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Product Lifecycle Management

21st Century Paradigm for Product Realisation

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Preface

The main subject of this book is Product Lifecycle Management (PLM).

PLM is a new paradigm for manufacturing companies. As its name implies, Product Lifecycle Management allows companies to manage their products across their lifecycles – from the earliest idea for a product all the way through to the end of its life. This is one of the most important activities in any manufacturing company.

PLM is important because it enables a company to be in control of its products across their lifecycle. If a company loses control, the consequences can be serious. If it loses control during product development, the product may be late to market and exceed the targeted cost. The results of losing control during use of the product may be frustration and a lack of satisfaction for the customer, or much worse, injury and death.

PLM is at least as important as other company activities such as Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and Customer Relationship Management (CRM). However, PLM differs from ERP, SCM and CRM in that it is focused on a company's products.

ERP, SCM and CRM bring visibility and efficiency to the way that companies carry out everyday business. However none of them addresses the heart of the company, its defining resource, the source of its wealth and value – its products. That is the role of PLM, which is why PLM is so important. Products define a company. Without its products, a company wouldn't be the same. There is little in a company more important than its products, and the way that they will be developed and used. Without those products, there will be no customers and no revenues.

PLM is also important because it improves the activity of product innovation and development, without which a company won't survive. The source of future revenues for a company is the creation of new products and services – not cost-cutting. PLM is the activity that enables a company to grow revenues by improving innovation, reducing time-to-market for new products, and providing superb support and new services for existing products.

PLM is also important, and a source of pleasure for CFOs, because it enables a company to get a clearer picture of current and future revenues, costs and value. It helps companies to reduce product-related costs. Product-related material and energy costs are fixed early in the product development process. PLM provides the tools and knowledge to minimise them. And PLM helps cut recall, warranty and recycling costs that come later in the product's life.

PLM provides a way to overcome problems with the use and support of existing products, and with the development of new products. But PLM doesn't just have the potential to solve problems in the product lifecycle and in new product development. It also helps companies seize the many market opportunities for new products in the early 21st century.

Existing technologies such as electronics, computing, telecommunications, robotics and biotechnology all offer scope for new products, as do newer technologies such as nanotechnology. The Internet, the World Wide Web and the Grid offer opportunities for new products and services, and new ways to develop, sell and support products. The Global Positioning System (GPS) underlies many new products. Mobile telephony offers new opportunities, as do portable computers and other portable devices. Radio frequency identification (RFID) technology allows products to be tagged with chips that can provide information about the product when they are scanned, enabling products to be tracked throughout their life. The issue of Sustainable Development is becoming increasingly important. The planet doesn't have an infinite supply of materials. With PLM, companies can address the effect of policies for sustainable production and consumption on existing and new products.

PLM is difficult to implement because it addresses the product's entire lifecycle – from cradle to grave. Managing product lifecycles in a global economy is a daunting proposition. Most companies have, in their product portfolios, many products at different lifecycle stages. PLM provides a framework in which all of a company's products can be managed together across their lifecycles.

PLM is cross-functional and, in the Extended Enterprise environment of the early 21st century, it's often cross-enterprise as well. Companies often work in different Extended Enterprises for different products. And the responsibility for the product may change at different phases of the lifecycle. At different times it may be with marketing, engineering, manufacturing, finance, marketing, sales and service groups in different companies. Getting agreement on a common approach among all these organisations can be time-consuming. Lifecycle participants are often in different time zones, using different systems and working for different companies. PLM helps get everyone to work together effectively.

Implementation of PLM may take a long time. Clarifying and straightening out processes, data and systems can be time-consuming. The processes and methodologies to propose, define, manufacture, support, upgrade, retire and recycle the product may not be aligned, or may even not exist. The knowledge about the product may be in different computer systems such as CAD (Computer Aided Design), PDM (Product Data Management), ERP, SCM and CRM. The format in which data is created in one system may not correspond to the format in which it's needed in another system. In spite of these difficulties, companies must meet the increasing demands of their customers, so need to rapidly and continually improve their products and services. To achieve this they will turn to PLM. This book helps them understand and implement PLM.

Chapter 1 provides an executive overview of Product Lifecycle Management. The need for PLM is described. Examples are given of some of the problems that occur, and the opportunities that are lost, in environments without PLM.

Chapter 2 provides an introduction to PLM. The meanings of the words "product" and "lifecycle" are clarified. The components of PLM are described. The issues that arise during the lifecycle of a product are introduced.

Chapter 3 puts PLM in a historical context, showing why it was not needed, or possible, until the early 21st century.

Chapter 4 describes the opportunities and benefits of PLM. At the beginning of the 21st century, there are huge opportunities for manufacturing companies. For example, globalisation has greatly increased the number of potential customers for their products and services. The world headcount continues to grow by more than 100,000 per day, promising even more customers in the future. Further developments in computing, the Internet, the World Wide Web, the Grid, mobile telephony

and database technology will create and meet needs that had not even been thought of before. PLM can help companies seize these opportunities and increase product and service revenues, reduce manufacturing costs and reduce in-life costs.

With PLM, these benefits can be achieved in different ways. New products can be introduced faster. Engineering change time can be reduced. The reuse of parts can be increased. Executives can take better decisions based on better information about products and projects.

In the fifth chapter, the rationale for PLM is explained. This chapter shows how Product Lifecycle Management provides a response to the many forces acting on manufacturing companies. Some of these are technology-based, some are market-based. Examples include mass customisation, the increase in the volume of digital information, reduced product lifetimes, and the changing geographical location of product development skills.

Chapter 6 describes how different people's views of PLM, resulting from their experience and position in a company, may hinder its implementation. Although it will be clear to some that PLM can help get control of a product across its lifecycle, reduce the cost and time to introduce new products, and improve products and services across their lifecycle, it may not be clear to all. PLM has a wide scope and affects many people. For it to succeed, they will all have to understand what it can do, and why it is needed.

Chapter 7 looks at some of the details of the product data and product workflow that are part of the product lifecycle activity. In many companies, there are problems in the product lifecycle environment, and it may require significant effort to put them right. Many of these problems are down in the details of the tasks that the company's workers carry out every day. Such problems are not always of interest to managers, who may be more interested in strategic topics, and are expected to produce results at a higher level. However, it is often a combination of problems at a low level that eventually leads to problems at a higher level.

Chapter 8 shows how PLM responds to the issues described in preceding chapters. Those chapters show all sorts of problems and questions that currently have to be addressed by companies that develop, manage and support products. The implementation of an effective PLM activity provides an answer to these problems and questions.

The ninth chapter describes some of the components of PLM. There are many of these, such as processes, information systems, human resources, organisational structure, work techniques and methodologies. Among the components in the information system group are CAD and PDM systems.

Chapter 10 shows how failure to achieve significant results through the implementation of individual components of PLM leads to the need to take a holistic view of PLM. Implementation of individual components of PLM is often frustrated by problems in the product lifecycle due to characteristics of traditional organisations such as multi-level hierarchies, departmental empires, poor communication, use of specialist jargon, uncoordinated performance targets, walls built to demarcate departmental frontiers, and serial product workflow through the departments.

One of the many confusing things for someone trying to develop a coherent approach to PLM is to understand the various ways in which words such as vision, mission, objectives, strategy, plan, metrics, structure and policy are used and understood. Chapter 11 defines these terms in the context of PLM.

The following chapter, Chapter 12, provides an overview of the PLM Vision – a high-level conceptual description of a company's product lifecycle activities. A Vision represents the best possible forecast of the desired future activities.

A PLM Vision outlines the framework and major characteristics of future activities. It provides a Big Picture to guide people in the choices they have to make, during strategy setting and planning, concerning resources, priorities, capabilities, budgets, and the scope of activities. Without a PLM Vision, people won't know what they should be working towards, so won't work effectively. Chapter 13 describes the process of developing such a PLM Vision, and Chapter 14 describes how to develop a structure for the PLM Vision.

Once the PLM Vision has been defined, people will want to know what the organisation will look like in the future. They'll ask what the PLM strategy is. They'll want to know how the resources in the product lifecycle should be deployed, structured and used in the next five years to achieve the Vision. They'll want to know how to organise the change from today's organisation to the future organisation. Chapter 15 describes the relationship between PLM strategy and PLM Vision. Chapter 16 describes related strategies in the industrial environment. Drawing on previous chapters, Chapter 17 identifies principles for developing a PLM strategy.

Chapter 18 introduces the content of a PLM strategy. A good, well-defined, and well-communicated PLM strategy is important because it provides the best chance of achieving the PLM Vision, makes sure resources and capabilities are used to their best, makes sure everybody knows what's happening, makes sure all resources are aligned in the same direction, and enables planning decisions to be taken in a coherent way. Chapters 19 and 20 show the five-step process with which a PLM strategy can be developed.

Chapter 21 describes the enterprise change management issues that arise when PLM is introduced. PLM can cause major upheaval in a company because of its effect on business processes and individual work assignments. Unless resistance to change is overcome, PLM won't succeed.

The main subject of this book is Product Lifecycle Management. Another important subject is PDM, which is one of the most important Information System components of PLM. Whatever PLM strategy is chosen, it is probable that PDM will be a major constituent. Unless the product data in the product lifecycle is under control, it will be difficult to get the product under control. PDM is addressed in detail in Chapter 22. PDM systems, which manage data across the lifecycle, are an essential enabler for PLM.

Chapter 23 looks at the reasons for implementing a PDM system. These include better management of information, increased reuse of information, workflow management, improved engineering change management, overall business performance improvement, resolution of business problems, functional performance improvement, better management of product development activities, automation of product development activities, IS effectiveness improvement, and the provision of an infrastructure for effective product development.

Anyone implementing a PDM system is likely to be faced by people who don't want to change the status quo. There are lots of people in most companies who can provide all sorts of justifications for not doing whatever is proposed. To prepare for such behaviour, anyone who wants to implement PDM needs to be well-armed with reasons. Fortunately, there are plenty of them. Chapter 24 describes the various ways in which use of PDM can be justified in different environments.

The following chapter, Chapter 25, addresses the financial justification of PDM. It describes typical costs and benefits, and shows how the payback and Net Present Value (NPV) of a PDM implementation are calculated.

Chapter 26 provides answers to commonly asked questions about the implementation and use of PDM such as: what PDM functionality will be needed?, who should be involved in implementing PDM?, how does PDM fit with Concurrent Engineering?, should PDM be outsourced?

Chapter 27 looks at some of the barriers to a successful implementation of PDM. These may have several sources such as information systems, human resources, the PDM project team, the processes in the product lifecycle, the organisational structure, funding, information, installation and everyday use.

Chapter 28 provides examples of PDM implementation in different industry sectors. PDM is used in all types of discrete and process manufacturing industry. The automotive and electronics sectors are major users of PDM, as is the aerospace industry.

Chapter 29 describes a maturity model for PDM, showing how companies evolve through different stages of maturity. The PDM implementation approach that a company develops will depend on how far the company has evolved through the following four stages: Stage 1, Traditional; Stage 2, Awakening; Stage 3, Adapting; and Stage 4, Modern.

Chapter 30 describes the details of implementing PDM. Even in a small company, it would not make sense for one person to introduce PDM alone. Many people use product data, and the more they are involved in understanding and defining their product data needs, the more likely they will be to support the introduction of PDM. The best way to achieve their support is by creating a cross-functional project team to introduce PDM. The activities that must be addressed in the project can be divided into four groups: project start-up; preparing to select a PDM solution; selecting a PDM solution; and implementation and use of PDM.

Chapter 31 provides details about the functionality of PLM systems, the basic functions that are used in PLM, and the types of systems that are built around this functionality. PLM solutions include a wide range of functionality such as data management, configuration management, document management, content management, workflow management, project management, program management, visualisation, collaboration, and integration with systems such as ERP, SCM and CRM systems. A wide range of vendors offer PLM-related software, applications and services. Some offer only products, some only services, other offer both. Some product vendors come from the CAD industry, some from the ERP industry, some from other industries.

Examples of use of PLM are given in Chapter 31. PLM is used in industries such as automotive, aerospace and electronic. It is also used by manufacturers of telecommunications and office equipment, consumer products, and domestic appliances. Manufacturers of heavy machinery such as machine tools, construction equipment and agricultural machinery use PLM. PLM is used in the petroleum, chemical, food, beverage, pharmaceutical and other process sectors, as well as by utility companies in the electricity, gas, and water sectors.

In a global economy characterised by intense competition, new technologies and ever-changing consumer preferences, it is to be expected that PLM will evolve in coming years. Chapter 32 provides an overview of some possible future developments in areas such as phase/gate methodologies; feedback from products; simulation of the Integrated Product Portfolio; increasing use of standards; product responsibility issues; product audits; joint industry activities for developing new products; and financing of new products.

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