Yao-wen Huang
Professor
University of Georgia
Shanghai Jiao Tong University
Shanghai Ocean University
huang188@gmail.com
Definition of New Product

- Either the development and introduction of a product **not previously manufactured** by a company into the marketplace, or

- The presentation of an old product into a **new market** not previously explored by a company.
“Can we have something new and improved for dinner?”
Why New Product?

- Product life cycles
- Company reasons (*Demand and Supply*)
- Marketplace reasons (*Consumers’ trend*)
- Technological reasons
- Government regulations
Product Development Cash Flow

- Sales Revenue
- Operating Costs
- Operating Profit
- Investment (−)

Cumulative Cash Inflow or Outflow ($)

Time

Development Time
Payback Time
Investment
Break Even Time
Product Development Cash Flow

- Sales Revenue
- Operating Costs
- Operating Profit
- Investment (-)

Cumulative Cash Inflow or Outflow ($) vs Time

- Development Time
- Payback Time
- Break Even Time
- Investment
Product Development Cash Flow
Product Development Cash Flow
Life Cycle of a Product in 5 Periods

- (1) Introductory
- (2) Strong growth
- (3) Decline in growth
- (4) Maturity
- (5) Decline in volume
Marketing Strategy for Product Life Cycle

- Understand that profits have a predictable pattern
  - Early stages: focus is on product information
  - Later stages: focus is on brand promotion

- Use market segmentation in maturity stage to maintain strong core customer basis
Is a “New-to-World” Product?
Is A “Never before” Product?
However, A New Product needs:

- To meet the definition
- To meet the market trend
- To meet consumer’s need
- To meet company’s image
Classifications of New Product

1. Line extension
2. Reposition
3. New form
4. Reformulation
5. New packaging
6. Innovative or value-added products
7. Creative products
General Stages of New Product Development Process

- Intention
- Ideation
- Prototyping
- Development
- Test market
- Production
- Launch
New Product Development Process

A **disciplined** and **defined set of tasks and steps** that describe the normal means by which a company **repetitively converts embryonic ideas into salable products or services**

Ref: PDMA
Product Development Stages in Nabisco Co.

1. **Concept development**
   - Ideation: brainstorming and screening
   - Market research + R&D

2. **Protocept development**
   - Transformation: from concept to prototype
   - Bench top to pilot plant
   - Consumer Focus group
   - *Multifunctional team*: Marketing, R&D, production, etc
Product Development Stages in Nabisco

3. **Pilot plant scale up**
   - Prototyping
   - Modification of formulations
   - Optimization
   - Shelf life study
   - In-home use test
   - Logistics
   - Engineering involvement

4. **Production development**
   - Full scale running
   - Commercialization
   - Fine tuning process
NDP Process involve Technology and Marketing

Gates: Where project is evaluated and dispositioned

Build Business Case

Technology Planning

Technology Investigation

Technology Comm.

Full Dev Alpha

Full Dev Beta

Launch Preparation

Market Launch

Stages: Where the work gets done

One of the big benefits of the process is to get engineers to focus on what is most important – not necessarily stuff that is urgent.
Operating Without a Process?

- Technology Driven
  - R&D Driven
  - Build it they will come

- Marketing Driven
  - I love the idea, let’s do it
  - The CEO asked me to do it
  - I had this idea and other two persons are OK with it

Ref: Delifer 2010
We Need A Structured NPD Process

Commonly referred to as the original NPD Process that made popular by Dr. Robert G. Cooper:

The Stage-Gate® Product Development Process
Activities/Work take Place During a Stage

- Cross functional work in parallel
- Early definitions get fine tuned as project advances
- Must have a plan to follow
- Ensure communication/collaboration
- No one team owns the stage
- Market research + Early product definition ensure reduced cycle time
Individual Project Review and Decisions are made at Gate

- Individual projects reviewed
- Decision Point: Go/ No Go/ Hold/ Recycle
- Scoring based on criteria
- Gatekeeper meeting
- Project Decisions
- Resources Allocated
- Quality evaluation of deliverables
How Stages Work?

A Go Decision from the Gate

- Action Plan
- Approved resources
- Date for next gate set
- List of Deliverables

Team decides how to “work the stage”
- Maps out the details of the Forward Plan
- Use the recommended list of best practice activities
- Apply sound PM methods
- Updates/Input - Senior Team engaged and informed

A deliverables pack
A recommendation: Go / Kill
If Go, a proposed “Forward Plan”
Resources requested for next stage

Ref: Delifer 2010
How Stages Work?

- **A Go Decision from the Gate**

- **Action Plan**
- **Approved resources**
- **Date for next gate set**
- **List of Deliverables**

- Team decides how to “work the stage”
- Maps out the details of the Forward Plan
- Use the recommended list of best practice activities
- Apply sound PM methods
- Updates/Input - Senior Team engaged and informed

- A deliverables pack
- A recommendation: Go / Kill

- If Go, a proposed “Forward Plan”
- Resources requested for next stage

Ref: Delifer 2010
How Stages Work?

A Go Decision from the Gate

- Action Plan
- Approved resources
- Date for next gate set
- List of Deliverables

Stage 1 Scoping

- Team decides how to “work the stage”
- Maps out the details of the Forward Plan
- Use the recommended list of best practice activities
- Apply sound PM methods
- Updates/Input – Senior - Team engaged and informed

Deliverables for next Gate

- A deliverables pack
- A recommendation: Go / Kill
- If Go, a proposed “Forward Plan”
- Resources requested for next stage

Ref: Delifer 2010
How Stages Work?

A Go Decision from the Gate

- Action Plan
- Approved resources
- Date for next gate set
- List of Deliverables

Stage 1 Scoping

- Team decides how to “work the stage”
- Maps out the details of the Forward Plan
- Use the recommended list of best practice activities
- Apply sound PM methods
- Updates/Input - Senior Team engaged and informed

Deliverables for next Gate

- A deliverables pack
- A recommendation: Go / Kill
- If Go, a proposed “Forward Plan”
- Resources requested for next stage

Ref: Delifer 2010
The Gates in the Stage-Gate Process

Each stage is preceded by a Gate

Gates = Decision Points or Go / Kill Points

Gates are where projects get resources & are prioritized
– get on management’s radar screen
Gates are the quality control check points in the process

Ref: Delifer 2010
Gates ensure that only the right projects move forward

Prescribed list of deliverables

- activities of the previous phase
- based on a standard list or menu
- key information for efficient decision making

Decision:
- Go / Kill / Hold / Recycle
- Forward Plan approved

Decision based upon...

Readiness check:
- Quality of execution?
- Deliverables in place?

Business rationale:
- Is it an attractive investment opportunity?

Action plans:
- Is the “Forward Plan” a good one?
- Are the resources available?

Ref: Delifer 2010
GATE SCORECARDS

Used by decision-makers to ensure assessment of projects on standardized, best-practice criteria.

GATE SCORECARDS

Benefit: Make better gate decisions, based on consistent, market-based criteria.
Flyover from A to Z

Purpose

Discovery
- To gather input for new or enhanced product ideas

Scoping
- A relatively quick, qualitative assessment to determine whether the project is worth further investigation.

Business Case
- To conduct a detailed investigation to develop a product definition and a business case.

Development
- To develop a prototype product, validated with customers.

Testing
- To provide final and total validation of the entire project: the commercial product, its production, and its marketing.

Launch
- Implement production and marketing launch plans.

Key Deliverables

Discovery
- Inquiry Form
- Screened Idea
- Preliminary Business Case

Scoping
- Business Case
- Product Definition
- Prototype
- Testing & Validation Plan
- Business Case

Development
- Validated Product
- Launch Plan

Testing
- Commercialization
- Post Launch Review

Launch
- Gate 1
- Gate 2
- Gate 3
- Gate 4
- Gate 5
*Flyover from A to Z*

**Purpose**

To gather input for new or enhanced product ideas

**Key Deliverables**

- Inquiry Form
- Screened Idea
- Preliminary Business Case
- Business Case
- Product Definition
- Prototype
- Testing & Validation Plan
- Business Case
- Validated Product
- Launch Plan
- Commercialization
- Post Launch Review

**Gate 1**

A relatively quick, qualitative assessment to determine whether the project is worth further investigation.

**Gate 2**

To conduct a detailed investigation to develop a product definition and a business case.

**Gate 3**

To develop a prototype product, validated with customers.

**Gate 4**

To provide final and total validation of the entire project: the commercial product, its production, and its marketing.

**Gate 5**

Implement production and marketing launch plans.

Ref: Delifer 2010
Flyover from A to Z

**Purpose**
- **Gate 1 (Discovery)**: To gather input for new or enhanced product ideas.
- **Gate 2 (Scoping)**: A relatively quick, qualitative assessment to determine whether the project is worth further investigation.
- **Gate 3 (Business Case)**: To conduct a detailed investigation to develop a product definition and a business case.
- **Gate 4 (Development)**: To develop a prototype product, validated with customers.
- **Gate 5 (Testing)**: To provide final and total validation of the entire project: the commercial product, its production, and its marketing.
- **Launch**: Implement production and marketing launch plans.

**Key Deliverables**
- **Inquiry Form**
- **Screened Idea**
- **Preliminary Business Case**
- **Business Case**
- **Product Definition**
- **Prototype**
- **Testing & Validation Plan**
- **Validated Product**
- **Launch Plan**
- **Commercialization**
- **Post Launch Review**

Ref: Delifer 2010
Flyover from A to Z

### Purpose
- **Discovery**
  - To gather input for new or enhanced product ideas
- **Scoping**
  - A relatively quick, qualitative assessment to determine whether the project is worth further investigation.
- **Business Case**
  - To conduct a detailed investigation to develop a product definition and a business case.
- **Development**
  - To develop a prototype product, validated with customers.
- **Testing**
  - To provide final and total validation of the entire project: the commercial product, its production, and its marketing.
- **Launch**
  - Implement production and marketing launch plans.

### Key Deliverables
- **Discovery**
  - Inquiry Form
  - Screened Idea
- **Scoping**
  - Preliminary Business Case
- **Business Case**
  - Business Case
  - Product Definition
- **Development**
  - Prototype
  - Testing & Validation Plan
- **Testing**
  - Validated Product
  - Launch Plan
- **Launch**
  - Commercialization
  - Post Launch Review
Flyover from A to Z

Purpose

Gate 1
To gather input for new or enhanced product ideas

Gate 2
A relatively quick, qualitative assessment to determine whether the project is worth further investigation.

Gate 3
To conduct a detailed investigation to develop a product definition and a business case.

Gate 4
To provide final and total validation of the entire project: the commercial product, its production, and its marketing.

Gate 5
Implement production and marketing launch plans.

Key Deliverables

Discovery
• Inquiry Form
• Screened Idea

Scoping
• Preliminary Business Case

Business Case
• Business Case
• Product Definition

Development
To develop a prototype product, validated with customers.

• Prototype
• Testing & Validation Plan
• Business Case

Testing
• Validated Product
• Launch Plan

Launch
• Commercialization
• Post Launch Review

Ref: Delifer 2010
Flyover from A to Z

### Purpose

- **Gate 1 (Discovery):** To gather input for new or enhanced product ideas.
- **Gate 2 (Scoping):** A relatively quick, qualitative assessment to determine whether the project is worth further investigation.
- **Gate 3 (Business Case):** To conduct a detailed investigation to develop a product definition and a business case.
- **Gate 4 (Development):** To develop a prototype product, validated with customers.
- **Gate 5 (Testing):** To provide final and total validation of the entire project: the commercial product, its production, and its marketing.
- **Gate 5 (Launch):** Implement production and marketing launch plans.

### Key Deliverables

- Inquiry Form
- Screened Idea
- Preliminary Business Case
- Business Case
- Product Definition
- Prototype
- Testing & Validation Plan
- Business Case
- Validated Product
- Launch Plan

- **Ref:** Delifer 2010
Flyover from A to Z

**Discovery**
- Gate 0: Purpose - To gather input for new or enhanced product ideas

**Scoping**
- Gate 1: Purpose - A relatively quick, qualitative assessment to determine whether the project is worth further investigation.

**Business Case**
- Gate 2: Purpose - To conduct a detailed investigation to develop a product definition and a business case.

**Development**
- Gate 3: Purpose - To develop a prototype product, validated with customers.

**Testing**
- Gate 4: Purpose - To provide final and total validation of the entire project: the commercial product, its production, and its marketing.

**Launch**
- Gate 5: Purpose - Implement production and marketing launch plans.

**Key Deliverables**
- Inquiry Form
- Preliminary Business Case
- Business Case
- Product Definition
- Prototype
- Testing & Validation Plan
- Business Case
- Validated Product
- Launch Plan

**Commercialization**
- Post Launch Review

Ref: Delifer 2010
From Ideas to a Winning Product

Idea Management Process
- Idea Submission
- Idea Assessment
- Idea Selection
  - Check Idea
  - Evaluate Idea

Project Migration
- Idea Selection
- Feasibility
- Build Business Case
- Go To Development

New Product Development Process
- Idea Screen
- Concept Screen
- Go To Development
- Post Development Review
- Go To Launch
- Post Launch Review
- Final Production & Launch
From Ideas to a Winning Product

Idea Management Process

1. Idea Submission
   - Check Idea

2. Idea Assessment
   - Evaluate Idea

3. Idea Selection
   - Project Migration

   - Idea Selection
   - Feasibility
   - Build Business Case
   - Development
   - Testing & Validation
   - Full Production & Launch
   - Post Launch Review
**Generic Stage-Gate Process**

**Discovery**
- Brainstorm with Industry and Technical Experts
- Intellectual Property Analysis
- Preliminary Market Assessment

**Scoping**
- Expert Opinions on Concept Feasibility
- Research on Standards and Regulations
- Examination of Aftermarket Environmental Issues
- Competitor Profiles
- Examination of Industry Situation and Trends
- Preliminary Technology Assessment
- Investigation of Licensable Technologies
- Research on Product Requirements
- Concept Testing

**Build Business Case**
- Identification and Investigation of Potential Strategic Partners
- Detailed Market Studies
- Channel Research
- Trademark Research
- Detailed Technical Assessment
- Business Model Assessment
- Positioning Research
- Pricing Research
- Identification and Profiling of Target Markets
- Assessment of "Make" vs. "Buy" Options

**Development**
- Evaluation of Alternative Production Processes / Procedures
- Expert Problem-solving and Decision-making Support
- Sourcing of Testing, Measurement and Monitoring Equipment
- Supplier Research
- Packaging Research
- Materials Research

**Testing and Validation**
- Assessment of Critical Test Criteria
- Expert Review of Test Findings
- Research on Optimal Test Methods
- Benchmarking Studies

**Launch**
- Identification of New Markets and Market Segments
- Ongoing, Automatic Intelligence Gathering Related To:
  - Scientific and Technical Advances
  - Competitor Activities
  - Market Conditions and Trends
  - Patent Activity
  - Changes in Standards and Regulations
- Identification of New Users in Current Segments
- Research on Opportunities for Product Improvement

Ref: Delife 2010
Stage-Gate Process: Stage 0

- Opportunities identification
  - Search for existing products in market
  - Look back the products invented/developed in history
- Brainstorm with Industry and Technical Experts
- Intellectual Property Analysis
- Preliminary Market Assessment

Ref: Delife 2010
Stage-Gate Process: Stage 1

- Expert Opinions on Concept Feasibility
- Research on Standards and Regulations
- Examination of Aftermarket Environmental Issues
- Competitor Profiles
- Examination of Industry Situation and Trends
- Preliminary Technology Assessment
- Investigation of Licensable Technologies
- Research on Product Requirements
- Concept Testing

Ref: Delife 2010
Stage-Gate Process: Stage 2

- Identification and Investigation of Potential Strategic Partners
- Detailed Market Studies
- Channel and Trademark Research
- Detailed Technical Assessment
- Business Model Assessment
- Positioning Research
- Pricing Research
- Identification and Profiling of Target Markets
- Assessment of “Make” vs. “Buy” Options
- Project establishment
Sample Stage-Gate Process: Stage 3

- Evaluation of Alternative Production Processes/Procedures
- Expert Problem-solving and Decision-making Support
- Sourcing of Testing, Measurement and Monitoring Equipment
  - Supplier Research
  - Packaging Research
  - Materials Research
  - Refinement

Ref: Delife 2010
Stage-Gate Process: Stage 4

- Assessment of Critical Test Criteria
- Expert Review of Test Findings
- Research on Optimal Test Methods
- Benchmarking Studies

Ref: Delife 2010
• Identification of **New Markets and Market Segments**

• Ongoing, Automatic **Intelligence Gathering** Related To:
  - *Scientific and Technical Advances*
  - *Competitor Activities*
  - *Market Conditions and Trends*
  - *Patent Activity*
  - *Changes in Standards and Regulations*

• Identification of **New Users** in Current Segments

• **Research on Opportunities for Product Improvement**

• **Review**
Success Rate Entirely New Products

3000 raw ideas .03%
300 submitted ideas .3%
125 beginning projects .8%

1.7 launches 60%
4 major developments 25%
9 large developments 11%

1 commercial success

Stevens and Burley, RTM May-June 1997
Familiarity Matrix: A Guide Place Your Project in One of the Nine Boxes

Decreasing knowledge of the technology

Decreasing knowledge of the market

Familiar

New, familiar

New, unfamiliar

Increasing risk of failure
Familiarity Matrix: A Guide Place Your Project in One of the Nine Boxes

<table>
<thead>
<tr>
<th>Market Expansion</th>
<th>Business Expansion</th>
<th>New Business Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Penetration</td>
<td>Business Extension</td>
<td>Business Expansion</td>
</tr>
<tr>
<td></td>
<td>Product Extension</td>
<td>Product Expansion</td>
</tr>
</tbody>
</table>

Decreasing knowledge of the market

Decreasing knowledge of the technology
Familiarity Matrix: A Guide Place Your Project in One of the Nine Boxes

<table>
<thead>
<tr>
<th>Probability of Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Product with unrelated technology in existing market: 50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Market Expansion</th>
<th>Business Expansion</th>
<th>New Business Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Extension</td>
<td>Business Extension</td>
<td>Business Expansion</td>
</tr>
<tr>
<td>Market Penetration</td>
<td>Product Extension</td>
<td>Product Expansion</td>
</tr>
</tbody>
</table>
Familiarity Matrix: A Guide Place Your Project in One of the Nine Boxes

<table>
<thead>
<tr>
<th>Market Expansion</th>
<th>Business Expansion</th>
<th>New Business Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Penetration</td>
<td>Business Extension</td>
<td>Business Expansion</td>
</tr>
<tr>
<td>Probability of Success</td>
<td>Product Extension</td>
<td>Product Expansion</td>
</tr>
</tbody>
</table>

Existing product in a new market: 15%
Familiarity Matrix: A Guide
Place Your Project in One of the Nine Boxes

<table>
<thead>
<tr>
<th>Probability of Success</th>
<th>Market Expansion</th>
<th>Business Expansion</th>
<th>New Business Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved product in existing market:</td>
<td>Market Extension</td>
<td>Business Extension</td>
<td>Business Expansion</td>
</tr>
<tr>
<td>75%</td>
<td>Market Penetration</td>
<td>Product Expansion</td>
<td>Product Expansion</td>
</tr>
</tbody>
</table>

“Suicide Square” .03%
Familiarity Matrix: A Guide Place Your Project in One of the Nine Boxes

<table>
<thead>
<tr>
<th>Market Expansion</th>
<th>Business Expansion</th>
<th>New Business Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Extension</td>
<td>Business Extension</td>
<td>Business Expansion</td>
</tr>
<tr>
<td>Market Penetration</td>
<td>Product Extension</td>
<td>Product Expansion</td>
</tr>
</tbody>
</table>

Probability of Success

New Product in a New Market: 5%
Causes of New Product Failure

- Inadequate Market Analyses
- Product Problems or Defects
- Lack of Effective Marketing
- Higher costs than anticipated
- Competitive Strength
- Poor Timing of Introduction
- Technical or Production Problems
- Other Problems

Ref: Cooper and Kleinschmidt

Percentage of companies who indicated
Final Remarks: The Stage-Gate Process

1. To ensure to spend resources on the **Right** projects
2. To ensure to do the projects the **Right** way
3. To **shorten** the time to market

*New product development is **complex**, its success depends upon **cross-functional cooperation and support** that often extends across an entire organization;

*Gate meetings are **deadlines**;
*Decisions can be made based on **complete information**;
*Link to project planning;
*Reminders & alerts for **tracking progress**.
Thanks!

Professor Yao-wen Huang
huang188@gmail.com