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PLM Implementation with Creation of Multiple Item using SOA Technology in Team center

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ABSTRACT : *PLM is gaining high importance in all types of industries like automobile, pharmaceutical, defense, fashion and electronic industries. Though definitions of PLM as defined by many PLM industries vary the final goal to streamline all business processes, retain the knowledgebase and manage the entire product data is achieved by PLM suits. The following paper describes PLM in brief and describes its various elements through software perspective. The paper also gives a brief introduction to how SOA technology helps to achieve remote access to the business databases over http and IIOP protocols and carry out repetitive tasks efficiently.*

Keywords - *HTTP, IIOP, PLM, SOA*

I. INTRODUCTION

In today's challenging global market, enterprises must innovate to survive. Business innovation must occur in all dimensions—product, process, and organization— to improve competitiveness and business performance. To differentiate themselves, enterprises must capture, manage, and leverage their intellectual assets. This can best be accomplished through proper application of a Product Lifecycle Management (PLM) approach that addresses the needs of the extended enterprise. PLM is a strategic business approach that helps enterprises achieve its business goals of reducing costs, improving quality, and shortening time to market, while innovating its products, services, and business operations.

II. WHAT IS PLM

A strategic business approach that applies a consistent set of business solutions in support of the collaborative creation, management, dissemination, and use of product definition information across the extended enterprise from concept to end of life—integrating people, processes, business systems, and information. By increasing an enterprise's flexibility and agility to respond swiftly to changing market pressures and competitors, PLM helps companies:

- Deliver more innovative products and services
- Reduce costs, improve quality, and shorten time to market, while achieving the targeted return on investment (ROI)
- Establish more comprehensive, collaborative, and improved relationships with their customers, suppliers, and business partners.

PLM solutions meld technology, methods, and best practices to address today are rapidly changing business environments. PLM is a catalyst for change within a business—an opportunity to improve processes and organizational relationships to create an innovative, measurably improved business. Once implemented, PLM solutions provide benefits that have demonstrated a positive impact on an enterprise's top and bottom lines. PLM solutions can improve business efficiency by providing:

- Dramatic reductions in time and cost of product changes
- Significantly shorter product cycle and lead times
- Decreased scrap and rework during production
- Improved productivity in design engineering

Direct savings include reductions in the time and cost to design products, reduced inventory, and better reuse of components, shorter time to market (thus earlier time to revenue) with new and enhanced products, and reductions in the time to locate and access needed information. These and other impacts deliver improved revenues and higher profits, much like other enterprise initiatives such as enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM) [1].

III. EVOLUTION OF PLM

There were four stages of evolution leading to PLM. The first phase was computer-aided design, engineering and manufacturing (CAD/CAE/CAM), which involved digital models of product and process. This was followed by product data management (PDM), which involved digital storage and retrieval of data. This in turn led to collaborative product commerce (CPC), which involved on-line exchange of digital data (drawing markup and online catalogues). The virtual product comprises a digital assembly of its part models. The parts are modeled in 3D using computer-aided design (CAD) programs and saved in standard formats (ex. IGES and STEP) for exchange between different programs. Computer aided engineering (CAE) programs enable simulating the product mechanism and optimizing the shape of each part under static/dynamic loads by simulating the internal stresses. The part models can be sent to a rapid prototyping (RP) system for automatic fabrication of a physical replica for form, fit and function testing. The tooling models (moulds, dies, jigs and fixtures) can be quickly developed by modifying the corresponding part models. Computer-aided manufacturing (CAM) programs enable planning, simulation and optimization of process parameters. Finally, computer-aided inspection systems enable automatic comparison of virtual and real parts for quality assurance. The 3D model is the connecting link in various CAX programs (X=design, engineering, manufacture and inspection). The programs generate a huge amount of data, which includes the solid models of different iterations and previous versions of products, as well as tooling, materials, process plans and results of analysis. Other important data include the bill of materials and engineering change orders. This necessitates a systematic approach to data storage, verification and retrieval, which is achieved by a product data management (PDM) system.

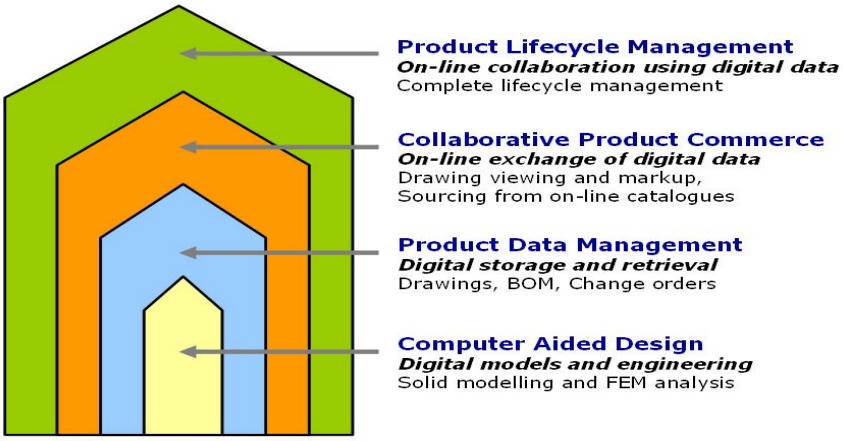

Fig.1 Evolution and components of PLM [2]

The PDM systems have rapidly evolved over the last decade and now allow distributed storage and remote access over Internet. They provide better data translation for exchange among various programs. Security is handled by data encryption during exchange and facilities for setting limits of access by non-core team members. Some useful utilities for collaboration are also provided. For example, comments or suggestions can be attached to product features. Two or more team members can synchronize their computer displays, point out product features (by an arrow visible to all team members) and discuss various improvements using a messaging or videoconferencing facility. On-line catalogues of parts made it easy to select, check compatibility with other designed parts and place an order for the part over the Internet. This was referred to as Collaborative Product Commerce (CPC) [2].

IV. TEAMCENTER AS A TOOL FOR IMPLEMENTATION OF PLM

PLM systems have software to manage the process data, Cad data and Knowledge data. In that Teamcenter, Windchill, Inovia, Aras etc Software are available.Teamcenter software is the product of Siemens PLM software's industry. The core of Teamcenter was developed internally by Siemens PLM. This includes core foundational capabilities Such as:

- Engineering data management
- Document and information access, navigation and retrieval
- Change management
- Classification management
- Structure management
- Digital validation
- Design in context
- Audit management
- Information security
- Issue management
- Workflow management

However, the core capabilities are available as well as the supporting capabilities also are in the Teamcenter software. For Teamcenter, these areas include:

- Visualization
- Manufacturing Process Management
- Requirements Management and Systems Engineering
- End-user Requirements Management
- Project Management
- Portfolio Management
- Digital Manufacturing
- Compliance
- Maintenance, Repair and Overhaul
- Supplier Relationship Management
- Community collaboration

The following paragraphs briefly describe some capabilities of Team-center unified platform

Lifecycle Visualization enables people to view and work with both 2D and 3D product information. This capability is provided to users throughout the enterprise, suppliers, partners, and customers without the need for these people to own or know how to use the information authoring tools such as CAD.

Supplier Relationship Management (SRM) enables an enterprise to effectively manage and engage its supply chain to manage product costs and quality including supplier performance. It includes a disciplined and systematic process for reducing the total costs of externally purchased materials, goods, and services while maintaining and improving levels of quality, service, and technology and to evaluate, prioritize, and manage preferences for supplier utilization.

Manufacturing Process Management (MPM) provides a mechanism to describe, simulate, optimize, and release manufacturing process plans and related definitions in collaboration with product design activities, and to communicate this information appropriately throughout the organization.

Maintenance, Repair, and Overhaul (MRO) enables companies to manage the maintenance, repair, and overhaul of complex products such as aircraft, ships, and plants throughout their lifecycle—from concept through to end-of life (e.g., decommissioning). It provides knowledge of a product's configuration, its maintenance and repair history, how it can be serviced, and what spares, test, and service equipment must be used to maintain the product or system as well as capabilities to define, schedule, and track maintenance activities. Additionally, MRO supports claims and warranty management by providing capabilities necessary to define and manage processes specifically focused at handling those activities.

Community Collaboration provides a platform for sharing information and working together across the product lifecycle. Real-time collaboration and application sharing can be used to create an environment for product and process information to be communicated among all key participants in the product lifecycle. It provides capabilities to securely integrate product lifecycle management data from many different sources into one interface.

Bill of Material (BOM) Management provides the ability to create and manage product structures and their multiple logical constructs. These products structures include part-to-part, part-to-document, and document-to-document relationships so that a complete bill of information (BOI) can be defined and managed throughout a product's and its associated information's lifecycles.

Compliance Management enables the definition, tracking, and reporting of all product-related information and activities required to confirm that a product meets regulatory compliance metrics. It is generally implemented with industry-specific solutions, e.g., Food and Drug Administration (FDA) compliance for pharmaceuticals or medical devices. Compliance Management is also used to support tracking and managing export controlled product related information, e.g., International Traffic in Arms Regulations (ITAR) [3].

V. WHAT IS ITEM?

The use of different product lifecycle management systems are very largely based on the use of items. An item is a systematic and standard way to identify, encode and name a physical product, a product element or module, a component, a material or a service. Items are also used to identify documents. An item means depends upon the specific needs and products of each company. From the viewpoint of product lifecycle management, it is essential that items and their classification should be uniform within each company. It is essential also that items form separate classes, subclasses and groups at a suitable level of coarseness according to the company's own or, alternatively, wider international standards.

VI. VNEED FOR CREATION OF MULTIPLE ITEMS

Service-oriented architecture (SOA) is an approach to design software applications, a PLM system that is not dependent on a rigid server and client architecture of a multi-tier environment. In New Product Design, to create the new product it requires number of components to be created in Teamcenter. For creation of each new item we have to apply same procedure each time. Every time the creation of the item or component requires lot of time, but the Teamcenter customization tool SOA (Service oriented architecture) may be used to create custom utility. That Utility will accept the names of items from CSV (comma separated value) file, which contains list of the components or items. Because of this, all items and item revisions will get created automatically reducing the time, errors, redundancy and efforts.

VII. SOA APPROACH

Teamcenter's SOA is a coarse-grained API that openly exposes Teamcenter's Business Logic Server capabilities to Web Services, as well as to language specific programs. This provides an ideal solution for enabling a wide range of applications to access your Teamcenter environment's product design and development information. Teamcenter itself functions as the engine and repository that connects all of your environment's design and product development information in a flexible and loosely coupled manner – while providing your entire global environment with a single point of access to these connected assets. SOA Language Bindings provide language-specific functions (.NET, C++, and Java) used by service consumers to invoke an SOA service and properly handle the ensuing response. SOA Toolkit provides tools that enable Teamcenter developers to auto-generate all of the artefacts necessary for exposing new Teamcenter business logic as SOA services. Teamcenter's SOA services provide new capabilities that allow you to deploy higher performing and more scalable WAN-friendly and firewall-friendly applications in a Teamcenter environment. Because these capabilities adhere to industry standards and established best practices, Teamcenter services are now accessible to a wider development community [4].

VIII. PROCEDURE FOR CREATION OF MULTIPLE ITEMS

1. Identify assembly.
2. Identify its child components.
3. List those components along with its parent assembly component.

4. Create program to carry out query so as, to find out existing components in the Teamcenter database.
5. Create code with input parameter for creation of item.
6. Create CSV (comma separated value) files which list the item ids, item revision ids and names of the items which need to be created in Teamcenter database.
7. Execute the program.

Out of above this steps step number 4 &5 needs to be done only once and rest of the step are repeated as per the case.

IX. ADVANTAGES OF SOA

1. SOA Services is Java, C++, .NET based Services.
2. SOA provides customers with the ability to quickly and easily develop task-specific clients, utilities, and system integrations using the power of the Teamcenter server.
3. SOA provides flexibility to choose the technology that best fits with your particular environment and standards.
4. SOA is comfort both LAN and WAN.
5. SOA is firewall-friendly applications in a Teamcenter environment.[5][6]

X. CONCLUSION

Many industries is trying to adopt PLM technologies to map their business processes in digital form. Teamcenter by Siemens is software tool that is widely used to implementing PLM. The newer versions of Teamcenter have in them Service Oriented Architecture. SOA is an enabling technology that helps to carry out implementation tasks from remote locations over http protocols. These implementation tasks include identification of the assembly components and creating those components in virtual environment of Teamcenter. As size of the assembly grows bigger, the numbers of components, that create the assembly, tend to increase. Hence task of creation of all these items in database becomes more tedious, time consuming and prone to human error. These tasks, which are to be carried out repetitively, have to be given to programs which are efficient and are simple to execute.

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