

Product Lifecycle Management Metrics: Phase II

**Update for PLM Advisory Board
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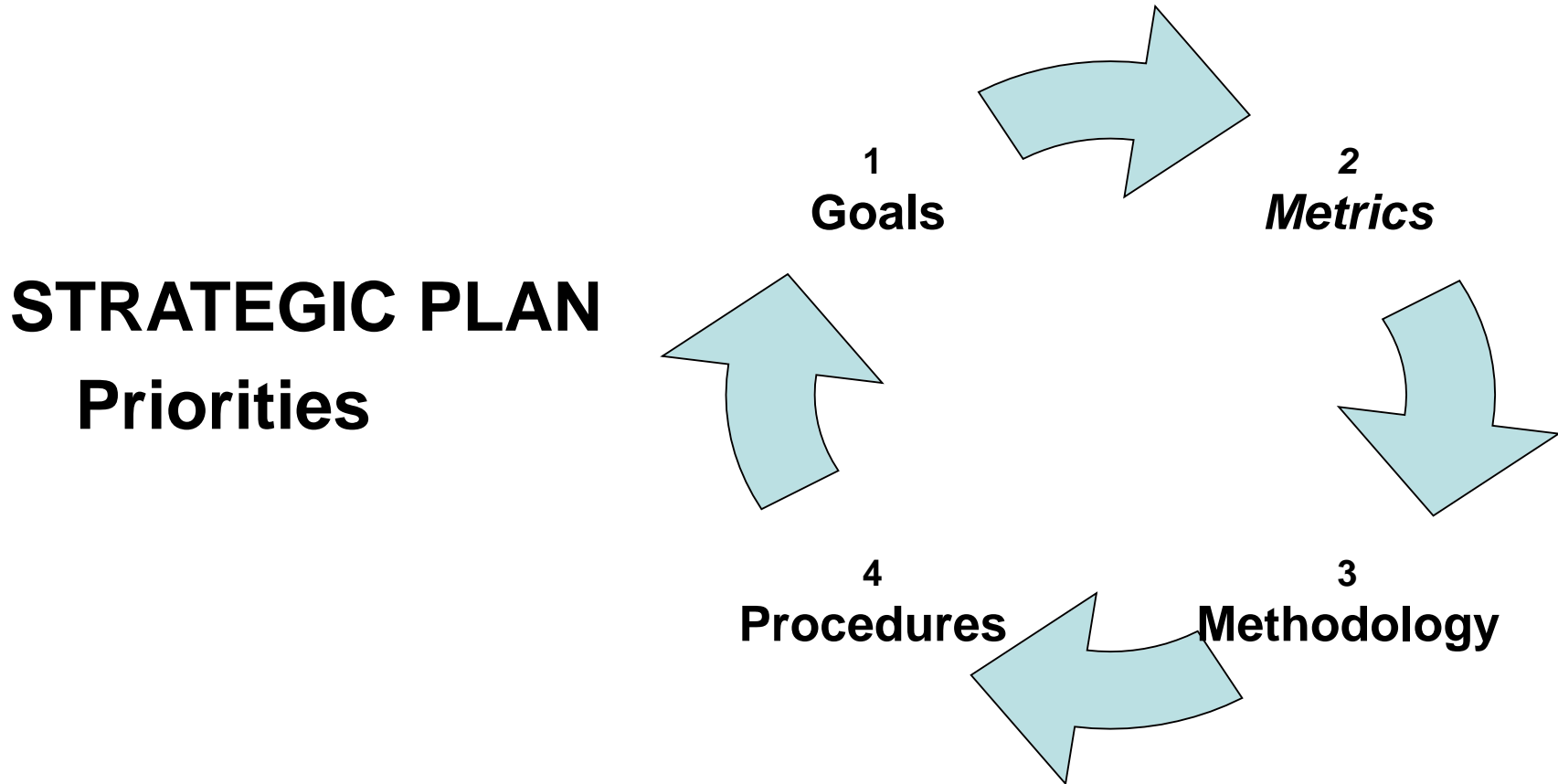
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Introduction

- Assess/measure the impact of PLM efforts
 - How well is the organization “PLMing”?
 - Enhance the traceability of the PLM efforts

PLM Assessment Model

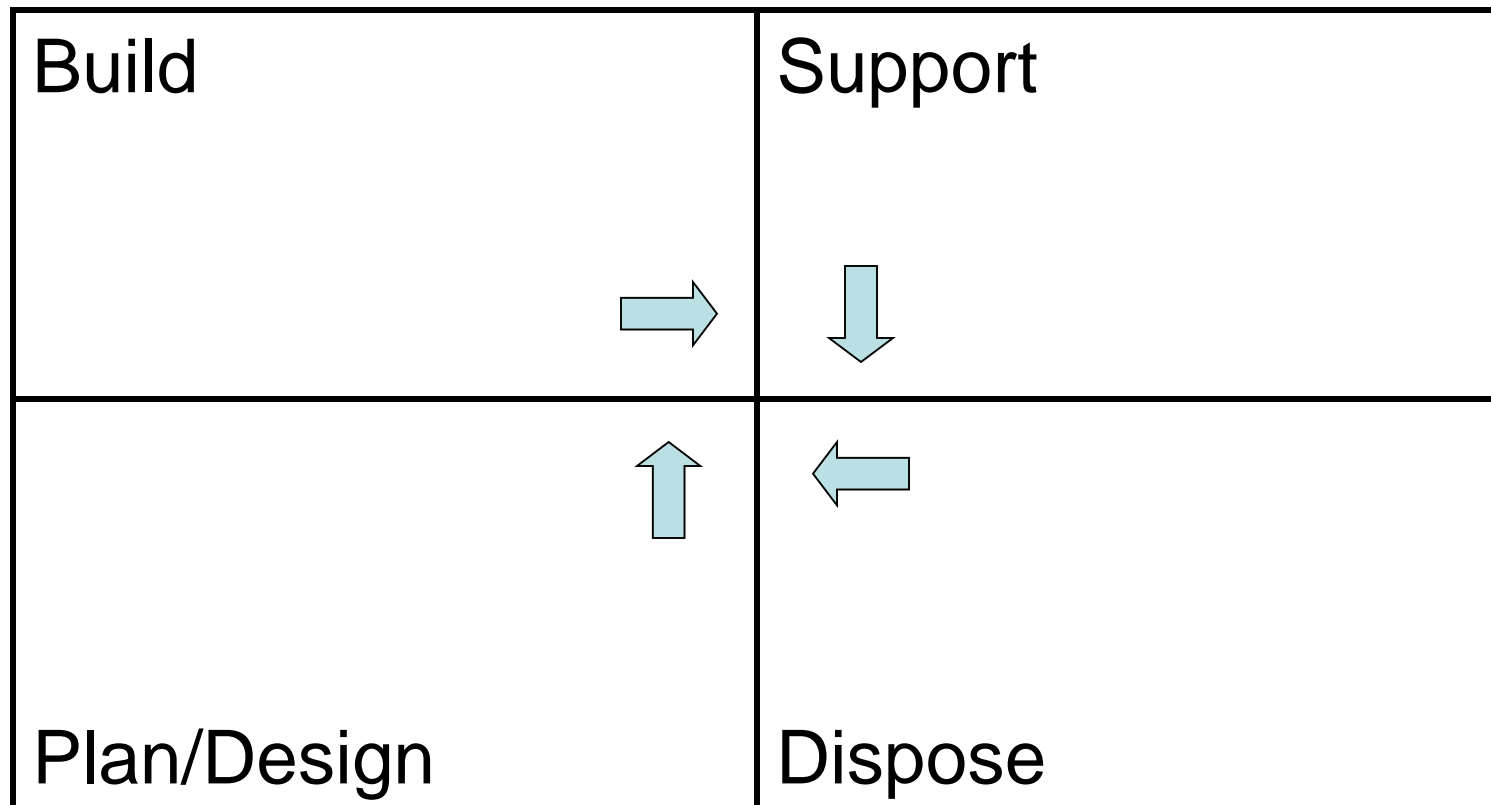


Metrics Framework

PLM Definition

“Product Lifecycle Management (PLM) is an integrated, information-driven approach comprised of people, processes/practices, and technology to all aspects of a product’s life, from its design through manufacture, deployment and maintenance – culminating in the product’s removal from service and final disposal. By trading product information for wasted time, energy, and material across the entire organization into the supply chain, PLM drives the next generation of lean thinking.”

Product Lifecycle



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*

Plan/Design Phase Waste Reduction Metrics

PLM Elements	People	Process/Practices	Technology
Waste Components			
Time	Time to locate information	Number of times designs are reused	
Energy	Amount of energy used to support face to face meetings	Amount of energy required to sustain a manufacturing line	Amount of energy spent in distribution of parts to sub-assemblies
Materials		Amount of inventory	Number of times raw material is delivered correctly

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

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

- Across
 - *Product*
 - *Process*

Plan/Design Phase Innovation Metrics

PLM Elements	Product	Process
Innovation Components		
Functionality	Number of new features	Improved process capabilities
Quality	Improved quality Number of and costs of warranty problems Number and costs of liability problems	Better Quality Management Systems

Survey Development

Targeted Areas, Key Performance Indicators, Metrics

- **Business Performance – 33 metrics**
 - Financial impact (11)
 - Generate new business (4)
 - Quality management systems (8)
 - Innovation/Adaptability (2)
 - Improved business cycle time (8)
 - **Organizational Performance- 35 metrics**
 - Improved corporate communications (10)
 - Organizational change (7)
 - Less reliance on paper (5)
 - Integration of software tools (8)
 - Reuse of designs (5)
 - **User Benefits- 30 metrics**
 - Standardized data source (5)
 - User search capabilities (7)
 - People benefits (18)
 - **Product/Service Benefits – 31 metrics**
 - Innovation (3)
 - Customer response time (4)
 - Manage product data (7)
 - Reuse of designs (5)
 - Fewer errors (5)
 - Automation/standardization of data (7)
 - **Process Benefits – 20 metrics**
 - Process definition (3)
 - Document management (8)
 - Engineering change management (9)
- Total number of metrics: 152
Likert scaled: 1-5

Strategic, Tactical, Plan/Design, Manufacturing, Support, Disposal

- Strategic – 34 metrics
- Tactical – 27 metrics
- Plan/design – 86 items
- Manufacturing – 82 items
- Support (marketing, sales, distribution, customer service) – 70 items
- Removal from service (dispose, reuse) – 65 items

- Total number of metrics: 364
- Likert scaled: 1-5

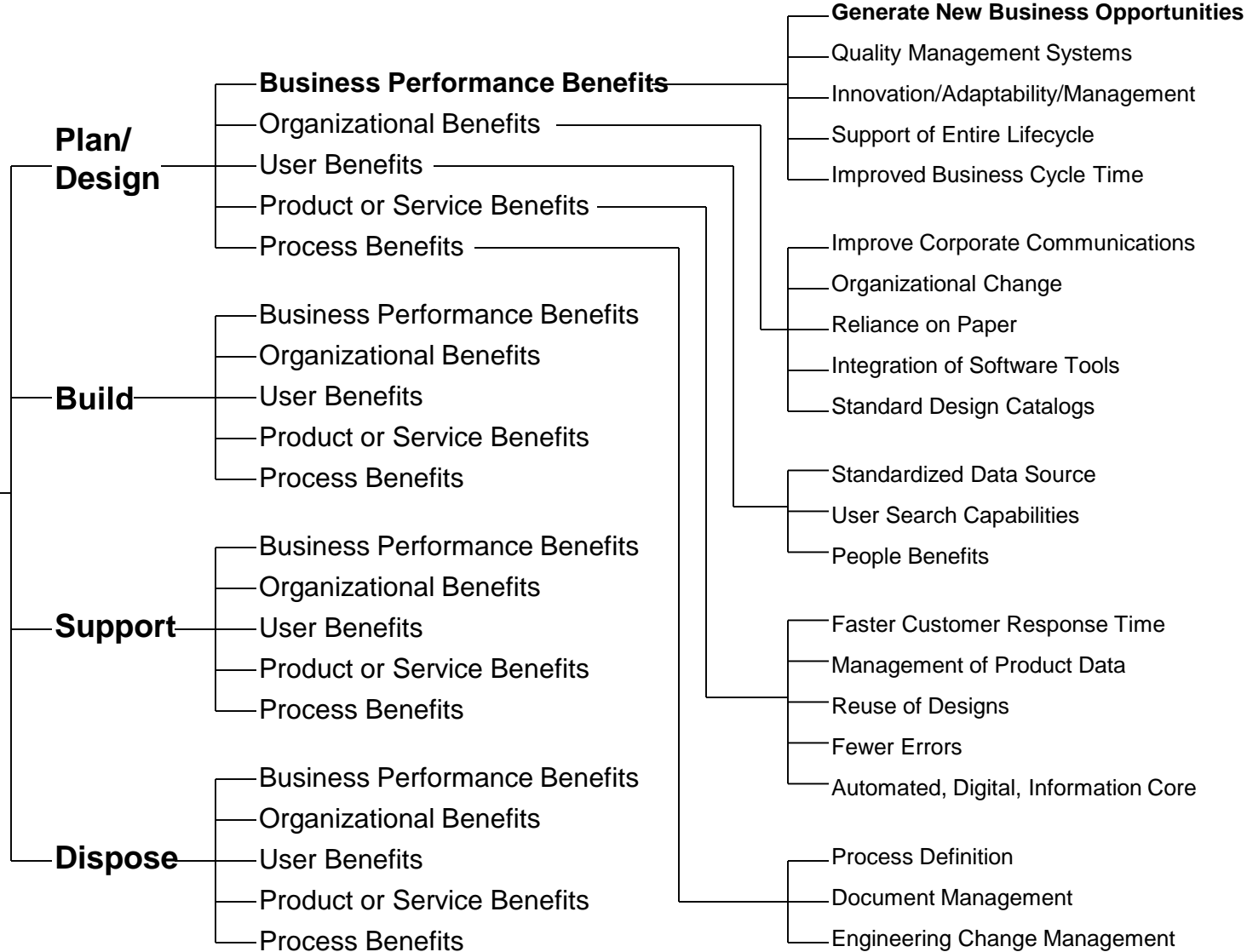
Objective

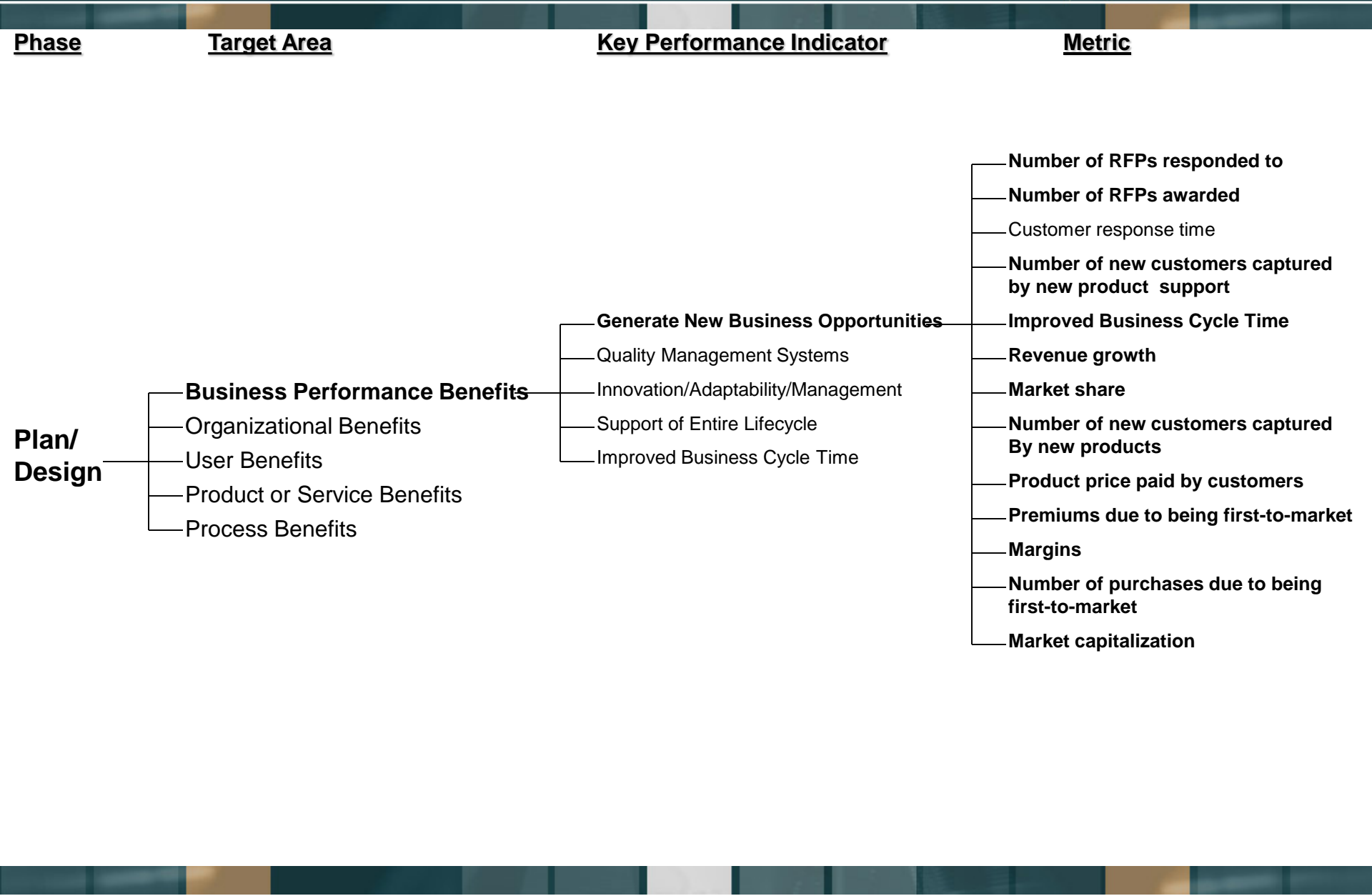
Phase

Target Area

Key Performance Indicator

**Waste Reduction/
Reallocation for
Innovation**





Final Survey (Web-based)

Selection of Final PLM Metrics

- Focus groups
 - Top items
 - Q sort
- Additional items
- 60 PLM metrics
- Open ended questions
- Demographics

Categories

- Business costs
- Planning and designing
- Manufacturing engineering
- Manufacturing
- Support
- Disposal
- Innovation

“Used in your organization”

- Collected at least on an annual basis
- Utilized by members of top management
- Stored in a manner that assures accessibility to appropriate organizational members
- Standard method for calculation

Possible Responses

- Used
- Not used, Important
- Not used, Not important

“Peak” at the Data

- 140 participants
- 25 non-deliverables (17%)
- 34 respondents (24%)

Demographics

- Sales revenue over the last full year
20% (100 - 500M) 73% (.5 – 5.0 B)
- Number of years using PLM
12% <5 years 56% >5 years
- **Since 2000, investment in PLM**
70% more/much more 15% don't know

Metrics

Percentage (Number of Respondents)

PLM Metrics	Used	Not used, Important	Not used, Not important
Average development cost per project/product	44.1 (15)	47.1 (16)	8.8 (3)
Average capital cost per project/product	41.1 (16)	38.2 (13)	14.7 (5)
Average cash expense cost per project/product	41.2 (14)	41.2 (14)	17.6 (6)
Average planning and design development cost per project/product	29.4 (10)	55.9 (19)	14.7 (5)
Average planning and design capital cost per project/product	29.4 (10)	14.7 (16)	23.5 (8)
Average planning and design cash expense per project/product	26.5 (9)	58.5 (20)	14.7 (5)

Metrics

Percentage (Number of Respondents)

Average manufacturing engineering development cost per project/product	38.2 (13)	50.0 (17)	11.8 (4)
Average manufacturing engineering capital cost per project/product	32.4 (11)	52.9 (18)	14.7 (5)
Average manufacturing engineering cash expense cost per project/product	35.3 (12)	50.0 (17)	14.7 (5)
Average manufacturing development cost per project/product	32.4 (11)	50.0 (17)	17.6 (6)
Average manufacturing capital cost per project/product	35.3 (12)	50.0 (17)	14.7 (5)
Average manufacturing cash expense per project/product	29.4 (10)	52.9 (18)	17.6 (6)

Metrics

Percentage (Number of Respondents)

Number of processes documented in regards to the support of products	29.4 (10)	41.2 (14)	29.4 (10)
Number of processes documented in regards to the disposal of products	23.5 (8)	38.2 (13)	38.2 (13)
Number of product prototypes built	47.1 (16)	32.4 (11)	20.6 (7)
Time to market for new products	55.9 (19)	38.2 (13)	5.9 (2)
Number of pre-production design changes	41.2 (14)	47.1 (16)	11.8 (4)
Number of post-production design changes	55.9 (19)	35.2 (12)	8.8 (3)
Number of parts re-used	29.4 (10)	52.9 (18)	17.6 (6)

Metrics

Percentage (Number of Respondents)

Amount of time required for product planning and designing	47.1 (16)	32.4 (11)	20.6 (7)
Amount of time required for manufacturing engineering	38.2 (13)	44.1 (15)	17.6 (6)
Amount of time required for manufacturing	47.1 (16)	38.2 (13)	14.7 (5)
Number of planning and design errors	38.2 (13)	50.0 (17)	11.8 (4)
Number of manufacturing engineering errors	26.5 (9)	61.8 (21)	11.8 (4)
Number of manufacturing errors	44.1 (15)	38.2 (13)	17.6 (6)
Cost per planning and design error	26.5 (9)	61.8 (21)	11.8 (4)
Cost per manufacturing engineering error	14.7 (5)	70.6 (24)	14.7 (5)
Cost per manufacturing error	20.6 (7)	64.7 (22)	14.7 (5)

Metrics

Percentage (Number of Respondents)

Reallocation of saved planning and design process time	52.9 (18)	32.4 (11)	14.7 (5)
Reallocation of saved manufacturing engineering process time	66.7 (23)	23.5 (8)	8.8 (3)
Reallocation of saved manufacturing process time	47.1 (16)	38.2 (13)	47.7 (5)
Hours of plant down time	20.6 (7)	41.2 (14)	38.2 (13)
Length of CEO approval time	23.5 (8)	38.2 (13)	38.2 (13)
Number of engineering change orders	52.9 (18)	32.4 (11)	14.7 (5)
Amount of inventory	67.6 (23)	23.5 (8)	8.8 (3)
Amount of personnel output (worker productivity)	47.1 (16)	38.2 (13)	14.7 (5)

Metrics

Percentage (Number of Respondents)

Number of collaborative research ventures	20.6 (7)	41.2 (14)	38.2 (13)
Number of business processes re-engineered	23.5 (8)	38.2 (13)	38.2 (13)
Number of new industry initiatives supported	23.5 (8)	35.3 (12)	41.2 (14)
Time to market for product improvements	44.1 (15)	47.1 (16)	8.8 (3)
Number of liability lawsuits	17.6 (6)	47.1 (16)	35.3 (12)
Number of product failures	41.2 (14)	29.4 (10)	29.4 (10)
Number of warranty claims	47.1 (16)	29.4 (10)	23.5 (8)
Number of product recalls	35.3 (12)	41.2 (14)	23.5 (8)

Metrics

Percentage (Number of Respondents)

Amount of time for break-even for new product introductions	41.2 (14)	44.1 (15)	14.7 (5)
Number of applications, operating systems, and DBMS integrated	17.6 (6)	50.0 (17)	32.4 (11)
Cost of tool design/redesign	32.4 (11)	58.8 (20)	8.8 (3)
Revenue from new products less than 3 years old	47.1 (16)	38.2 (13)	14.7 (5)
Market share	67.6 (23)	23.5 (8)	8.8 (3)
Overall revenue	70.6 (24)	23.5 (8)	5.9 (2)
Number of responses to RFPs	35.3 (12)	32.4 (11)	32.4 (11)
Number of RFPs won	41.2 (14)	23.5 (8)	35.3 (12)

Metrics

Percentage (Number of Respondents)

Amount of time to develop new ideas	26.5 (9)	52.9 (18)	20.6 (7)
Number of new product ideas evaluated	26.5 (9)	47.1 (16)	26.5 (9)
Number of simulated prototypes	20.6 (7)	44.1 (15)	35.3 (12)
Number of simulated tests	26.5 (9)	41.2 (14)	32.4 (11)
Number of new product functions or features	29.4 (10)	44.1 (15)	26.5 (9)
Number of customers captured by new products	41.2 (14)	47.1 (16)	11.8 (4)
Total number of new customers	47.1 (16)	44.1 (15)	8.8 (3)
Number of new products	50.0 (17)	41.2 (14)	8.8 (3)
Number of suppliers meeting requirements (cost, quality, or time)	35.3 (12)	38.2 (13)	26.5 (9)

Open-ended Questions

- Identification of business objectives to justify initial investment
- Identification of business objectives to justify continuing investment
- Identification of KPI used to measure impact of PLM
- Direction of impact, e.g., declined, improved, neutral
- Comments

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