PLM Implementation For E-Bike Manufacturer Using Teamcenter And NXCAD

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Abstract- *This paper discusses the results of a project in which Siemens' Team center and NX CAD software were coupled to produce Product Lifecycle Management (PLM) for an electric bicycle. The objective was to leverage current PLM tools to improve design, development, and overall product lifecycle management. The study investigates the history and relevance of PLM, the selection and deployment of Teamcenter and NX CAD, and the important characteristics used for optimization. It assesses the effectiveness of PLM deployment based on factors such as better cooperation, simpler data interchange, improved documentation, increased traceability, and successful change management. The essay finishes by emphasizing the relevance of PLM, the advantages of utilizing Teamcenter and NX CAD, and future deployment recommendations.*

The study investigates how PLM implementation influences numerous aspects of the electric bicycle project, including improved design collaboration, faster data exchange, increased documentation, higher traceability, and effective change management. To establish the return on investment and to justify the usage of PLM technologies, the project team did a cost-benefit analysis.

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Overall, this project demonstrates the success of PLM implementation in the context of an electric bicycle using Team center and NX CAD, with considerable benefits in design efficiency, collaboration, and overall product lifecycle management. The article finishes by emphasizing the significance of PLM, the advantages of using Team center and NX CAD, and future deployment recommendations.

Keywords- Electric Bicycle, Plm, Nxcad team center.

I. INTRODUCTION

The application of Product Lifecycle Management (PLM) is becoming increasingly important in the dynamic and competitive nature of the electric bicycle business. The demand for simpler design, development, and product lifecycle management has become critical as organizations attempt to manufacture creative and efficient items. The findings and impacts of a project focusing on the installation of PLM for an electric bicycle utilising Siemens' Teamcenter and NX CAD software are presented in this paper.

1. Background and Importance:

The electric bicycle industry has risen quickly in recent years, owing to factors such as environmental concerns, urban transit demands, and technological advancements. As a result of this increase, businesses are confronted with difficulties relating to design complexity, collaboration, data management, and effective product development processes. PLM provides a comprehensive solution to these issues by integrating people, processes, and data across the product lifecycle.

2. Project Goals:

The primary goal of this project is to establish PLM for an electric bicycle utilizing Teamcenter and NX CAD software, with the goal of improving design efficiency, collaboration, and overall product lifecycle management. The project aims to expedite design and development processes, enhance data management, increase cooperation among cross-functional teams, and speed time-to-market by exploiting the capabilities of these modern PLM systems.

3. Selection and Implementation of Teamcenter with NX CAD:

Choosing the correct PLM tools is critical to the project's success. In this case, Siemens' Teamcenter and NX CAD software were chosen for their comprehensive capabilities, scalability, interoperability, and user-friendly

interfaces. During the installation process, the software was carefully designed, tailored, and incorporated into the existing workflow. Data transfer, user training, and change management were all handled during the deployment process to ensure a smooth transition.

4. Key Features and Capabilities:

Teamcenter and NX CAD provide a variety of tools and capabilities for maximizing the PLM of an electric bicycle. This includes capabilities for centralizing product data, version control, revision management, change management, and collaborative design. These technologies will be utilized throughout the project to increase design collaboration, decrease mistakes, enable concurrent engineering, and improve traceability.

5. Impact and benefits:

It is anticipated that the implementation of PLM using Teamcenter and NX CAD will have a significant impact on several aspects of the electric bicycle project. It will allow for increased team design collaboration, faster data exchange, better documentation management, higher traceability, and more effective change management. These benefits will eventually lead to a quicker time to market, improved product quality, and more customer satisfaction.

Finally, this paper explains the project, which is centered on the installation of PLM for an electric bicycle utilizing Teamcenter and NX CAD software. The goal is to improve design efficiency, collaboration, and product lifecycle management overall. The selection and installation of various PLM solutions, as well as the major features and capabilities used, are described. The predicted effect and advantages of PLM implementation are underlined, emphasizing the importance of this project in the quest of creative and efficient product development in the electric bicycle business.

II. LITERATURE REVIEW

Studies have highlighted the challenges associated with PLM implementation in manufacturing industries. In the e-bike sector, robust data management, collaboration, and integration across the product development process are crucial. (Hu et al., 2018) These challenges include managing diverse components, suppliers, and regulatory requirements, which can be effectively addressed through PLM solutions.

Research suggests that implementing PLM systems, such as Siemens Teamcenter and NX CAD, can bring numerous benefits to e-bike manufacturing. Improved collaboration among cross-functional teams, reduced time-to-market, enhanced product quality, and better control over design changes have been emphasized. (Chen et al., 2020) PLM enables seamless integration between design, engineering, manufacturing, and supply chain processes, resulting in streamlined workflows and improved efficiency.

The integration of Teamcenter and NX CAD offers significant advantages in e-bike manufacturing. A case study by Liu et al. (2019) showcased the successful implementation of PLM using Teamcenter and NX CAD in an electric vehicle manufacturer. They reported improved data sharing, version control, and cross-department collaboration, leading to significant time and cost savings.

Utilizing PLM systems, such as Teamcenter and NX CAD, enables the creation of digital twins and simulation capabilities in e-bike manufacturing. Wu et al. (2021) highlighted the importance of digital twins in optimizing design, testing, and performance analysis of e-bike components. PLM systems integrate with simulation tools, allowing manufacturers to simulate and evaluate the performance of e-bike designs before physical prototyping, thus reducing development time and costs.

PLM implementation in e-bike manufacturing facilitates supplier collaboration and quality control. Li et al. (2017) emphasized the importance of PLM systems in ensuring regulatory compliance, managing supplier relationships, and tracking component quality. The integration of Teamcenter and NX CAD provides a centralized platform for managing supplier data, conducting quality inspections, and tracking product certifications.
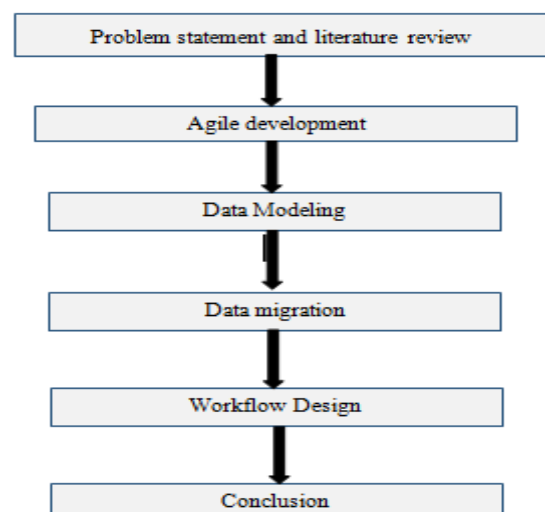
III. METHODOLOGY

Fig. 1. Block diagram of the system

IV. PROPOSED SYSTEM

V. SIEMENS TEAMCENTER:

Siemens Teamcenter is a Product Lifecycle Management (PLM) software system created by Siemens Digital Industries Software. It acts as a central repository for organizing and regulating product data and associated procedures throughout a product's lifespan. Teamcenter has features including data management, change management, communication, and analytics. It offers a secure platform for storing and managing product data while maintaining data integrity and access control. It improves change management by tracking and controlling engineering changes. Through real-time document sharing and automated workflows, Teamcenter enables seamless collaboration among team members. It is compatible with CAD software, allowing for simple data transmission and synchronization.

Additionally, Teamcenter provides analytical capabilities to gain insights into product data and project performance. Siemens Teamcenter is widely used in industries such as automotive, aerospace, and manufacturing to streamline product development processes, improve productivity, and enhance collaboration.

5.1 MY TEAMCENTER:

It is known as the TEAMCENTER's quick working area, or, as the name says, our workplace. This programme has basic capabilities including object creation and query-based object searching. Both our to-do list and our inbox are conveniently accessible. We may also create folders and save important information under the Home folder for easy access. Because this is a standard programme, we don't need to install any additional features or obtain a separate license to use it. We need to become familiar with the features of this programme in order to do our normal work.

5.2 STRUCTURE MANAGER:

The Structure Manager in Siemens Teamcenter is a critical component that enables effective product structure or bill of materials (BOM) organization and administration. It has an easy-to-use interface that lets users to design, update, and explore the hierarchical relationships between components, subassemblies, and the final result. Users can easily visualise and explore the product structure using the Structure Manager, expand or collapse nodes to different levels, and acquire a thorough grasp of how the components work together. It has drag-and-drop capabilities, which makes it simple to add, delete, or rearrange components inside the structure. Users

may also specify and maintain attributes such as part numbers, descriptions, quantities, and material requirements for each component, assuring precise data management.

The Structure Manager incorporates versioning and revision control capabilities to track changes made to the BOM, ensuring proper documentation and auditing. Collaboration is facilitated as multiple users can work simultaneously, while access control mechanisms maintain data integrity and security. Overall, the Structure Manager in Teamcenter streamlines the management of the product structure, enhancing efficiency, accuracy, and collaboration throughout the product lifecycle.

5.3 WORKFLOW PROCESS:

Workflow, as its name suggests, is the order in which actions are taken by a person to accomplish a process. Each task is carried out in turn. We can design a workflow process with a variety of tasks according to the needs of the business process using the TEAMCENTER Designer module. Some of the often used tasks to construct workflow processes include Do, Review, Condition, Or, Validation, and Status tasks. Each activity has handlers. When a job is initiated, server-side scripts called handlers are run on the workflow objects. To use this program, we need administrative rights. Figure illustrates the key TEAMCENTER modules.


5.4 SCHEDULE MANAGER:

The Structure Manager in Siemens Teamcenter is a critical component for effective product structure or bill of materials (BOM) organisation and administration. It has an easy-to-use interface that lets users to design, update, and explore the hierarchical connections between components, subassemblies, and the final result. Users can easily visualise and explore the product structure using the Structure Manager, expand or collapse nodes to different levels, and acquire a thorough grasp of how the components work together. It has drag-and-drop capabilities, which makes it easy to add, delete, or rearrange components inside the structure. Users may also specify and maintain properties, such as part numbers, descriptions, quantities, and material requirements, for each component, assuring correct data management.
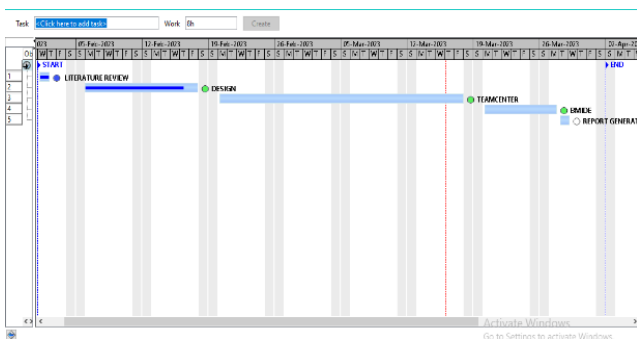
5.5 ORGANIZATION:

In Siemens Teamcenter, the organization module plays a crucial role in managing and organizing data, user access, and administrative settings within the Product Lifecycle Management (PLM) system. It provides a structured framework for configuring and maintaining the system based on the organization's specific requirements.

The organization module allows users to create and manage organizational units, such as departments, teams, or business units, within the Teamcenter environment. This helps in structuring the PLM system according to the organization's hierarchy and facilitates efficient data management and access control.
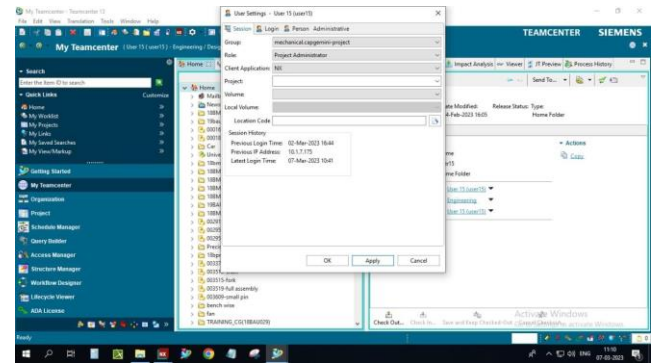
5.6 BUSSINESS MODULAR IDE (BMIDE):

In a nutshell, Teamcenter's BMIDE (Business Modeller Integrated Development Environment) is a tool that assists in customising and configuring the Teamcenter PLM (Product Lifecycle Management) system to meet individual business demands. It enables organisations to customise Teamcenter's data model, processes, and user interfaces without affecting the underlying code.

The BMIDE is a graphical interface via which administrators may establish and alter the business rules, data structures, and procedures that control Teamcenter's operation. It enables users to define and manage custom characteristics, object connections, and user interface forms.

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The BMIDE is a graphical interface via which administrators may establish and alter the business rules, data structures, and procedures that control Teamcenter's operation. It enables users to define and manage custom characteristics, object connections, and user interface forms. It provides a user-friendly interface to define data structures, workflows, and user interfaces, enabling a tailored Teamcenter system that enhances productivity, efficiency, and alignment with the organization's unique processes.

CONCLUSION

Finally, using Teamcenter and NX CAD to develop a Product Lifecycle Management (PLM) system for electric bicycle design and manufacturing processes gives various benefits and possibilities for your company. Using an integrated PLM solution may help you optimise your

workflows, improve collaboration, and increase overall efficiency in product development and lifecycle management.

As the primary PLM platform, Teamcenter enables centralised data management, version control, and change management. This ensures that your design files, bills of materials, and documentation are kept safe, easily accessible, and managed appropriately throughout the life of your electric bicycles. The interface with NX CAD enables even smoother design collaboration and real-time synchronisation, reducing errors and avoiding superfluous data entry.

Using eBikePLM, you can optimise your design processes, reduce time-to-market, and improve product quality. Through effective requirement management, the system ensures that all client specifications, performance objectives, and regulatory compliance requirements are met. With automated procedures and efficient change management, you can effectively handle design revisions and engineering approvals, allowing for faster decision-making and minimising the risk of mistakes and delays.

Furthermore, eBikePLM improves cross-functional team collaboration and communication. It features document sharing capabilities, discussion forums, and real-time notifications to promote effective knowledge exchange and ensure alignment among all stakeholders throughout the product lifecycle. This collaborative environment fosters innovation and accelerates the development of cutting-edge electric bicycles.

Furthermore, the system's analytics and reporting capabilities provide valuable insights into project status, design progress, and manufacturing efficiency. This data-driven strategy gives your firm the capacity to identify areas for improvement, optimise processes, and make informed decisions in order to achieve continuous improvement and corporate success.

Finally, implementing a PLM system for your electric bicycle project utilising Teamcenter and NX CAD is a strategic investment that will boost your organization's competitiveness, increase operational efficiency, and enable faster time-to-market. You can promote innovation, assure product quality, and meet the increasing demands of the electric bicycle sector by harnessing the benefits of integrated data management, collaboration, and analytics.

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