



PRO.FILE

PLM

White Paper on PLM Benefits and Features

Benefits

Bringing Product Innovation to Market

Best-in-class companies have put in place organization and technology infrastructures to enable new product development. Improving the new product development process, as Aberdeen research has identified, correlates to tangible business improvements. Enabling technology plays a key role in making these processes effective and efficient. Aberdeen's *Product Development in Consumer Industries Benchmark* reports the following benefits from companies utilizing product development automation:

- 17.5% reduction in product costs
- 75% reduction in ECO cycle times
- 25% to 35% reduction in design cycles
- 10% to 15% reduction in time-to-volume cycles
- 30% to 40% reduction in part duplicates and introduction of new parts
- 15% to 25% reduction in part search times (improving engineering efficiency)

Two primary enterprise applications, Product Lifecycle Management (PLM) and Enterprise Resource Planning (ERP), play key roles in enabling companies to develop and deliver innovative, profitable products. This research investigates the ways in which companies are using these technologies to help improve their product development processes.

Providing the Right Product Data for Execution

Having the right product information to support procurement, sales, manufacturing, distribution, logistics, and accounting is critical to execution. Although the information needed by manufacturing is a small subset of the original design data, the accuracy and availability of that information will significantly impact execution. The presentation and structure of the data may be different, such as the engineering bill of material (EBOM) and the manufacturing bill of material (MBOM) that are each designed to serve a different purpose, but the information must be in synch.

When determining the roles of ERP and PLM systems, it is important to ensure synchronization of released product data with the execution systems. ERP-PLM integration is becoming more prevalent. Survey respondents that have been using PDM or PLM for more than 1 year report integration in a number of areas, including:

- Item Definitions (71%)
- Bills of Material (82%)
- Engineering Changes (46%)
- Costs (60%)
- Sales History (46%)
- Quality / Defects (43%)
- Product Specification (43%)
- Item Lookup (36%)

The key findings of the research indicate

Over half of manufacturers see the value in a single, integrated system for product development, manufacturing, sales, and support. There is value perceived in pre-integrated solutions.

Less than one-quarter of companies surveyed, however, are willing to accept manual workarounds and inefficiencies for partners or customers as a tradeoff for a single system. Software capabilities to support product innovation and product development outweigh the need for a single system.

There is a clear separation and promotion process from design to manufacturing in both processes and systems. Innovation and execution are linked but independent disciplines. The system requirements for enterprise systems in product development and in executing a supply chain are different. PLM and ERP were developed to address different requirements in regards to:

- Lifecycle of product data: 60% of companies begin documenting products when the concept is initiated, before formal structure is defined.
- Product structure: Roughly two-thirds of manufacturers have conceptual and sub system level product hierarchies, before individual parts are de-fined.
- Product knowledge: Most products are never released to manufacturing, but saving product failures capture valuable company knowledge.
- Version control: Only one-third of companies release products in less than four iterations, generating designs manufacturing doesn't need.
- Data types: Product development typically involves multiple documents and less structured information, driving data management challenges.
- User population: Product development is a collaborative process, with frequent usage outside of the company's enterprise.
- In the execution cycle, companies must maintain a consistent view of products across departments, divisions, and often companies. Product data for execution often spans across multiple company sites, requiring a central source for product data.
- Over three quarters of manufacturers who have used PLM for more than 2 years have integrated ERP and PLM to some extent. PLM and ERP can be integrated to form a combined solution for product development and manufacturing.
- PLM and ERP play different, complementary roles in product innovation and execution and are being used in conjunction with one another to help companies capitalize on the innovation opportunity.

For a business to be successful in today's highly competitive global market, PLM is not an option...it is a competitive necessity. (CIMdata)

By increasing an enterprise's flexibility and agility to respond swiftly to new changes or new markets and competitors, PLM helps enterprise:

- Deliver more innovative products, services and marketing – improving customer relationships
- Reduce costs, improve quality, shorten time to market and ROI – increasing revenue and profitability
- Establish more comprehensive, collaborative, improved relationships with their customers, suppliers and partners – ensuring long-term corporate viability



PLM solutions have a positive impact on an enterprise's bottom line. Examples of specific benefits achieved by enterprises that have deployed PLM solutions include:

- An ~40 % improvement in Product Change cycle times
- A 15-30 % reduction in prototypes
- A 40 % reduction in lead times
- A 25 % productivity increase in design engineering
- Reduced development time for a household product by 75 % - from 18 months to 4 months
- Reduced time to cost a product from 5 days to 5 minutes
- Reduced the Engineering review process by 83 % - from 12 days to 2 days

These quantifiable improvements and cost savings resulted from PLM implementations. PLM solutions provide an improved ability to create cross-organization innovations through information sharing. Based on current implementation results, CIMdata estimates this can potentially deliver 5 to 10 % revenue uplift. Benefits from PLM solutions fall to an enterprise's bottom line. Results like those identified above, and the associated savings and business performance improvements, have helped increase net profits for organizations ranging from 10 % to more than 100%.

Conclusion

CIMdata believes that PLM is much more than a technology or software product. PLM is a strategic business approach to empower the business, to enable product and process innovation, and enhance both top and bottom line business performance. It includes technology, processes, best practices, and other elements that provide a complete solution to business problems.

Abstract

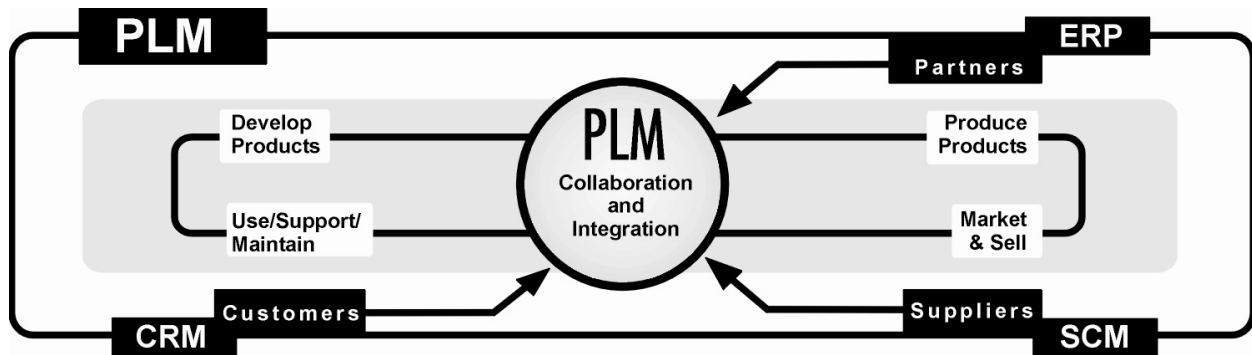
Data is Money & Process is Profitability

The net value of data is largely determined by how effectively it is managed. Typical product data starts out with a high value and decreases in value as it moves closer to the customer due to poor process management. Increasing profitability means retaining product data value as it moves through your company. Essentially, minimizing quality cost associated with data and procedures is the key to increasing profitability.

Product lifecycle management (PLM) includes storage, administration and supply of all product-related as well as all supplement data during the entire operational order processing and thereafter. PRO.FILE PLM is the product data management system that supervises the entire process, the product life history. It interacts with project managers, engineers as well as employees in quality assurance. Foremost support is given to the design department. PRO.FILE provides all required functions for design management, including those for passing work results from the technical designers to the neighbouring departments. Workflow management, scan and plot management as well as document viewing in large heterogeneous networks and over the Internet complete the range of powerful PRO.FILE features employed. Most modern knowledge management solutions evolve from a comprehensive embedding of a consistent product data management. PRO.FILE meets all requirements for a comprehensive product life cycle management.

PRO.FILE's modular structure makes it an extremely flexible instrument, which can easily be adapted to the respective requirements in an enterprise.





Competitiveness = Integrated Systems + Process Visibility

PRO.FILE PLM Benefits

PRO.FILE supports the management and execution layers in an enterprise, bringing products and services to the market more economically, faster, and with better quality.

Time and cost savings

Using classification and indexation reduces the expenditure for retrieving documents substantially. Drawings, bills of material or product descriptions can be re-used for similar products and comparable projects. One common database and the integration of applications in environments surrounding engineering prevent the cost-intensive and repeated design of parts and components. Additionally, administration expenses are clearly reduced, particularly with the implementation of release and change procedures. Experienced engineering managers who use PRO.FILE PLM emphasize that it is capable of shorting turnaround times in development and engineering by more than 40%.

Another benefit is that engineering documents of projects can be accessed at every time and from everywhere. All work results can be searched effortlessly even if the responsible collaborator isn't at his workstation.

Reduction of operating cost

Consistent use of digital design and document management allows reduction of personnel expenses, expenditures for reproduction or copy machines, microfilm equipment, re-enlargement mechanisms and related operating costs to a more economic level. The costs of duplication and distribution of documents are drastically reduced. Typically, capital expenses for digital archives amortize after a very short time.

Improvements in quality management

PRO.FILE PLM organizes the management of documents and data in the context of a quality management system that is in accordance with the regulations of ISO 9000. All data related to a project or a procedure is immediately available. Business processes become transparent and erroneous engineering due to outdated or inconsistent working documents is avoided.

Security

Product requirement specifications such as CAD models, drawings, machine programs, etc. are the know-how of an enterprise. Security is of elementary importance to protect these documents against loss or unauthorized access. All information is entered into a database and accessible within secured zones of the corporate computer network. Access rights are differentiated based on workflow functions and individual user authorizations. All transactions can be logged.

PRO.FILE PLM Functions

Product data management

In most manufacturing companies, part master data, bills of material and technical drawings form the backbone of product lifecycle management. This data and these documents drive manufacturing and, in later stages, also service and maintenance.

Administration of this data is therefore located in the centre of functionalities offered by PRO.FILE PLM.

Range of functions

- Administration of part master data
- Product classification
- Key characteristic lists
- Bills of material
- 'Where used' lists / activity report
- Change logs
- Drawing administration
- Version administration

Management of part master data and product classification

A principal feature of the PRO.FILE product data management system is the use of extremely flexible key characteristic lists to classify parts, assemblies and other product related documents. The system can quickly and easily be adapted to a company's requirements. With the key characteristic lists, base parts and assembly families can be described using complex hierarchically arranged product groups. Key characteristics of a product family can be agreed on at each level of a product hierarchy. Characteristics of higher levels are inherited onto the underlying description levels, according to the principles of an object-oriented tree.

Classification of parts by means of PRO.FILE PLM key characteristic lists is the ideal basis for the re-use of parts and assemblies and thus the source for important savings in the engineering department.

Parts from past engineering work can very easily be retrieved by the integrated efficient search system. Parts can then consequently be used for the engineering of new machines and components.

Previewing functions permit to view underlying CAD designs by simply pressing a key after having found the desired parts. Just as is with using a catalogue, they can be searched for in order to find the engineered unit most suitable for a new design.

Expensive multiple engineering is avoided and part variety is significantly reduced.

Structure and support of bills of material and activity reports

PRO.FILE automatically creates bills of material and activity reports for all integrated CAD systems. Direct support of different departments is provided by offering a variety of presentational forms for a bill of material, including a structured BOM, quantitative BOM, BOM of building sets, etc. 'Drag and drop' technology allows addition, deletion, modification, moving and regrouping of items. Additional integration modules allow the exchange of BOMs with ERP systems.

Upon modification of parts integrated in assemblies, PRO.FILE PLM references their usage and protects against unintentional changes of other designs.



Engineering change order processes (ECO)

As many 3D models as desired and any number of derived technical drawings of one or more CAD systems can be assigned to each part.

PRO.FILE PLM supports the entire product change order management. All changes to CAD models or drawings are documented in a change history. History entries include date, change reason and user. Additionally, processes defined using PRO.FILE Workflow assures change order control, from the beginning of the modification to the final release. All part master data, characteristics and the change history journal are transferred and documented in the title block of the respective drawings. Upon further modifications this data is updated automatically. Additionally, the bill of material can be inserted into the drawing.

PRO.FILE PLM supports the administration of different versions of CAD drawings and enables the organization to fully enforce guidelines according to EN ISO 9000. The history of revisions and versions of a CAD drawing is documented and accessible, creating a history that is comprehensive, even after a long period of time, illustrating when and which version of a drawing was current.

Basic Functions

Research functions

Central purpose of PLM solutions is the fast and unerring retrieval of parts, CAD designs and other documents stored in the PDM system.

PRO.FILE offers a standard user interface for the search for characteristics. It facilitates familiar conveniences of Windows-based systems: Wildcards, dropdowns or selection lists, logical links between fields etc. Search results are displayed in list form and can be sorted, regrouped and gradually refined.

The system includes viewing functions for the instant viewing of CAD models and drawings enabling users to find any desired drawing without the need of loading it into the CAD system. Users can scroll through search results, just like browsing a catalogue.

Relationships between parts and documents, contents and object arrangement in digital files can alternatively be represented by browser-based tree structures or with the help of list views.

User interface and languages

PRO.FILE PLM can be implemented in a heterogeneous system environment. The graphical user interface can intuitively and comfortably be used and corresponds to the 'look and feel' of Microsoft Windows-based systems.

The PRO.FILE WebGate provides the user interface for document searching and viewing on the Internet or an Intranet. This module enables users to select and read documents with the help of a standard web browser. PRO.FILE PLM is suited for application in a multinational or multilingual environment.

User administration and data protection

PRO.FILE PLM user administration includes definition, management and maintenance of users and user groups thus allowing for the description of department and work group structures as defined within an enterprise.

Passwords secure access to the system. Access rights to part data and documents can be defined at the user or group level, dependent on the workflow status of a part, document or drawing where necessary.

Uncontrolled and unauthorized access to data stored in PRO.FILE PLM is not possible. All master data is saved in one common database. This data represents the master datasets of parts, projects, documents etc. All primary data (files such as Word documents, TIFF and original CAD system data) is stored in an electronic vault, a particularly protected area of the computer network. PRO.FILE PLM is implemented only on mainstream, state-of-the-art database systems and common hardware platforms, assuring the highest level of availability and reliability. This includes support of operations on mirrored disk sets and the use of RAID systems.



Project-oriented functions

Collaboration in global work groups and project teams is a common and proven method of how work gets done. PRO.FILE PLM fully supports team collaboration. Access to product data and documents can be made available on a project-by-project basis. Employees can be assigned different roles within one or more projects, defining access rights at the project level.

Customization of forms and functions

PRO.FILE PLM adapts to the special requirements of an enterprise. Layout, attributes and data types of input and output fields in forms as well as the classification patterns for part master data and documents can be specified using the integrated graphical form designer. No programming knowledge is required. Additions and modifications can be made at any time, even during active system operation. Additionally, a system administrator can configure workflow processes and other functions. This unique feature guarantees that PRO.FILE PLM can be implemented in a very short time frame, reducing implementation and consulting costs significantly.

Integration of CAD systems

Working with a CAD system stands for most designers in the centre of their activity. PRO.FILE PLM promotes creative work, relieving engineers from day-to-day tasks. This is one of the biggest strengths of PRO.FILE PLM.

PRO.FILE PLM runs fully integrated within CAD systems. Its functionalities are integrated in the CAD system's user menus. This integration depth between CAD and PRO.FILE PLM promotes the acceptance of the product data management system based on its good ergonomics, leading to the expected positive effects on the productivity and the product quality. PRO.FILE product data, version and revision indices as well as bills of material are directly transferred and documented into drawing title blocks which will be automatically updated whenever a modification occurs.

Synopsis of functions

- Initiating PDM functions directly out of the CAD application
- Processing of CAD models controlled by PRO.FILE
- Check in / check out
- Drawing administration
- Updating of title blocks
- Automatic generation of BOM and 'where used' lists / activity reports
- Change reports
- Version and revision management of CAD documents
- Automatic generation of drawing copies in a neutral data format (HPGL, TIFF...)

Available are the following CAD integrations:

AutoCAD, Autodesk Mechanical Desktop, Catia 4, Catia 5, I-DEAS, Inventor, ME10, MEDUSA, MicroStation, Pro/ENGINEER, Solid Edge, SolidWorks, Unigraphics and others.

Integration of ERP systems

Availability of data processing applications in technical and commercial operations, as found in many enterprises, leads to multiple data entry and inconsistencies. Networking PRO.FILE PLM with an ERP system connects these two worlds, providing the highest level of data integrity possible. PRO.FILE PLM is the link between CAD and ERP.

The provision of company-wide access to data and documents avoids cost-intensive and quality-reducing multiple engineering. This clearly reduces support costs for data and documents in project management, maintenance as well as development and manufacturing. It enables the central monitoring and enforcement of procedures.



The networking of product data and document management between the PLM system PRO.FILE and an ERP system such as SAP R/3 has a tremendous impact, right down to the operational departments of an enterprise. Engineers can utilize the connectivity of these two systems at their workstation by directly accessing supplier and material master data, using this information for their actual activities. Independent communication processes accomplish the integration of the two systems. However, they continue to operate independently from each other. Data exchange can be continuous, periodically or action-triggered. Typically, data exchange takes place bi-directionally.

Range of functions

- Exchange of article master data and material master data
- Matching of article numbers
- Exchange of bills of material (BOM)
- Exchange of document master data
- Exchange of workflow states
- Viewing of stock, material, or supplier data

More than 25 different ERP systems and versions in approx. 80 projects have been integrated with PRO.FILE. Interfaces include standard solutions such as SAP R/3 as well as custom installations.

Integrated ERP systems:

Vantage by Epicor, BaaN IV, psipenta, SAP R/3, infor:com, Navision and others.

Document management

Documents are usually drafted in a context that is specific to a project or design process. They are part of the product data or the project documentation. PRO.FILE PLM connects product data management with the traditional document management.

PRO.FILE classifies and manages documents originating in different operational areas. For instance, there are text documents such as manuals, contracts, specifications, correspondence, meeting minutes, all emerging from different company departments. Similarly, documents can consist of CAD drawings or large-size plans. Other documents managed include digitized photographs, video, audio recordings or processor software for controlling machine components.

Documents can be assigned to the part master data of a component or an assembly without any restrictions. Alternatively, documents can be accessed using the characteristics of a document, related part or project.

Range of functions

- Classification of documents with determined or freelance characteristics
- Relationship between documents and parts
- Change logs
- Workflow Logs
- Creation of digital folders
- Document storage in the electronic vault
- Export/import of documents for external processing
- Integration of Office applications
- Integrated viewers with Mark-up and Redline



Integration of PRO.FILE PLM and Office applications

PRO.FILE PLM records documents at their place of origin and works fully integrated in Microsoft Word, Excel and other Office applications. Text documents or spreadsheets that have been drafted using these applications are directly stored in the database.

Each document is indexed with characteristics and search terms when saving it for the first time. These characteristics serve as attributes, enabling fast and easy retrieval at a later time. PRO.FILE is equipped with its own full-text search engine to locate any text-based documents with a specific content.

Check-in / checkout functions ensure that conflicts such as concurrent modification are avoided. Users are not allowed to alter documents that have already been retrieved by another user.

Loading of existing product data and documents

Existing archives or drawing databases can be imported to PRO.FILE with the help of the PRO.FILE Document Loader. Employing other suitable methods and programs, similar functions are available for 3D CAD models.

Scanning of external documents

With the help of suitable scanners, incoming documents can be catalogued, classified and stored. Depending on the size and the nature of an original, small-size keyboard or desktop scanners, A4-format batch scanners, or large format scanners can be used.

Organization of documents

Documents can be bundled using 'electronic folders' as well as be attached to projects or products. This guarantees direct access to all documents needed within a particular business process. A graphical browser allows the viewing of these grouped documents. Using drag & drop functions the entire document structure or links within it can easily be modified.

Document storage in the electronic vault

All documents managed by PRO.FILE are stored in the electronic vault. The vault establishes a protected area within the system. Access to it is only possible via the integrated document management system. No costly administration of user access rights at the file level is required.

Retrieval and viewing of documents

Documents can easily be retrieved, independently from document type or originating application or system. Document search in PRO.FILE PDM becomes very user-friendly through the availability of unlimited configurable characteristics. A user can search for a specific document very fast.

State-of-the-art, mainstream viewers address document viewing in PRO.FILE. Documents are first accessed by point-and-click or menus and then PRO.FILE automatically starts the suitable viewer.

Full-text search in documents

Full-text search in documents stored in PRO.FILE PLM can be conducted with freely chosen keywords.

Export/import of documents for external processing

Documents can be retrieved from PRO.FILE's protected electronic vault for external processing. At any time later they can be checked in again. While checked out, drawings are labelled as 'locked', avoiding any modification conflicts.



Document management on the web

Documents must be made available in the context of global work distribution and services, which increasingly can be found outside of the enterprise. Access has to be fast and must also be comprehensive to individuals who do not have deep experience with PLM. The PRO.FILE WebGate module meets these requirements entirely. Using a standard commercial web browser, PRO.FILE PLM documents can be searched for and retrieved locally, on any workstation.

During web use of the product, PRO.FILE PLM fully enforces access and security methods as defined in the system, protecting documents against any unauthorized access.

Workflow management

Within a product life cycle management, processes become more and more important to companies. Company-wide exchange of information demands functions for the coordination of work processes. PRO.FILE PLM provides workflow tools to control these processes. It allows a company to define and control specific business processes and release procedures for documents and drawings.

For this purpose, organizational structures such as users, departments, work groups or project groups and their access rights can be defined in PRO.FILE. Additionally, PRO.FILE lets organizations define different workflow states for documents, drawings, parts and assemblies.

PRO.FILE PLM provides configuration functions that describe the rules for workflow state transitions.

PRO.FILE can be integrated in mailing systems such as Microsoft Outlook or Lotus Notes. This allows for global exchange and forwarding of work results for members of the engineering teams involved. Information on workflow processes reaches recipients using the same communication stream as internal and external email flow.

Integration of PRO.FILE and report generators

Organizations can connect a report generator for performing data extracts and form or table presentations to PRO.FILE PLM. Report outputs and forms are available on-screen or can be printed.

Integration of PRO.FILE and plot management systems

This integration allows for organization of printer and plotter output of drawings and other documents, even in a geographically distributed work environment. The end user is authorized to generate documents on the nearest or most suitable output device. Additional functions such as set generation, paper choice and marking can also be installed.

Integration of raster processing systems

Many organizations have the need to restore or revise scanned documents such as drawings. In this situation, customers very often express the desire to have a redlining function available for marking up existing scans without changing any original document. PRO.FILE manages original documents as well as all document layers generated by raster editors.

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