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Product Data Management Dashboard Portal – A Survey

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Abstract

Product Data Management (PDM) systems play a vital role in modern engineering and product development by helping organizations organize and manage design files, project timelines, bills of materials (BOMs), and engineering change orders (ECOs) within a centralized platform. Despite their clear advantages, many companies still face challenges, such as fragmented data, poor collaboration, and difficulty in visualizing project information in real time. This survey examines the design and development of a PDM Dashboard Portal that offers role-based access, BOM tracking, ECO monitoring, and live visualization of essential project metrics. Drawing from recent studies, the paper highlights best practices for implementing PDM systems, integrating them with PLM platforms, and leveraging dashboards to support faster and more informed decision-making. A well-structured PDM dashboard enhances collaboration, minimizes rework, and improves transparency across the entire product lifecycle.

Keywords : Product Data Management (PDM); Product Lifecycle Management (PLM); Dashboard Visualization; Bill of Materials; Engineering Change Orders Collaborative Systems; Artificial Intelligence; Predictive Analytics

1. Introduction

Product Data Management (PDM) involves the use of software tools and databases to systematically store, organize, and track product-related data throughout its lifecycle [1], [2]. A strong PDM system enables teams to manage CAD files, project schedules, BOMs, ECOs, and supplier information in a structured and collaborative manner [2], [3]. However, challenges such as fragmented data, inconsistent access control, and limited real-time reporting continue to slow down its adoption in many industries [4].

PDM dashboards help overcome these challenges by providing real-time insights into project progress, health, and overall performance [5]. By improving accessibility for project managers, engineers, and quality analysts, these dashboards enhance team collaboration and streamline workflows [6], [7].

Modern dashboards go beyond traditional reporting. By incorporating predictive analytics, they can use historical project and design data to forecast potential delays, cost overruns, or component failures [8], [9]. This proactive approach allows managers to address issues before they negatively impact the product lifecycle, improving efficiency and reliability [9].

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2. PDM System Modules

2.1. User Management

Role-based authentication ensures secure access, assigning roles such as Admin, Engineer, Viewer, and QA based on responsibilities. Advanced dashboards can track user activity and maintain detailed audit logs for accountability [6], [8].

2.2. Project & Task Management

This module allows creation of projects, task allocation, and timeline visualization through Gantt charts, Kanban boards, and milestone tracking [2], [7]. Some dashboards also use AI-driven recommendations to optimize resource allocation and task sequencing [8].

2.3. Document & Version Control

Document management stores CAD drawings, design files, and related metadata securely with version control and approval workflows [1], [3]. Integration with cloud storage and PLM systems ensures that all team members are working with the most up-to-date information, reducing errors caused by outdated files [4], [5].

2.4. Bill of Materials (BOM) Tracking

BOM tracking captures parent-child relationships of components, enabling engineers to monitor costs, quantities, and material dependencies [3], [8]. Dashboards can dynamically highlight critical components that may cause delays or require attention [7], [9].

2.5. Engineering Change Orders (ECOs)

ECO modules simplify the submission, approval, and tracking of design changes while evaluating their impact on cost and timeline [4], [5]. AI-driven tools can help prioritize changes based on risk, cost, and schedule implications [8].

2.6. Supplier & Inventory Management

Modern PDM dashboards integrate supplier data, delivery schedules, and inventory levels to reduce supply chain risks [9], [10]. Automated alerts ensure managers can respond promptly to disruptions affecting BOM fulfillment.

2.7. Dashboard Visualization

Dashboards present KPIs in real time through interactive charts and drill-down reports [9], [10]. AI analytics can detect trends, predict risks, and provide actionable insights for better planning and resource optimization [8], [9].

3. Comparative Analysis

Table 1 Comparative Analysis

Paper / System	Technology Used	Key Features	Results / Contribution
Rachuri et al. (2008) [1]	PLM & PDM survey	End-to-end PLM integration, role-based access	Defined PDM standards and taxonomy
Fischer (2011) [2]	PDM Overview	Document management, version control	Improved collaboration and reduced redundancy
Umeda &Nonomura (2013) [3]	Lifecycle design	BOM and ECO management	Integrated lifecycle design for reduced errors
Liu (2021) [4]	Data-driven PDM	Dashboard-driven decision support	Real-time project insights
Huhtala et al. (2014) [5]	PDM in engineering	Change management	Highlighted PLM vs. PDM gaps
Mesihovic et al. (2025) [6]	PDM for project management	Gantt chart integration	Improved project scheduling

Qi et al. (2023) [7]	Mechanical PDM	CAD & BOM synchronization	High usability in manufacturing
Tech-Clarity (2015) [8]	Data management practices	Dashboard KPIs	Identified productivity gains
Dumitrescu et al. (2023) [9]	Data-driven PLM	AI-enabled PDM dashboards	Enhanced visualization & decision-making
Paranthaman Exporters IT Team (2025) [10]	Internal Report	PDM Dashboard prototype	Practical implementation plan

4. Advantages of PDM Dashboard Portals

- **Better Collaboration:** Centralized access to design files, BOMs, and project data ensures teams work together effectively and reduces miscommunication [2], [5].
- **Real-Time Decision Making:** Dashboards provide up-to-date KPIs, progress updates, and AI-driven predictions to enable proactive management [4], [7].
- **Reduced Rework:** Version control, ECO monitoring, and automated alerts prevent duplication and errors [3], [8].
- **Improved Transparency:** Role-based access allows stakeholders to view relevant data while maintaining security [6], [9].
- **PLM Integration:** Seamless integration enables enterprise-wide lifecycle management and consistent data flow [1], [4].
- **Predictive Insights:** AI-driven tools forecast risks, delays, and cost overruns to improve planning and resource allocation [8], [9].
- **Supply Chain Optimization:** Incorporating inventory and supplier data helps minimize delays and ensures timely BOM fulfillment [7], [10].

5. Conclusion

PDM Dashboards are now essential tools in modern engineering and product lifecycle management. By combining modules like BOM tracking, ECO workflows, document versioning, and supplier management, organizations can increase transparency, efficiency, and decision-making capabilities. Dashboards with real-time KPIs and AI-powered predictions allow managers to proactively manage risks, reduce errors, and accelerate product development. Future research will likely focus on integrating advanced AI analytics, machine learning-based risk assessment, and enterprise-wide PLM connectivity, making lifecycle management smarter and more intelligent. Overall, PDM Dashboard Portals enhance collaboration, improve accuracy, and streamline resource planning, helping organizations deliver products faster and more reliably.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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