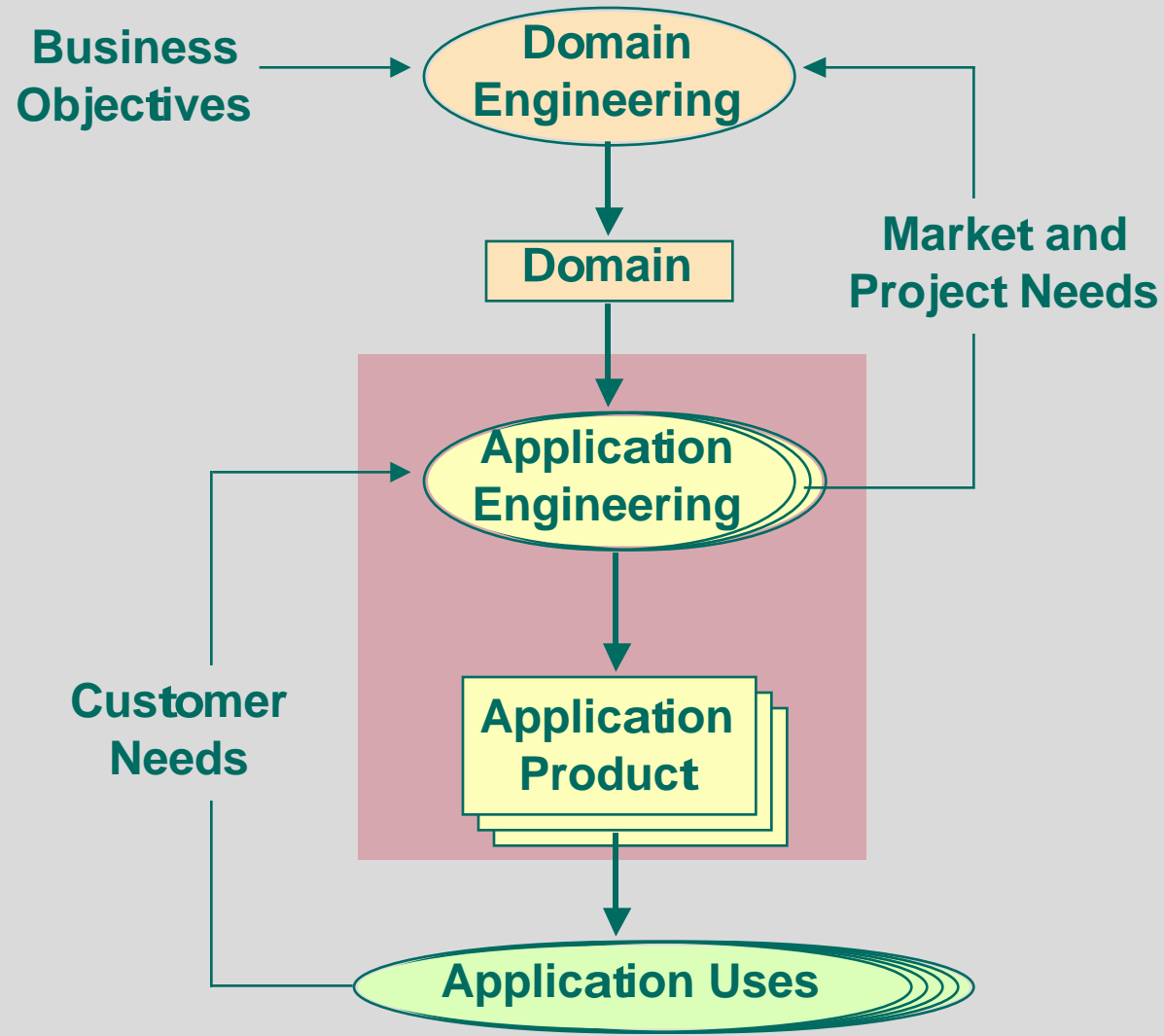


***Domain-specific Engineering***

**Application Engineering**

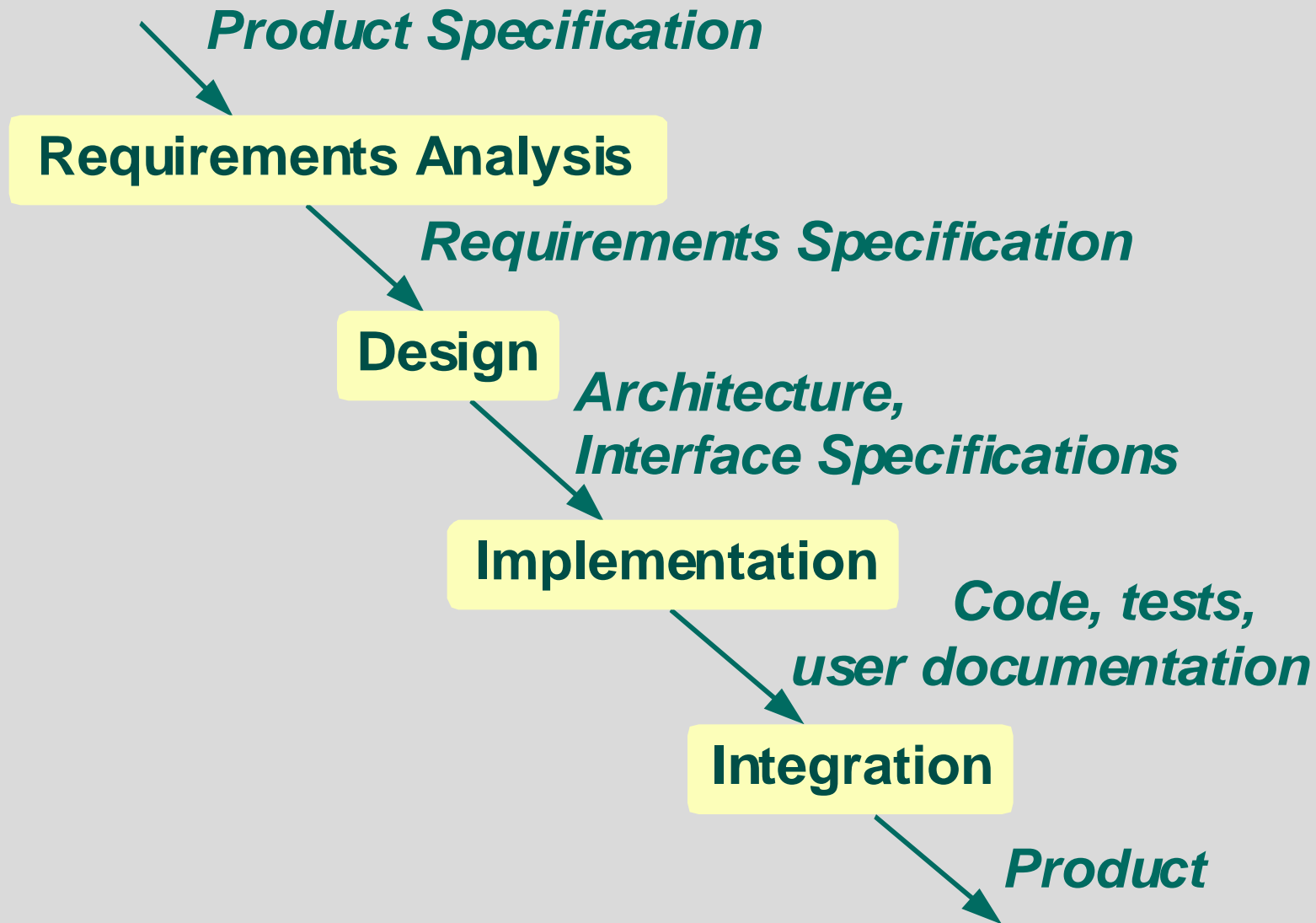
# Domain-specific Engineering



# Responsibilities of AE

- **Deliver a product to a customer**
  - on schedule and within budget
  - meeting actual needs (fit for use)
  - able to be cost-effectively modified as needs change
- **Comply with organizational and product line standards**
- **Make optimal use of DE-supplied capabilities**
- **Cooperate with DE to advance the product line business and achieve its long-term objectives for the market**

# What is Your Current AE Practice?



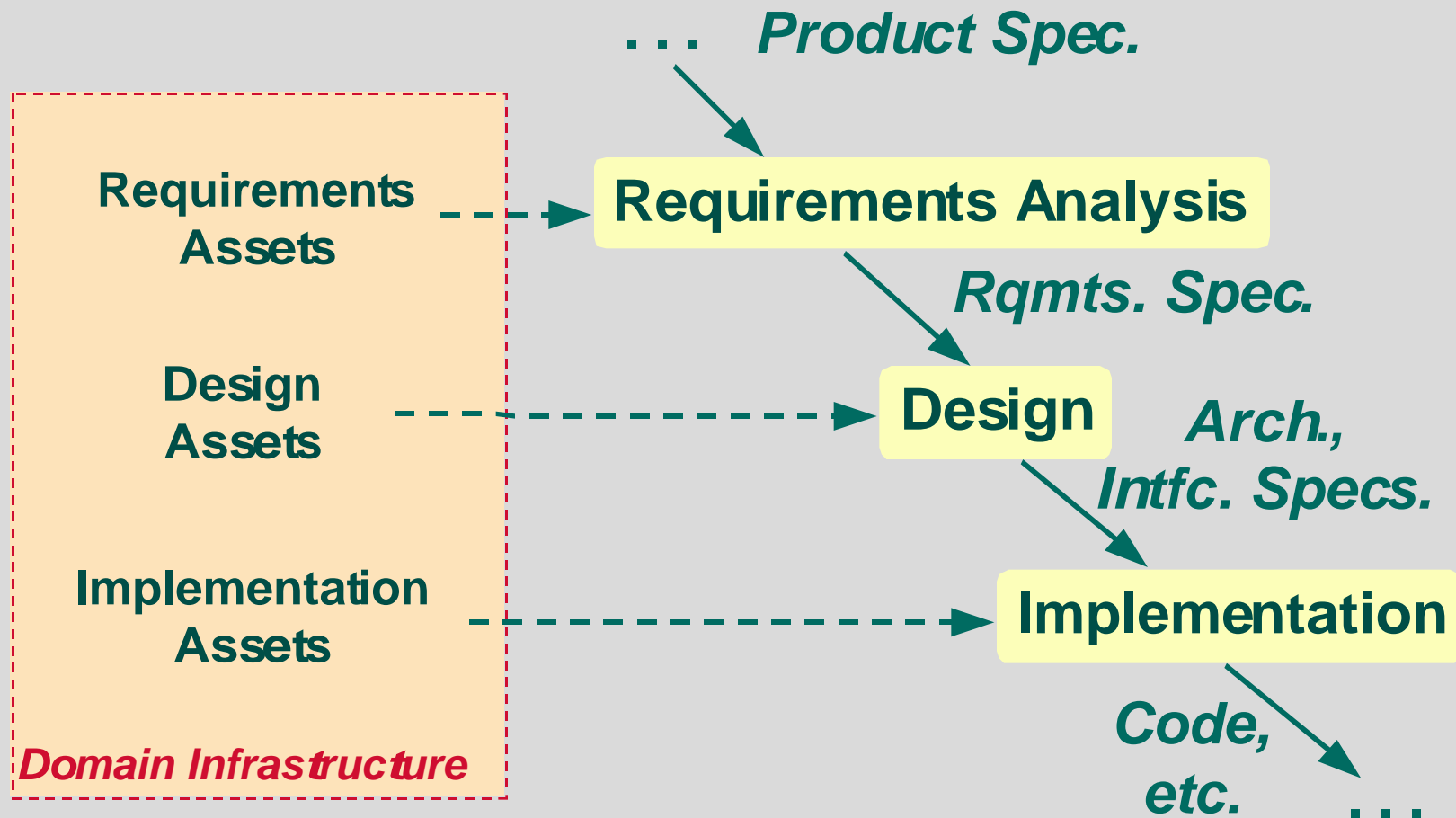
# Opportunities for Improvement

- **Eliminate redundant effort across projects: flexible reuse of all or parts of every work product**
- **Reuse and tailoring criteria applied consistently across all work products of the process**
- **Avoid multiple equally good solutions: standardize one “best” way to do everything and simplify tools and procedures**

## 2 Alternative AE Process Models

- **Augmented**
  - Same activities and workflow as current practice
  - Explicit focus on best reuse opportunities per work product
  - Reuse is planned and managed
  - 50-100% productivity improvement target
- **Streamlined**
  - Automation is introduced to mechanize the process
  - Work products are derived views of a unified product
  - Product is represented in terms of product family variabilities (how is it different from all others?)
  - 2.5-10x productivity improvement target

# An Augmented Application Engineering Process



# A Typical Work Product Task

1. Analyze work product requirements
2. Survey available domain assets
3. Define the structure of the work product  
(outline/diagram of parts and relationships)
4. Select and retrieve assets for reuse
5. Tailor assets for better fit
6. Construct unmatched parts
7. Evaluate the work product against its requirements
8. Revise work product as needed to satisfy requirements

*work product examples:*

*requirements specification, interface specification, code,  
user documentation*



# Augmented Process Properties

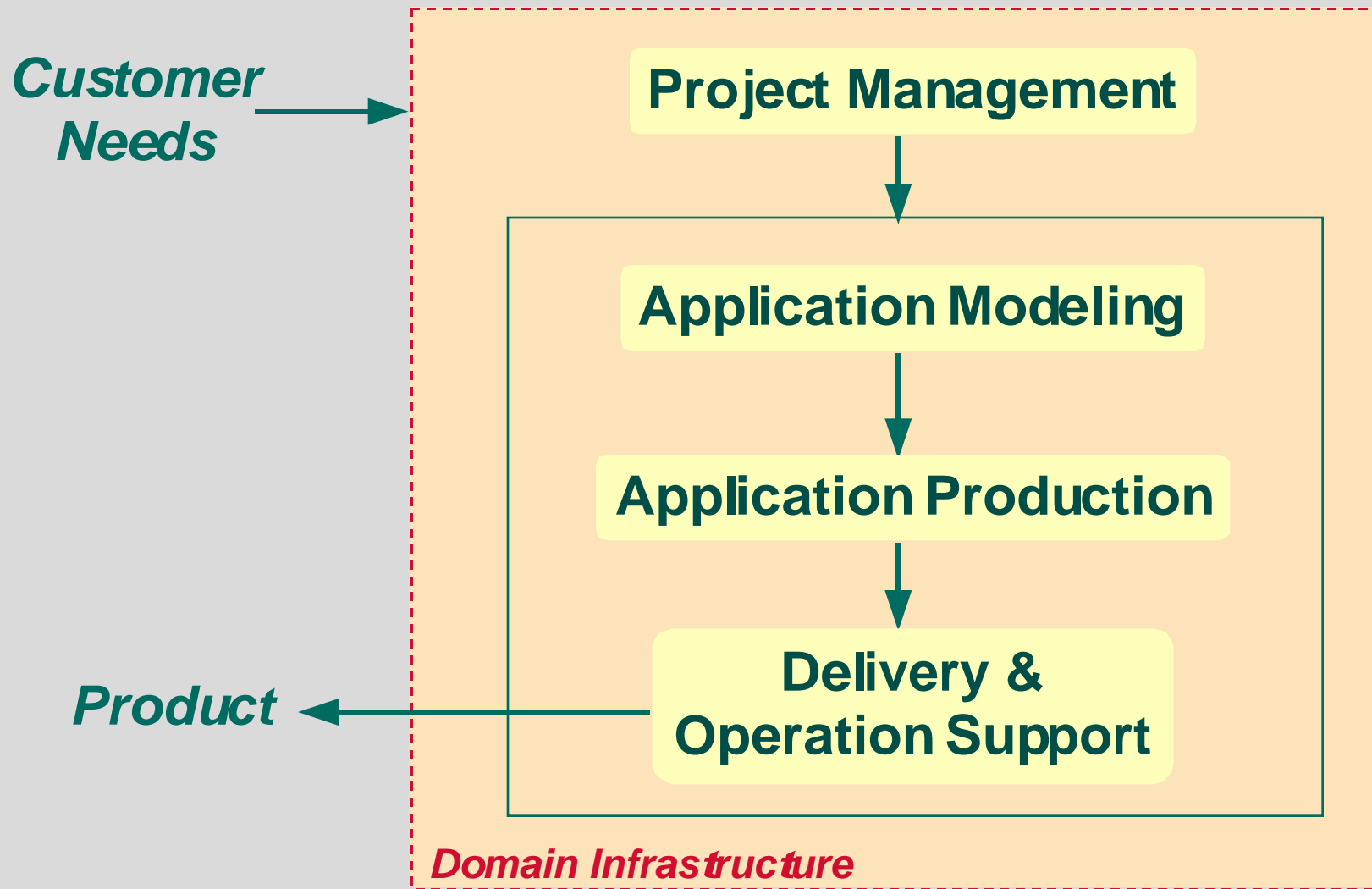
## *Benefits*

- **Leverage expertise of expert developers across projects**
- **Avoid repeated redevelopment of recurring similar parts, easy or hard**
- **Focus AE project effort on application-specific parts**

## *Costs/Risks*

- **Less availability of expert developers for project work**
- **Loss of investment if assets do not suit future needs**
- **Loss of investment if assets are not reused**

# A Streamlined Application Engineering Process



# Streamlined Process Properties

## *Benefits*

- Refocus projects on deriving whole-products by specification of key problem/solution attributes
- Standardize how the entire project works
- Standardize the form and content of products with a minimum of deviation accepted

## *Costs/Risks*

- Less availability of expert developers for project work
- Loss of investment if assets do not suit future needs
- Loss of investment if assets are not reused

# Streamlined Document Preparation

## *Wrong way:*

- Provide a boilerplate filled document template
- Allow developers to add/modify “as needed”

## *Right way:*

- Provide a “complete” document annotated with instructions on where and how to make any allowed addition, modification, or deletion
- Write instructions in terms of specific “decisions” that developers need to make to create the right document
- Base all documents on one set of decisions that are sufficient to describe different products

# Project Management

*Context:* **Customer needs**

*Needed Expertise:*

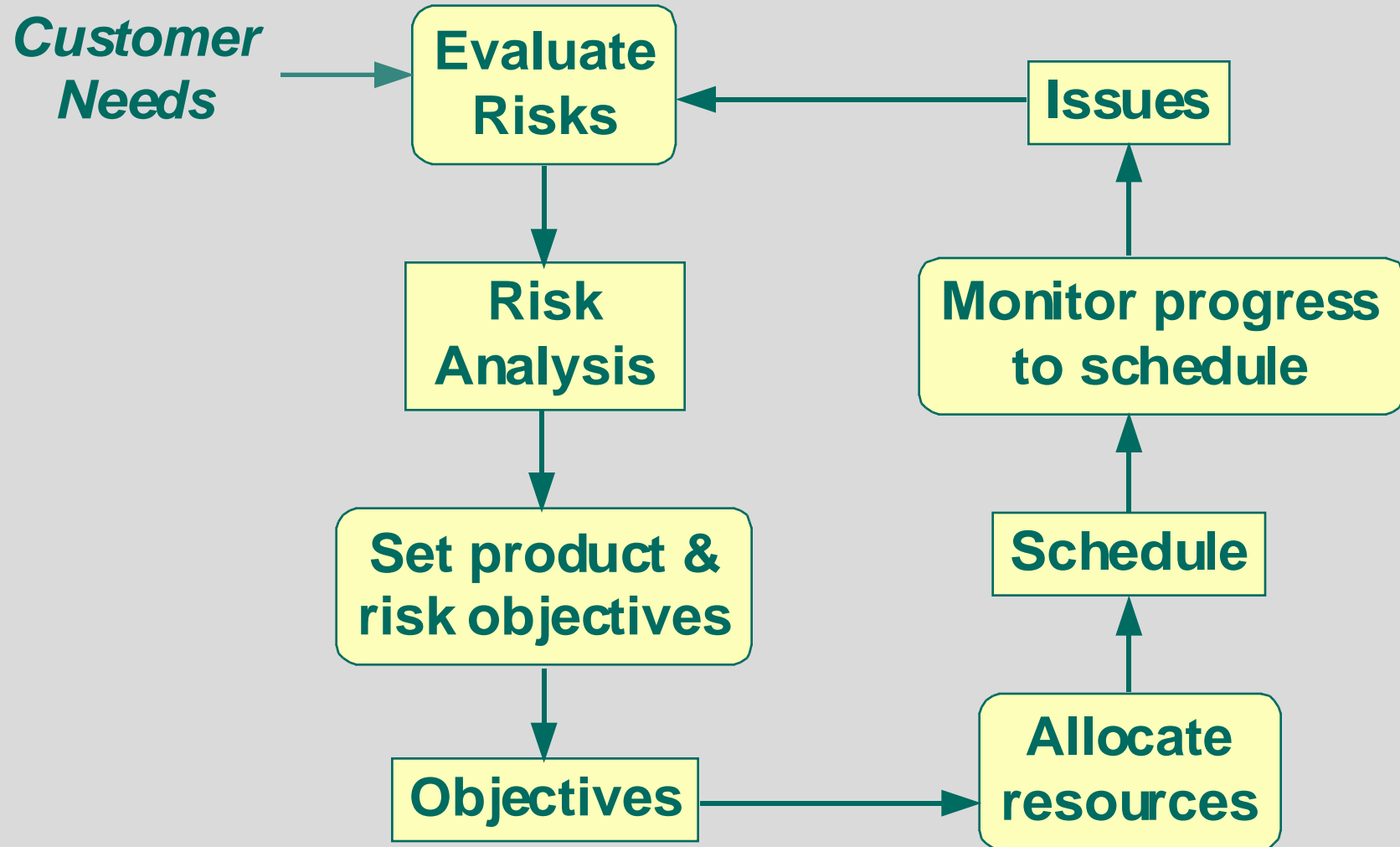
- **Project planning, monitoring, and control**
- **Coordination and control of staff and resources**

*Responsibilities:*

- **Organize and staff an application project**
- **Plan, monitor, and control project resources to deliver a product**

*Work Product:* **Project Plan**

# Project Management



# Application Modeling

*Context:* **Customer needs**

*Needed Expertise:*

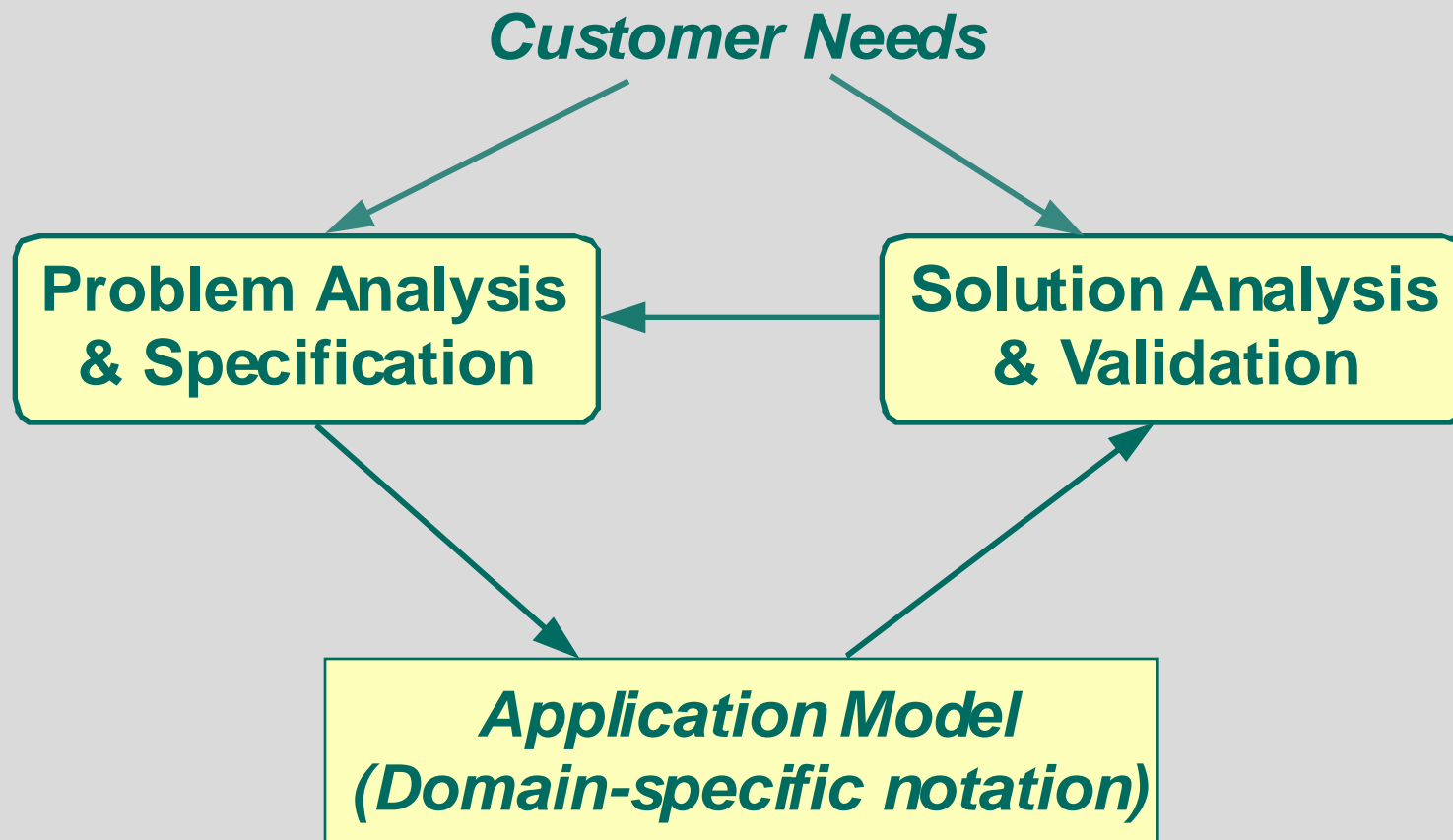
- **Requirements analysis**
- **Validation and assessment techniques**

*Responsibilities:*

- **Analyze customer requirements to specify a corresponding Application Model**
- **Validate the Application Model to customer needs**
- **Assess alternative Application Models to resolve tradeoffs among needs**

*Work Product:* **Application Model**

# Application Modeling





# Application Production

*Context: Application Model*

*Needed Expertise:*

- **Work product generation mechanisms**
- **Product verification techniques**

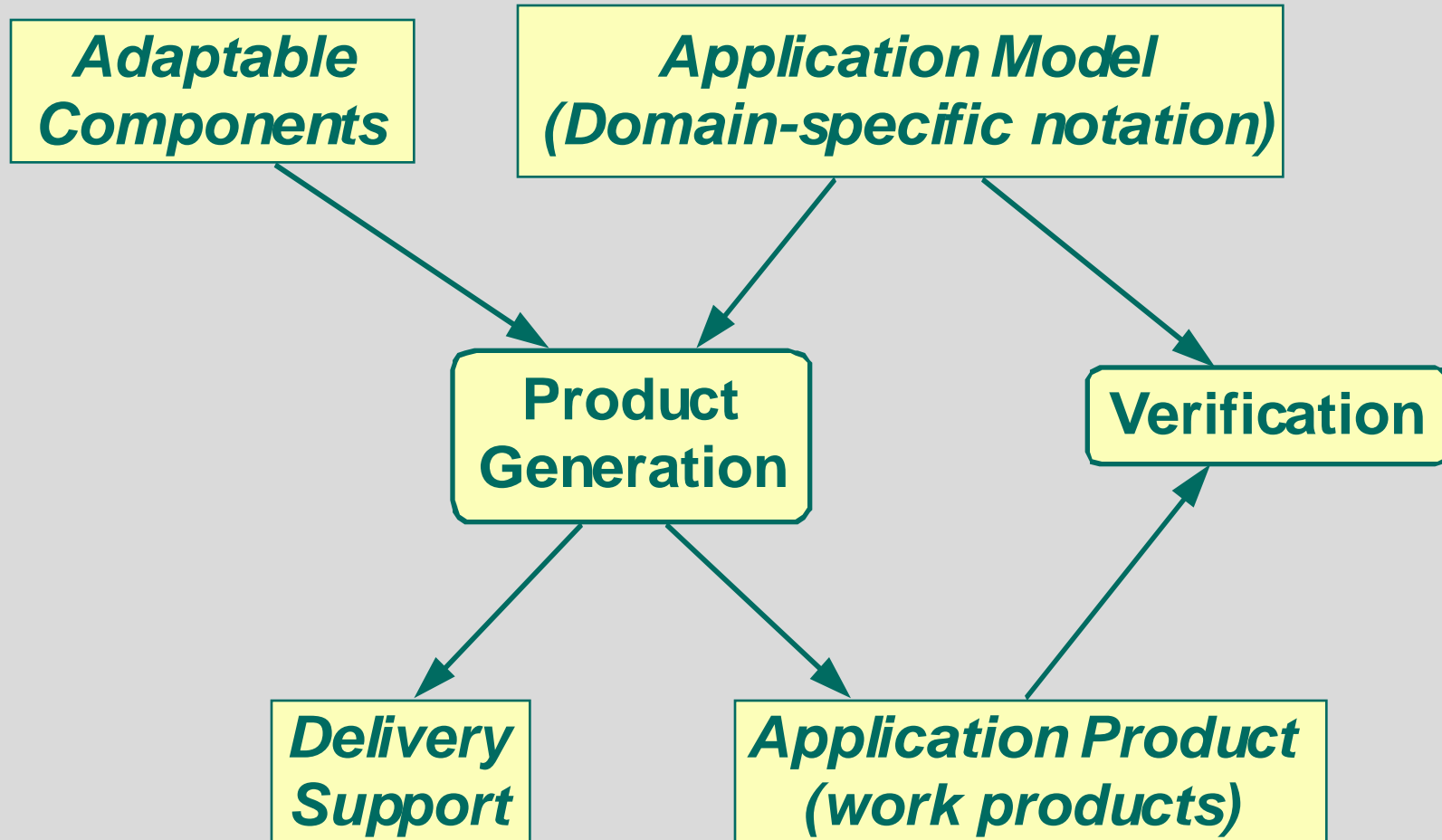
*Responsibilities:*

- **Generate a standardized product and verify that it conforms to the Application Model**
- **Produce installation and training materials for product delivery**

*Work Products:*

- **Application Product**
- **Delivery Support**

# Application Production



# Delivery & Operation Support

*Context: Application Product, Delivery Support*

*Needed Expertise:*

- **Training**
- **Customer service**

*Responsibilities:*

- **Install and verify the Application Product in the customer's operational environment**
- **Train and support users in proper use of the Application Product and evaluate its effectiveness**
- **Analyze and document suggested enhancements, future needs, or problems in Product use or fit to customer needs**