Innovation Management – New Product Development

Univ.-Prof. Dr.-Ing. Wolfgang Maass

Chair in Economics – Information and Service Systems (ISS)
Saarland University, Saarbrücken, Germany

SS 2012
Wednesdays, 10:00 – 12:00 a.m.
Room 0.21, B4 1
Lecture Agenda

Innovation Management
1. Introduction
2. Knowledge Management (1)
3. Knowledge Management (2)
4. Guest Lecture
5. Strategic Innovation Management
6. Case Study

7. New Product Development
8. Creativity Techniques
9. Planning Product Features
10. Experimentation Strategies
11. Open Innovation
12. Diffusion and Adoption of Innovation
13. Diffusion and Adoption of Information Systems
14. Business Planning and Writing
Success & Failure

- **Sony Walkman** – personal stereo audio cassette player
- First introduced in 1979 by Sony (Walkman TPS-L2)
- No market research before; but creation of whole new market
- Discontinuation of Walkman production in 2010 – after 30 years and more than 200 mio. units sold

- **Sinclair C5** = electrically assisted tricycle (introduced in Jan. 1985)
- Stimulus = changes in UK road traffic regulations – electrically assisted pedal vehicles could be used by anyone on roads over age of 14 without license
- Designed by experienced engineers (e.g., Lotus Cars); progressive in technology and ergonomics
- Marketing research done after essential concept
- Expectation: 100,000 units/year – production discontinued in August 1985 with 5000 units sold and £8.6 mio. lost

(Cross, 2011)
New Product Development

Lecture, 6th of June

How to be creative?

How to proceed when developing new products?

Where are differences between diverse product development projects and how to handle them?

Lecture, 20th of June

How to test my product ideas before market launch?

How to plan final features of my product?

Lecture, 27th of June

How to avoid failure in product development?

Where do product ideas come from?

Today’s lecture

How to be creative?
New Product Development

• “Product development is the set of activities beginning with the perception of a market opportunity and ending in the production, sale, and delivery of a product.“ (Ulrich & Eppinger, 2011, p. 2)

<table>
<thead>
<tr>
<th></th>
<th>Rollerblade In-Line Skater</th>
<th>Boeing 777 Airplane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual production time</td>
<td>100,000 units/year</td>
<td>50 units/year</td>
</tr>
<tr>
<td>Sales lifetime</td>
<td>3 years</td>
<td>30 years</td>
</tr>
<tr>
<td>Sales price</td>
<td>$150</td>
<td>$260 million</td>
</tr>
<tr>
<td>Number of unique parts</td>
<td>35 parts</td>
<td>130,000 parts</td>
</tr>
<tr>
<td>Development time</td>
<td>2 years</td>
<td>4.5 years</td>
</tr>
<tr>
<td>Internal development team (peak size)</td>
<td>5 people</td>
<td>6,800 people</td>
</tr>
<tr>
<td>Development cost</td>
<td>$750,000</td>
<td>$3 billion</td>
</tr>
</tbody>
</table>

(Ulrich & Eppinger, 2011)
Types of Product Development Projects

(Schilling & Hill, 1998; p. 67; Ulrich & Eppinger, 2011)

- Radically different products addressing new and unfamiliar markets
  - e.g., first digital copier by Xerox

- Creation of new family of products based on new, common platform
  - Addressing familiar markets and product categories
  - e.g., Xerox Lake – new, digital copier platform

- (a) Extension of existing product platform to better address familiar markets with new products
  - e.g., new copier based on non-digital product platform by Xerox
- (b) Incremental improvements to existing products

(Additional information from Ulrich & Eppinger, 2011)
Sources of Product Ideas

Event-oriented information search
- Recognition of discrepancy as trigger
- Definition of problem and tight scope of search (e.g., customers, retailers, employees, competitors)

Continuous information search
- Innovation as permanent task to close strategic gap
- Scope of search more comprehensive (e.g., environmental changes, scientific publications)

Information search

Purpose-driven information

Means-driven information

Generation of ideas

Innovative combinations of purpose and means

Gaining product ideas to generate appropriate information platform – reduction of uncertainties in early phases of product development

Purpose- and means-driven information (Baker et al., 1967; Hauschildt, 2004) because innovation = purpose-means-combination

New solutions - enabled by technological means primarily – open up new usage scenarios and target groups (purpose)

(Herstatt & Lüthje, 2011)
Sources of Product Ideas – Purpose-driven Information

(1) Customers

A - Quantitative methods

Product positioning models = multidimensional product-market-spaces

- Positioning of new products based on customer interviews regarding validation of current product offers and consideration of utility models (e.g., ideal product models (cf. last lecture))
- But: gaining new product features improbable

Conjoint analysis = measurement of customer needs by validating fictive products (Green & Srinivasan, 1990)

- Fictive products by combining diverse values of product features -- specification of relative meaning of product feature regarding overall benefit of product
- But: gaining new product features improbable

(Herstatt & Lüthje, 2011)
Sources of Product Ideas – Purpose-driven Information

(1) Customers

B - Qualitative methods

Focus groups & online communities

- Focus group = moderated, open discussions with 6-12 customers regarding specific product or product segment
- Using virtual communities for innovative questions in active and passive way
- But: inappropriate for radical innovations

Lead user = qualified and motivated customer that supports development of new products

- Ordinary customer has functional fixedness (von Hippel, 1988); not able to “fade out” current product offers – sustaining technologies
- Lead users (1) early recognize needs that will translate into market demands later on, (2) benefit from innovations that solve their problems / satisfy their needs

(2) Retail

- Source of information concerning customers, their needs and desires – possible, but rare
- Source of new product ideas – retailers similar to lead users (qualified end users)

(3) Environment

New product ideas through dynamic of environment (long-term changes in society, business, law etc.)

(Herstatt & Lüthje, 2011)
Sources of Product Ideas – Means-driven Information

(1) Employees (R&D, manufacturing)
Requirement: support of innovative activities by top-management, e.g., idea management via intranet, profit participation of employees

(2) Competitors
• Competition analysis – innovation behavior of current or potential competitors
• Information search simple, e.g., via Internet
• Reverse engineering

(3) Suppliers
• Food for thought concerning new products or complete product / process innovations
• e.g., supplier (technology) innovation platform at Ford; used by R&D engineers

(4) Technology Monitoring
• Technological-scientific publications
• Patents (Which companies in which market segment? Which technology is basis for large amount of patents? etc.)

(5) Knowledge Broker (large scope of search)
Product designer (e.g., IDEO) and consulting companies – combine knowledge of diverse technological scopes – interdisciplinary knowledge generate bridges

(Herstatt & Lüthje, 2011)
Models of Design Process

Descriptive models

- Exploration
- Generation
- Evaluation
- Communication

of problem space

of design = ready for manufacturing

Early in design process: generation of solution concept

Cross, 2011

Prescriptive models

1. Market, Environment, Company
2. Situation analysis
   - Understand the lifecycle phase
   - Assess product family’s strategic position
   - Assess the internal and external problem
   - Consider the competitive situation
   - Define the problem
3. Generate strategies
   - Generate strategic directions
   - Define the design concept
   - Define the product concept
4. Identify product ideas
   - Define options for the design concept
   - Define the product concept
5. Define products
   - Select the best product concept
   - Refine the product concept
   - Define the product concept
6. Development, Construction
   - Further development
   - Define the product concept
   - Finalize the product concept

Pahl et al., 2002 (referring to VDI guideline 2220)

Integrative models

- Designer explores and develops problem and solution together
- Problems -> sub-problems -> solved by sub-solutions -> solution
- Constant transfer of designer attention backwards and forwards between problem and solution space

- Design methodology; more analytical work
- Ensuring that design problem was fully understood – “real” problem identified
- Performance specifications are derived from design problem
- Generation of solutions for each performance specification (several alternative design concepts)

(Pahl et al., 2002 (referring to VDI guideline 2220))
Product Development Process

- Conceptual Design → Development → Testing

0. Planning
1. Concept Development
2. System-Level Design
3. Detail Design
4. Testing and Refinement
5. Production Ramp-Up

(Ulrich & Eppinger, 2011)
0. Planning

- „Phase zero“ -- launch of product development process
- **Identification of opportunities** guided by corporate strategy
- Assessment of technology developments and market objectives

„An opportunity is a *product description* in *embryonic form*, a newly sensed *need*, a newly discovered *technology*, or a rough match between a need and a *possible solution*.“ (Ulrich & Eppinger, 2011, p. 34)

<table>
<thead>
<tr>
<th><strong>Mission Statement: Dog Toy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Description</strong></td>
</tr>
<tr>
<td><strong>Benefit Proposition</strong></td>
</tr>
<tr>
<td><strong>Key Business Goals</strong></td>
</tr>
<tr>
<td><strong>Primary Market</strong></td>
</tr>
<tr>
<td><strong>Secondary Markets</strong></td>
</tr>
<tr>
<td><strong>Assumptions</strong></td>
</tr>
<tr>
<td><strong>Stakeholders</strong></td>
</tr>
</tbody>
</table>

- **Output**: project mission statement consisting of specification of target market for product, business goals, production constraints etc.

(Ulrich & Eppinger, 2011)
How to Identify Opportunities?

- Types of opportunities

Knowledge of Need

- New need/market
  - Exploration into new markets
  - New-category products and service

- Existing need/market that we do not address
  - Adjacent growth

- Existing need/market that we currently serve
  - Improvements, extensions, variants, cost reductions
  - Next generation products and services for core markets
  - Exploration with new solutions, approaches

Knowledge of Solution

(Terwiesch & Ulrich, 2009)
Product Development Process – 0. Planning

How to Identify Opportunities?

- Types of opportunities

Knowledge of Solution

(Terwiesch & Ulrich, 2009)
• **Step 1:** Establish a **charter** (closely analogous to the mission statement of a product)
  - „Create a **physical product** in the **cat toy category** that we can **launch to the market within about a year** through the **existing retail sales channel**.“

• **Step 2:** **Generate and sense** many opportunities
  - Focus on (organization-) internal and external sources of opportunity
  - **Structured creativity techniques** for generating opportunities: e.g., „**imitate, but better**“ approach – exploiting solutions by other firms and considering alternative solutions that address the same/alternative needs

• **Step 3:** **Screen** opportunities (cf. VanGundy, 1998)
  - Eliminate opportunities unlikely to result in creation of value
  - Focus on opportunities worthy of further investment
  - **How?** – 2 methods: **web-based surveys** and **workshops** with „multivoting“ („dots“)

(Ulrich & Eppinger, 2011)
Product Development Process – 0. Planning
How to Identify Opportunities?

- **Step 4: Develop** promising opportunities
  - **Resolve** greatest **uncertainty** at the lowest cost in time and money
  - Developing a few of the opportunities
  - Investigation concerning existing solutions; informal discussion with potential customers; concept generation; quick prototypes; customer interviews

- **Step 5: Select** exceptional opportunities
  - Handful of opportunities; uncertainty resolved; pick exceptional few opportunities
  - Application of methods of later concept selection (e.g., Pugh method) or Real-Win-Worth-it (RWW) method (Day, 2007): (1) Is the opportunity **real**?; (2) Can you **win** with this opportunity?; (3) Is the opportunity **worth it** financially?

- **Step 6: Reflect** on the results and the process

(Ulrich & Eppinger, 2011)
Product Development Process - 1. Concept Development

0. Planning

1. Concept Development

2. System-Level Design

3. Detail Design

4. Testing and Refinement

5. Production Ramp-Up

Mission statement

- Identify Customer Needs
- Establish Target Specifications
- Generate Product Concepts
- Select Product Concept(s)
- Test Product Concept(s)
- Set Final Specifications
- Plan Downstream Development

Perform economic analysis

Benchmark competitive products

Build and test models and prototypes

(Ulrich & Eppinger, 2011)
• **What?**
  - Customer needs expressed in "**language of customers**“ – to much margin for subjective interpretation, e.g., "the notebook boots fastly“
  - Specifications spell out in precise, measureable detail **what product has to do**
  - = unambiguous agreement on what the team wants to achieve in order to satisfy customer needs, e.g., "the average time for booting is less than 120 seconds“
  - Specification consists of **metric** (e.g., average time for booting) and **value** (e.g., less than 120 seconds) labeled with unit

• **When?**
  - After identifying customer needs –> setting of target specifications that represent **hopes** and aspirations of the team –> ranking of importance of each target specification
  - After selection of product concept, target specification have to be refined to final specifications (later subphase in concept development) -> lecture „Planning Product Features“

• **How?**
  ① Prepare list of metrics
  ② Collect competitive benchmarking information
  ③ Set ideal and marginally acceptable target values
  ④ Reflect on the results and the process

(Ulrich & Eppinger, 2011)
Product Development Process - 1. Concept Development

Establish Target Specifications

① Prepare list of metrics - Example
- Simple needs-metrics matrix represents relationship between needs and metrics
- Key element of „House of Quality“, graphical technique used in Quality Function Development (QFD) (Hauser & Clausing, 1988; Rawasamy & Ulrich, 1994)

<table>
<thead>
<tr>
<th>No.</th>
<th>Need</th>
<th>ST Track</th>
<th>Monday 3</th>
<th>Hex Tube Quadra</th>
<th>Hex Tube Ti 21</th>
<th>Toner pree</th>
<th>Gamhill Head Skin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ready for launch to the market</td>
<td>2</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>2</td>
<td>Allow easy transfer off slabs, efficient service</td>
<td>2</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>3</td>
<td>Ideal high-speed element on long trials</td>
<td>5</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>4</td>
<td>Allow high margin adjustment</td>
<td>3</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>5</td>
<td>Preserve the appealing characteristics of the joint</td>
<td>4</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>6</td>
<td>Stability of soft stage during hand operating</td>
<td>4</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>7</td>
<td>Light weight</td>
<td>4</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>8</td>
<td>Provide self-care position for thebac</td>
<td>2</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>9</td>
<td>Provide easy utility of amber, white, and blue lines</td>
<td>1</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>10</td>
<td>Eco-friendly</td>
<td>1</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>11</td>
<td>Many car dealers</td>
<td>1</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>12</td>
<td>Light weight</td>
<td>5</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>13</td>
<td>Need for quality for an additional installation</td>
<td>5</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>14</td>
<td>Need to be determined by price</td>
<td>5</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>15</td>
<td>Need to be improved by price</td>
<td>5</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>16</td>
<td>Can be easily accepted by maintenance</td>
<td>3</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>17</td>
<td>Allow easy replacement of major parts</td>
<td>1</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>18</td>
<td>Can be managed in many multiple tasks</td>
<td>3</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>19</td>
<td>Lasts a long time</td>
<td>5</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>20</td>
<td>Be safe in a crash</td>
<td>5</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metric</th>
<th>Performance of processor = &gt;4GHz</th>
<th>Dimension = &lt;= 25 x 15 cm</th>
<th>Weight = &lt;= 500g</th>
</tr>
</thead>
<tbody>
<tr>
<td>High speed processor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most portable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low weight</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

② Collect competitive benchmarking information - Example
- Competitive benchmarking chart with rows representing customer needs and columns representing competitive products
- Compare customers‘ perceptions of relative degree to which products satisfy their needs (Urban & Hauser, 1993)
- More „dots“ – greater perceived satisfaction of needs

(Ulrich & Eppinger, 2011)
Product Development Process - 1. Concept Development

0. Planning
1. Concept Development
2. System-Level Design
3. Detail Design
4. Testing and Refinement
5. Production Ramp-Up

Mission statement
Identify Customer Needs
Establish Target Specifications
Generate Product Concepts
Select Product Concept(s)
Test Product Concept(s)
Set Final Specifications
Plan Downstream Development

Perform economic analysis
Benchmark competitive products
Build and test models and prototypes

(Ulrich & Eppinger, 2011)
Product Development Process - 1. Concept Development

Generate Product Concepts

- **5-step method** breaks complex problems into simpler sub problems
- External (cf. sources of product ideas) and internal search procedures
- **Classification trees and combination tables** used to explore space of solution concepts and to integrate sub problem solutions into total solution

\\(1\) Clarify problem
(understanding; problem decomposition; focus on critical sub problems)

\\(2\) Search externally
(lead users; experts; patents; literature; benchmarking)

\\(3\) Search internally
(individual; group)

\\(4\) Explore systematically
(classification tree; combination table)

\\(5\) Reflect on solutions and process
(constructive feedback)

---

Remember...

- Overall problem ↔ Overall solution
- Sub-problems ↔ Sub-solutions

(Ulrich & Eppinger, 2011; Cross, 2011)
Example: Classification trees & combination tables

Syringe Dosing

- Pneumatic
- Hydraulic
- Electric

Concepts:
- Air piston
- Air motor
- Solenoid
- Motor

Classification tree of subproblem syringe dosing

- Linear
- Rotational

Concept combination table

<table>
<thead>
<tr>
<th>Syringe Dosing by Electric Rotational Motor</th>
<th>Address Bubbles by Removal</th>
<th>Load Syringe by Force Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worm Gear</td>
<td>Chemical</td>
<td>Spring Loaded Latch</td>
</tr>
<tr>
<td>Screw</td>
<td>Overdraw</td>
<td>Spring Loaded Ball Bearing</td>
</tr>
<tr>
<td>Rack and Pinion</td>
<td>Multiple Withdraw</td>
<td>Undersized Form</td>
</tr>
<tr>
<td>Slider Crank</td>
<td>Piezoelectric Transducer</td>
<td></td>
</tr>
<tr>
<td>Linkage Mechanism</td>
<td>Tapping</td>
<td></td>
</tr>
<tr>
<td>Winch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

e.g., accessible syringe doser that gives dosed syringe combined with audiovisual output
Product Development Process - 1. Concept Development

0. Planning
1. Concept Development
2. System-Level Design
3. Detail Design
4. Testing and Refinement
5. Production Ramp-Up

- Identify Customer Needs
- Establish Target Specifications
- Generate Product Concepts
- Select Product Concept(s)
- Test Product Concept(s)
- Set Final Specifications
- Plan Downstream Development
- Perform economic analysis
- Benchmark competitive products
- Build and test models and prototypes

(Ulrich & Eppinger, 2011)
Product Development Process - 1. Concept Development

Select Product Concept(s)

- Two-stage concept selection methodology
- Several iterations
- Both stages follow six-step process
  1. Preparing matrix
  2. Rate concepts
  3. Rank concepts
  4. Combine and improve concepts
  5. Select one or more concepts
  6. Reflect on results and process

(Alger & Hays, 1964; Ulrich & Eppinger, 2011)
Pugh Controlled Convergence Method addresses multi-criteria decision problems

Basics:

- Pugh matrix -> design concept vs. criteria (cf. target specifications)
- Selection of datum concept required, i.e. reference concept that is well understood and strong (e.g., market leader)
- Evaluation of design concepts with +, - and s (= same)
- s -> (1) design concept’s merit similar to datum concept, (2) difference between datum and design concept is controversial -> additional information needed
- Scores are counted – objective is not single winning design, but reduction of number of design concepts, e.g., eliminate weak concepts

Procedure – first matrix run:

① Create set of design concepts to be evaluated, e.g., design concept A, B, C, D + datum concept X

② Model set of opinions held by group of experts, i.e., estimated merit of concept regarding criteria and datum concept (+,-,s)

(Pugh, 1990, 1996; Frey et al., 2009)
Generate **Pugh matrix**

Eliminate concepts that are dominated by other concepts, i.e. concepts that generate no added in comparison to other concepts -> design concept D

### Procedure – between matrix runs:

**Concepts with more ‘+’ and less ‘-’ = good platforms**

**Concepts with less ‘+’ and more ‘-’ = sources for ideas**

#### Ideation = forming hybrids of two concepts
- choosing design concept of top 33% per random as basis for hybrid and combine with second design concept with most complementary strength, e.g., design concept C + B

#### Investigation = getting improved understanding of design problem
- Refining expert opinion for s-values of design concept of top 33%, e.g., design concept A (crit. 4) and C (crit. 3)
- Additionally, all design concepts receive refined estimate in three most influential criteria

**Select Product Concept(s)**

<table>
<thead>
<tr>
<th></th>
<th>Design Concept A</th>
<th>Design Concept B</th>
<th>Design Concept C</th>
<th>Design Concept D</th>
<th>Datum Concept X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crit. 1</td>
<td>-</td>
<td>s</td>
<td>+</td>
<td>s</td>
<td>0</td>
</tr>
<tr>
<td>Crit. 2</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Crit. 3</td>
<td>+</td>
<td>-</td>
<td>s</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Crit. 4</td>
<td>s</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Sum +</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sum s</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Sum -</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Net score</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>-3</td>
<td>0</td>
</tr>
<tr>
<td>Rank</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

(Pugh, 1990, 1996; Frey et al., 2009)
<table>
<thead>
<tr>
<th>Failure reason</th>
<th>Elaboration</th>
<th>Suggested safeguard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market too small</td>
<td><strong>Insufficient demand</strong> for this type of product</td>
<td>Market is defined and rough potential estimated in <em>opportunity identification</em>; demand forecasts in design and testing</td>
</tr>
<tr>
<td>Not new / not different</td>
<td><strong>Poor idea</strong> that really offers nothing new to the customer. Technology may be new, but the benefit to consumers is not evident.</td>
<td><strong>Creative and systematic idea generation</strong> in opportunity identification. Product design with <em>focus on customer</em>. Product and position tested before launch.</td>
</tr>
<tr>
<td>Major shifts in technology</td>
<td>“Blind-sided” by <strong>radical change in technology</strong>. Stay with old technology too long.</td>
<td>Monitoring. Education for R&amp;D. <strong>Contingency plans for shifts</strong>.</td>
</tr>
<tr>
<td>Lack of coordination in functions</td>
<td>R&amp;D develops product that does <strong>not meet customer needs</strong> etc.</td>
<td>Input from customer drives new product development process. Process used to <em>coordinate marketing, R&amp;D, engineering</em> etc.</td>
</tr>
</tbody>
</table>

(Extract / Urban & Hauser, 1993)
Innovation Management

1. Introduction
2. Knowledge Management (1)
3. Knowledge Management (2)
4. Guest Lecture
5. Strategic Innovation Management
6. Case Study
7. New Product Development
8. Creativity Techniques
9. Planning Product Features
10. Experimentation Strategies
11. Open Innovation
12. Diffusion and Adoption of Innovation
13. Diffusion and Adoption of Information Systems
14. Business Planning and Writing
Literature

Books:

• Hauschildt, J. (2004), Innovationsmanagement, Vahlen Verlag.
• von Hippel, E. (1988), The Sources of Innovation, Oxford University Press.
• Pugh, S. (1990), Total Design, Addison-Wesley.

Papers:

Literature

Univ.-Prof. Dr.-Ing. Wolfgang Maass

Chair in Information and Service Systems
Saarland University, Germany