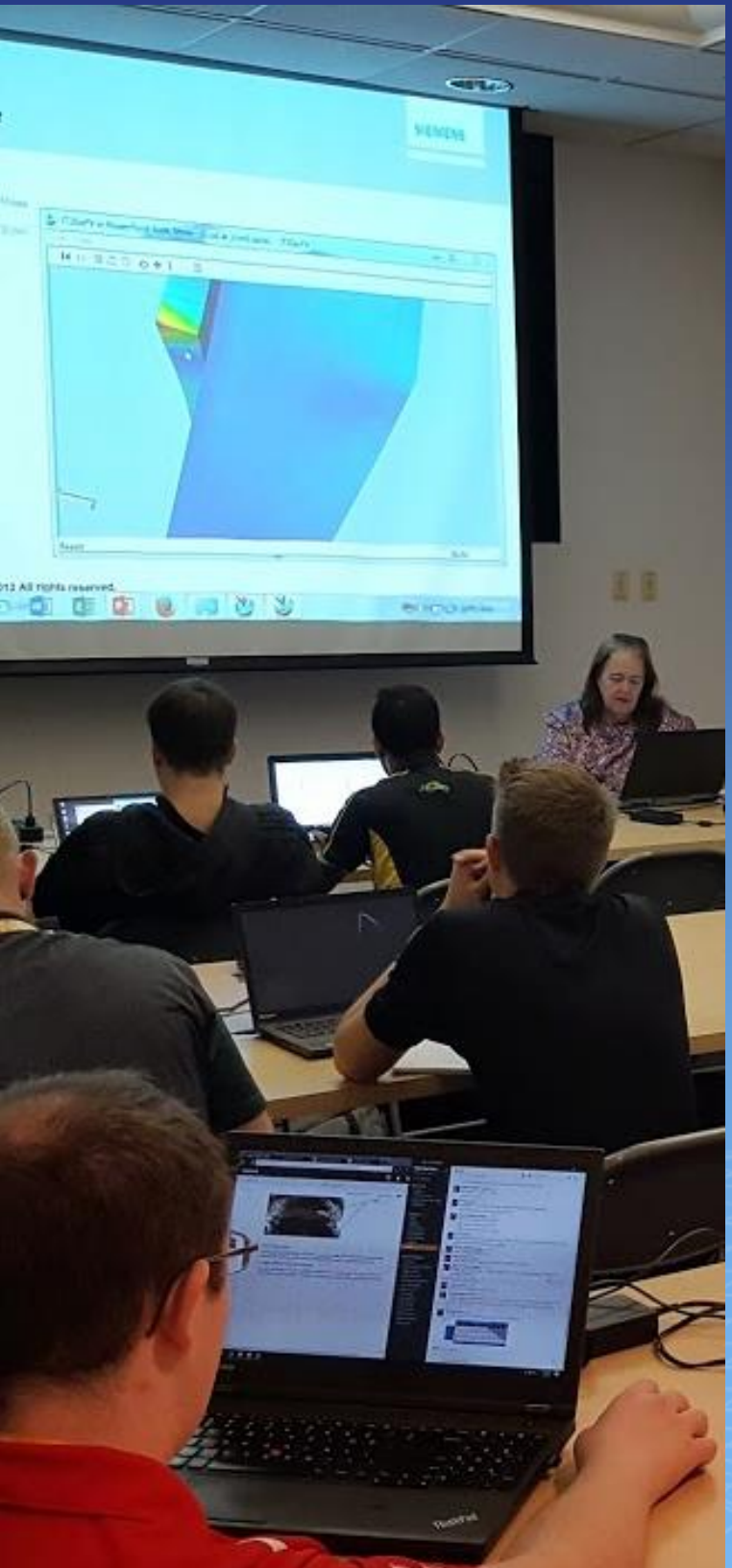

CIMdata eBook

Sponsored by Siemens PLM Software

Are Students "Real-World" Ready?

The Challenge in Preparing Students for Industry 4.0

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Introduction & Key Takeaways

Convergences of technology and demographics drive the need for a workforce that understands PLM

PLM as a Business Strategy

CIMdata defines Product Lifecycle Management (PLM) as a business strategy that supports the development of products including the information needed to support them throughout their lifecycle. A PLM strategy cannot be supported by any single software tool. PLM supports systems of systems across multiple disciplines. A PLM solution is composed of tools that support many disciplines for any company.

Business Drivers

Unprecedented convergences of technology and demographics are driving markets and highlighting the need for PLM strategies to help turn emerging markets into emerging economies—and mature markets into innovator markets—but this demands that the workforce understands PLM and how to use it to support rapidly evolving realities.

Today PLM supports product development initiatives such as digital twin, collaboration, and systems engineering, and is an essential element in the realization of Industry 4.0 and other emerging digitally-based business transformational strategies. Industry 4.0 is based on a number of current automation trends such as IoT, the cloud, and cyber-physical systems.

Companies have always managed their product lifecycles; however, they have done this through siloed manual methods. Manual PLM is insufficient to support today's very complex products based on systems of systems and a multitude of cross-disciplinary requirements. Education into new ways of approaching and supporting product development and the complete lifecycle is essential to help companies exploit innovation that leads to continued business success.

- Turning emerging markets into emerging economies, and mature markets into innovator markets demands a workforce that understands PLM and how to use it.
- Support for Industry 4.0 requires workers who understand the information & process management capabilities inherent in PLM.
- **The approach to PLM education that is needed to prepare students to support today's businesses requires more cross disciplinary thinking.**
- **Educational organizations must prepare tomorrow's leaders for tomorrow's realities.**
- The strategies and tools used in industrial companies today have far outpaced what is being taught in academic institutions. This has resulted in a significant gap in PLM education versus industry expectation.

PLM Education Supports PLM & Industry 4.0

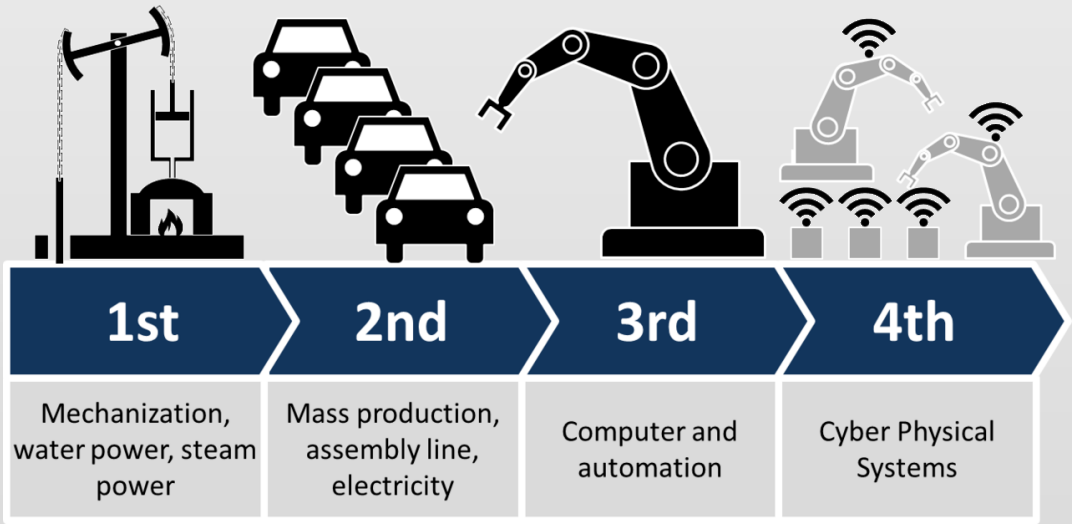
PLM education provides the essential foundation

Today's industrial companies are experiencing a very serious gap in new employees' understanding of and practical experience with using a multitude of concepts that exist in the PLM realm. What companies need isn't always what is being provided by educational institutions. This is not just an issue at the university level, education for tomorrow's work environment must start much earlier in the education pipeline.

Education needs to expand beyond its current focus on a narrow view of PLM as CAD tools for product design—providing just a more advanced form of drafting, to a focus on PLM's "big picture" with more attention on how PLM applies across and supports entire product lifecycle processes where information is not primarily geometry and shift towards how PLM impacts businesses well beyond product design: allowing them to expand into emerging markets, transform mature markets, and support broad-based innovation.

PLM's education needs to move beyond the engineering curriculum. When it does, its breadth and depth will expand students' thinking beyond the single step of product design to an understanding of PLM's diversity within the whole product realization continuum. As Professor Nate Hartman, Purdue University, said "Academia must embrace PLM as a methodology, like Lean, Six Sigma, and other initiatives. They need to understand that while different functional areas in the enterprise need to know about or participate in PLM to various degrees, it is important that everyone in their respective positions has a level of literacy."

The Four Industrial Revolutions
(*From Christoph Roser at AllAboutLean.com*)



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PLM Education Survey

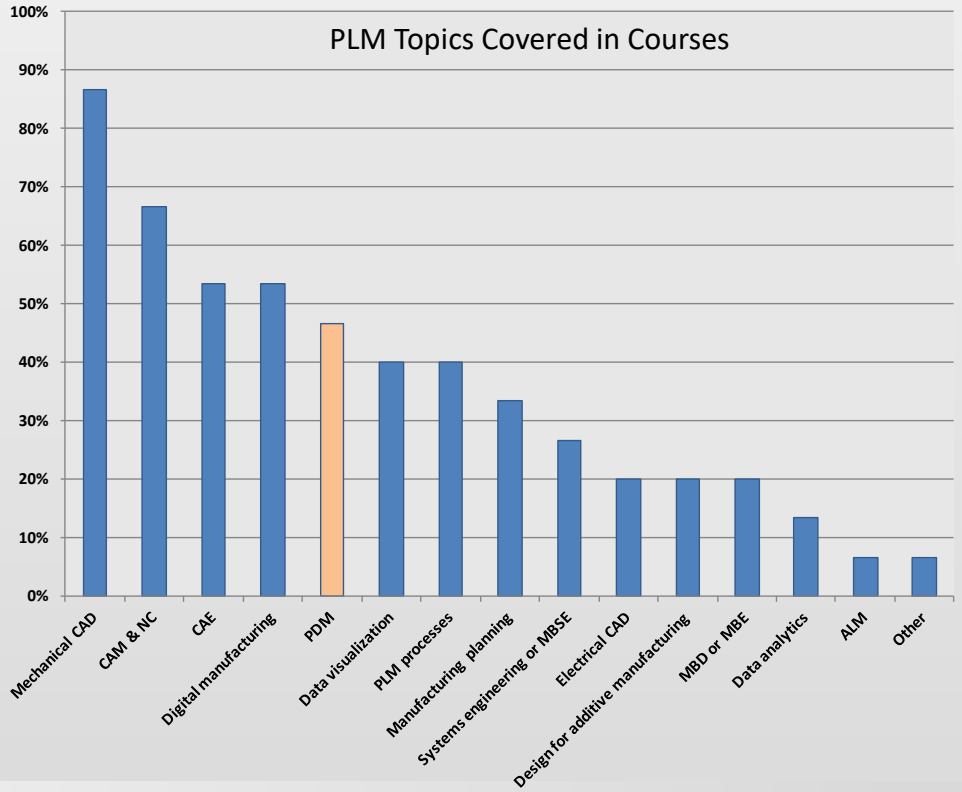
A look at what is being done today

To learn more about the issues that educators face, CIMdata executed a focused survey on PLM education and use in educational institutions today. We received responses from professors, teachers, and practitioners in universities, community colleges, and high schools from around the world.

The range of topics covered in PLM-related course offerings is quite broad, but is heavily biased towards what has always been taught in drafting classes, that is mechanical CAD, documenting the product design, but not preparing for the challenges of realizing and optimizing a product for use by its customers or maintaining it once it is released. In fact, the top four topics reported, as shown in the chart, are all related to product design and manufacturing.

The disappointment and danger in these results is that well over three decades into its history, **PDM concepts are taught in fewer than half of the programs surveyed**, and when PDM is used, it is fairly limited to managing CAD data.

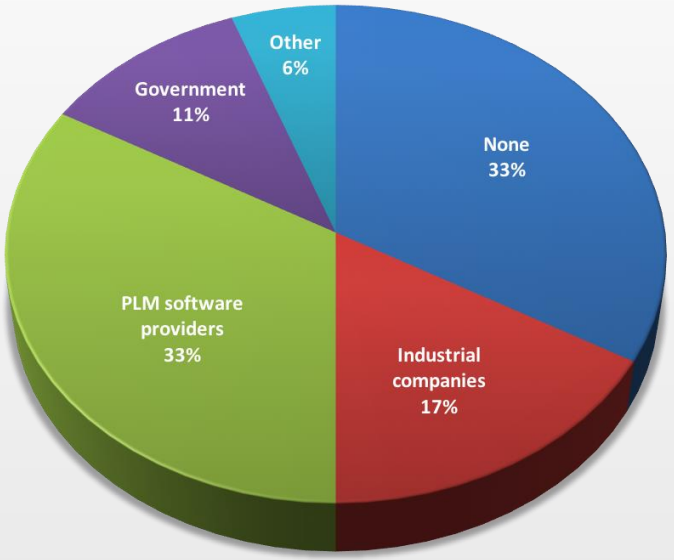
The strategies and tools used in industrial companies today have far surpassed what is being taught in the academy. **This leaves a significant gap in PLM education versus industry expectations** that is often cited as a problem by CIMdata's industrial clients—emerging students do not understand how to employ PLM concepts beyond product design, and are often still doing little more than computerized drafting.



PLM Education Survey

A look at what is being done today

We would like to see model-based enterprise (MBE) including systems engineering and other related strategies such as simulation-driven product development (SDPD) higher on the topics in the chart below. While these may not be as adopted by industry today as they will be in the future, **academia needs to lead the way in both education and research** of these techniques that are critical to improving the concept to design to manufacturing processes productivity. Doing so would accelerate industry learning their value from new, more recently educated, employees.



Educators Receive PLM-Related Funding from Various Sources

PLM Topics Educators Most Want to Cover in Future Courses in Weighted Order (Most Important from Top to Bottom, Ranked: 1 Most Important, 5 Least Important)

Today there is a gap in understanding that what companies need isn't always what is being provided by educational institutions. **This is not just an issue at the university level, education for tomorrow's work environment must start much earlier, and in some cases does.**

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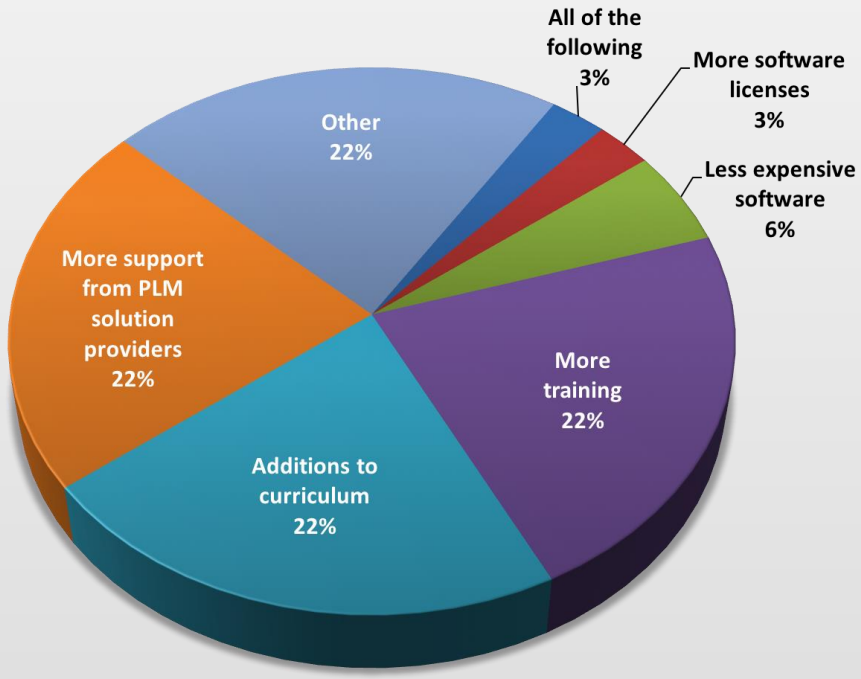
What Academia Must do to Support Industry

PLM education programs must include PLM impacts on areas outside of product engineering

Certain key characteristics and capabilities must be part of the education syllabus to support a better understanding of how PLM and other enterprise solutions throughout an extended enterprise enable processes and data for the entire community of product developers. **These key characteristics include an understanding of how PLM impacts areas outside of product engineering, such as marketing, purchasing, product support, project management, costing, manufacturing, etc.**, and how PLM changes the ability to support product engineering's use of new initiatives such as MBE, systems engineering, SDPD, etc.

The breadth of people involved in product development decision making demands that many disciplines need access to PLM—their work depends on the information and processes that are enabled by it. This requires that PLM education extend well beyond engineering to students of business and operations strategies who need PLM-based information—they need to be PLM literate to understand how product development processes impact business. As Professor Hartman stated, "For PLM education to succeed, faculties need both enlightenment and recognition that PLM is not just an engineering discipline."

Educational institutions pointed out what they most need to keep moving forward with PLM. A struggle that was voiced is that finding new information to support current and expanded curricula was difficult. A solution provider sponsored consortium of educators willing to share their course materials is one way to help alleviate this problem. Access to more training was cited repeatedly throughout our discussions with educators. While the solution providers received praise for what they are doing to support education of PLM, the reality is that they could do more.



What Educators Most Need so they Can Improve Engineering and Manufacturing Education

Conclusions

PLM education must teach how PLM impacts *ALL* areas of product development

Educational organizations must prepare tomorrow's leaders for tomorrow's realities as embodied in Industry 4.0, systems engineering, SDPD, and similar initiatives. This includes the need for educators as well as engineering and manufacturing leaders to understand the impacts and value of PLM in driving new economies, markets, and technologies. The education of the next generation of workers for industrial companies is a critical element, and having them cognizant of the capabilities inherent in a PLM strategy is critical to ongoing success.

Educators need to do much more to promote PLM literacy. **They *MUST* expand PLM education beyond 2D drafting and a purely engineering focus to encompass other business areas in which a modern PLM strategy has profound impacts.** To not do this will reduce PLM education to teaching a trade (drawing with CAD instead of on a drafting board) that does not support current and future industrial company needs.

PLM solution providers have to do their part as well. When they do not support the activities of educators they do not promote well-educated graduates—the future product developers and product lifecycle managers. This mismatch hampers industrial growth, the growth of PLM, and the potential benefits to be realized through PLM.

It is important to realize that without organized education, PLM expertise in industry is grown in much the same way that systems engineering expertise is grown: many years of experience at a company in a variety of positions, learning processes by absorption, gaining knowledge of the products and operational strategies. However, that takes much too long.

While the PLM solution providers continue to support education programs with free (or very inexpensive) software, they do not do as much in the areas of training and providing use cases and supporting materials. Providing additional support would help PLM in industry to move to a new level of adoption and value. But, this also assumes that educators would use additional materials and training to improve their curricula.

Siemens PLM Software is on a path with curriculum and software support that will help educators to continue building a valuable supply of more qualified PLM practitioners prepared to participate and thrive in the evolving digital future.

PLM Education Needs Active Support

Education in PLM is critical to provide companies with the real-world ready talent they need

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Siemens PLM Software's Approach

Siemens PLM Software delivers a multitude of PLM capabilities in support of education, *PLM education that is critical to provide companies with the real-world ready talent they need*. The educators we talked to were pleased with how helpful it was to have an integrated solution that covered the gamut from planning to engineering design to manufacturing within one platform, making data more accessible for roles beyond engineering, and providing these capabilities to educators in a cost-effective manner.

The continuum of digital enterprise capabilities from Catchbook to Solid Edge through the high-end NX and Teamcenter solutions as well as Tecnomatix digital manufacturing, existing in the same platform framework, is very attractive in the education environment. These provide essential support for teaching advanced product development concepts such as systems engineering and SDPD. Synchronous Technology was cited several times for simplifying the user experience for students who do not have much time to learn tools and often must import data from other CAD solutions.

Siemens PLM Software provides a global academic program that is focused on empowering the next generation of digital talent. It coordinates activities with educators at all levels from primary to high school to junior college to university. This group is a great help in providing educational materials and training. Part of Siemens PLM Software's education program is their Learning Advantage program: a self-paced on-line training facility, that is always available to educators and their students.

High school teacher Christopher Faust of Huntsville (Alabama) City Schools, stated that "Siemens PLM Software has been very supportive, providing financial support to Greenpower, taking an active interest in the teaching program, and providing good product training courses for the teachers."

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