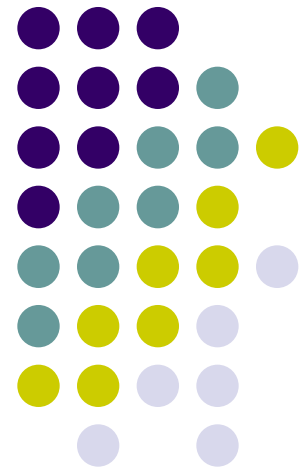


ME 482 – Rapid Product Development and Manufacturing

Chapter 4

Rapid Product Development (RPD)



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- Nowadays more and more manufacturing companies have realised that **the ability to quickly develop a customised product in an economic and efficient way** is **critical** for them to survive in the keen competitive international market.
- **Rapid product development (RPD)** has been proposed for the rapid development of products **with low cost, high value addition and acceptable quality.**
- RPD is an interdisciplinary methodology **to combine all influences of an engineering process** to an iterative product development.
- RPD topics focus not only on product, but also on their **development process.**
- RPD process is achieved by combining and integrating various innovative technologies and tools, e.g., **rapid manufacturing, simultaneous engineering, computer supported tools, and a supportive environment.**

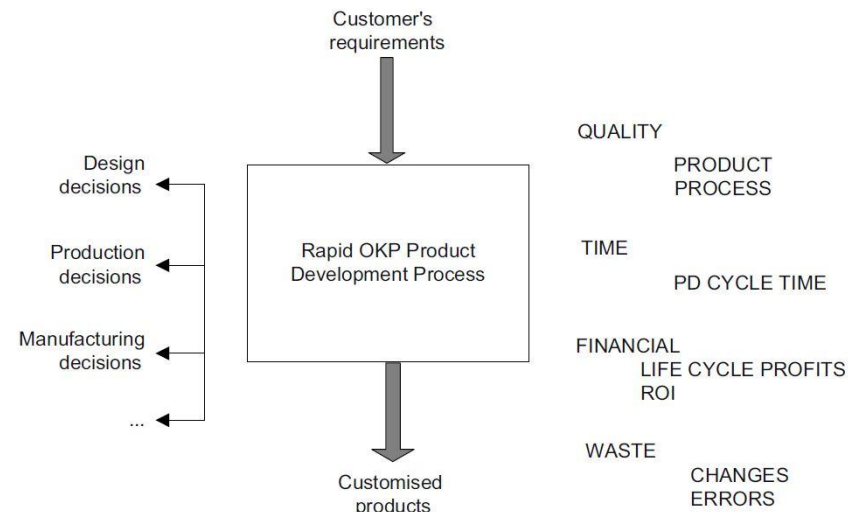


The main objectives of RPD are:

- To shorten **production time** to market (from product definition to market launch)
- To develop products by **optimising key factors** (time to market, cost and quality)
- To **increase products quality**, achieve **high profit** and **decrease waste** (changes, reworks and errors)
- To **rapidly respond to the customer's requirements** and market changes



- The effectiveness of a company's product development process **must be evaluated against some objective criteria** (a set of quantifiable parameters/metrics). The metrics typically fall into the following four broad categories:
- **Product Quality:** meeting the needs and **expectations of customers.**
- **Lead Time:** the time from starting a product definition to finally delivering the product to the customer.
- **Financial:** **the return on investment** has always been the focus of PD.
- **Product Development Waste:** results from a lack of proper preparation and planning, poor implementation, insufficient information interchange and poor product development processes. (*errors, reworks, changes*)



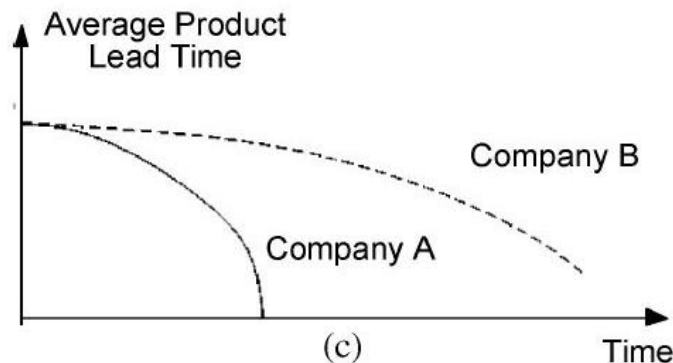
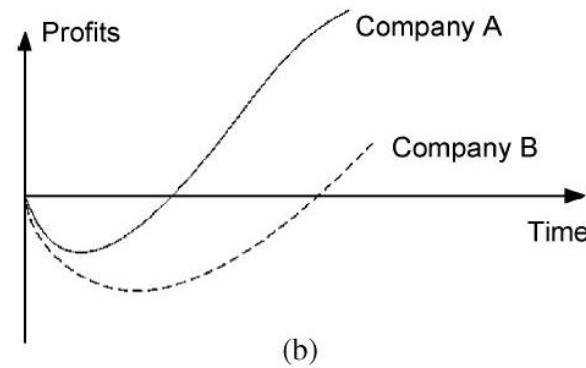
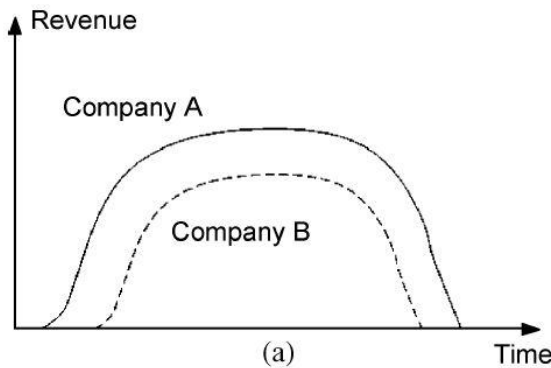


To improve the performance of product manufacturing enterprises and **to win the RPD competition**, the major research problems are:

- High Customisation
- A Successful Approach
- Production Planning and Control
- Continual Customer Influence
- Complicated Product Data and Information Flows
- Complicated Logistics Management



- In the market, successful products usually achieve high marks in each of the categories of performance metrics, *e.g.*, *short lead time, low waste and low cost.*
- Many of the metrics affect each other. For example, **quality products can be sold well in the market**, and hence **lead to a higher life cycle profit.**





There are many factors driving the need for companies to improve their product development process. The major drivers forcing the company to move towards RPD are:

- **Aggressive Global Competition:** In increasingly fierce competitive global economy, there are foreign as well as domestic competitors **who can do it better**, and **when they do, they will seize market share**.
- **Rapid Changing Technologies:** Many technology changes take place within each generation. It is not uncommon for technologies to change dramatically every two or three years. As a result, **product life cycles are rapidly declining**. This reduces life cycle revenues and profits. Hence, **companies are being forced to develop products at a faster pace**.
- **Increasingly Complex Market:** Markets continue to become more diverse and complex. Customers, increasingly exposed to the advertising and marketing efforts of global competitors, are becoming more sophisticated and demanding. **Competitors are decreasing prices and adding product differentiation**.



A new generation of product systems should contain the key features of agility and rapid responsiveness, to maintain competitiveness in the global marketplace and the ability to rapidly combine the strengths of “partners” to meet market needs.

- **Enterprise integration.** An individual company have to integrate its product development processes **with its partners via networks**.
- **Support for organisations that are globally distributed.** This includes distributed knowledge-base systems or product information systems that are needed to support product development processes.
- **Being able to cope with the heterogeneous and distributed manufacturing system environments.**
- **Open and dynamic structure.** The manufacturing systems should be able to **dynamically integrate new subsystems** into the environment for specific applications or **remove existing systems from the systems** without influencing the basic structure of the working environment.



- **Support cooperation and collaboration.** The manufacturing systems should support geographically distributed teamwork, which includes cooperation and collaboration among team members.
- **Agility and high customisation.** The manufacturing systems must be used **to shorten the product development cycle time** and **to respond to customers' requirements quickly.**
- **Technical advancement.** RPD systems need to adopt new technologies to keep its advantages over existing manufacturing systems.
- **Compatible with most existing PD software tools.**
- **Stable and easy to use and maintain.** The system should be **user-friendly** and fault tolerant both at the system level and subsystem level so as to detect and recover from system failures at any level and minimise their impact on the working environment.



- There is a great potential of using the Internet to build up a virtual product enterprise with the capability of RPD. Hence, **using the Internet to achieve RPD has become the most promising solution to meet the requirements of the next generation of product development systems.**
- The Internet and its relevant technologies (*e.g., world wide web, communication, software tools and hardware*) have made great progress in the past few years. The outstanding features of the Internet make it the best supporting platform for RPD.
- The Internet platform has the capability to integrate diverse software tools to support applications. This facilitates the development of an RPD system that is able to integrate current techniques for product development to support distributed team members working together to design, manufacture and support products cooperatively and concurrently.



New technologies have been continually put forward and gradually updated to the Internet platform. They include;

- Internet-based CAx technology
- Internet communication technology
- Internet-based design for X
- Internet-based collaborative design
- Internet-based decision support
- Internet-based workflow management
- Internet-based CAE/CAD/CAPP/CAM technology
- Internet-based virtual simulation technology

The Internet-based RPD system with the integration of these technologies will have great technological advantages over the traditional standalone environment or Internet-based systems for supporting only a single stage of the product development process.