
- Manage “communication”, “assignment of tasks”, “authorities” and “responsibilities” between humans in production; a production control system
- Enforce compliance of production to documentation
- Support validation; compliance of plant versus technical docs
- Support verification; internal consistency and completeness)



Technical documentation hypothesis

Hypothesis: BoM problems are symptoms, errors have been made earlier, we need more and better

HQ Technical documentation manages business processes to control human production of documents itself(!)

HQ Technical documentation manages business processes to control human production of the plant

* Technical documentation is a complex and sophisticated engineering artefact to be produced



Technical documentation observations

Observation 1: To produce HQ technical documentation we need to have a HQ enterprise

Observation 2: Business alignment and IT fail (lit)

Observation 3: State of the art document IT systems fight symptoms

Hypothesis: We fail due to lack of scientific foundations for HQ enterprise design and implementation



Enterprise ontology & enterprise engineering

Enterprise ontology founded on empirical sciences PSI (Performance in Social Interaction); TAO theory (Technology, Architecture & Ontology); FI theory (Fact & Information); logic & formal methods

- DEMO modeling methodology for enterprise, delivers four conceptual aspect models for “shared reasoning”
- DEMO processor executes DEMO models for simulation and production (* prototype).
- Conceptual model-instance driven IT systems, no programming; the model is the source code
- Recursive and iterative enterprise modeling process



Case management systems (1)

Case management systems are “IT systems designed for the process-driven interactive production of services for a demanding customer”; a production environment.

Case management systems contain business processes to control the *production of the set of HQ documents*

Case management systems contain the business processes to monitor and control the actual *production of the plant*

Case management systems contain ALL relevant multimedia information, process states, deadlines, etc.

Case management systems can be unlimited large (formal correctness, aggregation, recursion and nesting)



Case management systems (2)

How to build a case management system for document control?

- 1 Design sets of recursive fine-grained DEMO models
- 2 Design a structured dossier with empty documents and sets of (recursively nested) business processes for *production of documents*, using the DEMO models
- 3 Design business processes using DEMO models to control future *production of plant (+more)*, using the DEMO models
- 4 Overall validation by simulation and shared reasoning, iterative improvements until overall acceptance



Highlights case management systems for HQ technical documentation

Complex relation between:

- The plant
- Construction & operation of the plant controlled by technical documentation and business processes
- Production of technical documents controlled by business processes and case management (dossier) system
- Case management system design directly derived from DEMO enterprise models
- Business processes are DEMO models being executed
- DEMO methodology founded on Enterprise Ontology
- Enterprise Ontology strong formal foundations, etc.



Current status

Most of the software suite is operational in production since 1997 with strong professional trackrecord

New incarnation of software suite is now founded on the strong Enterprise Ontology theory and DEMO methodology

Prototype DEMO processor exists, professional version under construction

EEC FP7 research project in preparation to finalize some remaining theoretical issues

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