



Integrating PLM and Factory Automation

The expanding reach of PLM to shop floor systems provides an opportunity for a two-way seamless flow of information throughout the entire product lifecycle, with manufacturing information incorporated earlier into product development while knowledge of production-related issues are leveraged more readily in product design.

By Ed Miller
President, CIMdata Inc.

Once focused almost exclusively on engineering design, Product Lifecycle Management (PLM) is expanding into other areas. The approach now encompasses a broadening range of activities from early-stage product strategy development and planning, to product engineering and manufacturing engineering, and through to product maintenance, support and field service.

A major aspect of this continuing evolution is the increasing integration of PLM with factory automation equipment such as PLCs and transfer lines. Whereas PLM focuses mainly on virtual product and process development, the expansion into factory automation provides an opportunity to share and leverage key product-related information from both the physical and virtual environments. In concept, the combination of design solutions with production automation systems can be used to create a more all-inclusive seamless environment of two-way information flow, enabling manufacturing information and features to be incorporated earlier into the overall product development process and allowing changes and knowledge of production related issues to flow more readily back into the product design process.

PLM Moves Closer to the Shop Floor

The integration of PLM and factory automation is a logical step in the long-term maturing of the market and another major step toward fulfilling the promise of the Computer Integrated Manufacturing (CIM) strategies that were first proposed some 25 to 30 years ago. This reinforces the continued expansion of PLM as an enterprise-wide full product lifecycle initiative that will encourage more collaboration throughout the entire product development lifecycle.

PLM initiatives have been validated as excellent business performance enhancers and have become major programs in leading companies around the world. PLM focuses on support for the entire virtual product lifecycle, in the same manner that Enterprise Resource Planning (ERP) focuses on support for the product production lifecycle. These major initiatives are complimentary and, as shown in Figure 1, have overlaps and many different points of interaction throughout the lifecycle of a product. Product structure definition is one of the most recognized areas of overlap, but there are many others as well. The area of Execution includes systems such as MES and Factory Automation and, as shown in Figure 1, is overlapped heavily with both PLM and ERP.

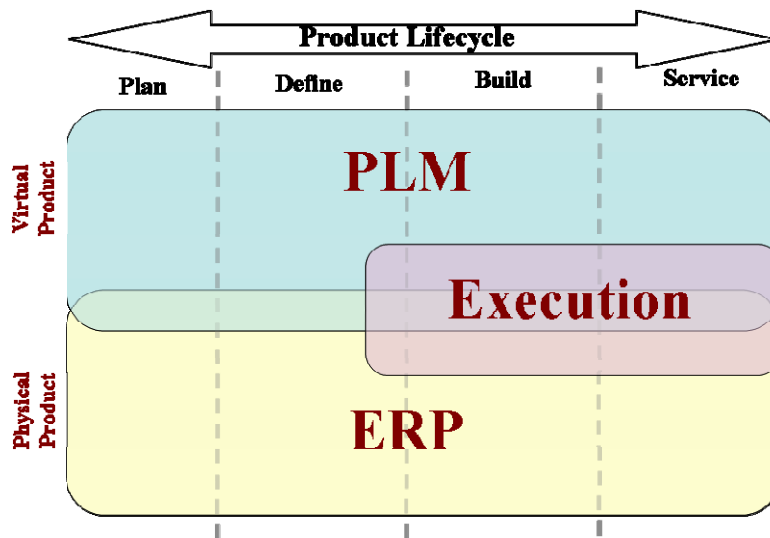


Figure 1—PLM supports the Virtual Product Lifecycle

As PLM is expanded through a close integration with factory automation (and other areas of Execution) and thus gets closer to the factory floor, this begins to provide a major point of integration between the traditional arena of PLM and the production planning arena of ERP. This integration between PLM and ERP provides the opportunity to share and leverage key product-related information from both environments. Although not the only area of overlap between these two major enterprise initiatives, it is a substantial one and offers excellent opportunities to better integrate the entire manufacturing enterprise.

The Expanding PLM Footprint

The evolution of PLM can easily be seen in the changing scope of the “PLM footprint” that industrial companies pursue and the commercial PLM solutions that the suppliers are providing. The footprint of the overall PLM vision is depicted in Figure 2, and illustrates PLM supporting the product lifecycle from initial product planning through its end of life.

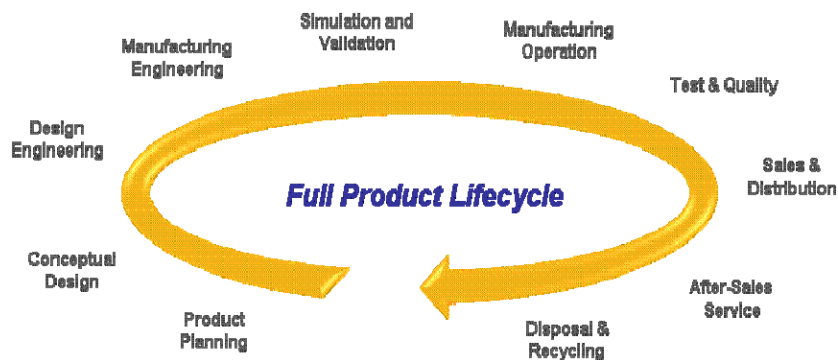


Figure 2—PLM supports the Full Product Lifecycle

This footprint has expanded from one that predominantly focuses on engineering design to one that encompasses a full range of activities. The broader the PLM footprint, the higher the business performance acceleration and more complete integration to factory automation becomes a logical expansion of that footprint. The evolution is not nearly complete, but it is clear that the scope of the

“realistic” PLM footprint has expanded substantially over the past several years and PLM has become a true enterprise program for market-leading firms.

A common theme of PLM’s expansion has been the integration of the various components of the footprint into a single “logical” solution, even if it is supported by a variety of different technologies and solutions from multiple sources. As newer areas of lifecycle support have been developed and become available, they have gradually been incorporated more effectively into more complete PLM solutions. The evolutionary expansion of the PLM footprint to include Factory Automation solutions with Programmable Logic Controllers (PLC), transfer lines, and feedback mechanisms should follow the same pattern, with initial integration at the most critical points of interaction, followed later by more extensive incorporation into full enterprise solutions.

Bridging the Gap between Design and Production

For companies designing and manufacturing products, the combination of PLM with Factory Automation can help bridge the gap that remains between the production processes and the various design and manufacturing engineering processes. This gap causes a number of issues that can only be solved when production and design systems communicate easily and share common definitions of product and production equipment designs and processes.

One area that will be impacted is Digital Manufacturing solutions that are used to develop and simulate production processes. The same types of data can be used to set up process automation monitoring solutions in an integrated environment, saving data regeneration. PLM integration also provides a secure data storage and access facility for all data.

The potential to greatly reduce the negative impacts, including costs of engineering changes that occur due to problems found in production is substantial. In an integrated environment, the production systems can capture issues and communicate them directly into the PLM environment used by the various engineering organizations. Direct tracking and communication of these issues has the potential to reduce the long lag times that can adversely impact production schedules and lead to lower product quality.

There is also a potential for savings when the production automation systems can base their planning and scheduling calculations and simulations on a common set of product and tooling design information. For instance, when ongoing machining operations can be checked against the desired part geometry, tooling failures such as wear can be detected and analyzed more quickly, leading to fewer scrapped parts.

Need for Executive Involvement

The commercial availability of integrated PLM-Automation solutions, however, does not necessarily mean that investments in these expanded solutions will be easily forthcoming. Although the potential value may be outstanding and the vision may match the strategic objectives of most major industrial companies, companies will still need to find ways to justify and fund investments in these expanded and enhanced solutions. This may be one of the most challenging aspects of PLM’s continued evolution.

As suppliers of comprehensive PLM solutions that include Digital Manufacturing have discovered, the ideal “buyers” of comprehensive PLM solutions that encompass both engineering design and Digital Manufacturing are really the CEOs, CIOs, and CTOs of companies—those individuals within an organization that have a clear focus on the overall performance of the business. However, most

investment decisions are championed by heads of major functional units within the business—VPs of Engineering, Manufacturing, etc.

In many organizations, Design Engineering and Digital Manufacturing investment decisions are funded by different organizations. Investments in Factory Automation solutions are typically funded by different groups as well. Thus, suppliers selling comprehensive PLM solutions that encompass all of these solutions are faced with a difficult exercise of determining “who” is the most appropriate person upon which to focus their sales efforts.

Industrial companies that want to take advantage of the value offered by broad PLM solutions, and now even more valuable PLM-Automation solutions, must raise the level of the investment discussions to include the full executive team and consider these investments as enterprise-wide initiatives. This typically results in greater returns but is more difficult and takes longer to achieve.

The Changing Landscape of PLM Suppliers

The PLM market movement toward greater integration with production systems will undoubtedly impact the competitive landscape for suppliers of broad-based comprehensive PLM solutions as well as suppliers of more limited-scope offerings. Some of the major components of comprehensive PLM solutions include Design Tools (especially MCAD and Simulation/Analysis), Digital Manufacturing, and cPDM. Competitive market impacts in each of these three areas are potentially substantial and the furthering of all three in concert offers the greatest opportunity to increase the impact of PLM on the enterprise.

The PLM-Automation evolution has the potential to significantly increase the visibility and credibility of Digital Manufacturing within PLM solutions—it will certainly help validate the move toward Automation that the major Digital Manufacturing suppliers have been pursuing. The increased market exposure should help to accelerate development of the Digital Manufacturing market, benefiting all suppliers of these technologies, whether for large-scale solutions or more focused solutions.

Major industry acquisitions tend to force competing suppliers to respond in order to compete effectively. For example, as Dassault Systèmes’ DELMIA program became more substantial, UGS (now Siemens PLM Software) took the step of acquiring Tecnomatix rather than just partnering with them. In turn, PTC acquired PolyPlan (and redeveloped it as MPMLink) to help them address Digital manufacturing as well. More recently, Siemens’ acquisition of UGS and their stated objective of tightly integrating the PLM solutions with their Automation solutions has again impacted the industry. This Siemens move should again raise competitive pressure regarding manufacturing and Automation support and we are seeing competitive reactions by the other major suppliers.

The impact on suppliers of design tools (whether they are targeted at product design, tool design, or facility design) will be increased awareness of the overlaps and the potential opportunities to be gained from cross-utilization of design technologies and data within an overall enterprise environment. With the broader opportunities provided through integrated PLM-Automation solutions, design tool suppliers will be forced to assess whether they remain focused on either product design or facility design, or attempt to broaden their offering.

Challenges will be substantial for suppliers of cPDM solutions. The opportunity to develop and provide more comprehensive solutions that address further expanding enterprise needs and accommodate more manufacturing-focused needs is terrific, and offers real growth opportunities. However, it also creates a situation where cPDM solutions provided by suppliers who were previously focused on manufacturing may gain additional credibility. In this case, the major ERP suppliers like SAP and Oracle, may find an opportunity to better establish themselves as credible suppliers of cPDM solutions—the backbone of

PLM strategies. Although ERP suppliers have not yet substantially participated in the Automation market, cPDM suppliers haven't either to any great extent. Thus, the opportunity exists for each of these two "camps" to seriously try to fill this new opportunity, possibly resulting in new PLM market dynamics. In fact, we are already seeing more emphasis on this opportunity from major ERP suppliers with more substantive programs for ERP-MES integration.

It is clear that there also will be a significant impact on suppliers of Automation solutions as well as suppliers of PLM solutions. The availability of comprehensive solutions that include more integrated Automation-PLM capabilities should raise the competitive pressure on traditional suppliers of Automation solutions, and should result in more attention to integrated Automation-PLM solutions throughout industry.

PLM as a Critical Enterprise Investment

As a result of the PLM-Automation evolution, PLM becomes an even more critical enterprise investment for industrial companies. This natural evolution of PLM is transforming it from a primarily design-centric solution to one that is encompassing all elements of the virtual product lifecycle. The PLM-Automation integration will ensure manufacturing's key role in PLM strategies, and significantly enhance the overall business value of these solutions as design, manufacturing, and information management are totally integrated. But PLM's evolution isn't complete. It will continue to be expanded and its value enhanced with better links into other major aspects of the product lifecycle.

The potential for industrial companies is substantial, and they should pay close attention to the opportunities that the PLM-Automation evolution provides. Of course, this expansion of the scope of an overall PLM-Automation vision and strategy will require re-thinking and solid effort to be effective. However, the potential is too significant to ignore, and forward-thinking companies will be leading this movement as PLM's footprint takes a big step onto the factory floor.

Significant technical challenges and organizational barriers notwithstanding, early adopters that put in the time and effort into integrating PLM and factory automation have a tremendous opportunity to highly differentiate themselves on an otherwise level playing field and emerge as clear business winners in the decades to come.

About PLM

CIMdata defines PLM as 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. PLM forms the product information backbone for a company and its extended enterprise.

About CIMdata

CIMdata, an independent worldwide firm, provides strategic consulting to maximize an enterprise's ability to design and deliver innovative products and services through the application of Product Lifecycle Management (PLM) solutions. Since its founding more than 25 years ago, CIMdata has delivered world-class knowledge, expertise, and best-practice methods on PLM solutions. These solutions incorporate both business processes and a wide-ranging set of PLM enabling technologies.

CIMdata works with both industrial organizations and suppliers of technologies and services seeking competitive advantage in the global economy. In addition to consulting, CIMdata conducts research, provides PLM-focused subscription services, and produces several commercial publications. The

company also provides industry education through international conferences. CIMdata serves clients worldwide from locations in North America, Europe, and Asia Pacific.

To learn more about CIMdata's services, visit our website at www.CIMdata.com or contact CIMdata at: 3909 Research Park Drive, Ann Arbor, MI 48108, USA. Tel: +1 (734) 668-9922. Fax: +1 (734) 668-1957, or Siriusdreef 17-27, 2132 WT Hoofddorp, The Netherlands. Tel: +31 (0)23 568-9385. Fax: +31 (0)23 568-9111.

Ed Miller president of CIMdata, is an internationally recognized authority on PLM and a frequent keynote speaker at conferences and seminars around the world on trends, directions, strategies, methods, and technology issues. He welcomes reader comments and can be reached at e.miller@CIMdata.com.