Development Processes and Organizations

A Generic Development Process

- What is a Process?

A Process is a sequence of steps that transforms a set of inputs into a set of outputs.

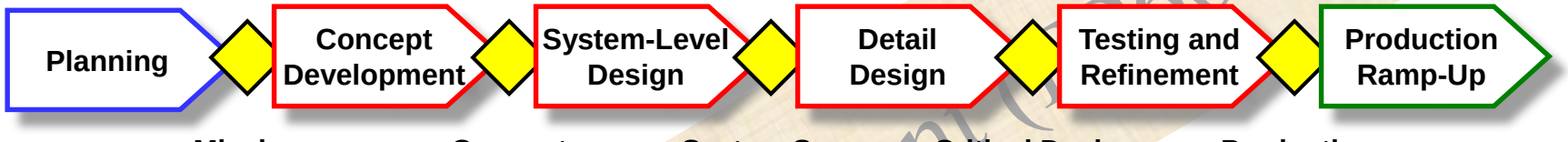
- What is a PD Process?

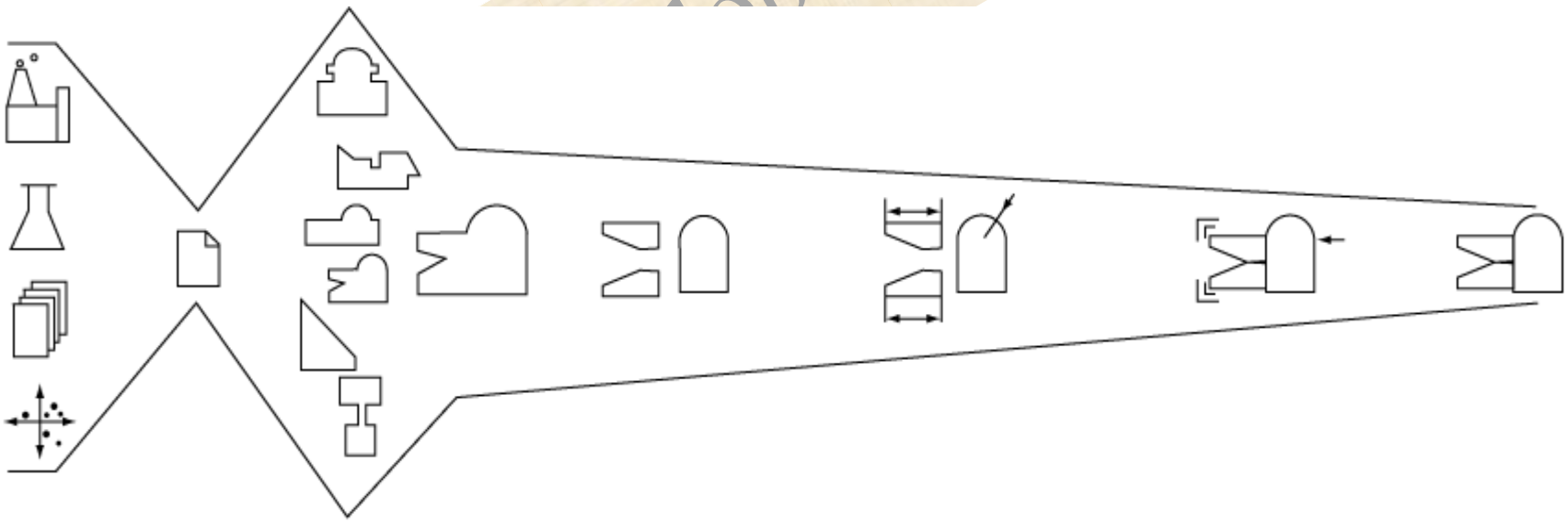
A PD Process is a sequence of steps or activities which an enterprise employs to conceive, design & commercialize a product.

Why well defined Dev. Process?

- QA
- Coordination
- Planning
- Management
- Improvement
- Morale & satisfaction

Generic Product Development Process





Phase 0

- **Planning**

Key Functions	Responsibilities
Marketing	• Articulate market opportunity • Define market segments
Design	• Consider product platform & architecture • Assess new technologies
Manufacturing	• Identify production constraints • Set supply chain strategy
Other functions	• Research: Demonstrate available technologies • Finance: Provide planning goals • General Management: Allocate project resources

Phase 1

- **Concept Development**

Key Functions	Responsibilities
Marketing	• Collect customer needs • Identify lead users • Identify competitive products
Design	• Investigate feasibility of product concepts • Develop industrial design concepts • Build & test experimental prototypes
Manufacturing	• Estimate manufacturing cost • Assess production feasibility
Other functions	• Finance: Facilitate economic analysis • Legal: Investigate patent issues • General Management: Supporter & reviewer

Phase 2

- **System-Level Design**

Key Functions	Responsibilities
Marketing	• Develop plan for product options & extended product family • Set target sales price point(s).
Design	• Generate alternative product architectures • Define major subsystems & interfaces • Refine industrial design
Manufacturing	• Identify suppliers for key components • Perform make-buy analysis • Define final assembly scheme • Set target costs
Other functions	• Finance: Facilitate make-buy analysis • Service: Identify service issues • General Management: Supporter & reviewer

Phase 3

- **Detail Design**

Key Functions	Responsibilities
Marketing	• Develop marketing plan
Design	• Define part geometry • Choose materials • Assign tolerances • Control industrial design control documentation
Manufacturing	• Define piece part production processes • Design tooling • Define QA process • Begin procurement of long-lead tooling
Other functions	• General Management: Supporter & reviewer

Phase 4

- **Testing & Refinement**

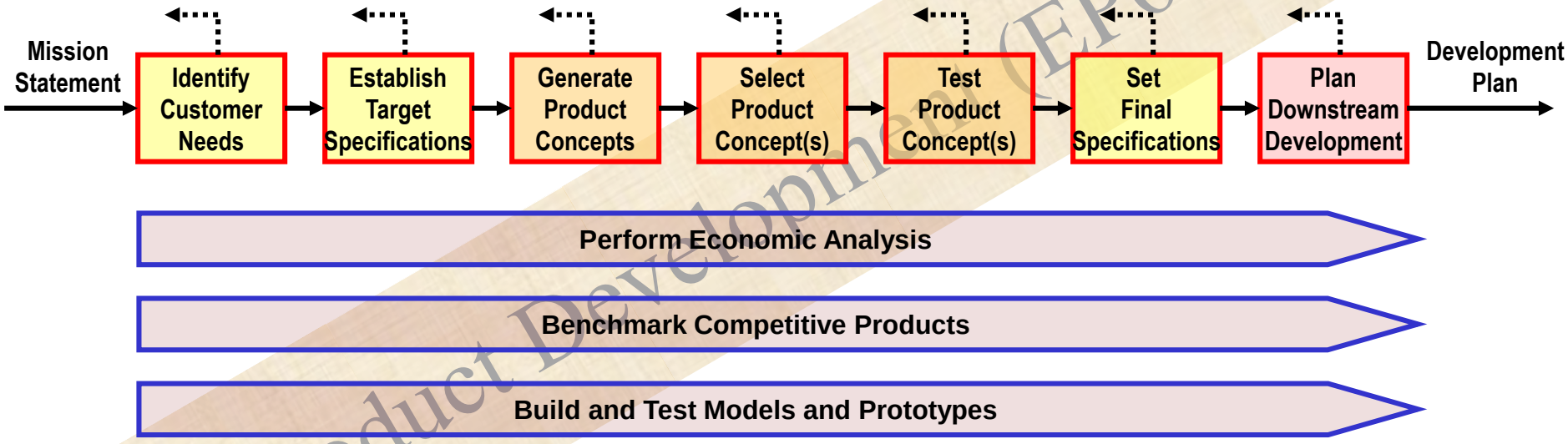
Key Functions	Responsibilities
Marketing	• Develop promotion & launch materials • Facilitate field testing
Design	• Reliability testing • Life testing • Performance testing • Obtain regulatory approvals • Implement design changes
Manufacturing	• Facilitate supplier ramp-up • Refine fabrication & assembly processes • Train work force • Refine QA processes
Other functions	• Sales: Develop sales plan • General Management: Supporter & reviewer

Phase 5

- **Production Ramp-up**

Key Functions	Responsibilities
Marketing	• Place early production with key customers
Design	• Evaluate early production output
Manufacturing	• Begin operation of entire production system
Other functions	• General Management: Supporter & reviewer

Concept Development: The Front End Process



Market – Dependent Products:

- Generic (Market - Pull) Products
- Technology – Push Products
- Platform Products
- Process – Intensive Products
- Customized Products
- High – Risk Products
- Quick – Build Products
- Complex Systems

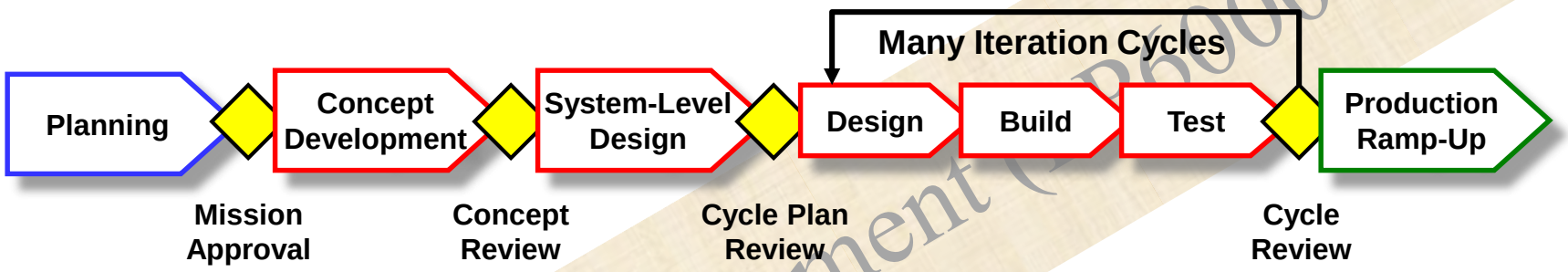
Variants in the PD process

Process Type	Description	Distinct Features	Examples
Generic Products	The team begins with a market opportunity & selects appropriate technologies to meet customer needs	Process generally includes distinct planning, concept dev., system-level design, detail design, testing & refinement & production ramp-up phases	Sporting goods, furniture, tools etc.
Technology–Push Products	The team begins with a new technology, then finds an appropriate market	Planning phase involves matching technology & market. Concept dev. assumes a given technology	Gore-Tex rainwear, Tyvek envelopes etc.
Platform Products	The team assumes that the new product will be built around an established technological subsystem	Concept development assumes a proven technology platform	Consumer electronics, computers, printers etc.
Process–Intensive Products	Characteristics of the product are highly constrained by the production process	Either an existing production process must be specified from the start or both product & process must be developed together from the start	Snack foods, breakfast cereals, chemicals, semiconductors etc.

Variants in the PD process

Process Type	Description	Distinct Features	Examples
Customized Products	New products are slight variations of existing configurations	Similarity of projects allows for a streamlined & highly structured development process	Motors, switches, batteries, containers etc.
High-Risk Products	Technical or market uncertainties create high risks of failure	Risks are identified early & tracked throughout the process. Analysis & testing activities take place asap.	Pharmaceuticals, space systems etc.
Quick-Build Products	Rapid modeling & prototyping enables many design-build-test cycles	Detail design & testing phases are repeated a number of times until the product is completed or time/ budget runs out.	Software, cellular phones etc.
Complex Systems	System must be decomposed into several subsystems & many components	Subsystems & components are developed by many teams working in parallel, followed by system integration & validation	Airplanes, jet engines, automobiles etc.

Rapid Iteration PD Process



Complex System PD Process