Supporting Innovation Networks with Continuous Process Improvement

A PLM Approach to NPDI for Global Electronics Manufacturing

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Product Marketing, UGS PLM, Tecnomatix

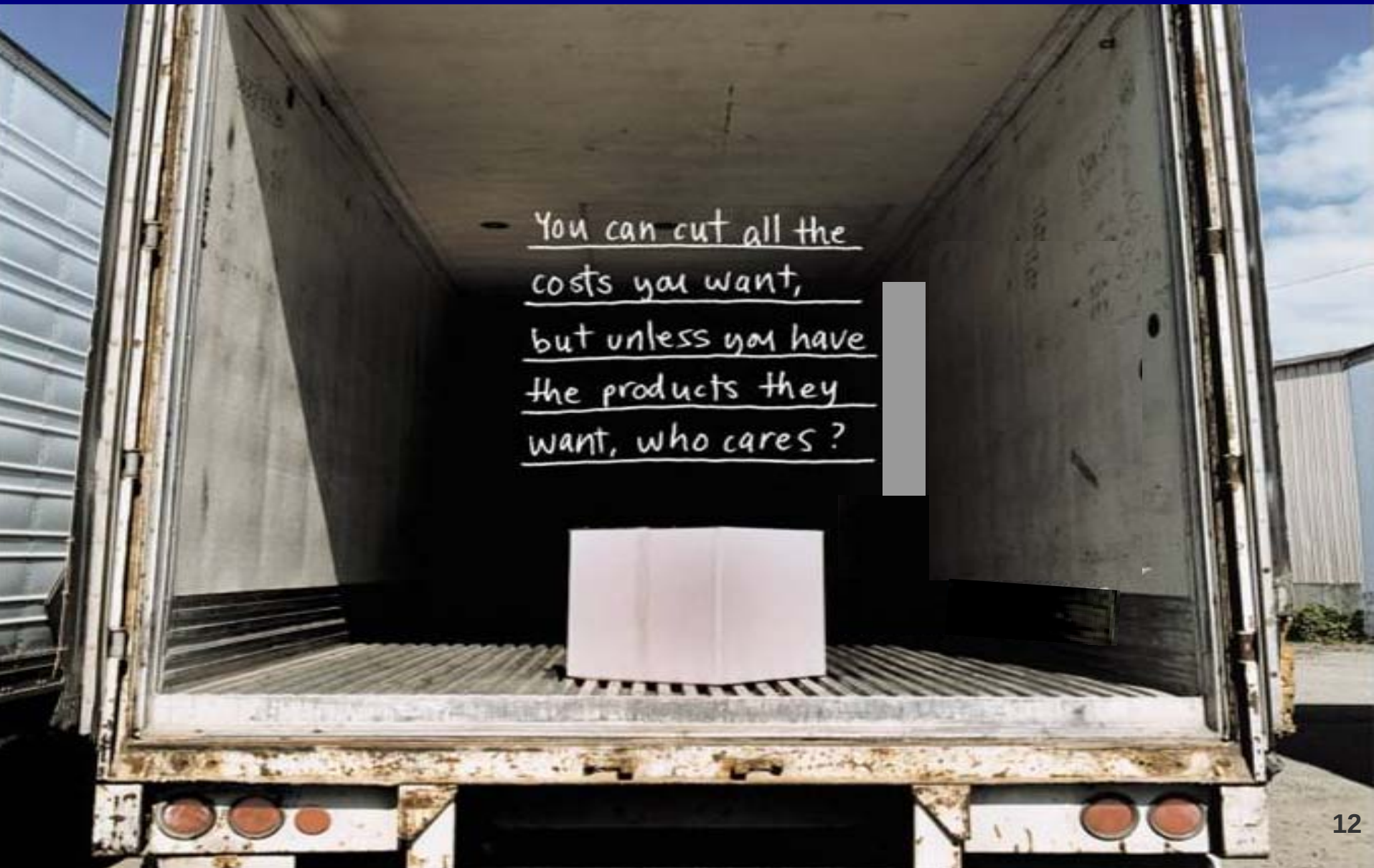
Premium Partners:

Agenda

- Business Drivers
- Innovation Networks for High Tech & Electronics Manufacturing
- The NPI process for High Tech
- Continuous Process Improvement (CPI) Definition & Goals
- CPI Opportunities in the NPI process
- Case Study
- Conclusion

The UGS Value Proposition

Accelerating Growth & Innovation



The UGS Value Proposition

Accelerating Growth and Innovation

While companies are outsourcing many aspects of their business, the core of a company's value remains the same….. **Its Products**

New Product Development & Introduction

The process by which organizations conceive, develop, <u>MANUFACTURE</u> & commercialize new products and services.

It impacts...

- Customer needs assessment; product idea creation; concept outline & testing; **manufacturing feasibility assessment; design & validation: manufacturing ramp up**; promotion/sales/marketing planning; service & support planning
- Ideas leads invention which leads innovation

Why is speed to market important?

Its not just about beating competition.

- Shorter product lifecycles results in higher rates of commoditization and price erosion
- Faster to market means the ability to catch premium prices

[consumer electronics has] dramatically shorter product lifecycles (e.g. From 1 year to 3-6 months) and price erosion (7% per year), requiring new and different processes, systems, and change management capabilities. For example, every six months 30% of the average consumer electronics product portfolio is replaced, so flexibility is mandatory to continually change production.

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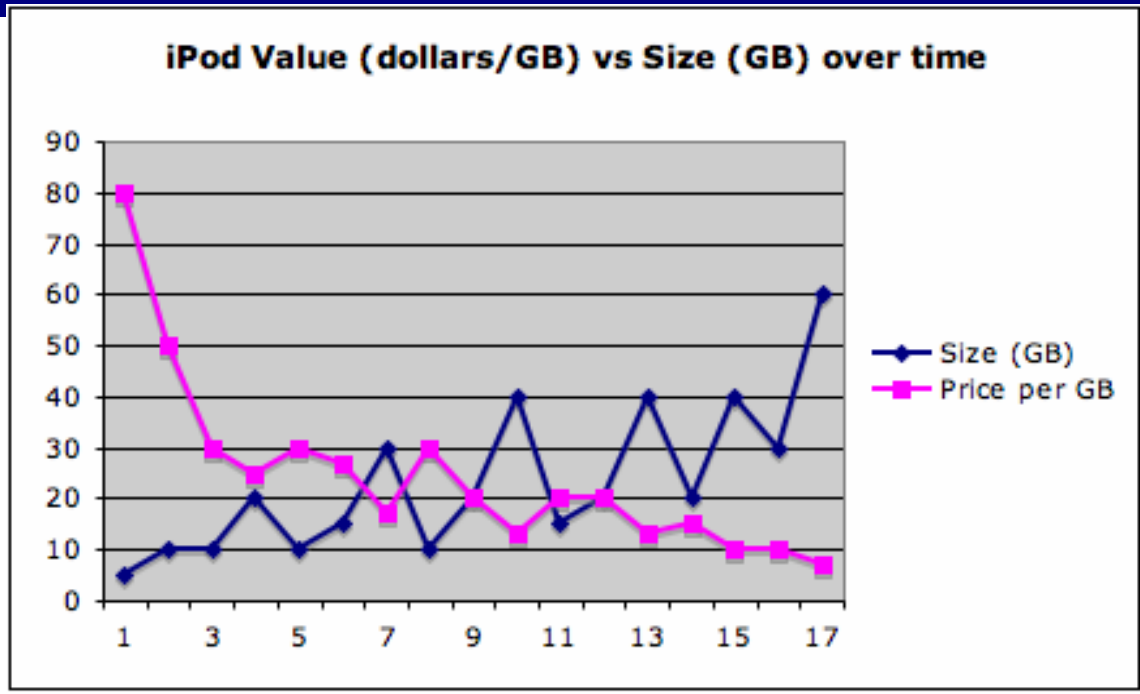
Commoditization of Consumer Electronics: The iPod Story



Generation	Size (GB)	Price ($)	Price per GB
1	5	$400	$80
5	60	$400	$7

Source: James R. Stoup, “How Much Cheaper is the iPOD Going to Get” from www.applematters.com

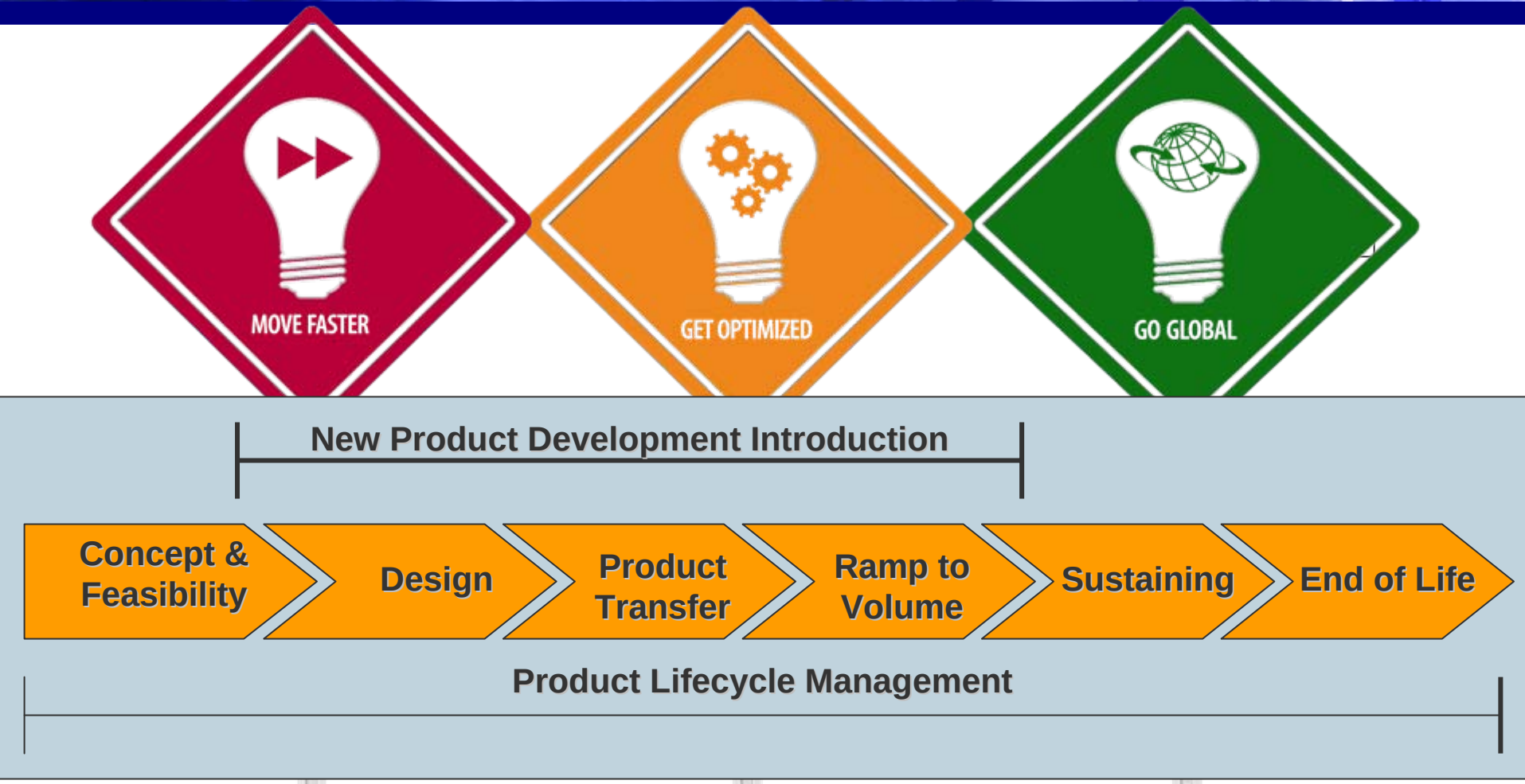
What is the Innovation Network for High Tech and Electronics Manufacturing?

OEM's: Brand owners. Outsource a portion or all of their manufacturing. Examples include: Cisco, IBM, Nokia, Eriksson, HP, Dell.

ODM's: Provide design and manufacturing services, will also market products under their own brand. Examples include: BenQ, Wistron, Asus, Quanta, Lite-On, Mitac, Inventec.

EMS: Provide manufacturing and supply chain services. Do not own any brands on their own right. Examples include: Flextronics, Solectron, Jabil, Celestica, Sanmina-SCI

The NPDI Cycle for High Tech & Electronics*



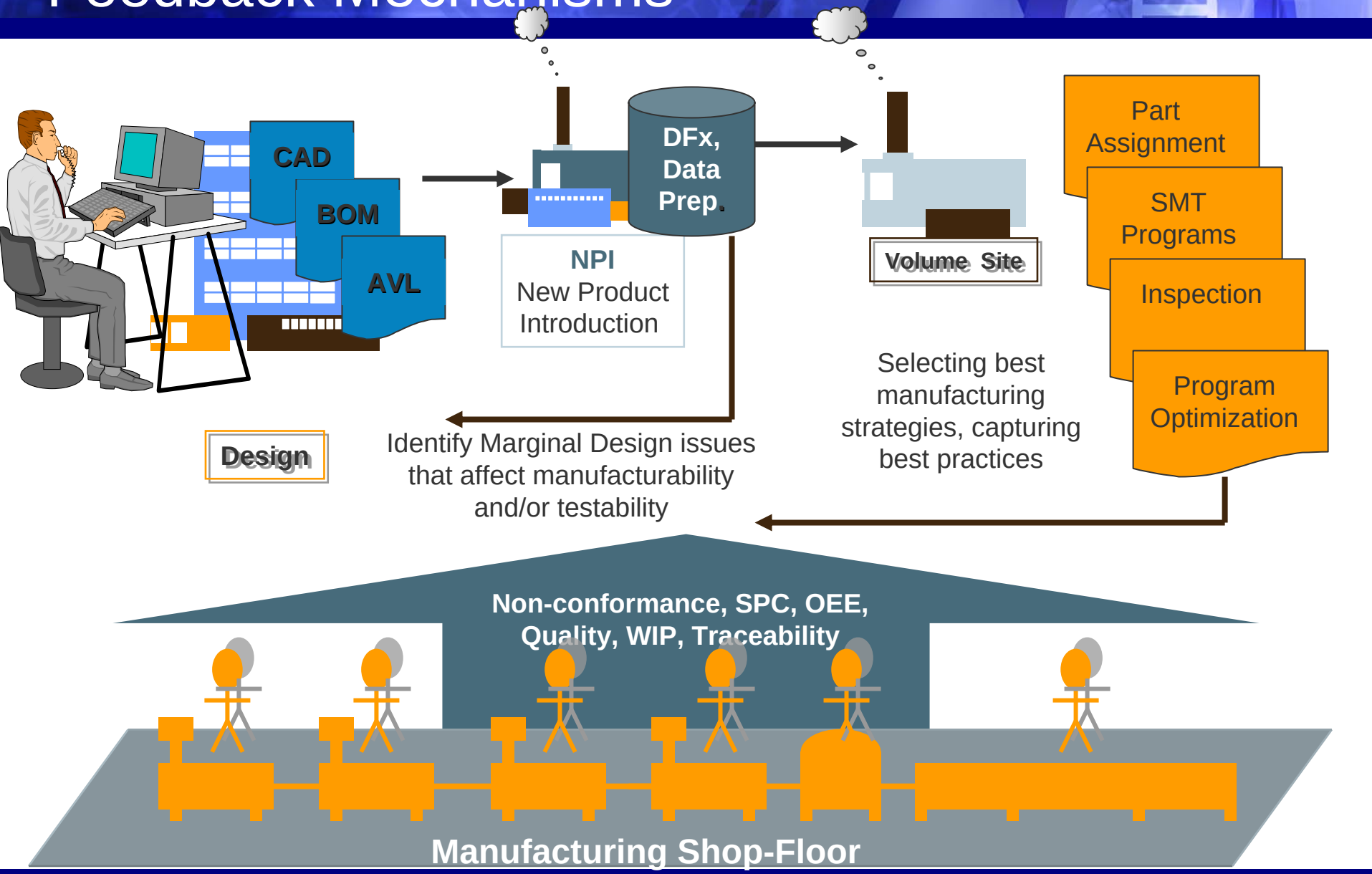
* Accenture View

The Continuous Process Improvement Initiative

- **Continuous Process Improvement (CPI) drives manufacturing organizations to constantly fine tune processes with the net result of**
  1. **Compressing NPI cycles that lead to faster production launch**
  2. **Eliminate process defects that improve the quality of the process design and increase first pass yields**

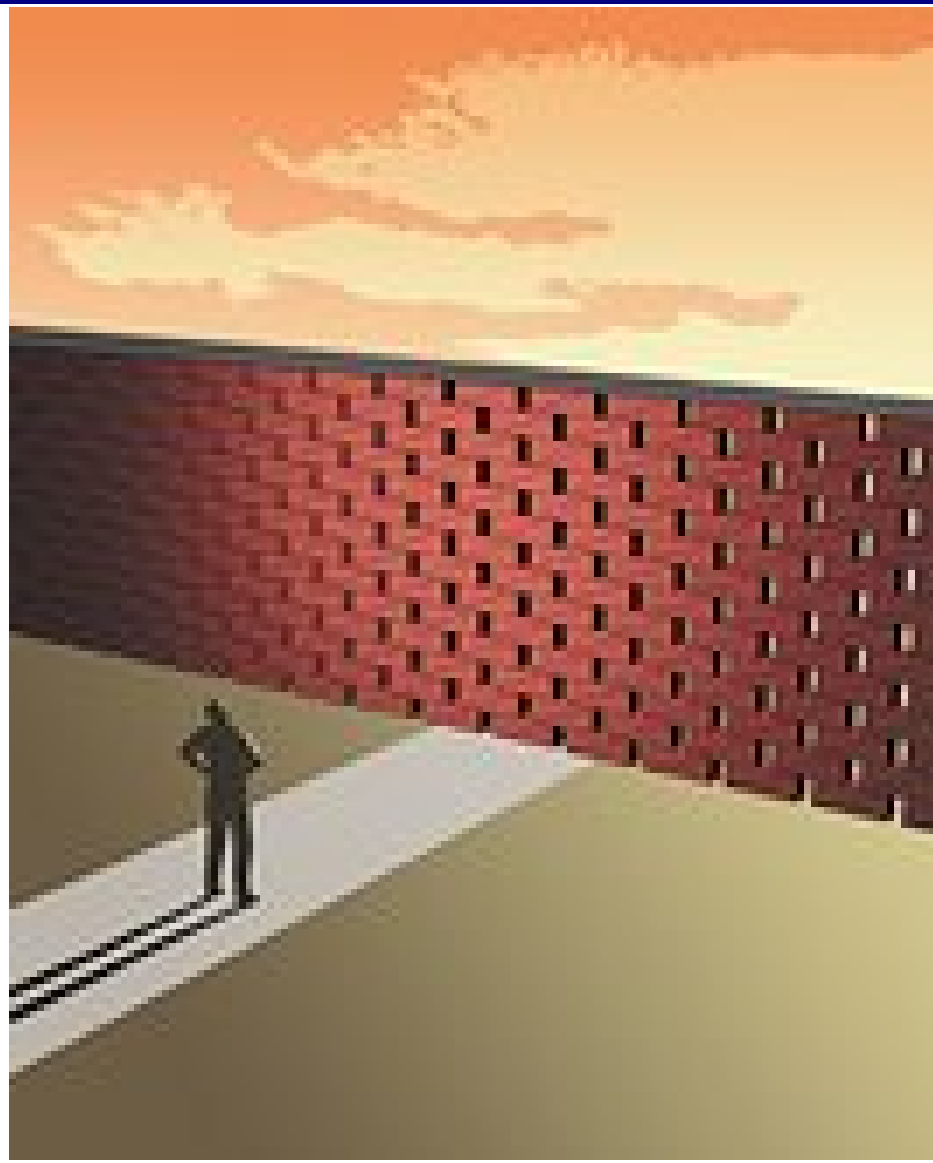
CPI = Process Compression with Improved Process Quality through the reduction of NON-VALUE ADDED Activities

Continuous Process Improvement Feedback Mechanisms



Barriers to CPI initiatives for PCB Assembly NPI

- Inability to leverage CAD
- Insufficient development of rule-sets
- Inflexibility when developing process plans
- Missing resource and part libraries
- Need to develop individual machine programs for mixed lines
- Use of non-dedicated tools for developing work instructions and manufacturing documents

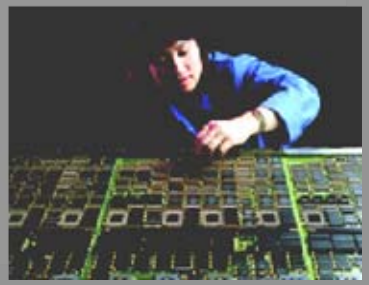


NPI process for PCB Assembly Goals

DFx Analysis	Convert CAD	Verify BOM	Compare BOM to CAD	Assign Parts	Generate and Optimize Machine Programs	Debug and Fine Tune	Visual Aids & Work Instruct	Setup sheets and kitting	Hand Assembly

Continuous Process Improvement Goals

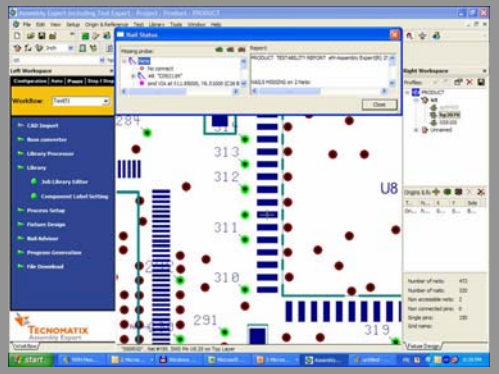
- Reduce NPI Durations by automating process design
- Reduce NPI errors by eliminating process defects
- Maximize resource utilization
- Convert process gains to manufacturing uptime and increased revenue opportunity



CPI opportunities for DFx

DFx Analysis	Convert CAD	Verify BOM	Compare BOM to CAD	Assign Parts	Generate and Optimize Machine Programs	Debug and Fine Tune	Visual Aids & Work Instruct	Setup sheets and kitting	Hand Assembly

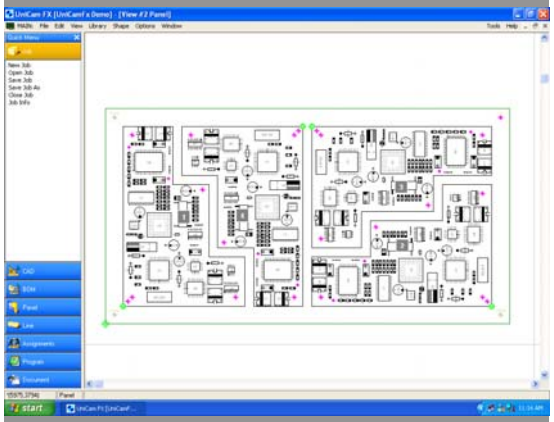
- Assure board can be assembled against user defined manufacturing constraints
- Eliminate marginal design issues upfront
- Assure sufficient test coverage and select test strategies before fixture investments
- Develop and maintain rule sets



CPI opportunities for CAD

DFx Analysis	Convert CAD	Verify BOM	Compare BOM to CAD	Assign Parts	Generate and Optimize Machine Programs	Debug and Fine Tune	Visual Aids & Work Instruct	Setup sheets and kitting	Hand Assembly

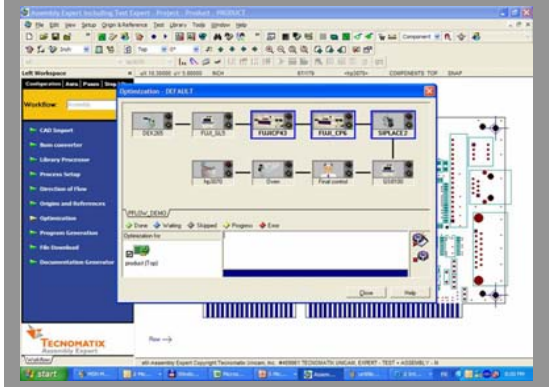
- Utilize native CAD in process design
- Assure correct BOM version introduced
- Merge BOM to CAD, assure there are discrepancies between versions

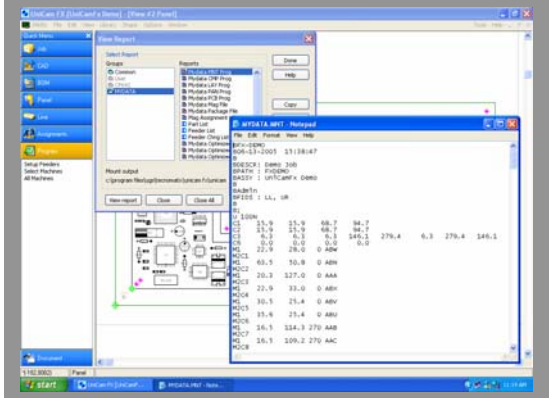


CPI opportunities for Part Assignment

DFx Analysis	Convert CAD	Verify BOM	Compare BOM to CAD	Assign Parts	Generate and Optimize Machine Programs	Debug and Fine Tune	Visual Aids & Work Instruct	Setup sheets and kitting	Hand Assembly

- Assign components and processes
- Configure lines and operations
- Define workflow
- Visually represent the manufacturing process
- Compare alternative scenarios
- Facilitate transfer between lines and sites

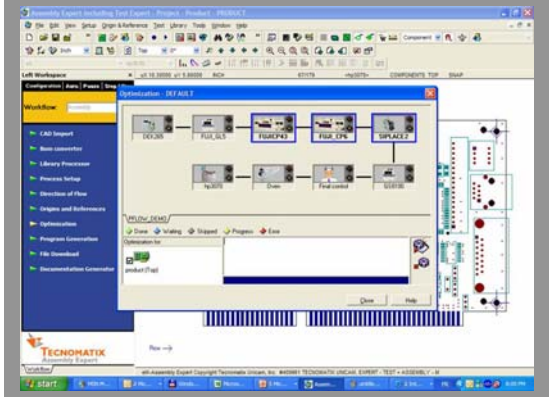


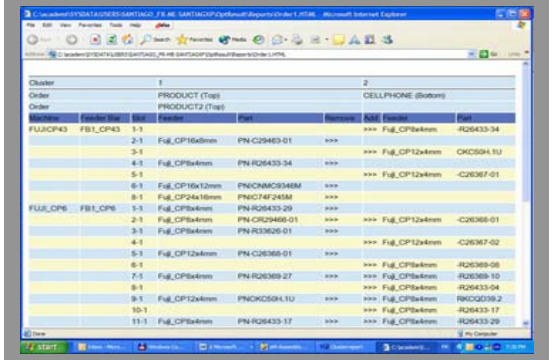


CPI opportunities for Programming and Optimization

DFx Analysis	Convert CAD	Verify BOM	Compare BOM to CAD	Assign Parts	Generate and Optimize Machine Programs	Debug and Fine Tune	Visual Aids & Work Instruct	Setup sheets and kitting	Hand Assembly

- Balance lines and optimize placement paths
- Cluster jobs for common setup
- Generate recipes
- Fine-tune for additional balancing opportunities

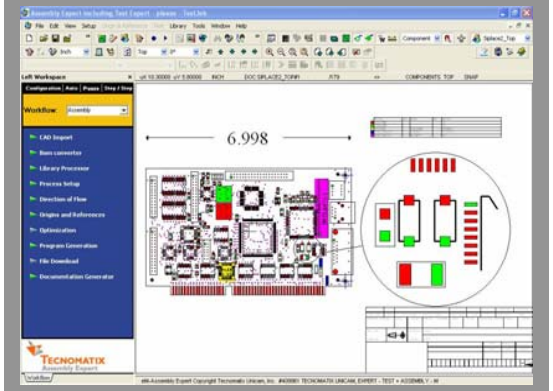


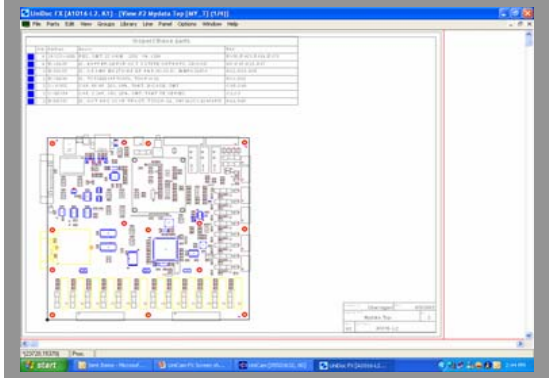


CPI opportunities for Documentation

DFx Analysis	Convert CAD	Verify BOM	Compare BOM to CAD	Assign Parts	Generate and Optimize Machine Programs	Debug and Fine Tune	Visual Aids & Work Instruct	Setup Sheets and Kitting	Hand Assembly

- Hand insert instructions
- Manufacturing documents
- Kitting and setup sheets
- Visual aids
- Debugging





CPI Case Study

RENISHAW
apply innovation™

- Renishaw is a UK based provider of CMMs (Coordinate Measuring Machines) and Digitizing Systems (gathering data from undefined 3D surfaces).

CPI Goal: Reduce time to check and convert design data for use in manufacturing

As Is Process:

1. Design is released to Manufacturing
2. Recover eCAD & BOM to create the Assembleon (SMT platform) programs via PPS-Pro (1 time)
3. Recover eCAD & BOM to create the Mydata Programs via Mydata Software (2 times)
4. Recover eCAD & BOM to create the IFR program (3 times)
5. Maintain 3 different types of jobs and libraries
6. No connection to Teamcenter to save the Jobs
7. For each ECN, the process start again on step 2

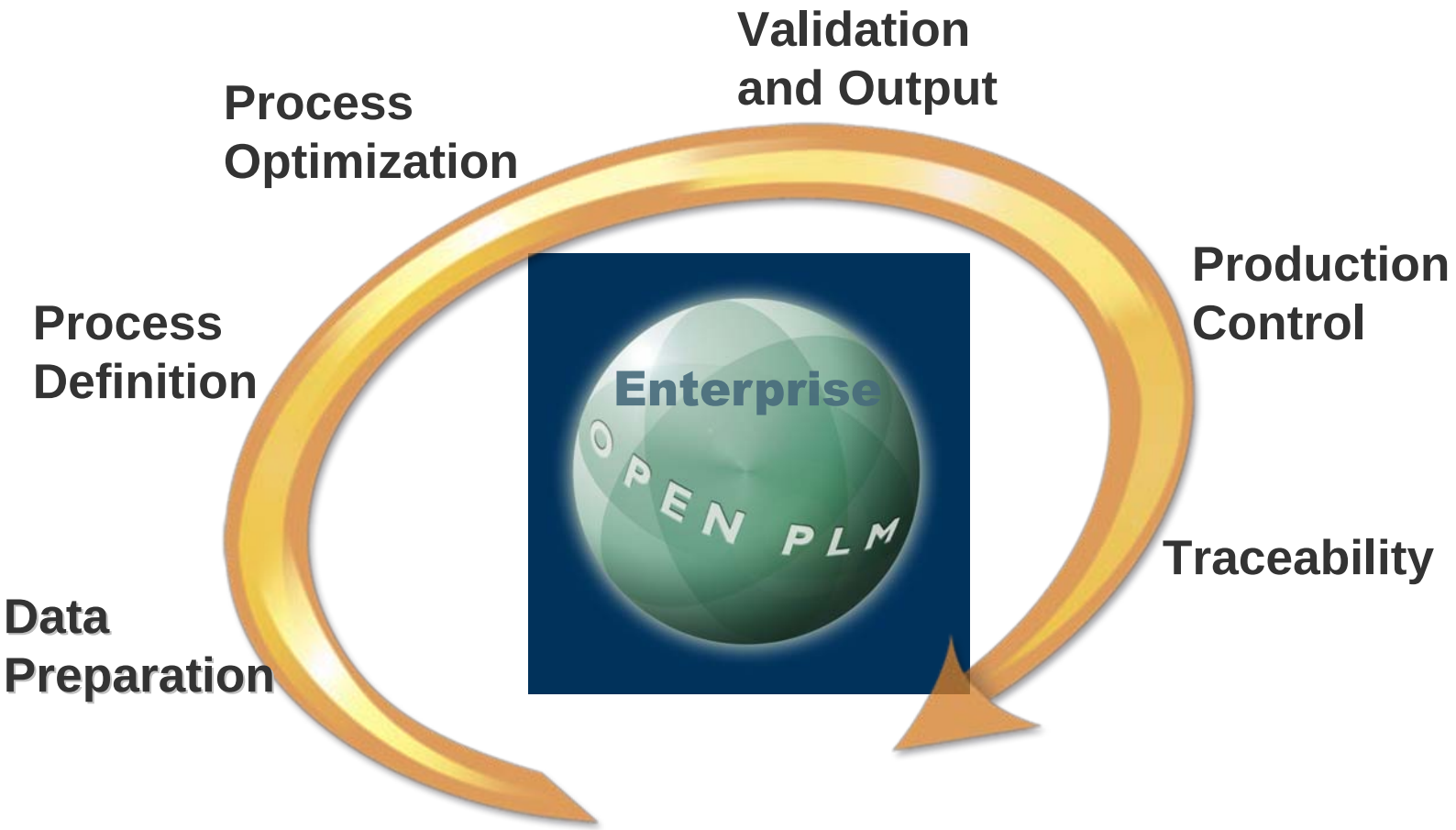
To be Process:

1. Design is released to Manufacturing
2. Recover eCAD & BOM to create Assembleon, Mydata & IFR Machine program (1 time process)
3. Save 1 type of job and libraries within Teamcenter
4. For Each ECNs, the process can start on step 2

CPI Enablers at Renishaw

- Single programming tool for supporting three different SMT machine platforms
- Unify three different jobs into a single database
- Capture and maintain manufacturing jobs in PLM platform (Teamcenter)
- Streamline ECN introductions – utilize single database

UGS Digital Manufacturing Solutions for PCB Assembly and Test



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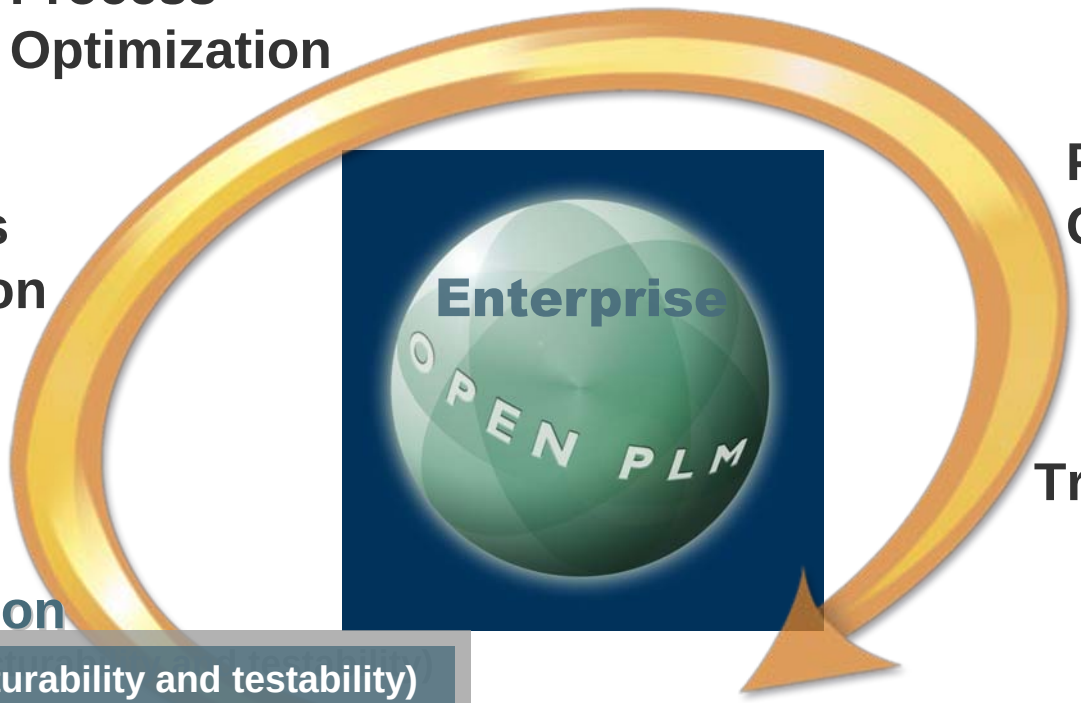


Validation and Output

Process Optimization

Production Control

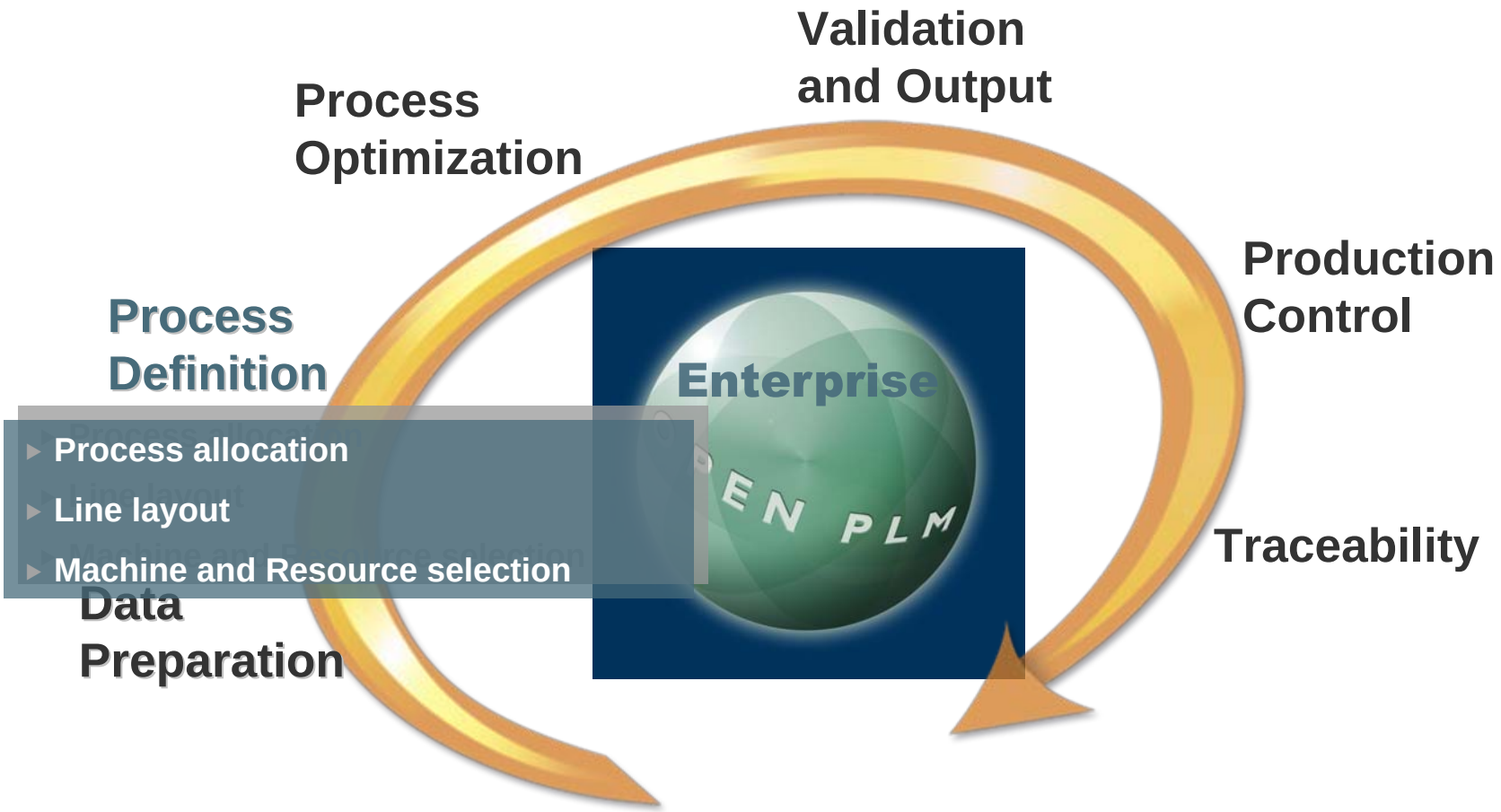
Process Definition

Traceability

Data Preparation

- DFx (manufacturability and testability)
- CAD & BOM merge
- Discrepancy checks
- Job and Revision Management

UGS Digital Manufacturing Solutions for PCB Assembly and Test



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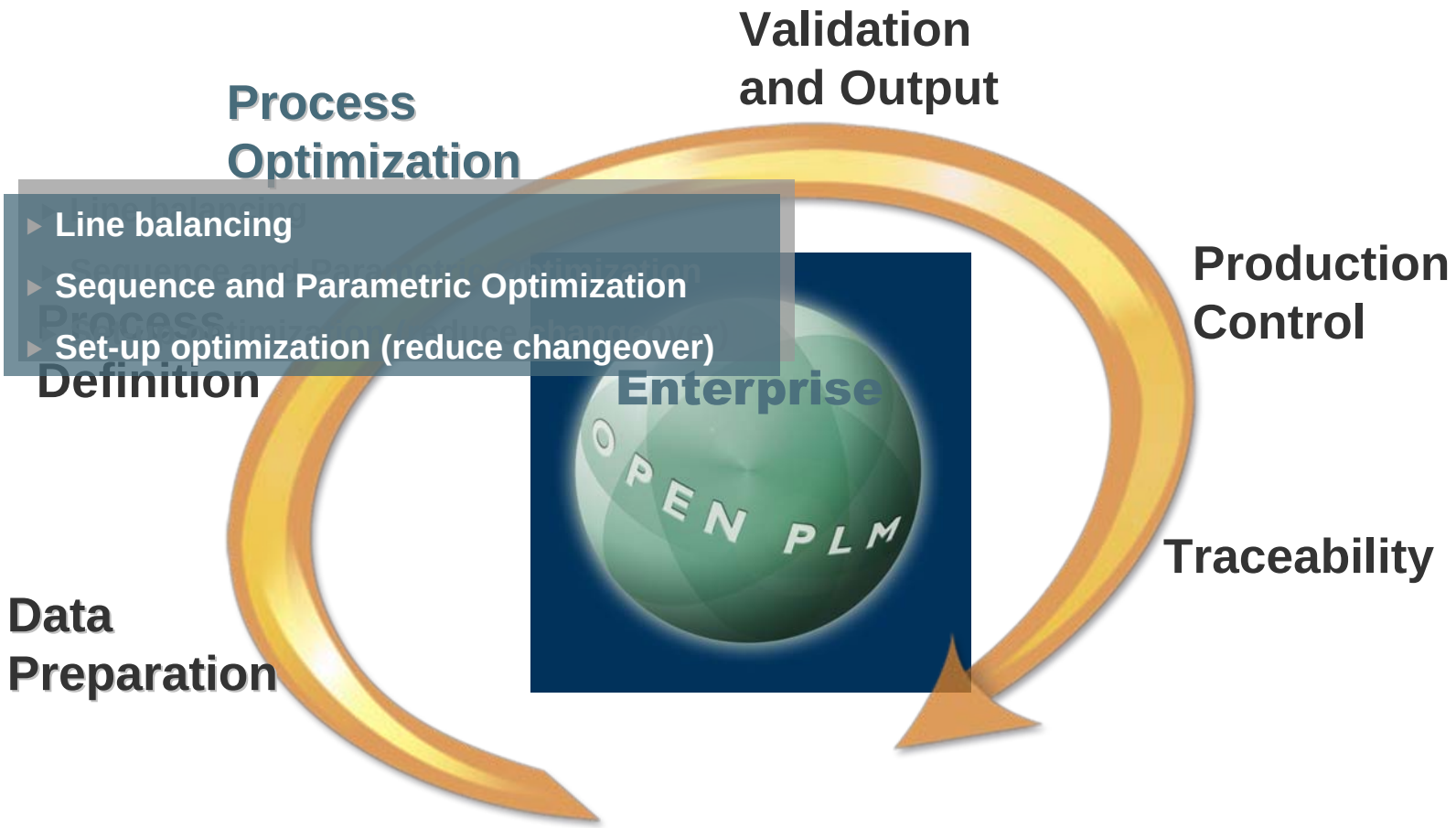

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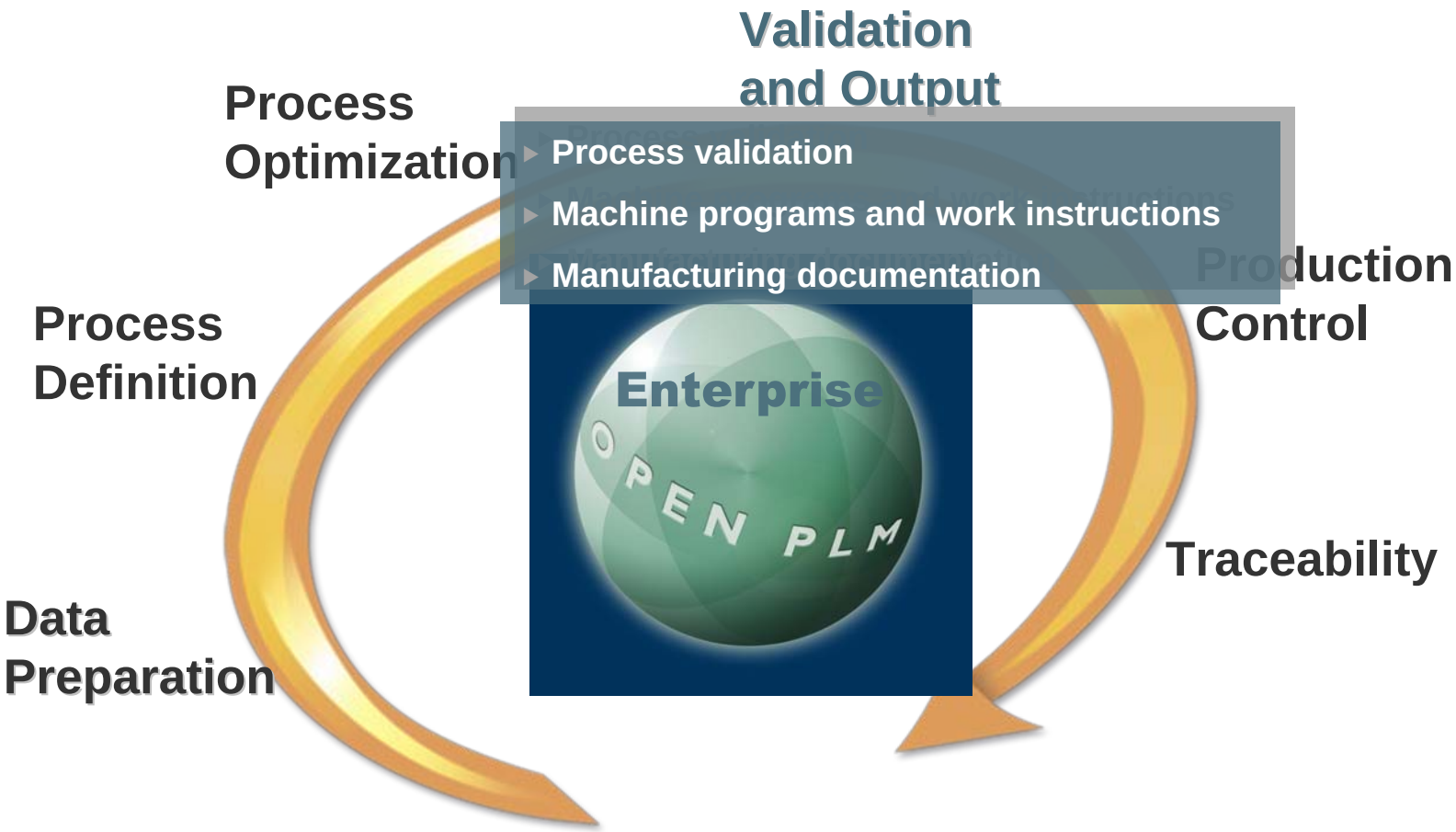

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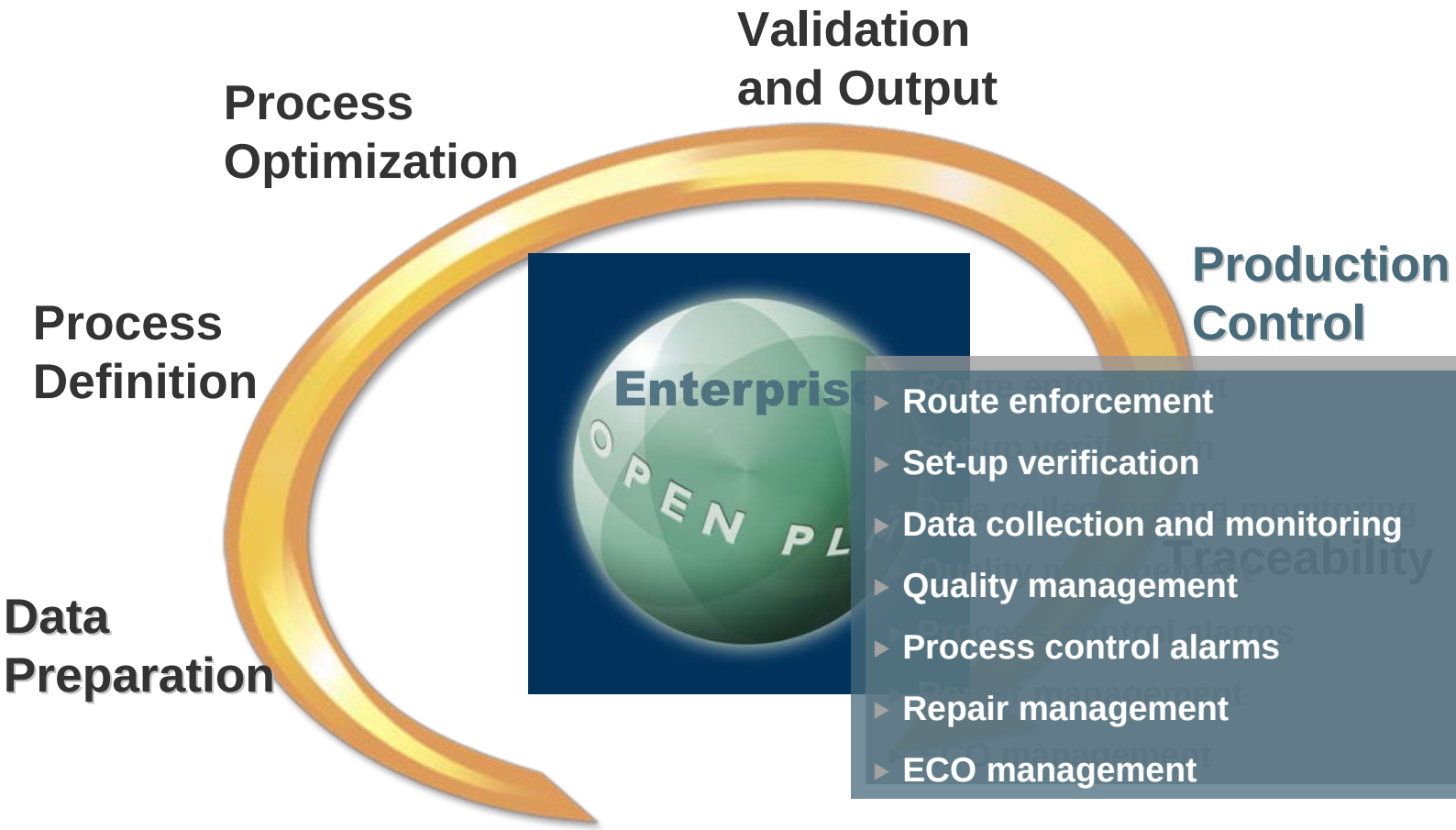

- Route enforcement
- Set-up verification
- Data collection and monitoring
- Quality management
- Process control alarms
- Repair management
- ECO management

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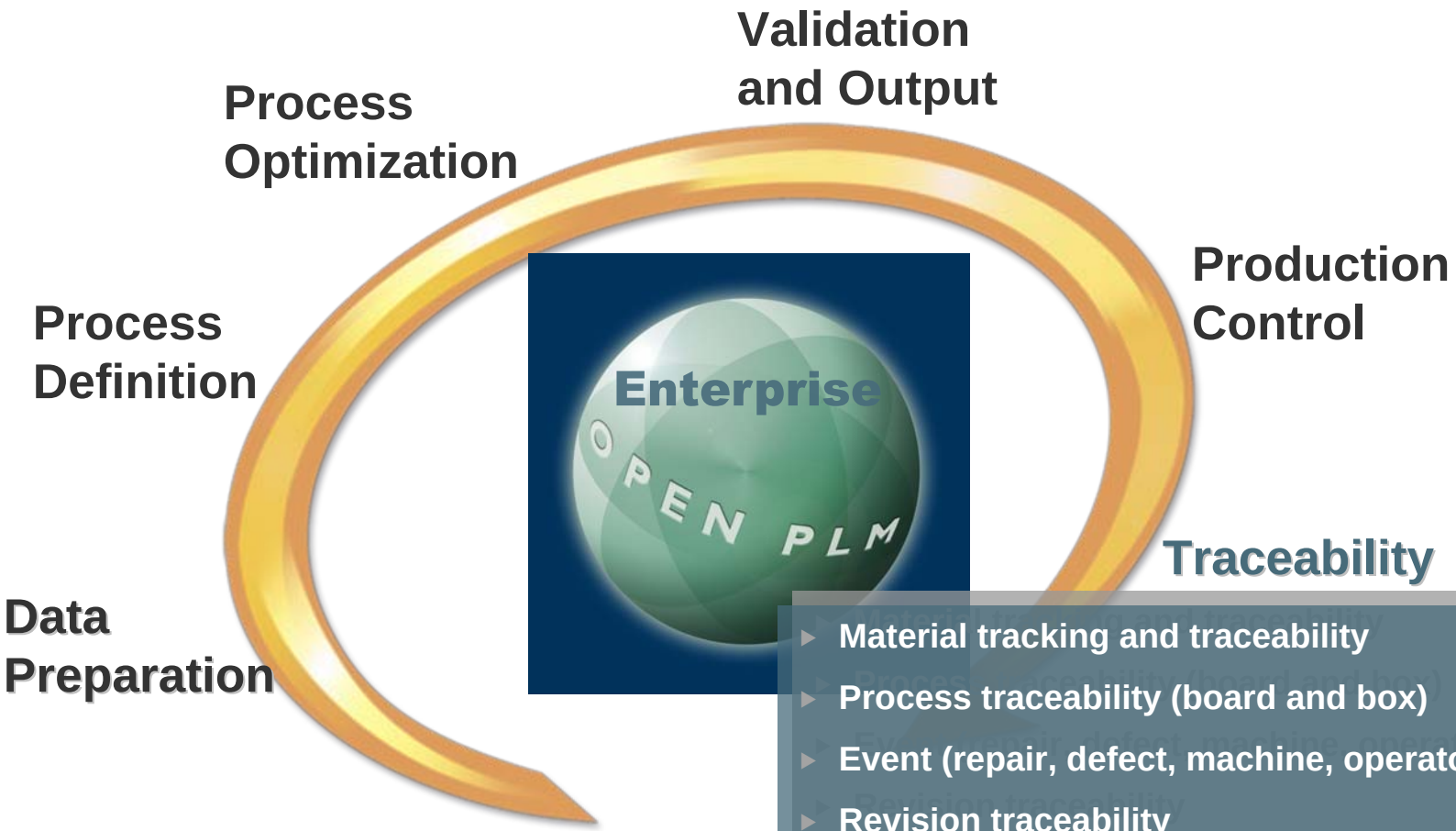
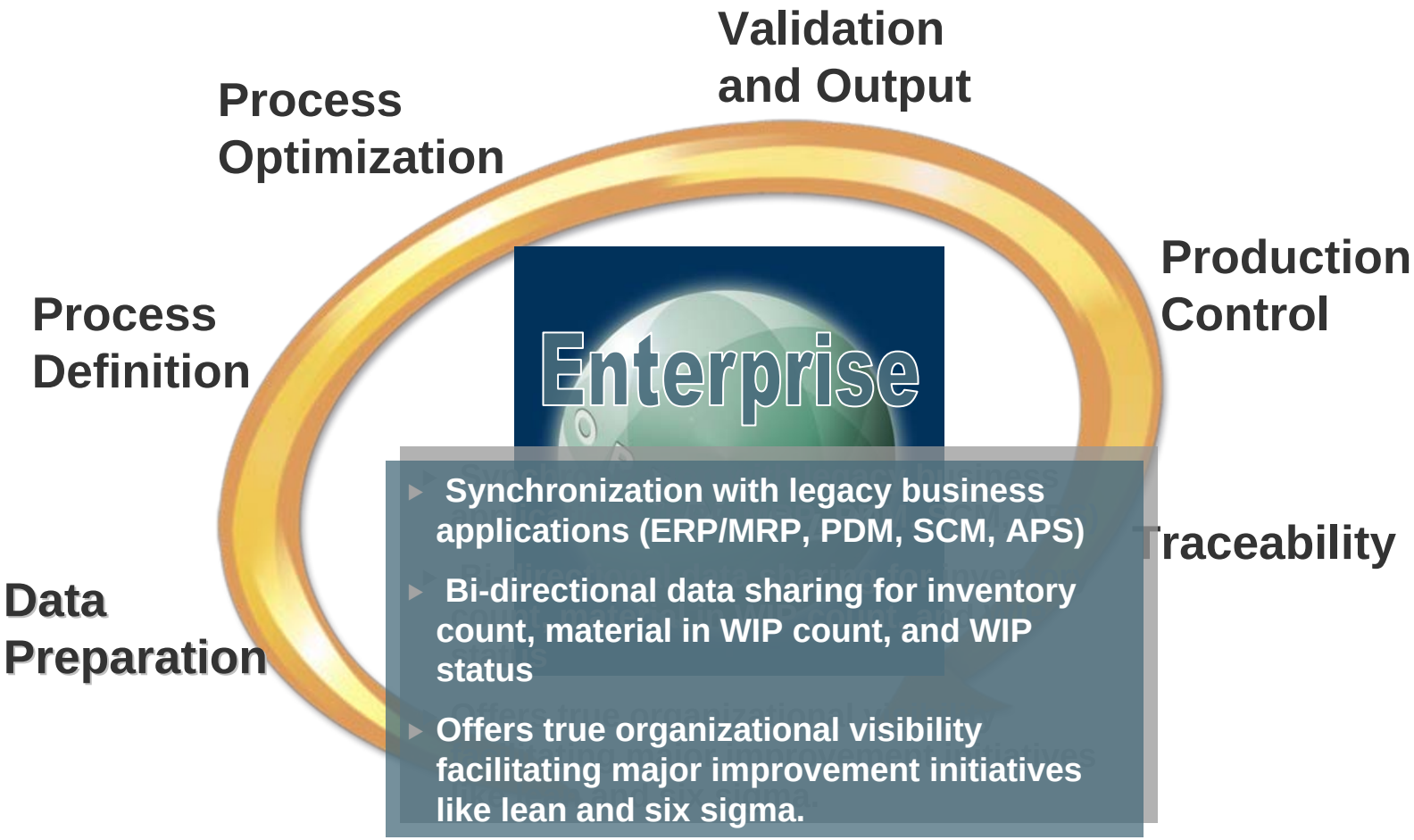


Traceability

- Material tracking and traceability
- Process traceability (board and box)
- Event (repair, defect, machine, operator)
- Revision traceability
- Compliance support (environmental and safety such as RoHS and Tread Act)

UGS Digital Manufacturing Solutions for PCB Assembly and Test



Summary

- Manufacturing feasibility and process design is critical part of the NPDI process
- Taking a CPI approach regarding NPI enables “Speed to Market”
- CPI barriers result from disparate and non-dedicated tools for process planning
- CPI initiatives will:
  - Shorten NPI Durations
  - Improve Process Quality
  - Reduce non-value added activities

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- Bullet 1
- Bullet 2