Proceedings of the 15th International Conference on Manufacturing Systems – ICMaS
Published by Editura Academiei Române, ISSN 1842-3183

"Politehnica" University of Bucharest, Machine and Manufacturing Systems Department
Bucharest, Romania, 26–27 October, 2006

TRENDS AND CHALLENGES IN PRODUCT LIFECYCLE MANAGEMENT

Daniel PLAY, Jean-Luc TERUEL

Abstract: *An application of PLM (PLM GEDOTEC) has been developed in order to show the different steps of a product life, during training in the Industrial Engineering Department at INSA-Lyon. Because of the general use of PLM in industries and the existence of PLM software's such as Smarteam, Windchill, Teamcenter, Matrix One, etc. it was decided 3 years ago, to implement an application of PLM dedicated to the management of product development. It allows to exercise the engineering of project management as well as data management. The application aimed at friendly and strongly engineering communication in order to increase both the quality of a project and data singularity, correspondence, cohesion, traceability and cued availability. The application known as PLM GEDOTEC allows also to develop training for universities and specific use in industries with the help of information and communication technologies. This paper rapidly presents the implementation and the actual use of the application of PLM GEDOTEC after an introduction of general aspects of PLM. The last paragraph presents future and new developments specially oriented towards KBM (Knowledge Based Management). To conclude, the benefits expected for education and industry of such PLM's system are highlighted.*

Key words: *product lifecycle management (PLM), project management (PM), training for education.*

1. INTRODUCTION

In all industries, pure mass production is completed by system production in global market where the key factors are global product quality, market reactivity and global Business Process Management (BPM), and finally Product-base IntelleCtual Knowledge (PICK) for future. [1, 2, 3, 4]. Obviously, many parameters like standardization of elements, product variants, etc. … can be introduced from these conditions but these are not really new only by the fact that now all items are interrelated. Another fact of progress in industries is the development of Information Technologies (IT) and the existence of a huge software market at disposal. Consequently, engineers in practice have to make choice between specific computer software's considering their own applications. And then, engineers have to manage implementation of a PLM system well accepted by all potential project participants. Under these conditions, they can hope to capitalize the project data and consider future with a new sense of optimism.

As a mater of fact, two strategies coexist in all industries. The first one is dedicated to production of products and goods (Fig. 1) concretized by for example Enterprise Resource Planning (ERP) and Manufacturing Executive System (MES). And the second one is dedicated to Product evolution along time supported by Product Lifecycle Management (PLM) and Project Management (PM) (Fig. 2). It is well known in automotive or aerospace industries that PLM is a strategic goal but it is the same goal for all domains of industries either for material or software products. And the first purpose of implementing such a PLM system is to achieve more than a simple interface to project management but effective data sharing (Fig. 3).

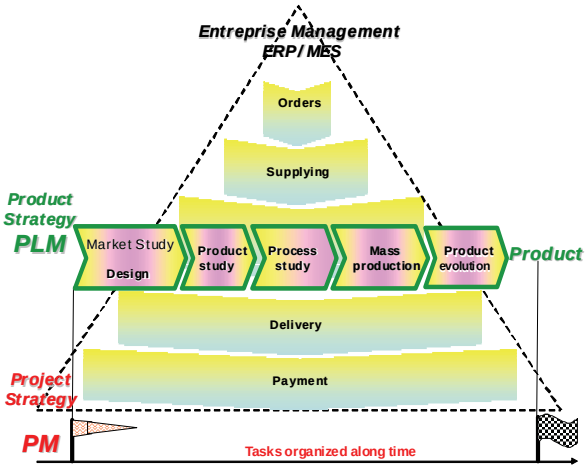


Fig. 1. Two product approaches in practice.

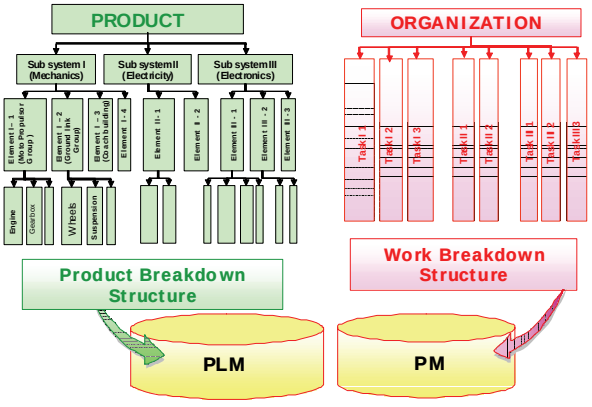


Fig. 2. Management of product and project data.

Thus PLM-PM system can be seen as a product approach that is derived from a common architecture and

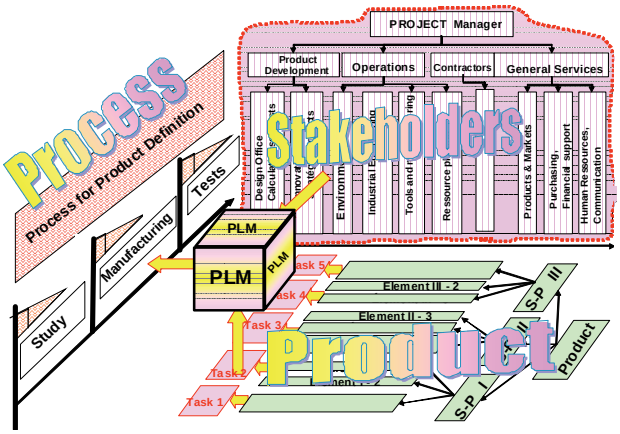


Fig. 3. Connection between Project and Product Management.

data model and which can support the related business processes. Briefly, three groups of driving factors can be isolated:

- Industrial context and targets for technical data management:
  - Integration to design, reduction of cost and delays, standardization of procedures in order to facilitate collaborative activities.
  - Inter and intra sites communication.
  - Application easy to use, etc. …
- Data definition:
  - Type of data for product description, versioning the information.
  - Bill Of Materials (BOM).
  - Computer Aided Design files for geometric and architecture, description, files for project description (Text file, e-mail, project files, etc.).
  - Files for behaviour description, etc..
- Data management requirements:
  - Description of all data related to a design Project and specific viewing capacity.
  - Storing and vaulting of data.
  - Controlling project operation and historic release.
  - Requests at different levels of documentation, data sharing and managing with multi access the project data.

Returning for a moment to the engineering training of students, the preceding list can be organized in different lectures and practical works can be implemented. But the main purpose at INSA Lyon, is to reach industrial engineering training and thus customization of existing software's is necessary to avoid informatics efforts and to stay aligned on the red line of project and product management. An application PLM GEDOTEC was consequently developed.

2. DEVELOPMENT AND USE OF THE PLM GEDOTEC APPLICATION

2.1. General context

The application PLM GEDOTEC was developed from SMARTEAM software but can be translated under other general PLM software's. Fig. 4 gives a general view of the configuration. When mechanical project is concerned,

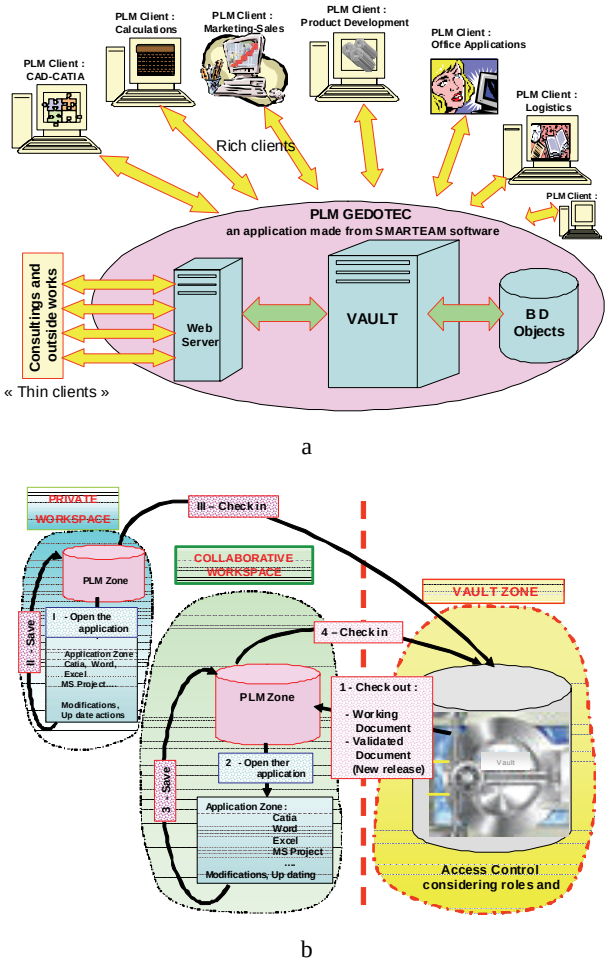


Fig. 4. CATIA and SMARTEAM context for the PLM GEDOTEC: a – work context; b – definition of work zones.

CATIA suite can be used. All the applicative software's of Office suite are also used. In particular, MS project serves as a predefined general flowchart of a project with different tasks and resources stored in the PLM Data base. Roles and authorizations are given for each project partner. Different work zones are defined as private zone but also a collaborative zone permits to the whole partners of a project to product data, to coordinate in a dynamics way all the partner's actions, and to communicate and make any predefined exchanges. Obviously, a vault zone gives the three classical possibilities sum up by in progress or active, validated and archived classes. Finally, a partner into a project team can use the system either as a rich client or as a thin or web access client.

2.2. General developments

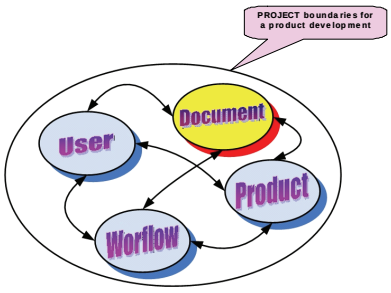


Fig. 5. Relations between groups of data.

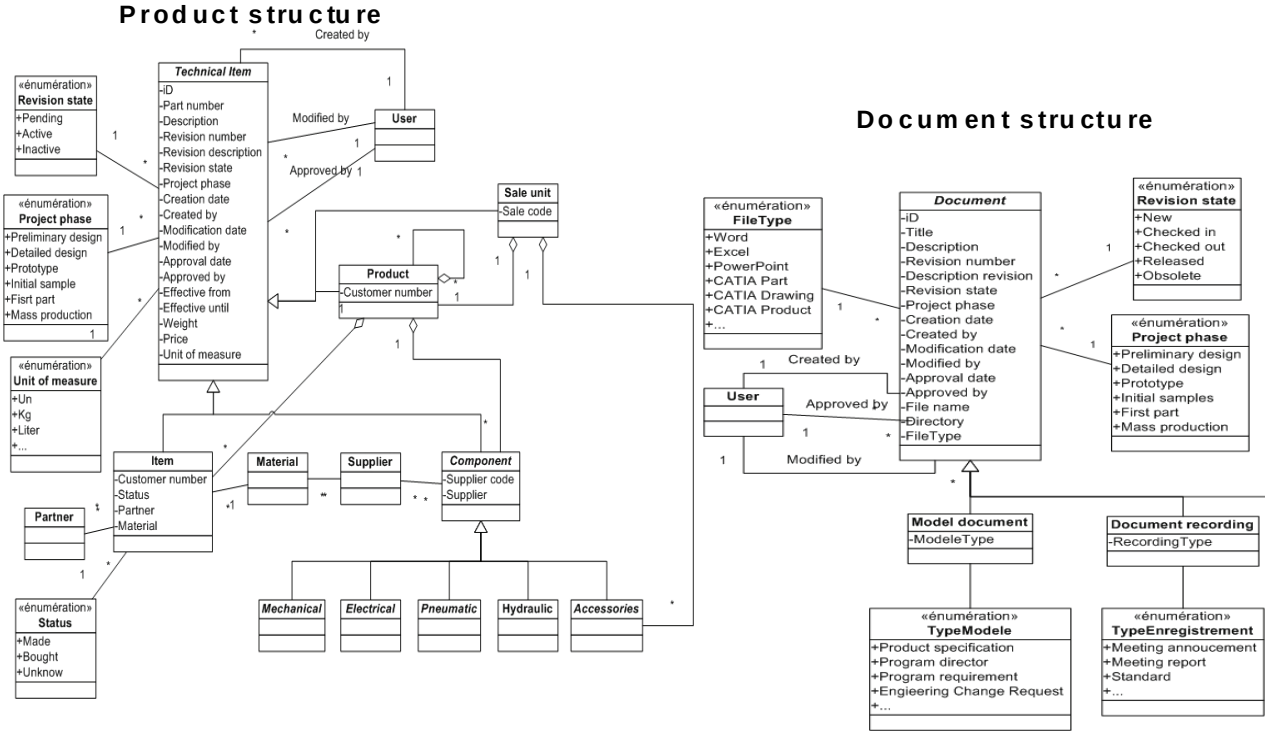


Fig. 6. Definition of data structures.

A general data base structure [5] was defined and implemented under the Oracle structure of SMARTEAM software (Fig. 5). It allows to insure uniqueness and integrity of data and to store all documents and information concerning a project (Fig. 6). It allows to give a clear view of structured data. For example, project information are linked to project tasks.

2.3. Specific developments

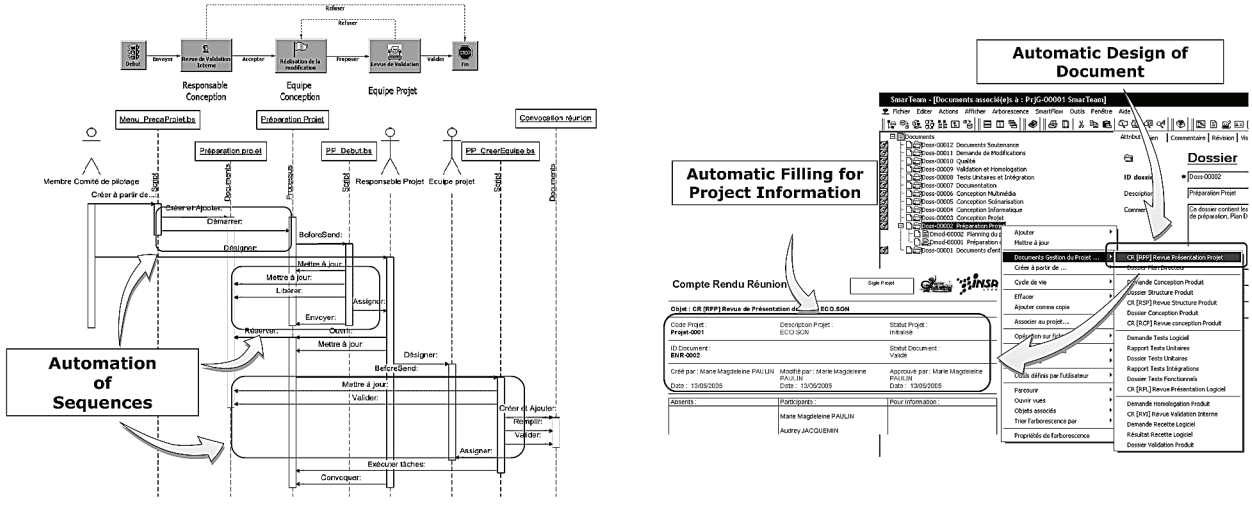
A significant fact of rejection from final project users consists in memorising several informatics procedures.

Thus, automation of low level processes like Engineering Change Order (ECO, Fig. 7) have to be achieved [6, 7]. A specific business function library was then developed. Final users connected on the PLM GEDOTEC can ask edition of various project documents. Obviously, human mistakes are avoided if all the project references are automatically written.

2.4. Experimentation

Introduction of PLM in curriculum is considered progressive in the three first years of the LMD University training (according with the Figs. 8, 9, 10):

- the fist year, lectures on PLM principles (16 h), practical works with PLM GEDOTEC (12 h) and an introduction by practice of project management (team of ten students, 48 h);
- the second year, lectures on project management (20 h) and practice of PLM during project (ten students teams, 300 h);



a b

Fig. 7. Automation of procedures and data filling: a – automation of procedures; b – data filling of predefined documents.

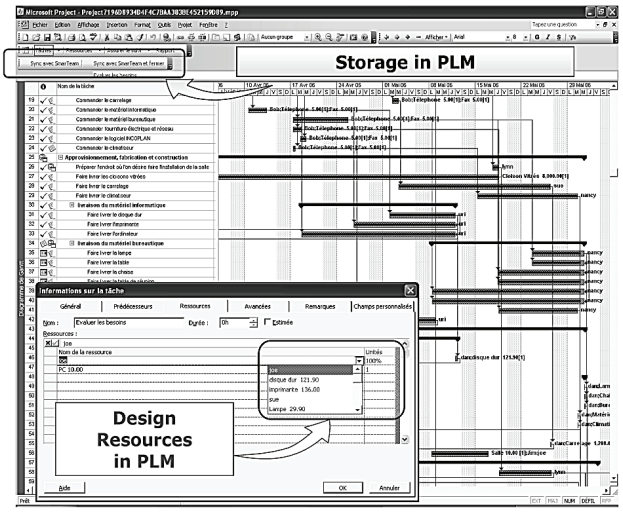


Fig. 8. Explicit link between PM and PLM.

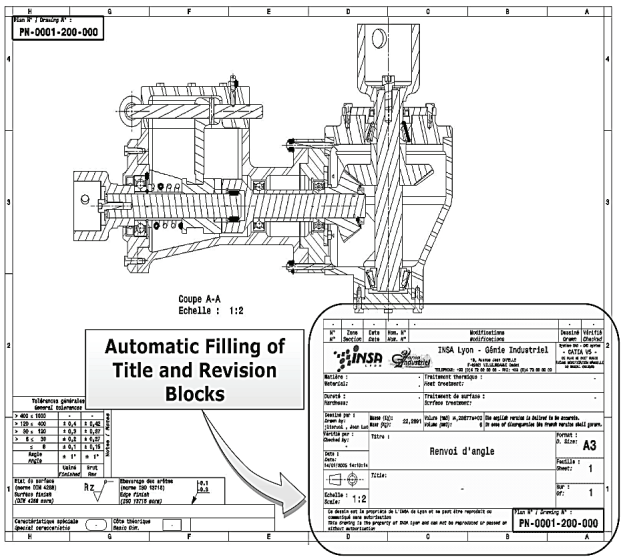


Fig. 9. Editing formatted documents.

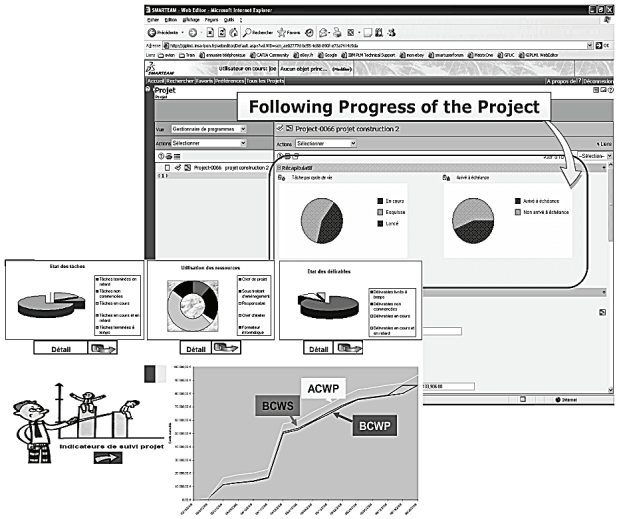


Fig. 10. Following the evolution of a project.

- the third year, industrial experiences transmitted by companies (ten students groups, 48 h).

Under these conditions, young engineers can get real competencies in PLM and PM.

3. PERPECTIVES AND CONCLUSION

3.1. KBM (Knowledge Based Management)

Currently, data mining is exercised from data bases. The precise organisation of PLM-PM gives a first level of structured data that allows beginning of efficient operations of knowledge extraction. Historical facts and versioning are easily identified and reporting becomes easy. Note that connection with ERP can be made. More over, product and process ontology's should be extract from materials resulting of project data and processes. Strategic knowledge can be separated from other skills.

3.2. Return to the experimentation

Classical objectives of PLM training are reached (non-quality saving, efficiency saving, enabling extend collaboration). Also the link with the human team managers was clarified and finally reinforced.

Implementation of PLM GEDOTEC was made step by step discovering progressively the user's reactions that ask for more automation or better display presentation. The resistance to change was always present particularly when procedures are suggested. The implementation requires twice time as it was scheduled because many details were not defined at the beginning.

3.3. Conclusion

At the end, benefits are obvious and market differentiating based on experiment is gained. Aligned processes and capitalisation are reached. Project quality increases whilst risks during project and partner misunderstandings are decreased. A new generation of PLM application can be emphasis in due course.

REFERENCES

[1] Debaecker, D. (2004). *PLM : La gestion collaborative du cycle de vie des produits*, Edition Lavoisier, France.

[2] Saaksvuoti, A., Immonen, A. (2002). *Product Lifecycle Management*, Edition Springer.

[3] Grieves, M. (2006). *Product Lifecycle Management, Driving the next generation of lean thinking*, MacGraw-Hill, 319 P.

[4] (2001). *Collaborative Product Definition Management (cPDM): An Overview*, CIMdata, 4th Edition, `http://www.cimdata.com`

[5] Maurino, M. (1995). *La gestion des données techniques – Technologie de concurrent engineering*, Edition Masson.

[6] Coad, P. (1992). *Object Oriented Patterns*, Communication of ACM, vol. 35 n°9.

[7] Cauvet, C., Rieu, D., Espinasse, B., Giraudin, J. P., Tollenaere, M. (1998). *Ingénierie des systèmes d'informations produit : une approche méthodologique centrée réutilisation de patrons*, Congrès Inforsid, Montpellier, France.

Authors:

Professor Daniel PLAY, INSA-Lyon, Industrial Engineering Dept., France, Bât. Jules Verne, 19 Av. Jean Capelle, 69621, Villeurbanne, France, E-mail: `daniel.play@insa-lyon.fr`
Associated Professor Jean-Luc TERUEL, INSA-Lyon, Industrial Engineering Department, France, Bât. Jules Verne, 19 Avenue Jean Capelle, 69621, Villeurbanne France,
E-mail: `jean-luc.teruel@insa-lyon.fr`