Measuring the Impact of Product Lifecycle Management: An Assessment Model and Metrics Framework

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Introduction

• Measure the impact of PLM
  – How well are we PLMing?
  – Can we enhance the traceability of our PLM investments?
PLM Metrics Project

– Define an Assessment Process

– Define a Metrics Framework
Assessment Model
PLM Assessment Process Model

1. Goals
2. Metrics (Impact Measurement)
3. Methodology (Data Collection)
4. Procedures (Data Use)

Strategic Plan
Metrics Framework
PLM/Lean Thinking
Savings due to *Waste Reduction*

- To all aspect of a product’s life
  - *Plan/design*
  - *Build*
  - *Support*
  - *Removal/dispose*

- Integrated, information-driven approach to reducing wastes associated with
  - *Time*
  - *Energy*
  - *Materials*

- Across
  - *People*
  - *Processes and practices*
  - *Technology*

PLM – Next Generation Lean
Revenue Generation due to *Innovation*

- Provides opportunities to reallocate captured resources toward *innovation*
  - Functionality
  - Quality

- Across
  - *Product*
  - *Process*

# Product’s Lifecycle

<table>
<thead>
<tr>
<th>Build</th>
<th>Support</th>
</tr>
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<tbody>
<tr>
<td>Plan/Design</td>
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The lifecycle of a product includes stages such as build, plan/design, support, and dispose. The process flows from build to support to dispose, with bidirectional movement between plan/design and dispose.
Information Characteristics About a Product/Process

- **Singularity** – unique and controlling version of the information
- **Correspondence** – link between actual and virtual representation
- **Cohesion** – integration of various views/schematics/descriptions
- **Traceability** – chronological ordering of all documents through time
- **Reflectivity** – changes in virtual representation reflect actual changes and vice-versa
- **Cued Availability** – having the right information available when needed

### Information Characteristics Reflected in PLM Metrics

<table>
<thead>
<tr>
<th>Build</th>
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<tbody>
<tr>
<td>Singularity</td>
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</tr>
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<td>Correspondence</td>
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</tr>
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</tr>
<tr>
<td>Traceability</td>
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<td>Reflectivity</td>
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# Waste Reduction Framework (per phase)

<table>
<thead>
<tr>
<th>PLM Elements</th>
<th>People</th>
<th>Process/Practices</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste/Reallocation Components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
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</tbody>
</table>
# Plan/Design Phase

## Waste Reduction Metrics

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<tr>
<td>Waste Components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>• Time to locate information</td>
<td>• Number of times designs are reused</td>
<td></td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>• Amount of energy used to support face to face meetings</td>
<td>• Amount of energy required to sustain a manufacturing line</td>
<td>• Amount of energy spent in distribution of parts to sub-assemblies</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td></td>
<td>• Amount of inventory</td>
<td>• Number of times raw material is delivered correctly</td>
</tr>
</tbody>
</table>
**Innovation Framework** (per phase)

<table>
<thead>
<tr>
<th>PLM Elements</th>
<th>Product</th>
<th>Process</th>
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<tbody>
<tr>
<td>Innovation Components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functionality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality</td>
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## Plan/Design Phase
### Innovation Metrics

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<th>Product</th>
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</thead>
<tbody>
<tr>
<td>Innovation Components</td>
<td>• Number of new features</td>
<td>• Improved process capabilities</td>
</tr>
<tr>
<td>Functionality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>• Improved quality</td>
<td>• Better Quality Management Systems</td>
</tr>
<tr>
<td></td>
<td>• Number of and costs of warranty problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Number and costs of liability problems</td>
<td></td>
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Waste Reduction/Reallocation for Innovation

Objective

Phase

Target Area

Key Performance Indicator

Business Performance Benefits
- Organizational Benefits
- User Benefits
- Product or Service Benefits
- Process Benefits

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Generate New Business Opportunities
- Quality Management Systems
- Innovation/Adaptability/Management
- Support of Entire Lifecycle
- Improved Business Cycle Time

Improve Corporate Communications
- Organizational Change
- Reliance on Paper
- Integration of Software Tools
- Standard Design Catalogs

Standardized Data Source
- User Search Capabilities
- People Benefits

Faster Customer Response Time
- Management of Product Data
- Reuse of Designs
- Fewer Errors
- Automated, Digital, Information Core

Process Definition
- Document Management
- Engineering Change Management

Objective

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- Engineering Change Management
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<th>Phase</th>
<th>Target Area</th>
<th>Key Performance Indicator</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan/Design</td>
<td>Business Performance Benefits</td>
<td>Generate New Business Opportunities</td>
<td>Number of RFPs responded to</td>
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<tr>
<td></td>
<td></td>
<td>Quality Management Systems</td>
<td>Number of RFPs awarded</td>
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<tr>
<td></td>
<td></td>
<td>Innovation/Adaptability/Management</td>
<td>Customer response time</td>
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<tr>
<td></td>
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<td>Support of Entire Lifecycle</td>
<td>Number of new customers captured by new product support</td>
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<tr>
<td></td>
<td></td>
<td>Improved Business Cycle Time</td>
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<tr>
<td></td>
<td>User Benefits</td>
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<td>Revenue growth</td>
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<td></td>
<td>Product or Service Benefits</td>
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<td>Market share</td>
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<td></td>
<td>Process Benefits</td>
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<td>Number of new customers captured by new products</td>
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<td>Product price paid by customers</td>
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<td>Premiums due to being first-to-market</td>
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<td>Margins</td>
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<td>Number of purchases due to being first-to-market</td>
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<td></td>
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<td>Market capitalization</td>
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Summary
Past, Present, Future

• **Past**
  – Reviewed PLM Literature
  – Conducted Focus Groups
  – Interviewed Industry Experts
  – Developed PLM Assessment Model
  – Developed PLM Framework

• **Present**
  – Creating Metric Model
  – Identifying Metrics
  – Creating Self-Assessment Metric Survey
  – Testing and Revising Metric Survey

• **Future**
  – Conduct Survey Assessment
  – Data Analysis
  – Case Study Results and Conclusions
  – Publications, grants, consulting
  – Develop Diagnostic Tool
References


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