An Engineering Data Management System for DESY

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DESY is preparing the introduction of an Engineering Data Management System (EDMS) as a strategic tool to improve the workflow and the information flow in ongoing and future projects. For this purpose, a task force has been formed with the objective to identify areas which would benefit from the use of an EDMS, understand management's responsibilities and profits, create a precise requirements specification, make a market survey, and launch and implement small pilot projects.

Key words: Engineering Data Management; Object-Oriented Methods; Project Management; Worl-Wide Collaboration;

1 Introduction

DESY is currently working on a conceptual design report for a future Linear Collider. Such a new project is challenging DESY in many ways: design, construction, and operation involve a large, heterogeneous community of several thousand scientists and engineers which are distributed over at least three continents, the complexity of accelerator and experiment exceed current projects by several orders of magnitude, and the whole enterprise lasts several decades.

The Linear Collider project accumulates a huge amount of information, which needs to be organized in a way that over the entire life time every document is accessible at any time for everybody who needs it. In addition, information production has to be managed coherently to ensure that the available human and financial resources are used in an optimum way. The latter is becoming increasingly important, as financial and personnel resources are diminishing, while the complexity of research facilities continues to grow with every generation.

2 Engineering Data Management

Engineering Data Management Systems (EDMS) are an enabling technology for managing product life-cycles and processes, where "product" represents eg accelerators, experiments, or parts of them. Engineering Data Management is a reorganization of existing processes, and an integration of existing tools based on up-to-date computing technology.

An EDMS enables global information access. It introduces a new culture of information interchange, where people no longer have to search and gather the information they need: new and updated information is automatically forwarded and distributed to everybody who needs it, usually via e-mail. This "automatic notification" feature is especially valuable for distributed project teams, where it creates an "inhouse" feeling even over long distances. An EDMS contains the following major components (cf fig 1):

- *Data and Document Management* is based on a data vault which contains all the data and documents which are related to a given product. It captures documents whenever the application saves them, and stores them at a safe place. Thus, users work on documents with their existing tools, but data is accessed de facto only through the EDMS. Documents are classified according to their type and characterized by additional attributes, which specify eg author, date of creation, release level etc. Product Breakdown Structures (PBS) are maintained in the EDMS to enable users to browse a product's "structure tree".
- *Work and Workflow Management* define what exactly happens to a document or product when a team member "works" on it, ie performs given actions, and how data and documents are passed between processes. The Work Breakdown Structure (WBS) enables resource planning and scheduling.
- *Version Control and Configuration Management* support the simultaneous creation and evolution of different versions for each document, log their modification history, and keep track of which specific set of documents contributes to what product release. Version control and configuration management are the basis for parallel investigation and implementation of alternative designs, cooperative work of several team members on the same activity, and recovery of earlier project states at any time.

3 The Need for an EDMS at DESY

An EDMS addresses people who need frequent random access to documents from several different departments. At DESY, such people are in

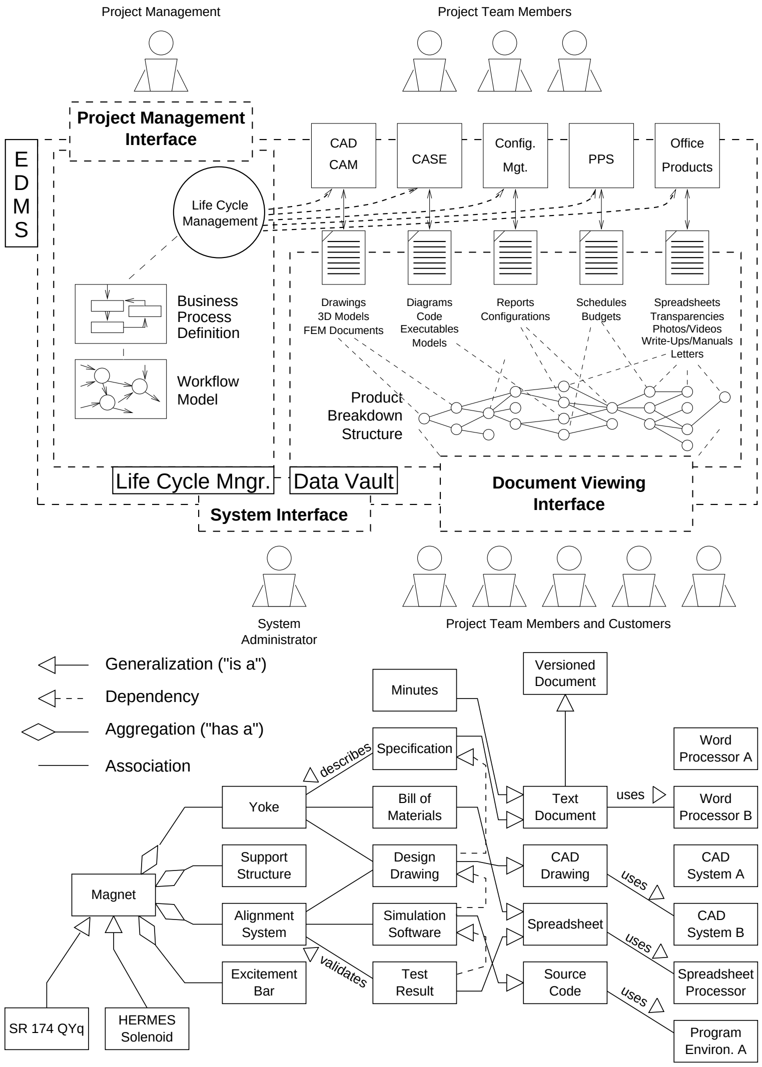

Fig. 1. (a) Architecture of an Engineering Data Management System (EDMS). (b) Example for a Product Breakdown Structure (PBS) and other relationships which are maintained by the EDMS to facilitate high-level document navigation and retrieval (Only a small subset of relations is shown).

- groups who participate in the design, assembly, implementation, or maintenance of accelerator or experiment components,
- groups which contribute to DESY's infrastructure, like eg buildings, tunnels, water, heating, air conditioning, or electricity,
- management and administration.

In a short survey, some representatives of different groups were asked to name the most important deficiencies which they would hope to cure with an EDMS. The answers included

- document access through a unique, easy-to-use and intuitive interface similar to the World Wide Web,
- access to drawings and other documents at the place where they are needed (eg workshop, clean-room),
- browsing capabilities to access different levels of detail,
- navigation aids to access related information (eg for checking constraints),
- tools for short and easy communication with the author of a document, and
- general improvement of teamwork, including opportunities to check and track the status of work in other groups for planning purposes.

The introduction of EDM at DESY is a strategic decision with long term consequences for the entire laboratory, which needs careful preparation. It has to be preceded by an evaluation phase with well defined objectives. The evaluation should result in a clear recommendation to introduce EDM, and a proposal of an appropriate solution for DESY.

4 The EDMS Task Force

As a first step, a task force is being formed for evaluating EDM at DESY. The group faces four major tasks (cf table 1), which will take a bit more than one year.

(i) *Identification of Target Areas for EDMS Usage:* The EDMS task force has to talk to the potential user community to identify their requirements on and expectations of an EDMS. User requirements analysis should identify different scenarios which illustrate the benefits of EDM, and allow cost/benefit estimates.

(ii) *Market Survey and Product Selection:* The requirements specification will be the basis for a market survey and the product selection. After formal product evaluation, selected providers should demonstrate their products at DESY. One product will be selected for a test installation, which will be used for the pilot projects.

(iii) *Incremental Implementation of Functionality:* EDMS implementation starts with the data vault and the communication means. But before any project can feed data or documents to the EDMS, it is necessary to model the product structure, and to create the basic class structure. When this is successfully done, workflow management can be introduced.

(iv) *Selection of Pilot Projects:* Pilot projects of three to six months are needed to demonstrate and evaluate the benefits of an EDMS. It is important that they cover all the key features of an EDMS, ie data and document management functions, product performance and acceptance, and workflow and process management capabilities. Good candidates for pilot projects are a data vaulting project in the mechanical engineering department (digital drawing archive), and a workflow management project in the computing division. Other potential candidates include test facilities for the Linear Collider, or updates for HERA.

Table 1
Tentative schedule for EDM introduction at DESY.

	Task	Duration	Result
1	identification of target areas for EDMS usage	3 months	Requirements Specification
2	identification and preparation of pilot projects (parallel with task #1)	3 months	Objective Specification, Meta Data Model
3	market survey and product selection (after demonstration)	4 months	Formal Product Evaluation, Product Installation
4	active phase of pilot projects	3 – 6 months	Definitive Proposal for EDM Introduction at DESY