Customer-Centric Innovation

Prof. Frank T. Piller | RWTH Aachen University
About me: Frank Piller

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Studying innovation since 1994, but also practicing it by helping large companies to innovate and by being involved in a number of startups

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A magic formula for innovation?

\[ I = f(n, op, u_f, o, c, pd, $, l) \]

\[ I = f(\text{need, opportunity, (frustrated)user, openness, creativity, process\&discipline, budget, luck}) \]
The Basic New Product* Process

* The same process applies to service development
The Development Funnel

Front End of Innovation (FEI) to New Product (Service) Development

Opportunity → Ideas → Discovery (ideation and concept development) → Innovative Concepts → Realization → Invention → Nurture

New Product (Service) Development:
- Products / Services (market launch)
- Knowledge

FEI activities are less structured and less predictable ("fuzzy")

Development activities can be structured by a formalized and prescribed set of activities

Stages of the innovation process / time

Based on Wheelwright / Clark 1992
The Frontend of Innovation (FEI)

Source: Lercher 2016, 2017
Four main clusters of FEI activities

1) Understanding the external environment of our business units & our customers

2) Identifying gaps between our present state and an envisioned future

3) Creating alternatives for solutions to benefit from opportunities identified in previous stage

4) Combining ideas into concepts which cover primary features and customer benefits of future solution
Methods for generating ideas & concepts

Creating concepts internally:
Using a managed process run by the innovation team

Market Research
(Voice of the customer)

Creativity Techniques

Generating ideas & concepts

Gathering (existing) ready-made concepts from the periphery:
Customer Co-Creation

Collect concepts from others inside the organization

Collect concepts from outside the organization

Innovation is the result of a dedicated firm activity

Innovation is the result of a (frustrated) user
Methods for generating ideas & concepts

Creating concepts internally:
Using a managed process run by the innovation team

Market Research (Voice of the customer)
Creativity Techniques

Gathering (existing) ready-made concepts from the periphery:
Customer Co-Creation

Collect concepts from others inside the organization
Collect concepts from outside the organization
Job-based thinking for innovation

Formulating jobs: Three dimensions

- Functional
- Emotional
- Social

Formulating jobs: Examples

1) **Action verb** (with direction)
2) **Object of action**
3) **Contextual clarification**

The example of a powertool (driller)

**Functional**: „Reduce likelihood of hitting the water pipe when renovating an old house“

**Emotional**: „Provide me with larger satisfaction once I finished the task“

**Social**: „Reduce the disturbance for my neighbors“
Methods for generating product concepts

Generating Concepts

Creating concepts internally:
Using a managed process run by the innovation team

Market Research
(Voice of the customer)

Creativity Techniques

Gathering (existing) ready-made concepts from the periphery:
Customer Co-Creation

Collect concepts from others inside the organization

Collect concepts from outside the organization
Lead users as the source of functional novel innovation

Users as the source of innovation:
User as originators of first-of-type innovations and major improvements of existing products

Mountain bike
Open Source Software
Scientific Instruments
Petroleum Processing
Conclusions: The Frontend of Innovation

The Frontend of Innovation (FEI) is …

- a customer-centric process of opportunity recognition
  (technological opportunities, but especially open problems (“jobs”) of
  customers, i.e. customer insights)
- ideation and
- concept development.

The ingredients of the FEI are: Dedicated methods of analysis, creativity, but also lots of evaluation and selection.

It is followed by the (technical) development stage, where technical problem solving, product design & engineering takes place. After a final screen, the new product is then ready for launch.
Implementation and Project Phase
Innovation & Creativity Management

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Facets of creativity:
What are abilities of a creative person?
Problem solving has two components:

1. Search process based on prior experience
2. Trial-and-error-learning

Five-Step-Process of Concept Development according to Ulrich & Eppinger

Step 1: Clarify the Problem
Step 2: External Search
Step 3: Internal Search
Step 4: Explore Systematically
Step 5: Reflect on the Results and the Process

The Innovation Funnel

The Front End (FEI) to New Product (Service) Development

- **Opportunity**
  - **Direction:** Where should we look?
- **Ideas**
  - **Initial Review:** Is the idea worth screening?
- **Innovative Concepts**
  - **Full Screen:** Should we try to develop it?
- **Realization**
  - **Progress Report:** Have we developed it?
- **Invention**
  - **Nurture**
  - **Knowledge**
  - **Products / Services (market launch)**

**The innovation process is also a process of continuous evaluation**

Based on Wheelwright / Clark 1992, Source: Crawford, Di Benedetto 2001
A magic formula for innovation?

$l = f(need, opportunity, (frustrated)user, openness, creativity, process&discipline, budget, luck)$
The Big Picture

Source: Lercher 2016, 2017
Managing the Innovation Process

See you soon!
Please study the syllabus for all important information and organizational detail!
Managing Innovation: An introduction

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The objectives of this video module

This is not an innovation management class – but a motivation to study the management of innovation and technology in larger detail.

We will define some important terms and introduce some of the core frameworks and concepts of innovation management.

At the end of the module, you will have more questions than answers – but hopefully more background knowledge, too, when engaging in deeper study – either on your own or in our classes or workshops.
What is innovation?

Defining innovation
What is an innovation?
Your Top 10 of Innovation

In 2002, the BBC asked the listeners of its *Today* program on Radio 4 to nominate their top ten inventions of all time. This is what the British public responded (in descending order):

1. **Bicycle** (Pierre Lallement, 1866)
2. **Radio** (Guglielmo Marconi, 1897)
3. **Computer** (Alan Turing, 1945)
4. **Penicillin** (Florey and Heatley, 1940)
5. **Internal Combustion Engine** (Nicolaus Otto, 1876)
7. **Light Bulb** (Thomas Edison and Joseph Swann, 1829)
8. **Cat’s Eyes** (Percy Shaw, 1936)
9. **Telephone** (Alexander G Bell, 1876)
10. **Television** (John Logie Baird, 1923)

Our definition of an innovation

An **innovation** is the **creation (invention), introduction (launch) and successful diffusion (adoption)** of **products, services, systems, processes, or even business models**, which are **new from the perspective of the particular organization and/or user**.
Innovation in a broader understanding

Creation of new technological knowledge

Invention

Innovation

First usage

Innovation

Repeated usage

Diffusion
What is special about innovation?

The nature of innovation
Innovation is an open ended problem, characterized by several characteristics but full of opportunities, too!!
A typical story of innovation
The story of Barbie reminds us of some key characteristics of innovation:

- Role of outsiders as the source of innovation (innovative users play a central role)
- Not always the result of a structured planning process
- A lot of resistance
- The power of working with prototypes
- The need for being open and un-biased
- So much coincidence & luck

Innovation Management:
Making this a structured, systematic, and repeatable process
Innovation management is the systematic management of innovation processes. It refers both to product, process, and organizational innovation.

Innovation management includes a set of tools that allow managers and engineers to cooperate with a common understanding of processes and goals.
Are there different kinds of innovation?

Structuring different types of innovation (Part 1)
Different types of innovation (I): Outcome of the innovation process: Products, services, and processes

- Embodied in a company's tangible output: a new product offering (new product development)
- Can be new or improved offerings, often variants
- Example: iPod, Post-it, Pharmaceuticals

- Similar to product innovation, but the outcome is a new service offering
- Rather new perspective that services can be systematically innovated, too
- Example: New telephone banking process, new logistic service

- Concerning the way companies conduct their business – production, marketing techniques, etc.
- Objective: Improve efficiency of value creation
- Example: Assembly line production, airlines using e-tickets
The relation of product versus process technology
Object of analysis: industry level

Different types of innovation (II): Degree of innovativeness (uncertainty): Radical versus incremental innovation

The innovativeness of an innovation process is characterized by the number of elements in a system effected by the innovation and the resulting uncertainty in performing the innovation project and diffusing its outcome.

It can be seen as the RESULT of an innovation process (output), but also as an OBJECTIVE when planning an innovation project (input).

- **Radical, discontinuous innovation**
  - New to the world and fundamentally different to existing products and processes
  - Risky and uncertain concerning technology, market acceptance, demand, regulation, …
  - Example: Satellite phone technology

- **Incremental, continuous innovation**
  - Gradual changes or improvements to existing offerings
  - Leveraging existing skills and knowledge
  - Example: Development of the next MS Office package
Innovativeness as an input measure: Managing innovation based on the expected (desired) result

Why is it important for the manager of an innovation project to "define" the perceived (expected) degree of innovation when setting up the project?

- Information requirements
- Budget & scheduling
- Team composition
- Stakeholder involvement
- Internal communication of project ...

Why it is important to evaluate the achieved degree of innovativeness before the invention is being launched? to the market or its internal users?

- Marketing planning
- Communications budget
- Sales and launch execution ...
Some typical shares of different innovation types of a large consumer good company

- **New-to-the-world** (really-new) products (10% of new products): Inventions that create a whole new market. Ex.: Polaroid camera, Sony Walkman, Palm Pilot, Rollerblade skates, P&G Febreze and Dryel.

- **New-to-the-firm products** (20%): Products that take a firm into a category new to it. Ex.: P&G brand shampoo or coffee, Hallmark gift items, AT&T Universal credit card, Canon laser printer.

- **Additions to existing product lines** (26%): Line extensions and flankers that flesh out the product line in current markets. Ex.: Tide Liquid, Bud Light, Apple’s iMac, HP LaserJet 7P.

- **Improvements and revisions to existing products** (26%): Current products made better. Ex.: P&G’s continuing improvements to Tide detergent, Ivory soap.

- **Repositionings** (7%): Products that are retargeted for a new use or application. Also includes retargeting to new users or new target markets. Ex.: Arm & Hammer baking soda sold as a refrigerator deodorant; Aspirin repositioned as a safeguard against heart attacks.

- **Cost reductions** (11%): New products that provide the customer similar performance but at a lower cost. Exchanging components, materials, “cost engineering”.

Are there different kinds of innovation?

Structuring different types of innovation (Part 2)
Different types of innovation (III): Degree of change in the product system: Component versus architectural innovation


### Components / core concepts

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<tr>
<th>System/ linkages</th>
<th>Reinforced</th>
<th>Overturned</th>
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<tbody>
<tr>
<td>Unchanged</td>
<td>Incremental Innovation</td>
<td>Component Innovation</td>
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<tr>
<td>Changed</td>
<td>Architectural Innovation</td>
<td>Radical Innovation</td>
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</table>

**Incremental Innovation**
- Gradual refinement/improvement of existing components leaving the system unchanged

**Radical Innovation**
- Complete overhaul of components and system

**Component Innovation**
- Using new components within an unchanged system

**Architectural Innovation**
- Reconfiguration of an existing system using unchanged or new components; main changes in design and way how components interact
Different types of innovation (IV): Degree of change from the firm perspective: Sustaining versus disruptive innovation

Performance improving ("sustaining") Innovation (improvements of merit): Replacement of old model by a next and better version

Example: The new Volkswagen Golf.

Efficiency improving Innovation (Process innovation) An offering of the same solution for the same customers at a lower price ("low-end disruptions"). Example: Walmart's retail innovations, "just in time" manufacturing by Toyota.

Market creating Innovation (disruptive business model innovation): Transformation of existing (complex or expensive) solutions in such a radical manner that a new market is created (with a new class of customers). Result of combining a cost-reducing technology with a business model.

Example: Video streaming “on demand” replacing the video rental store

Picture Source: Wikipedia Media Commons (CC BY-SA)
A common structure of innovation categories: The “Ansoff Matrix”

There are many shades of innovation – it is important to know what you want to achieve

(contingencies of an innovation project)
Why do we have to innovate?

Outcomes and objectives of innovation
Why is innovation important for the company?

- **Demand**
  - Saturation of basic needs
  - Increasing individualization

- **Competition**
  - Increasing liberalization
  - Increasing globalization
  - need for differentiation

- **Input efficiency**
  - Increasing supply scarcity
  - Shifting price relations
  - Changing values of employees

- **Tech. progress**
  - Microelectronics
  - Laser technologies
  - Biotechnology
  - New materials

- **Societal demands**
  - Environment
  - Social needs
  - Consumer safety

Innovation pressure
Why is innovation important for the company?

Schumpeter’s Theory of Industrial Development

Entrepreneurship = the discovery and exploration of information advances

Innovation of an entrepreneur = „Exploration of new combinations“, the innovator becomes a „creative destroyer“

Entrepreneurial idea

Information on supply side

(Know-How, personnel, materials, capacities)

information on demand side

information about transformation (production) process

„building a better bridge“ (competitive advantage)

(customer preferences, willingness to pay)
Why is innovation important for the company? Michael Dell is a typical example of a Schumpeterian innovator

Michael Dell’s innovations:

Business Model Innovation, service innovation, plenty of process innovation, using the existing architecture of the PC industry
Why is innovation important from the perspective of our society and economy at large?

- To increase **economic growth** by producing the same with less factor input or by producing more with the same factor input (*quantitative growth*)

- To get products which **better fit to customer needs** (*qualitative growth*, enhancing consumer welfare)

- To **increase productivity of downstream industries** by supplying better components and machines

- To **support ecological or social sustainability** by producing products and services in a different, more efficient way

- Because knowledge once created can be used by others as well.
That we have to innovate seems to be out of question today.

The question is how.
From why to how

Searching for best practices of managing innovation
Relationship between R&D Input and Output
The consequence:

A focus on best practices and “proven” methods for successful innovation
## The World's Most Innovative Companies

### Browse the List

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>5-Year Avg. Sales Growth (%)</th>
<th>5-Year Avg. Net Income Growth (%)</th>
<th>Enterprise Value ($bil)</th>
<th>Innovation Premium*</th>
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<tr>
<td>1</td>
<td>Salesforce.com</td>
<td>39.5</td>
<td>78.7</td>
<td>20.7</td>
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<td>37.6</td>
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<td>Intuitive Surgical</td>
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<td>9</td>
<td>Bharat Heavy Electricals</td>
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What do executives think and do about innovation?
Innovation is a top strategic goal of executives

### Where does innovation rank among your company’s strategic priorities?

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<th>Percentage of respondents</th>
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<td>Top priority 1</td>
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<tr>
<td>Top-three priority</td>
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<td>Top-ten priority</td>
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<tr>
<td>Not a priority</td>
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### Percentage of respondents who consider innovation a top-three strategic priority

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<tr>
<th>Year</th>
<th>Percentage</th>
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<td>2006</td>
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<td>2007</td>
<td>66</td>
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<td>2008</td>
<td>66</td>
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<td>2009</td>
<td>64</td>
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<tr>
<td>2010</td>
<td>72</td>
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The total percentage of respondents who said that innovation is one of their company’s top-three priorities rounds to 72 percent.

Source: BCG Innovation Survey 2010
Satisfaction with the return on innovation spending has risen for the past three years, but remains rather low

Source: BCG Innovation Survey 2010
How to measure success of innovation: customer satisfaction and revenue growth are dominating metrics

Source: BCG Innovation Survey 2010
A risk-averse culture and lengthy development times are the biggest hurdles to benefit from innovation.

Source: BCG Innovation Survey 2010
Innovation management
(as a discipline of management research):

Identification of success factors and hurdles to achieve a high return on innovation spending. Development of corresponding tools and methods.
How does innovation happen?

Innovation = information processing in a structured process
There are two main understanding how innovation happens

- Innovation is the result of a (frustrated) user
- Not a systematic process
- Invention is happening anyway. It is the task of the company to build “absorptive capacity” to capture this external input
- Focus on managing this inflow of external input
- User innovators profit from using their invention

- Innovation is the result of a dedicated firm activity
- It is a systematic process of different stages: From opportunity recognition towards market launch
- Managing the risk of innovation (uncertainty)
- Focus on internal creativity and problem solving
- Manufacturer innovators profit from selling the innovation

Pictures: Wikipedia Media Commons (CC BY-SA)
A typical structure of a systematic innovation process

- Ideation
- Realization ("R&D", product development)
- Concept development
- Nurture (market launch)

Doing things right

Increasing the efficiency

Increasing the effectiveness

Doing the right things
Every innovation process requires two kinds of information, influencing its efficiency and effectiveness.

Need information

- Needs and preferences of users and customers
- Which benefit shall the innovation provide, which (open) problem shall it solve?
  - Explicit or latent information
- Getting access to the right need information influences the "fit to market"

=> Effectiveness of innovation process
Most new products / services do not flop because of technical failure, but because they do not meet customer requirements – firms did not get sufficient access to need information.
Many companies face the problem of obtaining the right need information – which often is “sticky”
Sticky information is information that is difficult to transfer between two actors

“The stickiness of a given unit of knowledge or information is defined as the incremental expenditure required to transfer that unit from one place to another, in a form that can be accessed by the recipient. When this expenditure is low, information stickiness is low; when it is high, stickiness is high. By implication, sticky information is harder to move.” (Eric von Hippel, Management Science 1994)

Some reasons:

>> Information needed by developers may be *tacit*

  Can you *tell* your child how to ride a bike?

>> A *lot* of information is often needed by developers

  “You didn’t *tell* me you were going to use the product *that* way!”
In development, firms need to get access to solution information

Solution information

- Technical knowledge how a need can be transferred into a product / Service
- What is the principle behind the need?
  - Often information already known (somewhere)
- Getting access to the right solution information determines **time-to-market** and **cost-to-market**

=> **Efficiency** of new products development
When an innovation project does not meet its "time to market" or "cost to market" objectives, the cause often is that the development team did not have access to the right solution information – or was searching at the wrong place.
Innovation (as an activity) = disciplined problem solving
Experimentation (trial and error learning)

Search (based on prior experience)

local search bias

K N O W L E D G E

C R E A T I V I T Y
Local search: To look only for solution information in your own technical domain based on previous experience

- Sometimes, prior experience is helpful – when new problem is closely related to old problem (continuous improvement)
- Sometimes, Prior experience is not helpful – can impede problem resolution -> Problem: "stuck in a paradigm", "tunnel perspective"

Local search bias: Negative biasing by previous experience may block an innovator to find the "best" solution for a given question

=> "reinventing the wheel"
=> long "time to market", high "cost to market"

Some reasons for local search:
Experience and previous training, Limited access to information available, Methods to evaluate information
Overcoming these two challenges is a central success factor of systematic innovation management.
What are methods to reduce the problems of "stickiness of need information" and the "local search bias"?
Some measures to get access to (sticky) need information

**Market research / "Voice of the customer" methods**
- Qualitative research, e.g. trend scouts, focus groups
- Quantitative research, e.g. surveys
- Combined methods, e.g. "Outcome driven innovation"
- Trend studies, third-party-data

**Observing customers**
- "Empathic design", e.g. observing customers in real environments
- Clinics and lab research (usability)
- Participative design

**Using past-data and iterations**
- Exploration of last season's sales data, educated guess of experienced sales person etc.
- Purchasing trend studies, using analysts and consultants
- Study competitors
Some measures to reduce the local search problem

Change your search style
- Training to improve cognitive search style, get experience in search
- Creativity techniques like brainstorming, TRIZ, QFD, etc.

More effective external search
- Broaden the breath and width of search (open innovation)
- Assign gatekeepers and special boundary roles
- Build absorptive capacity: establish bridging strategies

Partner with organizations with different knowledge
- Alliances and networks, R&D consortia, supplier integration in R&D
- Mergers & acquisitions
- Informal organizational arrangements

Find people with different knowledge
- “Knowledge flows with people moving” => diversity in organizations
- Interdisciplinary teams
- Job rotation

Source: Building on Karim Lakhani (2007)
In our lectures, we will discuss these and other methods and organizational principles in larger detail
What is the *real* challenge of innovation?

Thinking about innovation shapes the way we manage it
Innovation often follows an established paradigm (basic model)

Ray Ewry (1873-1937)
Olympic Games, London, 1908
World record: 1.98

Mildred McDaniel (1933)
Olympic Games, Melbourne, 1956
World Record: 2.15

Richard Fosbury (1947),
Olympic Games, Mexico, 1968
World Record: 2.24
How we think about something ... shapes the way we manage it.
Frugal innovation: Thinking differently, “stealing with pride” from other industries

Use of near and far analogies

Successful Innovation Management:

**Balancing Short-Term Profitability with Long-Term Sustainability**

The fundamental problem of managing innovation on an aggregated level ...
What is the *real* challenge of innovation?

The innovation challenge and the exploitation-exploration paradigm
Successful Innovation Management:

**Balancing Short-Term Profitability with Long-Term Sustainability**

The fundamental problem of managing innovation on an aggregated level …
Exploration versus exploitation

Foundation: Article by James March (1991)

• **Exploration**: “... includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation.” => radical, disruptive innovation

• **Exploitation**: “... includes such things as refinement, choice, production, efficiency, selection, implementation, execution.” => incremental, performance-improving innovation

Firms need both sets of innovative activities for long time survival. *But as their execution demands very different activities, capabilities, processes, and evaluation criteria, firms often focus on exploitation – and fail ...*
Firms need to master two distinct challenges at the same time:

- **Established business (EXPLOITATION)**: Strengthening and extending the core.
- **New business (EXPLORATION)**: Creating the new.
Firms need to master two distinct challenges at the same time:

- Strengthening and extending the core (Established business (EXPLOITATION))
- Creating the new (New business (EXPLORATION))
Firms need to master two distinct challenges at the same time:

- Strengthening and extending the core business
- Creating the new business (EXPLORATION)

Established business (EXPLOITATION)

Firms need to master two distinct challenges at the same time

Ambidexterity: “The test of a first rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function.” (Fitzgerald)

In the context of innovation: “the capacity to simultaneously achieve alignment and adaptability at a business-unit level”
A risk-averse culture and lengthy development times are the biggest hurdles, finds BCG study.

What are the biggest obstacles you face when it comes to generating a return on your investments in innovation?

<table>
<thead>
<tr>
<th>Percentage of respondents</th>
<th>40</th>
<th>30</th>
<th>26</th>
<th>24</th>
<th>22</th>
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</thead>
<tbody>
<tr>
<td>Risk-averse culture</td>
<td>31</td>
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<td>Lengthy development times</td>
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<td>Difficulty selecting the right ideas to commercialize</td>
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<td>Inability to adequately measure performance</td>
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<td>Not enough great ideas</td>
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<td>Lack of coordination within the company</td>
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<td>Compensation not tied to innovation results</td>
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<td>Insufficient support from leadership and management</td>
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</table>

Source: BCG Innovation Survey 2010
Mastering exploration is important: It is key driver for profit

Source: PDMA Study 2010
Circumstances of innovation: Fit of new opportunities and the nature of customers served

<table>
<thead>
<tr>
<th>Nature of the Opportunity</th>
<th>Core Business</th>
<th>Adjacency</th>
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<tbody>
<tr>
<td>Good fit w/ current org.</td>
<td>Existing customers served in traditional ways</td>
<td>New customers or existing customers served in fundamentally different ways</td>
</tr>
<tr>
<td>Poor fit w/ current org.</td>
<td>Performance innovation (or “poor dogs”)</td>
<td>White Space (Business Model Innovation)</td>
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</tbody>
</table>

Nature of the Customer

Source: M.W. Johnson: Seizing the White Space, 2010
The more we move to the “white space” (engage in exploration), the more we have to build and manage assumptions.

Source: M.W. Johnson: Seizing the White Space, 2010
The recent focus on business model innovation emphasizes an innovation system that allows firms to deal with assumptions about their future – and to create (and test) new business models as systematically as new products (i.e. to engage in exploration)
What did we talk about in all the previous slides?

Summary and conclusions
A few important things to remember

- **Innovation** is the creation (invention), introduction (launch) and successful diffusion of products, systems, or processes which are **new from the perspective** of the particular organization or user.

- Innovations are **open ended, complex problems** and result from a **social process**.

- They often have their **origin in an user with an open need**, but also are the **result of a structured innovation activity** by a firm.

- Identifying “**best practices**” of firms with high innovation performance is a core activity in innovation research.
A few important things to remember

- **Addressing the two core problems of managing an innovation project**: getting access to the right “sticky” need information, and finding technical solution information without being limited by “local search”.

- The idea of the **stage-gate process** is to de-risk the consequences of making innovation activities under insufficient information.

- **Mental models** shape our understanding of innovation and provide the "sandbox where we play" to innovate: Need to balance between exploration (*long-term sustainability*) and exploitation (*short-term profitability*). This is perhaps the largest challenge of managing innovation.
Stay open, start innovating, and to explore innovation

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