Development of Product Lifecycle Management for the Industrial Growth

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Abstract:
Nowadays, companies are upcoming with various challenges regarding reaching the product into the market in a short period of time for decreased time-to-profit to get return from market shortly. To overcome these challenges, the technology of Product Lifecycle Management (PLM) is used by the companies which provides a method to rapidly plan, organize, manage, measure, and deliver new products or services much faster, better, and cheaper in an integrated way. This study elaborates a full scenario of technology solutions for PLM based on the complete analysis of industry requirements. This proposed PLM technology solutions will form the frontier basis for the further research, development and application of PLM systems which will keep the companies at higher position in the competitive market.

Keywords: *Product Lifecycle Management (PLM), Teamcenter, Windchill, Customization.*

1. INTRODUCTION

Every product manufactured in the industry has its own product lifecycle, wherein a lifecycle of a product consists of various phases which involves many professional disciplines and requires many skills, tools and processes. A product require different kinds of strategies in each lifecycle stages which includes marketing, financing, manufacturing, purchasing and human resource. PLM can be used for managing all the information about the corporation product throughout the whole product lifecycle, wherein manufacturer can reduce the time to establish a new model in different ways.

Various kinds of tools or software systems are developed for managing product information, wherein the information refers to the geometric description of products generated by Computer Aided Design (CAD) system. The CAD software systems are integrated with the PLM tool such as SIEMENS Teamcenter, PTC Windchill, DASSAULT Ennovia, etc. to manage the information regarding the data model in the form of attributes and their values which can be stored in the database that configures the tool software by using Business Modeller Integrated Development Environment (BMIDE), wherein the data model objects defines the objects and rules used in PLM tool for example teamcenter. Teamcenter is the most widely used software to digitally manage the data which describes the product. The CAD software such as NX, CATIA, Solidworks, Autocad, Creo, etc. can be integrated with teamcenter software system to digitally manage the respective data of the CAD model generated through any of the CAD software. The attributes can be termed as properties of the product which describes the product's information. For example, the properties of the product can be material, mass, density, volume, colour, weight, length, width, name, ID, etc. These attributes from the CAD software system are mapped with the existing attributes of teamcenter software system or any new attributes generated in the teamenter through BMIDE so that whenever the attribute values are filled in the CAD software, it gets reflected into the teamcenter software or vice versa according to execution of attribute mapping by generating the attribute mapping file. The assembly/part which is drawn in any of the CAD software is stored as a dataset in the teamcenter.

Sometimes companies has to face many challenges for effective management of whole product lifecycle, wherein the customer demands for mass customization, they also demand for such a product that brings complexity. In general, this challenges comprises of increased speed, increased demand, increased outsourcing and pervasive internet. PLM is a strategic business approach that enables the

organization to achieve its business goals of improving the quality of the product, reducing the costs and decreased scrap, rework during production and shortening time to market, while innovating its product, services and business operations.
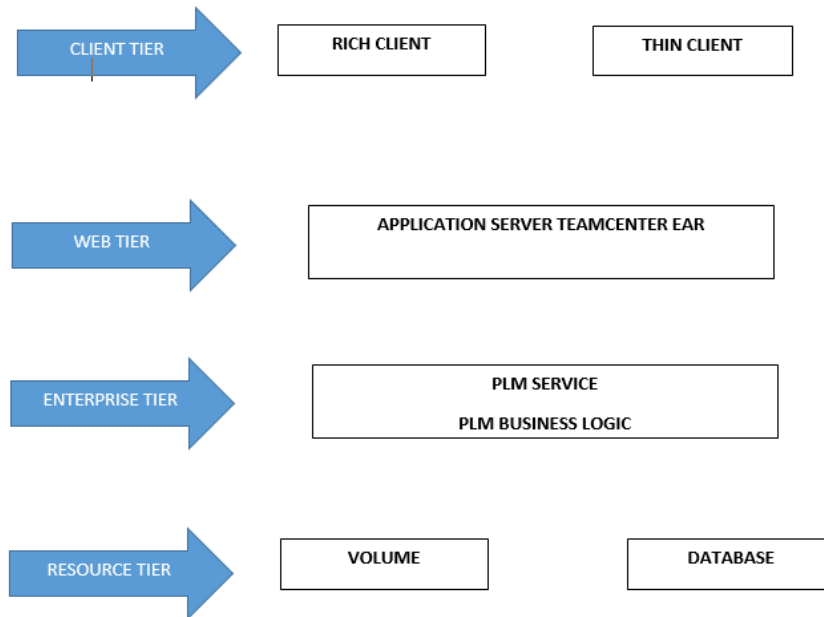

Fig 1: Teamcenter Four Tier Architecture

Fig 1 illustrates the teamcenter Four Tier architecture, wherein a Client tier comprising of Rich Client which is preferably a java application and Thin Client which is preferably a module which provides an access to a teamcenter through a web browser, UI (User Interface) provides browser based view. A Web tier is a java application that initiates web application server such as Oracle Web logic which is to be termed as third party application used for communication between client tier and enterprise tier, wherein enterprise tier comprises of PLM services comprising of manifestation of data model in PLM Application and process a request for database transaction consisting of a configurable pool of teamcenter C++ server processes and server manager. Web Application Manager generates EAR file which is later deployed to web application server on web tier host. User access the thin client from browser using web tier host. The resource tier comprises of a database, volumes and file servers with two file management systems i.e. Teamcenter File Management system and Teamcenter file services, wherein all the datasets originated in teamcenter such as CAD, CAM, CAE models along with the files of other formats are stored in Volume.
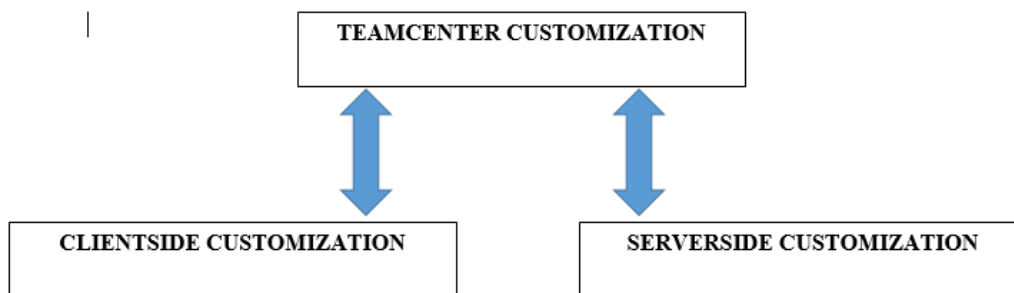

Fig 2: Teamcenter Customization

Fig 2 illustrates the methods of Teamcenter Customization, wherein Client Side Customization is dealt by using Programing language like Java and by using teamcenter wizards. This method of customization can be used to add New Application in Teamcenter such as Menu Bar, Toolbar, UI (User

Interface) form on client side. Persistent Object Module (POM) classes can be created as per the requirement of organization by using Client side customization, wherein Server Side customization is performed by using Teamcenter API (Application program Interface) called as ITK (Integration Toolkit), C/C++. The ITK is a set of C functions used directly by Teamcenter and Unigraphics. Codeless and Codefull customization can also be performed by using Business Modeller Integrated Development Environment (BMIDE).

2. LITERATURE SURVEY:

The literature shows different ways for serving up the information to PLM systems, wherein an optimum support structure has been developed for the product information that can access, store, reuse and serve all the product information throughout the entire lifecycle, wherein it describes an implementation of the information modelling structure which provides a collective storage of all the product information at all stages of design process by using support of interrelated systems such as CAD, CAM, CAE and others were the information is interchanged [1]. Some embedded technologies comprises of PLM system associate with a product service support that provides three phases of life of the product, wherein first phase consists of Bottom Of life (BOL), second one Middle Of Life (MOL) and third phase is preferably an End Of Life (EOL) of the product. BOL represents (Bill of Materials) design support system which includes BOM information, Product Order information, and the information regarding the maintenance and service and system configuration. MOL represents usage status information, maintenance history and information about the product logistics. EOL represents the cycling and reusing parts or component information. The New Product Development (NPD) stages are taken into consideration, wherein according to customer's feedback and need a proper significant planning has been introduced were the concept, cost estimation, drawings are to be analysed that gives a final optimum solution [2]. PLM plays vital role in automotive and aerospace industries were the designs are complex and where there is no possibility of building a prototype model. IBM-DASSAULT's PLM solution, ENNOVIA VPM, enables the DASSAULT aviation to collaboratively design the FALCON 7X Business Jet, simultaneously, Boeing 7X7 commercial aircrafts and F-35 Joint Strike Fighter (JSF) were deployed by UGS PLM solutions [3]. The present literature has sought to develop a structure for Lean Product Development. Existing ways carried out for lean Product Development observed to be partial or incomplete, wherein it pays specific attention to the human aspects of NPD and PLM. So, it was decided to implement the new approach in different environments to ensure that it is one of the best structure [4]. Nowadays, Siemen's Teamcenter software has been used frequently to digitally manage data in whole product lifecycle by using Business Modeller IDE (Integrated Development Environment) which is a tool that configures the business data model by adding properties, rules and extensions, wherein Teamcenter customization can be carried out either in a code full manner or in a codeless manner. Method of teamcenter customization comprises of two categories, Client side customization and Server side Customization. Client side customization is performed by using JAVA language and wizards available in teamcenter that enable to create a new application, menu bar or UI (User Interface) form on client side. The server can be customized by using teamcenter API (Application program Interface) called as ITK (Integrated Tool Kit) which are small set of C functions used by teamcenter and unigraphics. The company manufacturing sheet metal components, metal forming and fabrication of automotive components manage the data by using teamcenter, wherein these data is stored in database in the form of dataset which is a CAD model drawn in NX software. Previously, it was very difficult to export the data (Assembly/Parts) manually in the local drive one by one. This process was time consuming. So to overcome this problem, teamcenter API has been used to create a utility or ITK function for the extraction of NX assembly to local drive so that it can automatically fetch all the assemblies along with its respective parts [5].

3. RESULTS AND CONCLUSION:

There exists number of developed tools which are significantly useful for Product Lifecycle Management (PLM). But there is need to customize the tool such as Siemen's Teamcenter software as per the manufacturer's requirement so that the data

can be managed easily and the end user could be able to use it without consuming much time period.

Business Modeller IDE can be configured by using codeless method of customization as well as code full customization by using teamcenter APIs.

CAD, CAM and CAE software systems can be integrated to teamcenter were the datasets are created in the rich client of Teamcenter along with the values of attributes mapped accordingly. This results in ease of managing the data stored in database of teamcenter.

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