

PLM System Implementation in Effective Monitoring of Student's Project Work

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Abstract— The concept and implementation of Product Lifecycle Management (PLM) has drawn much attention in both industry and academia. This paper presents the implementation of PLM system for the students of industrial and production engineering in carrying out their academic mini-projects and capstone project work, through identifying a systematic approach for projects execution using ENOVIA-V6 PLM software application. The paper concludes with milestones identified for continual improvement in implementation of PLM software applications for the next academic projects, as the broad scope of PLM has allowed it to emerge into a primary means by which to improve product development processes across the value chain in order to deliver the most business value.

Keywords—Product Lifecycle Management, PLM–Enovia

I. INTRODUCTION

Even though the product lifecycle concept has represented a central element of manufacturing and marketing theory since its development in the 1950s, it is only recently that it has begun to attract attention due in large part to its broad scope and possibilities of collaborative design within national boundaries and in trans-national environments.

The concept of Product Lifecycle Management (PLM) was derived from Product Data Management (PDM). This can broadly be defined as a way for engineers and suppliers to talk amongst themselves via networks as products evolve through their lifecycle. An ideal PDM/PLM system manages all forms of product data, which could include CAD files, text files, or any other information related to the product development. The broad scope of PLM has allowed it to emerge into a primary means by which to improve product development processes across the value chain in order to deliver the most business value.

II. SCOPE OF PLM

Generally, PLM enables collaboration within and between enterprises [1]. The scope of PLM is not well defined and concepts are not yet been firmly established either in academia or industry. Based on a detailed literature review of both archival and industrial journals, developed a proposed definition of PLM as follows:

Product Lifecycle Management is the product information management process by which a product is evolved from conceptualization, detail design, manufacture, distribution, maintenance, and recycling.

Product Lifecycle Management includes the subsystems of Enterprise Resource Planning, Product Data Management, Document and Knowledge Management, Collaboration and Process Management, Total Quality Management, Customer Relationship Management, Supplier Relationship Management, and Environment, Health and Safety Management.

Figure 1 details the different elements of the lifecycle of a typical engineered product and places it within the context of a PLM system.

Note the two perspectives or views (role based versus functional) that can be taken in developing software modules.

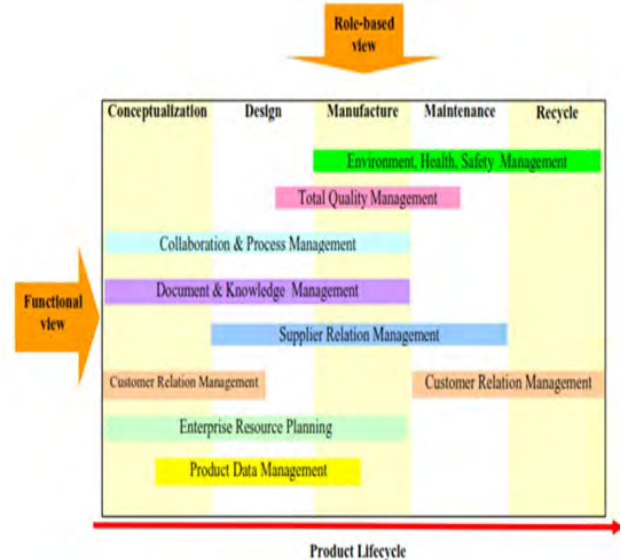


Fig. 1. Subsystems within a product lifecycle management (PLM) system

It must however be noted here that these modules are not mutually exclusive or discrete. They are closely inter-related and data is freely exchanged from one to another.

III. CURRENT COMMERCIAL PLM SOFTWARE SYSTEMS

PLM solutions are a unique combination of software, middleware, hardware and services that put allow data to be the core of the product development process. This enables the organization to extract greater value from data, collaborate in a more effective manner, streamline processes, improve employee productivity, and set the foundation for innovation. Here, we briefly summarize the major PLM systems available in the marketplace today.

UGS, Dassault Systemes, and PTC are three of the largest PLM vendors. The UGS Velocity Series is a series of modular, yet integrated solutions that is focused towards the needs of the mid-market [2]. It consists of a preconfigured family of modules encompassing digital product design, engineering analysis and data management software modules. PLM software from Dassault Systeme/IBM promises to help foster innovation by tailoring or customizing an appropriate combination of application software, middleware, hardware and services for a successful PLM implementation. CATIA, ENOVIA, and SMARTEAM also provide flexible product data management and business process management systems [3]. Parametric Technology Corporation (PTC), makers of Pro/Engineer software have extended their scope and now market a suite of product development and information management solutions utilizing a 'Product First' philosophy. This is centered on the idea that great products make great companies, which helps companies identify and realize value in their product development process [4].

There are also smaller software vendors providing PLM software such as Agile [5], Matrix One [6], Omnify [7], Arena [8]. Their packages are mainly targeted at small and medium sized enterprises. Their products typically provide bi-directional interfaces with design (CAD/CAE) tools and enterprise systems (ERP/MRP).

IV. OBJECTIVES

The implementation of PLM carried out with the following objectives:

- i. To involve students actively in different stages of their project execution.
- ii. To make students understand the requirements of product data management and product life cycle management practically.
- iii. To develop skill among students to use of modern tools and lifelong learning in workplace.

TABLE I. QUICK STATISTICS OF PLM ENOVIA USERS

Users \ No.	Capstone Project	Mini-Project
No. of students	63	80
No. of Teams	16	20
No. of Projects	16	20
No. of guides	12	12

V. METHODOLOGY

The steps adopted for implementation of PLM are as follows:

- A. Creation of project template in PLM software for assuring the systematic execution of student project.
- B. Conduction of classroom sessions for students for understanding PLM environment.
- C. Assessment

A. Creating the project template

The project template is created as per the tasks which need to be accomplished in a particular phase of the project work. The Figure 2 shows a format of project template created in PLM Enovia software for VIII semester student's capstone project during academic year 2013-14.

Task Name	Task Type
<input type="checkbox"/> Capstone Project IP 2013-14	Project Template
<input checked="" type="checkbox"/> PHASE-I	Phase
<input checked="" type="checkbox"/> Problem Definition	Task
<input checked="" type="checkbox"/> Literature Review/field survey	Task
<input checked="" type="checkbox"/> Methodology	Task
<input checked="" type="checkbox"/> Alternative Designs	Task
<input checked="" type="checkbox"/> Assessment for CIE	Gate
<input checked="" type="checkbox"/> Assessment for SEE	Gate
<input checked="" type="checkbox"/> PHASE-II	Phase
<input checked="" type="checkbox"/> Implementation	Task
<input checked="" type="checkbox"/> Analysis and Discussion of results	Task
<input checked="" type="checkbox"/> Assessment for CIE	Gate
<input checked="" type="checkbox"/> Assessment for SEE	Gate

Fig. 2. Project template from PLM Enovia

The project tasks are assigned to students to fulfill the requirement of that task in a particular phase, which is updated in PLM software in the form of documents such as word file, part design files, assembly files, mechanisms, presentations etc. in respective phase and tasks. These documents will be submitted to respective guides for review the supportive documents collected.

The guides will review the work carried out by the students and will give the approval for the completion of that

particular task, which helps in assessing the students according to the rubrics. Each project phases has gates which is assigned to guides of project batches, to clear or approve these gates the check lists involving information about the regular meeting/interaction related to project tasks need to be attached. An overall approval of phase is can be generated.

Mini-project view of phase wise project execution in PLM Enovia

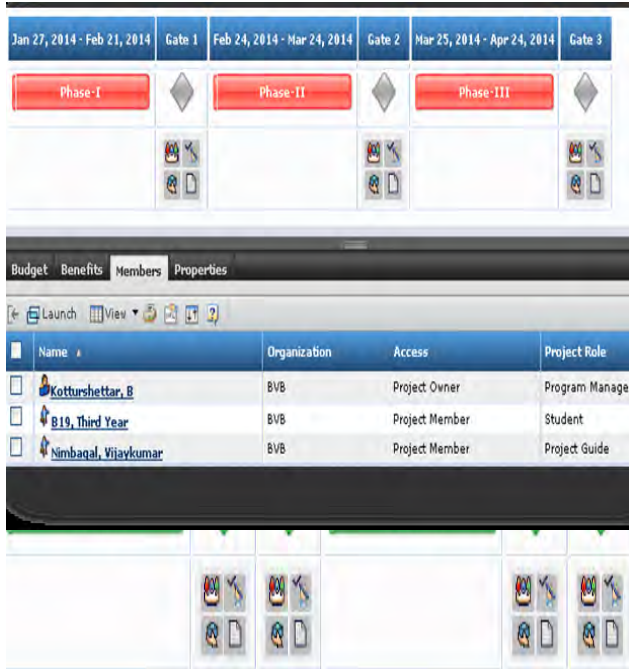


Fig. 3. Approved status of capstone project in PLM Enovia

B. Conduction of classroom sessions

The classroom sessions are conducted to students for hands on learning of PLM software usage. Three sessions conducted under this regard are;

- Introduction to PLM(Product lifecycle management)
- Guidelines for PLM implementation in projects.
- Execution of project through PLM.

C. Assessment

In PLM implementation, preliminarily more focus is towards effective monitoring of projects work carried out by the students, however the difficulty is encountered in assessing the student's performance through PLM software by the guides and review committee, as the students may feel difficulty in fulfilling the given tasks within time period and getting approvals on the same day. Thus assessment is done through regular interactions with guides and their valuable feedback uploaded in PLM software during approval stage. The rubrics based assessment for the program outcomes identified and there attainment in capstone project is represented below.

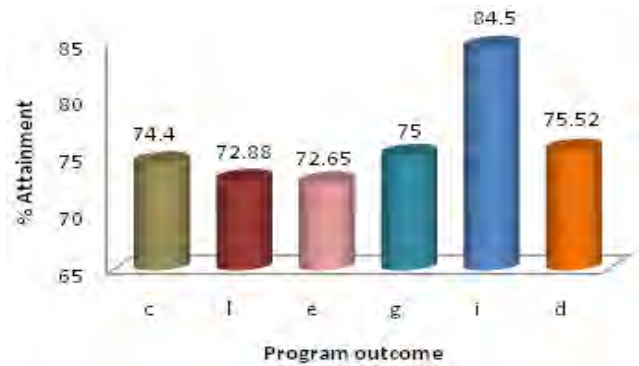


Fig. 4. Program outcomes assessment (Capstone Project)

The rubrics based assessment for the program outcomes identified and there attainment in Mini-project is represented below.

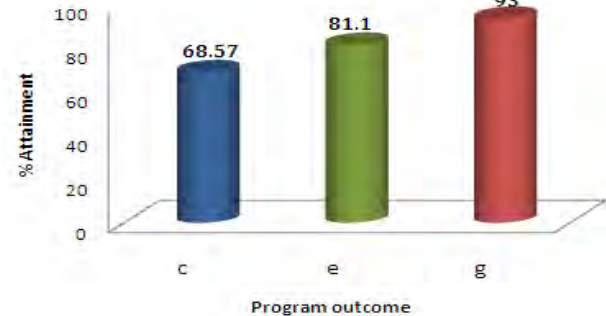


Fig. 5. Program outcomes assessment (Mini Project)

VI. CONTINUAL IMPROVEMENT IN PLM IPMLEMENTATION FOR THE CURRENT ACADEMIC PROJECTS 2013-14.

As a part of continual improvement in the PLM implementation process, this academic year projects are reviewed through presentations using PLM, after completion of each respective phase. This helped students to enhance hands on experience and active team participation. For the improvement in projects monitoring by the project guides, the following steps are initiated;

- Hands on training of PLM software usage for guides for successful timely review.
- In revised project templates each tasks are provided with particular deadline for finishing task. Simultaneously guides will review the status of the project.

VII. MILESTONES IDENTIFIED FOR NEXT ACADEMIC BATCH

The implementation of PLM for next academic batch the following milestones are identified which need to be achieved:

- The scope of PLM implementation need to be extended for integration with Catia-V5/V6 directly, which is more challenging task.

- Creation and realization of BOM in PLM software to understand material procurement strategy with reference to the knowledge of subjects such as supply chain management, operations management etc.
- Generating ECR (Engineering change request), EIN (Engineering Issue note) etc. as similar way to industrial products.

VIII. CONCLUSIONS

From effective implementation of PLM in the project works following conclusions are drawn:

- The implementation of PLM is successfully carried out by students in their project work management and it was found that, they have understood the basics of its usage and applications.
- Students are able to understand the real world application of PLM software tool, which will enhance their career opportunities.

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