Making IPPD Real

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17 November 2008

Topics

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- CMMI®'s Influence IPPD Implementation
- IPPD in the CMMI®
- Defining Concurrent Engineering
- Adding Concurrent Engineering to IPPD
- Lifecycle Processes in the IPPD Context
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CMMI®'s Influence IPPD Implementation

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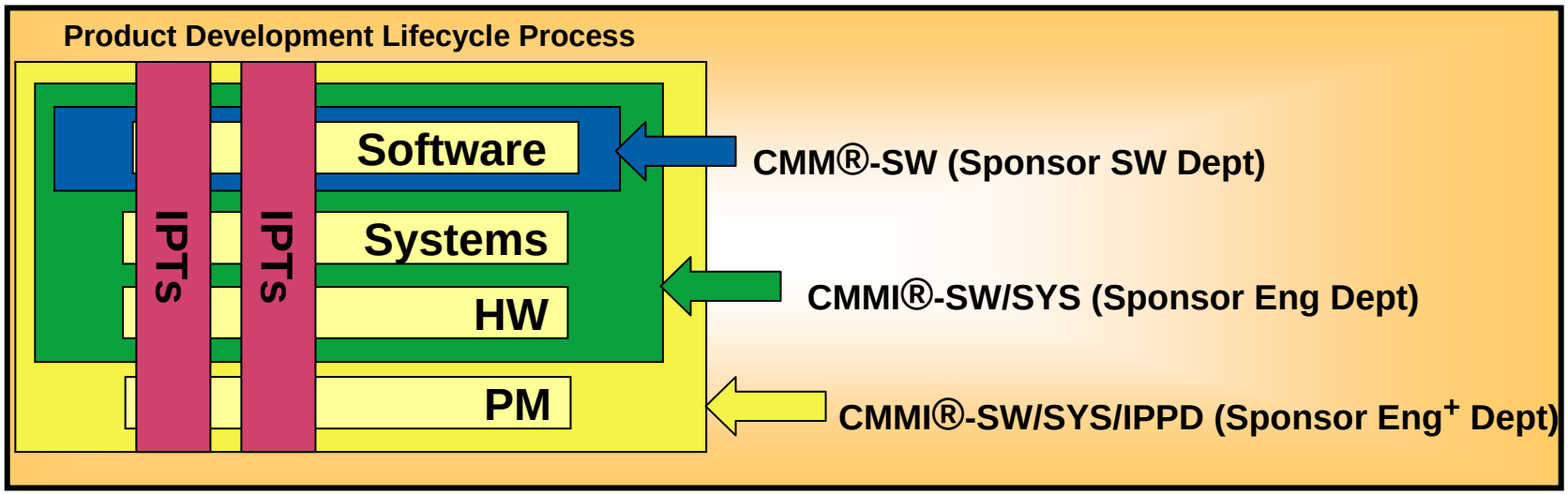
- A Company's implementation of CMMI® may have been influenced by the evolution of the CMMI®



- In this context IPPD meant bringing more disciplines into the scope of the Appraisal plus forming Integrated Teams (Multidiscipline Teams)
- This addressed IPPD requirements related to Teaming and Shared vision
- This valid approach for implementing the CMMI® requirements for IPPD and yields organizational benefits

IPPD in the CMMI®

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- As an example in OPD – SG1 IPPD Addition

  – Integrated processes that emphasize **parallel** rather than serial development are a cornerstone of IPPD implementation.

  – The processes for developing the product and for developing product-related lifecycle processes, such as the manufacturing process and the support process, are integrated and conducted **concurrently.**

  – Such **integrated processes** should accommodate the information provided by stakeholders representing all phases of the product lifecycle from both business and technical functions. Processes for effective teamwork are also needed.

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[CMMI® for Dev 2006]

IPPD in the CMMI®

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- CMMI® Defines IPPD as
  - "A systematic approach to product development that achieves a timely collaboration of relevant stakeholders ***throughout the product lifecycle*** to better satisfy customer needs." [CMMI® for Dev 2006]

- This implies IPPD consists of three parts which are
  - Integrated Teaming (Required & Expected)
  - Shared Vision (Expected)
  - Concurrent Engineering (Informative only)

Defining Concurrent Engineering

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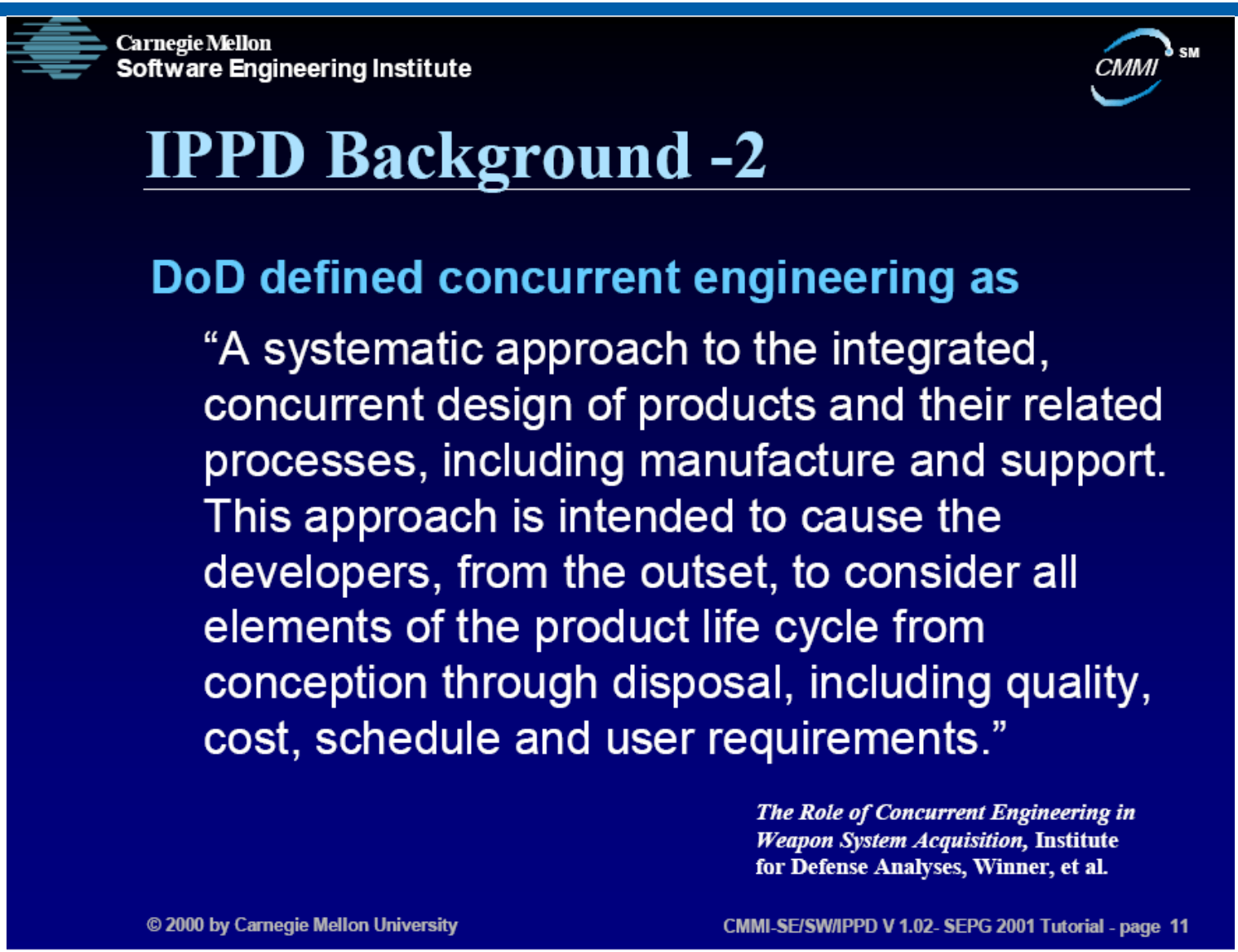

[SEI CMMI® IPPD Tutorial 2001]

Defining Concurrent Engineering

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- One of the Key Tenets from the DoD Integrated Product and Process Development Guide is:
  - ***Concurrent Development of Products and Process***
    - Processes should be developed concurrently with the products they support.
    - It is critical that the *processes* used to manage, develop, manufacture, verify, test, deploy, operate, support, train people, and eventually dispose of the product *be considered during product design and development*.
    - Product and process design and performance should be kept in *balance* to achieve life-cycle cost and effectiveness objectives.
    - Early integration of design elements can result in *lower costs* by requiring fewer costly changes late in the development process.

[DoD IPPD Guide, 1996]

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Defining Concurrent Engineering

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- DoD Integrated Product and Process Development Handbook section 1.2.2 Concurrent Development of Products and Processes
  - Concurrent development of products and processes refers to the **simultaneous development** of the deliverable product and all of the processes necessary to make the product (development processes) and to make that product work (deliverable processes).
  - These processes can significantly influence both the **acquisition and life-cycle cost** of the product.
  - Process examples include the **manufacturing processes** needed to fabricate the product, the **logistics support processes** needed to support the product, or, for a data collection system, the process to collect and disseminate the information gathered.

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[IPPD Handbook, 1998]

Adding Concurrent Engineering to IPPD

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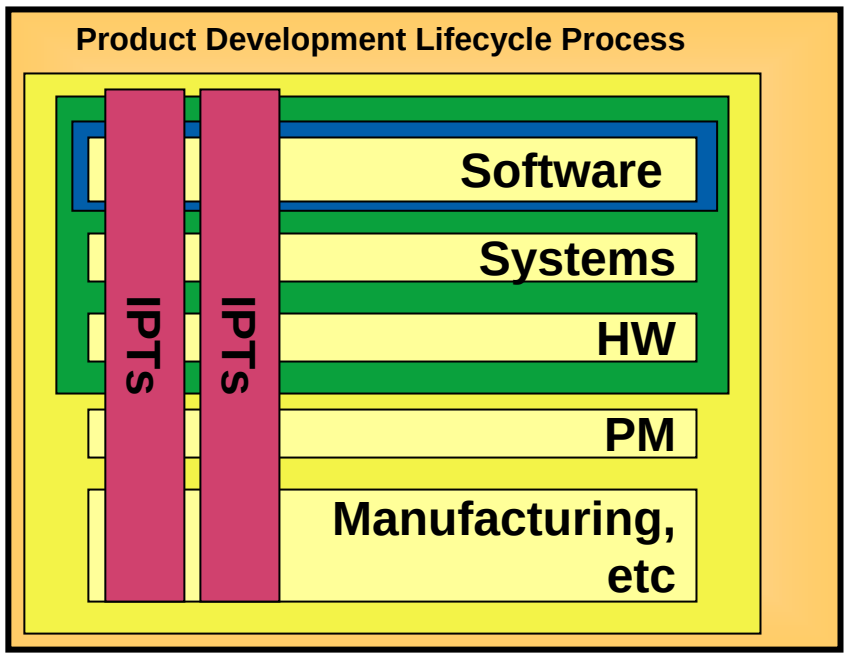
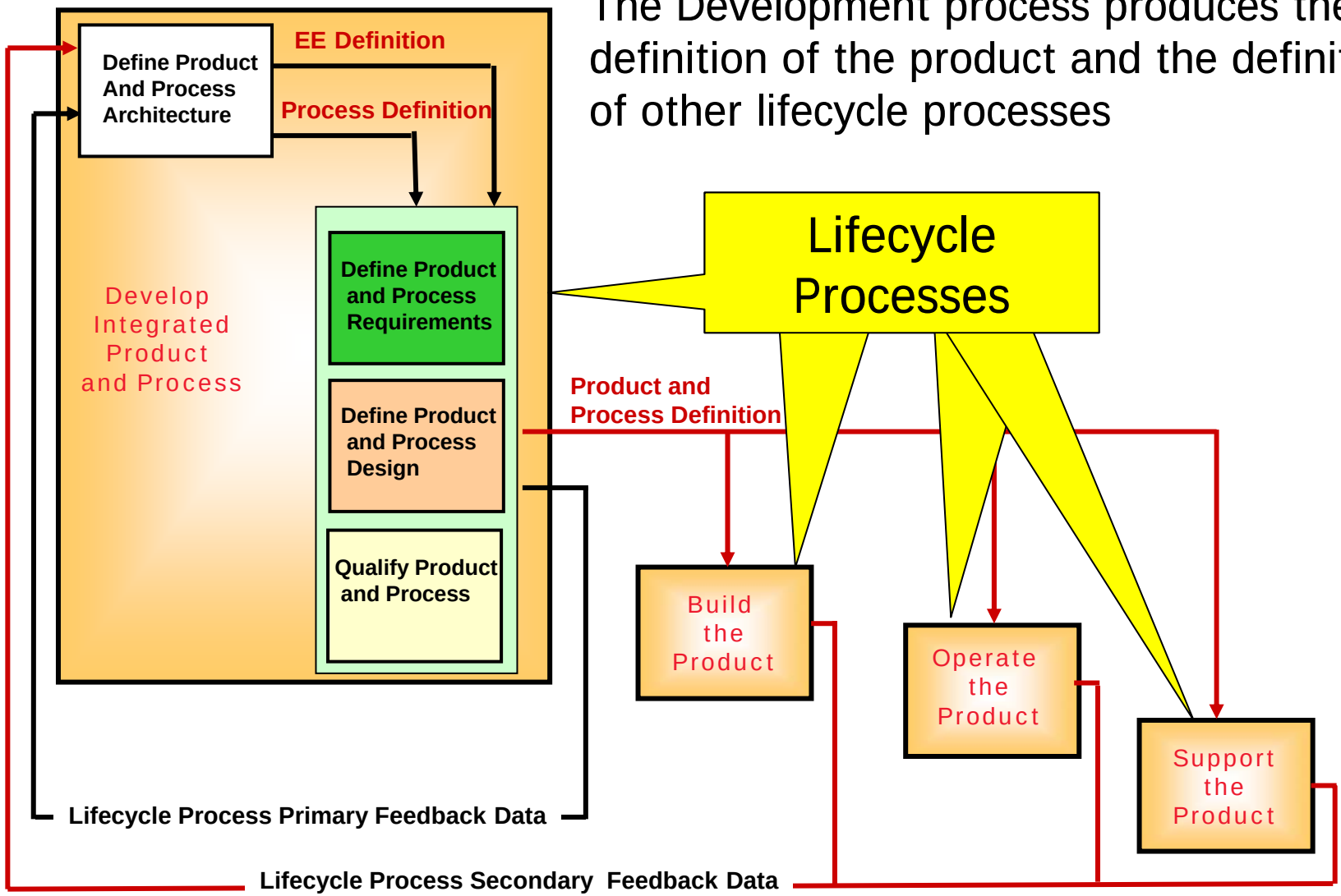
- The commonly accepted idea is to bring organizations who perform downstream lifecycle processes to make input into the product development activity
  - This approach has proven a good start, but is hero or personality dependent



- Better – Update the development process to produce the design of all lifecycle processes (build, operate and support) for the product (i.e., Integrated Product and Process Development)

Lifecycle Processes in the IPPD Context

The Development process produces the definition of the product and the definition of other lifecycle processes



Optimizing Product Lifecycle Costs

- Adding Concurrent Engineering to IPPD allows trade offs to be made during development that involves downstream lifecycle processes resulting in overall product lifecycle cost reduction

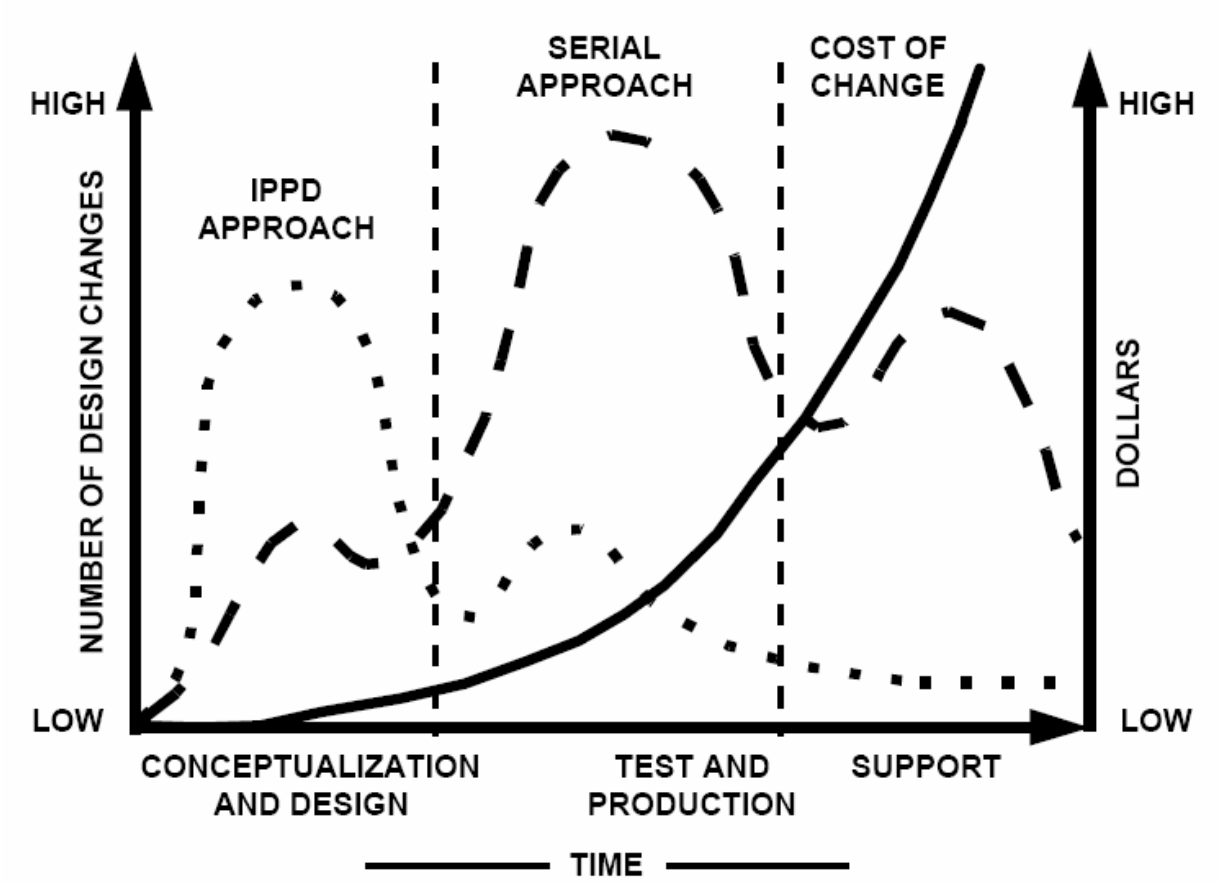


Figure 1-3. Traditional Serial Approach Versus IPPD [Winner, 1988]

Optimizing Product Lifecycle Costs

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Reported benefits attributed to concurrent engineering include:

- Improving the quality of designs which resulted in dramatic reductions of engineering change orders (greater than 50 percent) in early production
- Product development cycle time reduced by as much as 40 to 60 percent through the concurrent, rather than sequential, design of product and processes
- Manufacturing costs reduced by as much as 30 to 40 percent by having multifunction teams integrate product and process designs
- Scrap and rework reduced by as much as 75 percent through product and process design optimization

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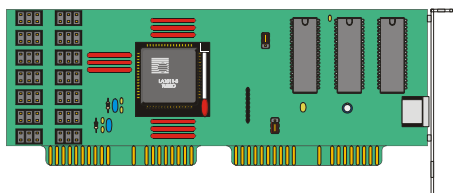
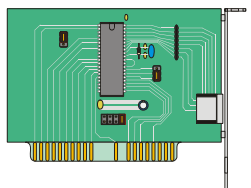
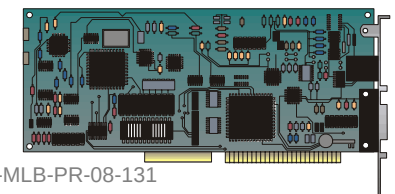
[Winner, 1988]

Example of Lifecycle Optimization

- A Telephone Switch had three different processing functions (monitor & control, switching, digital signal processing)
- The development process produced three optimized designs, with a different circuit board type for each function - i.e., 3 separate cards
  - Manufacturing processes would need to support 3 builds (different circuit board production, set up of component insertion, solder masking, etc.
  - Support processes would need to support the different cards - spare boards for on-site support, different depot level maintenance, test fixtures, technical manuals describing the different boards, etc.
- Concurrent engineering to optimize development, manufacturing and support lead to a single processor board, that could accomplish all three processing functions
  - Higher development costs, but lower manufacturing and support costs







Summary

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- The DoD IPPD Handbook defines IPPD in three parts:
  - Integrated Teaming
  - Shared Vision
  - Concurrent Engineering
- CMMI®-DEV+IPPD allows an IPPD implementation without concurrent engineering which will yield some benefits
- However, adding concurrent engineering provides the capability to optimize across all lifecycle processes during the development lifecycle process when the cost is lower
- Not developing processes concurrently with the product results in utilizing an inefficient manufacturing and support process or causing a redesign of the product, which could potentially wipe out any other cost reductions achieved through the application of other IPPD principles [IPPD Handbook, 1998]

- IPPD Principles:
  - Integrated Teaming
  - Shared Vision
  - Concurrent Engineering

Takes all three!

Questions?

References

- [DoD IPPD Handbook, 1998]
  DoD Integrated Product and Process Development Handbook, August 1998. section 1.2.2 Concurrent Development of Products and Processes (Dated 1998)
- [DoD IPPD Guide, 1996]
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- [Winner 1988]
  The Role of concurrent Engineering In Weapons Systems Acquisition, Robert Winner, James Pennell, Harold Bertrand, Marko Slusarczuk. December 1988. Institute for Defense Analysis Report R-338
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