# SNS COLLEGE OF TECHNOLOGY

**Coimbatore-35**
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# DEPARTMENT OF MECHANICAL ENGINEERING

## 19MEE403 - Industrial Digitalization

IV YEAR / VII SEM

## UNIT – 2
## SMART FACTORY AND PRODUCT LIFE CYCLE MANAGEMENT

# PRODUCT DATA

Product data refers to the detailed information associated with a product throughout its lifecycle, from design and development to manufacturing, distribution, and end-of-life management. This data is crucial for ensuring that products meet quality standards, comply with regulations, and satisfy customer needs.

Here are the main types of product data:

1. **Design Data**
   1. **Description**: This includes all the information related to the design of the product, such as drawings, schematics, 3D models, and design specifications.
   2. **Examples**: CAD files, blueprints, design notes, and engineering drawings.

2. **Material Data**
   1. **Description**: Material data encompasses the details about the raw materials and components used in the product, including their properties, grades, and sources.
   2. **Examples**: Material specifications, supplier information, and certificates of conformity.

3. **Manufacturing Data**
   1. **Description**: This type of data covers the information related to the manufacturing processes, equipment, and parameters used to produce the product.
   2. **Examples**: Process flowcharts, machine settings, work instructions, and quality control measures.

**Bill of Materials (BOM)**

•**Description**: A BOM is a comprehensive list of all the materials, components, and assemblies required to manufacture the product.

•**Examples**: Lists of parts, quantities, part numbers, and sources.

**Product Specifications**

•**Description**: These are the detailed technical requirements that the product must meet, including dimensions, tolerances, performance standards, and regulatory compliance.

•**Examples**: Specification sheets, technical standards, and regulatory certifications.

**Test and Validation Data**

•**Description**: This data includes the results of tests and validation processes that confirm the product meets design and performance criteria.

•**Examples**: Test reports, validation protocols, failure analysis, and certification documents

**Product Lifecycle Data**

•**Description**: Lifecycle data tracks the product from its initial concept through design, production, and eventually disposal or recycling.

•**Examples**: Lifecycle analysis reports, environmental impact assessments, and end-of-life disposal guidelines.

**Usage and Maintenance Data**

•**Description**: This includes information on how the product should be used, maintained, and serviced throughout its operational life.

•**Examples**: User manuals, maintenance schedules, service bulletins, and troubleshooting guides.

**Sales and Marketing Data**

•**Description**: Data related to how the product is marketed and sold, including customer demographics, pricing strategies, and market feedback.

•**Examples**: Product catalogs, pricing data, sales forecasts, and customer feedback.

**Regulatory and Compliance Data**

•**Description**: This includes information necessary to ensure that the product complies with relevant laws, regulations, and industry standards.

•**Examples**: Compliance certificates, safety data sheets (SDS), and regulatory filings.

# PRODUCT LIFECYCLE MANAGEMENT (PLM)

Product Lifecycle Management (PLM) systems are comprehensive software solutions designed to manage the entire lifecycle of a product, from its initial concept and design through manufacturing, distribution, and eventual retirement. PLM systems integrate people, processes, business systems, and data across the entire product lifecycle, providing a centralized platform for managing all product-related information.

**1. Centralized Data Management**

•**Description**: PLM systems provide a single source of truth for all product-related data, ensuring that all stakeholders have access to the most up-to-date information.

**2. Document and Content Management**

•**Description**: This feature allows for the storage, organization, and management of all documents and content related to the product, including design files, specifications, manuals, and regulatory documents.

**3. Product Data Management (PDM)**

•**Description**: PDM within a PLM system manages the creation, change, and archival of product-related data, such as CAD models, bills of materials (BOMs), and part lists.

**4. Bill of Materials (BOM) Management**

•**Description**: BOM management allows users to create, manage, and share detailed lists of materials, components, and assemblies required to build a product.

**5. Change Management**

•**Description**: Change management features track and manage changes to product designs, processes, and documentation throughout the product lifecycle.

## 6. Collaboration and Workflow Management

•**Description**: PLM systems provide tools for collaboration among cross-functional teams, including designers, engineers, suppliers, and manufacturers. Workflow management features help automate and streamline processes.

## 7. Project Management

•**Description**: Project management features allow users to plan, track, and manage product development projects, including timelines, milestones, resources, and budgets.

## 8. Regulatory Compliance Management

•**Description**: PLM systems help organizations manage and comply with industry standards and regulatory requirements by integrating compliance checks and documentation into the product development process.

## 9. Supplier and Manufacturing Collaboration

•**Description**: This feature enables collaboration with suppliers and manufacturers, including sharing designs, specifications, and requirements.

## 10. Product Portfolio Management

•**Description**: PLM systems allow organizations to manage their entire product portfolio, including tracking the performance, costs, and profitability of each product.

**Key Elements of System Architecture**
**Components**:
**Description**: These are the individual parts or modules that make up the system. Components can include software modules, hardware devices, databases, user interfaces, and external services.
**Examples**: In a web application, components may include the user interface, backend server, database, and API services.

**Layers**:
**Description**: System architecture often organizes components into layers, each with a specific responsibility. This layering helps in managing complexity and promoting separation of concerns.
**Common Layers**:
**Presentation Layer**: Handles the user interface and user interaction.
**Application Layer**: Contains the business logic and rules.
**Data Layer**: Manages data storage, retrieval, and persistence.
**Infrastructure Layer**: Supports the underlying system, including network, servers, and databases.

**Interfaces**:
**Description**: Interfaces define how different components of the system communicate with each other. They include APIs, protocols, and data formats.
**Examples**: RESTful APIs, GraphQL interfaces, and SOAP protocols are common interfaces used in web services.

**Data Flow**:
**Description**: Data flow refers to the movement of data between components within the system. It defines how data is input, processed, stored, and output by the system.
**Examples**: In an e-commerce application, data flows from the user interface (e.g., adding items to a cart), to the business logic (e.g., processing orders), and finally to the data layer (e.g., storing order details).

**Integration Points**:
**Description**: These are specific points where the system integrates with external systems or services, such as third-party APIs, databases, or legacy systems.
**Examples**: A payment gateway integration in an e-commerce platform or a CRM system connecting to an email marketing service.

# Thank You