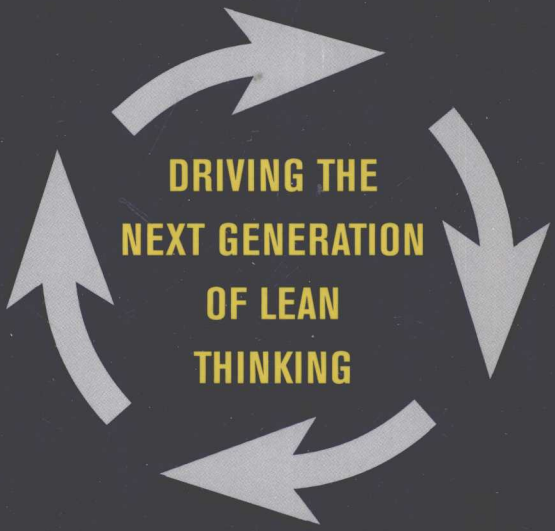
How GE, P&G, Ford, Toyota, and Other Leading Companies Achieved Dramatic Increases in Productivity and Profit

PRODUCT LIFECYCLE MANAGEMENT



MICHAEL GRIEVES

PRODUCT LIFECYCLE MANAGEMENT

DRIVING THE NEXT GENERATION OF LEAN THINKING

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PRODUCT LIFECYCLE MANAGEMENT

To my wife, Diane,
of five wonderful years

Acknowledgments

MY FORMAL INTRODUCTION to Product Lifecycle Management, or PLM, came over coffee. I met Gary Baker, a vice president with EDS working on the General Motors account and a longtime colleague of mine from the days when I chaired the Michigan Technology Council. I was planning a session for the Management Briefing Seminar (MBS), which in spite of its inauspicious name was and is an important get-together of the automotive industry organized by the University of Michigan and the Center for Automotive Research each summer in the beautiful resort area of Traverse City, Michigan.

In previous years I had organized sessions at MBS around the topic of information exchanges. Material exchanges were all the rage during the Internet era. Material exchanges in the automotive industry appeared to be win-lose propositions, with the powerful automobile manufacturers certain to wring every last bit of profit from the supplier community.

My perspective on exchanges was a little different. It involved a focus on information and not material. If the automotive community could develop exchanges of information such as order flow, product specifications, product status, warranty costs, etc., then costs could be replaced by this information. This could be a win-win

proposition for both the automobile manufacturers and their suppliers. Gary, who had attended my session the previous year, said, "Your ideas about information exchanges are related to something we are working on called Product Lifecycle Management (PLM). Let me introduce you to our people."

The Internet bubble burst, taking with it a good deal of interest in exchanges. However, the interest in PLM continued to grow and the ideas about PLM continued to mature. A lot of my ideas came about because Ed Borbely, the Director of the Center for Professional Development in the College of Engineering at the University of Michigan, encouraged me to develop the first university-based executive education course in PLM. The interaction with executives and managers involved with PLM allowed me to crystallize my thoughts about PLM as a larger approach to the product information management problem and its relationship to other approaches and systems.

I would also like to thank my professional friends and colleagues who have helped me refine my ideas about PLM: John Crary, the CIO of Lear Corporation who was my partner in crime in developing information exchanges and implemented PLM, which gave me a window into its actual use; Lorie Buckingham, CIO of Visteon Corporation, who helped me refine some ideas on the strategy of moving a large organization into PLM; Eric Sterling, VP UGS; Peter Schmitt, VP Delmia; Raj Khosho, VP UGS, who helped me clarify the use of information as a substitute for wasted time, energy, and material at a workshop in Qingdao, China; Ed Miller, CEO of CIMdata, who has presented an overview of the ever-evolving PLM supplier community in my courses; and Nino DiCosmo, Chairman and CEO of Autoweb, Inc, who had planned a peaceful trip with me to Tokyo for a board meeting, but spent it having to critique the issue of information singularity.

My editor, Jeanne Glasser, deserves a great deal of credit for identifying PLM as a topic worth reading about, tracking me down, and convincing me that writing a book would be fun—and then having to put up with the problems of a new author.

Last, but not certainly not least, I would like to thank my lovely wife, Diane, for encouraging me to write this book and then leav-

ing me alone to do it. My son, Rob, and his wife, Chris, were also encouraging. Their children, Nick, Bianca, Jake, Gabrielle, and Bella constantly remind me by their observations and actions that there are new, exciting, and useful ways of looking at the world, even if, as Nick who is 12 puts it: they "have no clue" what I'm talking about when I talk about PLM.

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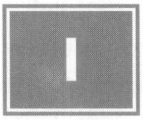

Introduction—The Path to PLM

PRODUCTIVITY IS driven in waves. We create new ways of doing things or new things to do that drive a new wave of productivity. Some waves of productivity are driven by a seminal invention such as the steam engine, the automobile, or the computer. Other waves are driven by our approach to the way we do things, such as the assembly line, the multidivisional or M-form corporation, or lean manufacturing.

As the newest wave in productivity, Product Lifecycle Management—popularly referred to as PLM—emerged in the last few years fully formed, or so it seemed. PLM was first piloted in the automotive and aerospace industries: two sectors with complex, manufactured products. The electronics industry, which has product management issues that focus more on software configuration than the complex product configurations of the automotive and aerospace industries, was also an early adopter of PLM or PLM-like technologies. With the success of PLM in these three industries, interest in PLM has spread to businesses as diverse as consumer packaged goods (CPG), industrial goods, medical devices, and even pharmaceuticals.

PLM is an outcome of lean thinking—a continuation of the philosophy that produced lean manufacturing. However, unlike lean

manufacturing, PLM eliminates waste and inefficiency across all aspects of a product's life, not solely in its manufacture. PLM is focused on using the power of information and computers to deliberately pare inefficiencies from the design, manufacture, support, and ultimate disposal of a product. Wherever possible, PLM enables the movement of inexpensive information bits in place of expensive physical atoms, a concept popularized by Nicholas Negroponte.[1]

In doing this, PLM takes "lean" to the next level. Lean manufacturing is a continual process that works at taking out the inefficiencies in the manufacturing process. However, as lean manufacturing efforts find and eliminate waste, products are being produced less efficiently at other phases of development. PLM uses product information, computers, software, and simulations to produce the first product as efficiently and as productively as the last product throughout the design, development, and delivery process.

Lean manufacturing requires considerable resources because changes that improve production cause equipment to be reconfigured, machines rearranged, and material relocated as the lean manufacturing engineers test their hypothesis that this new method will decrease waste. Once the system is set in place, PLM uses little in the way of resources, since this same process is done digitally.

Testing lean approaches is time intensive, so only the most promising ideas for streamlining the manufacturing process can be tried. The wall clock ticks away as the new configurations are set up, production commences, and the results are evaluated. PLM does not operate under the same time constraint. PLM can simulate wall clock time, and it can do multiple versions of it simultaneously, so all hypotheses can be tested, not just the most promising.

Finally, lean manufacturing can only take an organization so far. The most efficiently produced product resulting from the best lean manufacturing processes can be flawed as a result of design failure or failure in actual use. It is nothing more than efficiently produced scrap that is a waste of time, energy, and material. Productivity increases in the production of scrap are a disappointing, but logical, result of a limited approach to lean manufacturing.

Lean Thinking–Globally!

Seeing what lean thinking can do on the manufacturing floor has left companies eager to extend these benefits of lean into other parts of the organization. But, to do so, lean will have to be accompanied by an integrated approach to product information and the tools and techniques needed to enable that integrated approach. The level of productivity that PLM can drive promises to be enormous, as evidenced by the attention it has received in a short period of time.

PLM has attracted worldwide attention on a global basis; it is not solely an American or European initiative. It is being adopted by organizations everywhere. We expect organizations based in the more industrial Asian countries such as Japan and Korea to be early adopters of PLM. However, organizations in such diverse countries as India, Malaysia, and China are also not only adopters, but innovators of PLM.

PLM is able to raise the bar on productivity because it allows for the complete integration of everything related to a product or service—both internal and external—into the organization producing it. As you'll learn as you read this book, PLM uses information technology and organizational practices and processes to improve efficiencies both within and across functional areas. Dividing work along functional areas, such as engineering, manufacturing, sales, and service, is an organization's method of dividing tasks in order to simplify complexity.

In the past, a great deal of effort and focus has been placed on increasing efficiencies within these functional areas. Although improvements can always be made within the various functional areas, these initiatives suffer from the law of diminishing returns. The high-return projects have been identified and remediated. This is especially true of those companies that have embraced Six Sigma project teams, where their mantra is continual improvement.[2]

In fact, PLM initiatives are becoming an option for Six Sigma teams looking for areas of improvement. Because PLM generally originates in a specific departmental area, it may be natural simply to view PLM as a functional area initiative. PLM projects can naturally start in engineering, because that is where product information

originates, and there are a substantial number of opportunities to make improvements through better organization of product information. However, as we shall see throughout this book, the bigger opportunity is to use PLM to enable better information flow across the entire organization.

Functional areas can easily become isolated silos, with little communication or coordination among them. Attempts to optimize performance within these silos can actually lead to substantial underperformance across the whole organization and its related supply chain.

PLM holds the promise of improving productivity through a cross-functional approach, using product information. By linking different functional areas through shared product information, PLM can help organizations break down the silo perspective and unlock productivity gains as functional areas benefit from a shared base of information. As supply chains become more integrated, PLM has the potential for impact across these supply chains—not just within the organization. This will enable productivity and performance gains that cannot be obtained if the focus is solely on individual areas.

The other allure of PLM is that it does not improve efficiency and productivity from simply a cost-reduction perspective, but also from a revenue perspective. Increasing costs are not an inherently bad thing. If revenues are increasing, it is almost impossible not to increase costs. The key to increasing profits is just not to let costs increase at a faster rate than revenues.

PLM has within its framework the opportunity to increase innovation, functionality, and quality—three drivers of increased revenues—by better organizing and utilizing the intellectual capital of an organization. The ability to develop and build creative, more useful, and better products from the same amount of effort will also drive productivity and is a great deal more sustaining than cost cutting. As the old adage goes, "You can't simply save your way to prosperity." Real prosperity requires revenue growth.

At first blush, PLM appears to be a relatively straightforward concept. As the name implies, it is the management of the information about a product throughout its entire life cycle from initial design to final disposal. However, as will be explained in the next

chapter, the devil is in the details of this seemingly obvious explanation. In addition, there is still a good deal of discussion and disagreement regarding the form, scale, scope, and implementation of PLM.

Even in its initial phases, PLM is a "big idea" information technology undertaking. Similar to Enterprise Resource Planning (ERP) initiatives, PLM's greatest promise is not in the foundation projects that affect one functional area, but in its larger strategic use that is cross-functional, enterprise-wide, or even supply chain inclusive.[3]

However, the days of the chief executive officer (CEO) and chief information officer (CIO) going to their board of directors and saying, "Give us $500 million and two years, and we'll give you an enterprise system" have come and gone—if they ever really existed. So too are the days when any project involving the Internet received automatic approval without the annoyance of having a financial justification or even a business proposition that was quasi-logical.

As John Crary, CIO of Lear Corporation, a $13 billion automotive supplier says, "The only way CIOs will bring projects to their board for approval is if they have a well defined Return on Investment (ROI)."[4] PLM holds that promise, and it does it on a "pay as you go" basis, as we shall see. This is the only way that such a broad technological concept could even hope to be funded in this day and age.

In this introduction, we will explore why PLM and other information systems have the potential for such a powerful impact on the productivity of an organization. This will be the basis for the claim that PLM will drive the next wave of lean thinking in organizations that adopt and embrace PLM. The success of PLM relies on some underlying fundamental premises. We will explore four of them in this introduction. We use these premises every day to guide our decisions regarding information technology adoption. However, we often do not realize it. Nor do we realize the increasing impact of these premises. The premises we will discuss are: information as a substitute for time, energy, and material; the trajectory of computer technology development; the virtualization of physical objects; and the distinction between processes and practices.