MOT 131A Emerging and Breakthrough Technologies

Prof.dr. J. Roland Ortt

Lecture 7 and 9: Strategies during the pattern

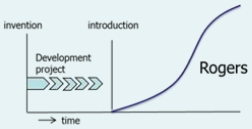
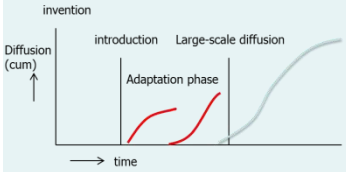
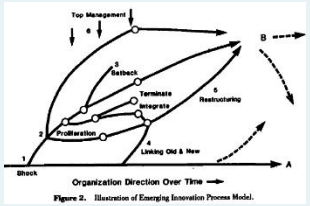
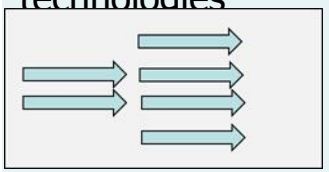
Assignment 2 (reminder)

- The Kodak case
  - The nature of the case compared to assignment 1
  - 4 questions

- Planning
  - 29-09: the information is open
  - 04-10: initial results can be shared (4 questions)(voluntary)
  - 05-10: we study those results
  - 06-10: lecture, discussion, extra questions (5 questions in total)
    group work 18.00u hand in full results (graded assignment)

Three levels of innovation processes

Alternative models, theories on each level

Project (level 1)	Stage-gate 	Agile-projects 	Hybrid-projects ….	Ad-hoc 
Pattern (level 2) - (F)Actors, mechanisms - Strategies	innovation-diffusion paradigm 	Pattern development and diffusion 	Minnesota studies 	-
Discipline (level 3)	The genious inventor 	The fertile R&D context 	Invention is combining technologies 	-

MOT131A Lecture

Strategies during the pattern

1. Introduction
2. Product innovation and alternative strategies.
3. Scenario/Strategy combinations.
4. Strategies during the innovation phase.
5. Strategies during the adaptation phase.
6. Strategies during the stabilization phase.
7. Conclusions

Introduction (learning material)

Slides + 3 Articles strategies

product-innovation and alternatives: slides
scenario/strategy combi: Chintan Shah-article
innovation phase: slides

(see also Schroeder et al, 1986; Markham et al, 2010 from the lecture on factors)

adaptation phase: 2 articles about niche strategies.
stabilization phase: slides

Introduction (learning goals)

Describe strategies during the pattern.

You can mention these strategies and indicate when
(in the face of which barriers or problems) they can be adopted

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Product innovation and its alternatives (a)

Questions:

- What are alternatives for innovation?
- How do these alternatives compare in terms of investment, payback time and risk?

Product innovation and its alternatives (b)

	Investment (-- to ++)	Payback time (shrt, mdl, lng)	Risk (-- to ++)
Market penetration			
Market development			
Product improvement			
Cost cutdown, efficiency process innovation			
New product development			

Product innovation and its alternatives (c)

	Investment	Payback time	Risk
Market penetration	+/-	short	+/-
Market development	+	middle	+
Product improvement	+/-	short	+/-
Cost cutdown, efficiency process innovation	-	short	-
New product development	++	long	++

Product innovation and its alternatives (d)

	Investment	Payback time	Risk	Order of preference
Market penetration	+/-	short	+/-	2
Market development	+	middle	+	3
Product improvement	+/-	short	+/-	2
Cost cutdown, efficiency process innovation	-	short	-	1
New product development	++	long	++	4

Best alternative strategic option:
- Low investment
- Short payback time
- Low risk

Order of preference is then (1-4)

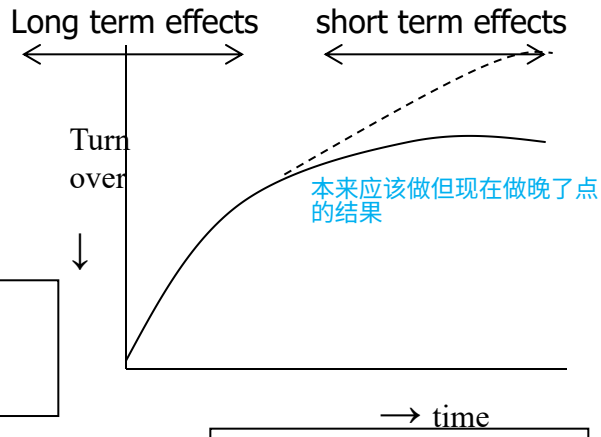
Why innovate if it is such low preferred strategic option?

Only long-term option, the long term outcomes of the strategies are not depicted

- **Stakeholders often force companies towards a short-term alternative**
- **What is the effect of market and technology trends on the relative preference for the strategic options?**

Product innovation and its alternatives (e)

Conditions that require innovation



Long term effects External

Market changes

Technology changes

Long term effects Internal

Portfolio unbalanced

too late

Short term effects

Competitors introduce better products

Consumers switch

Price/performance ratio deteriorates

Turnover / Profit decreases

New product
New production
New organization

New product version/service marketing mix
Production optimization
Organization optimization

Ad 4. Product innovation and its alternatives (f)

	Invest-ment	Payback time	Risk	Reward (long term)
Market penetration	+/-	short	+/-	+
Market development	+	middle	+	+
Product improvement	+/-	short	+/-	+
Cost cutdown, efficiency process innovation	-	short	-	+
New product development	++	long	++	+++

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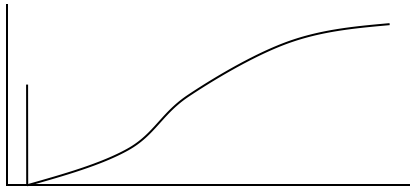
Scenario/strategy combinations (a)

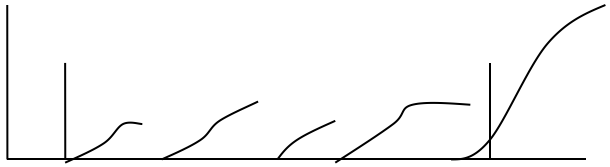
What are possible scenario's after the invention?

(article with Chintan Shah)

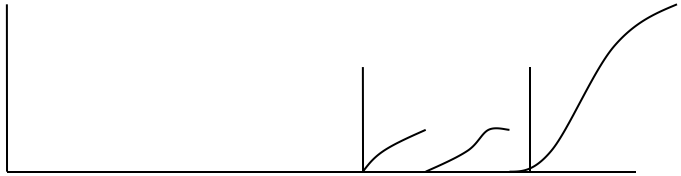
Almost directly after invention large-scale production and diffusion



Quickly after the invention a market introduction and after that a long period of trial and error before large-scale diffusion



Long period of development before the first market introduction



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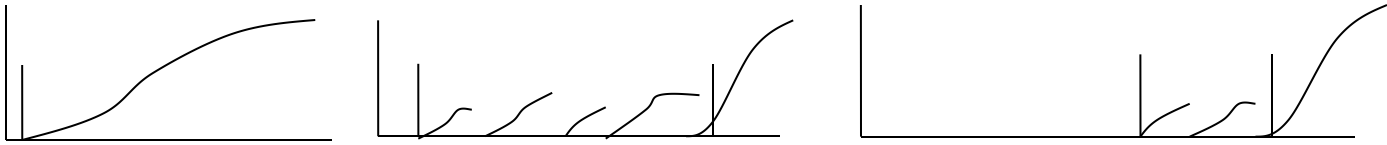
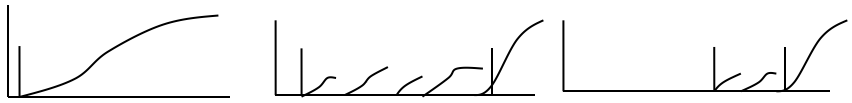
Scenario/strategy combinations (b)



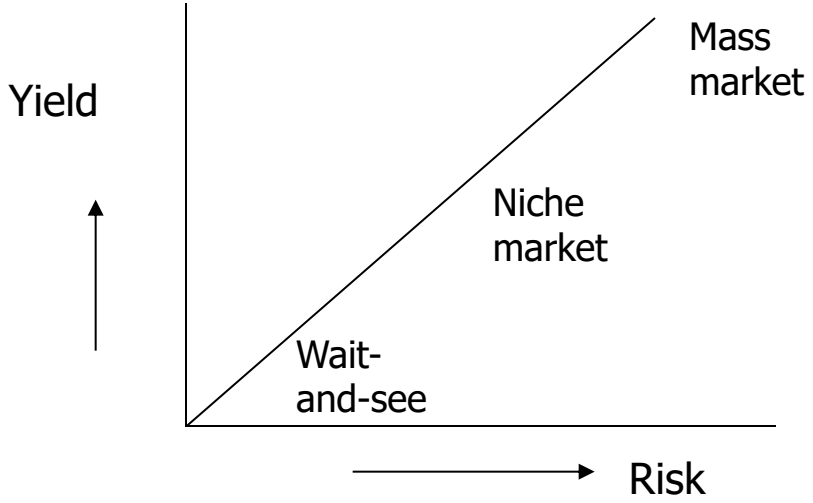
Strategie	Scenario 1	Scenario 2	Scenario 3
A Mass market strategie			
B Niche market strategie			
C Wait-and-see			

Scenario/strategy combinations (c)



Strategie	Scenario 1	Scenario 2	Scenario 3
A Mass market	++	--	--
B Niche market	+-	++	-
C Wait-and-see	-	+	++

1. Every scenario has a "best" category of strategies.
2. Expected yield and risk of strategies are strongly related
   1. Wait-and-see low risk/yield
   2. Mass market high risk/yield



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Strategies during the innovation phase

1. Length of the innovation phase?
2. Why does it take so long? (Depends on your model/theory!)
3. What are the activities and barriers or problems in the phase?
4. What are the strategies to deal with that?

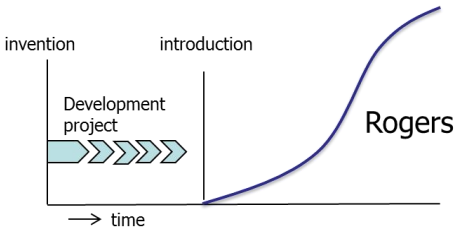
Ad 1. Length Innovation phase

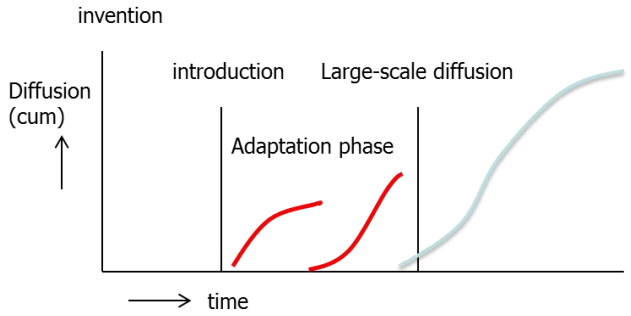
Industry → Mean value ↓ (st dev)[1]	Chemicals, metals & materials	Pharma & healthcare equipment	Telecom, media & Internet	Electronic equipment	Aerospace & defense	Totals
Duration Innovation phase (I)	4.9 (3.2)	21.6 (23.3)	8.9 (10.8)	7.2 (5.4)	7.6 (10.2)	10.0 (13.5)

均值（标准差）

Ad 2. Why does it take so long? (Depends on your model/theory!)

Theory: Life cycle vs Evolutionary perspective

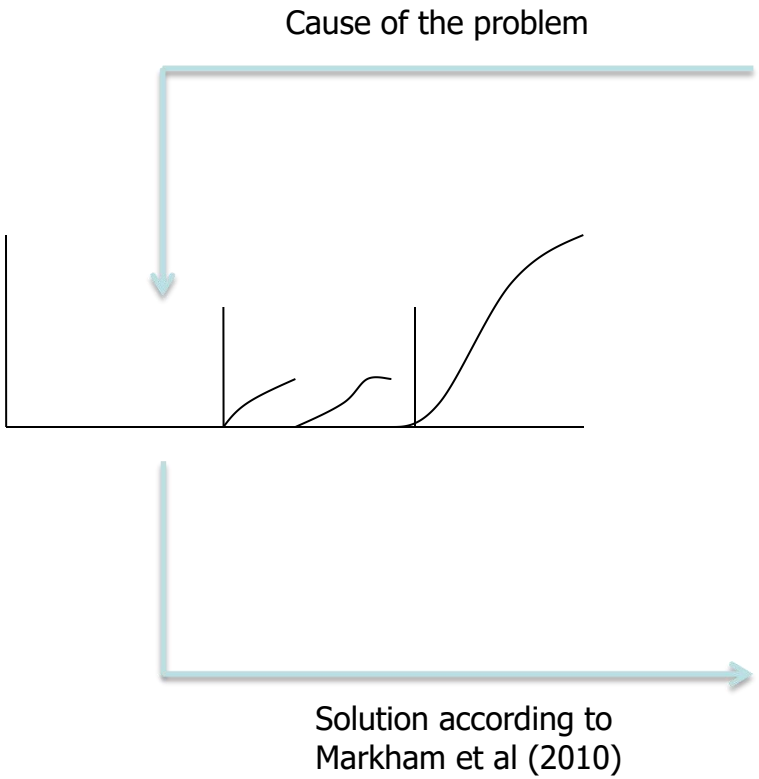




Life cycle model	**Evolutionary model**
Innovation = project	Innovation = no project 1. Combination of parallel projects 2. Innovation is increased later on
Success based on good management	Success is based on entrepreneurial action
Success is assessed in terms of diffusion	Most successful products diffuse first chaotic
Success is predictable (curve fitting) and requires a good idea/concept at the start.	Success is created, requires persistent and flexible action rather than just a good idea/concept at the start
Implications of model for cause length innovation phase	**Implications of model for cause length innovation phase**
Product development issues determine the length of the innovation phase: Financing problem Valley of Death	Many more problems may cause a delay, several actions are possible, all of which can determine the length of the innovation phase

Strategies during the innovation phase

Ad 2. Why does it take so long? (product development issue in life cycle perspective)



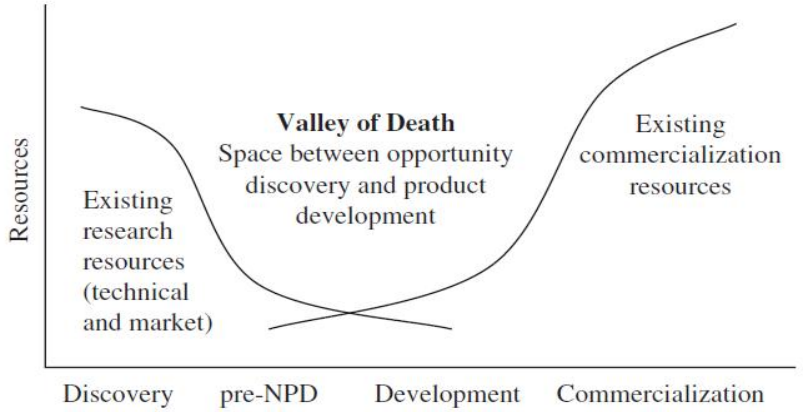


Figure 1. Valley of Death

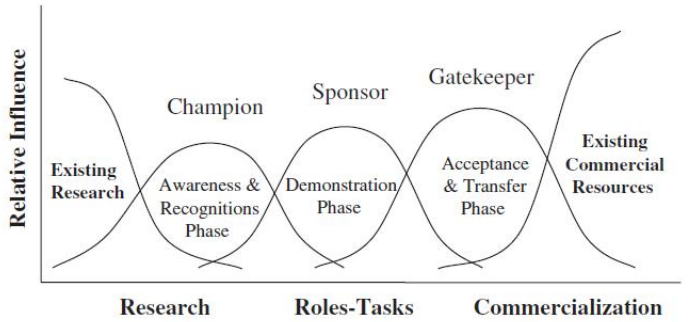


Figure 3. Model of Roles and Activities to Cross the Valley of Death

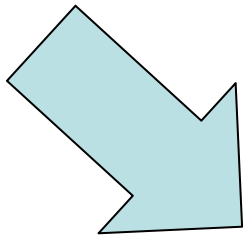
Strategies during the innovation phase

Ad 3. What are the activities and barriers or problems in the phase?

Activities

Basic research to improve principle (scientific development).
Basic research on subprinciples in the larger system (scientific development).
Applied research required to complete the system (technology development).
Formation of network of actors with complementary competences/resources.
Vision on the system (function, type of use, type of product type of users).
Competition with other new or incumbent (existing) systems.
Choice product/market combination(s).
NPD-process (product/service, marketing-mix, production, organization).
Pilot/testing.

Intro = start phase 2



Problems to tackle

1. Funding problem
2. Principle technology immaturity problem; uncertainty performance competitive systems
3. (Shared) vision is lacking
4. Network of actors willing to learn and build up vision is lacking or scattered

Strategies during the innovation phase

Ad 3. What are the activities and barriers or problems in the phase?

Effect Name problem cause	1 Funding	2 Principle	3 Vision	4 Network
1. Funding problem		X Development efforts are delayed.	-	X Network formation is delayed.
2. Technological Principle immaturity problem	X Immature technology affects funding		-	X Actors tend to wait.
3. (Shared) vision is lacking	X Visions compete for funding. No vision blocks funding.	X Development efforts are delayed.		X Alternative networks compete.
4. Network of actors willing to learn and build up vision is lacking or scattered	X Funding is difficult with no network or scattered with multiple networks.	X Learning/ development is scattered and delayed.	X Vision formation is scattered and delayed.	

→ Risk

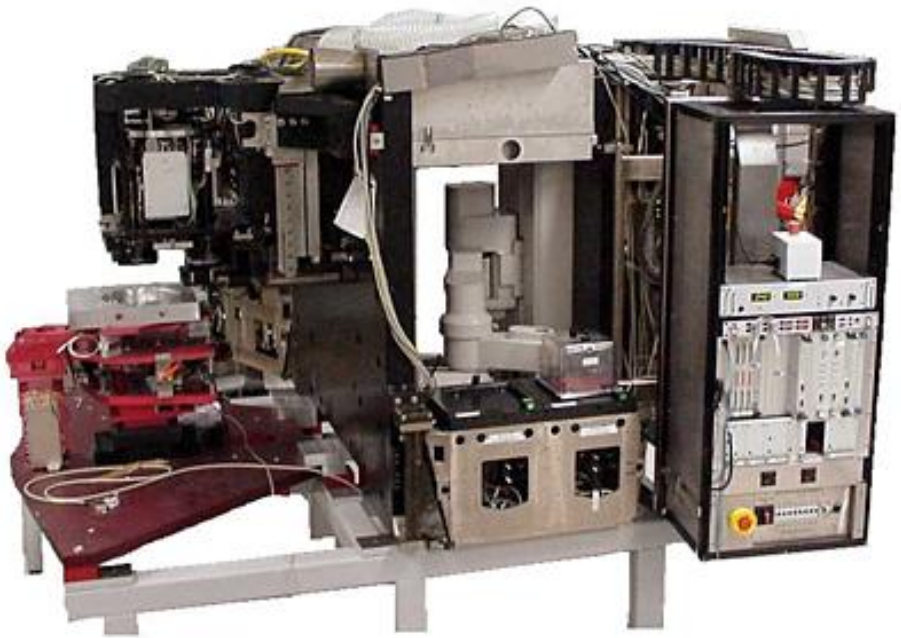
Strategies during the innovation phase

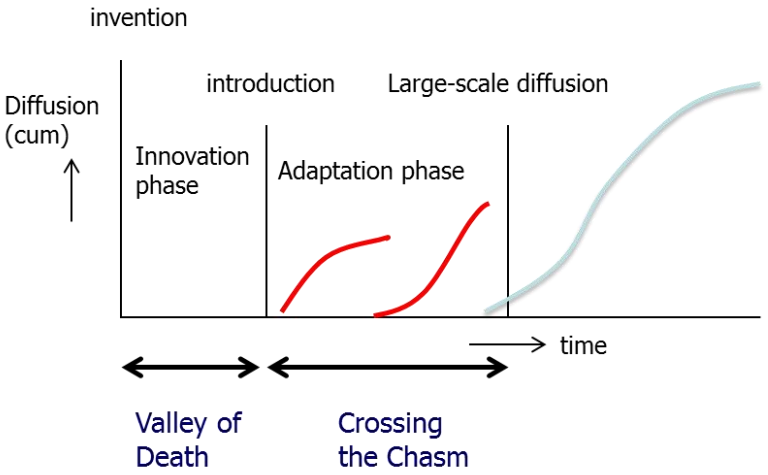
Ad 4. What are the strategies?

1. In house-development strategy	(Dupont, Philips, Bell labs) Early 20th century: corporations
a. Portfolio innovation strategy.	Closed innovation (risk pooled in large portfolio) When?
2. Joint development strategy.	(JSF, ..) Late 20th century: innovation networks
a. License in strategy.	Open innovation
b. Buy (shares in) company strategy.	Pharmaceutical companies buy (shares in) Biotech starters
c. Joint ventures	Pool risk and resources (car brands share platform)
3. Subsidized development strategy.	(sustainable energy technologies)
a. Pre-competitive subsidy (EU, ..)	advantage: standard; disadvantage: not proprietary
4. Pre-funding development strategy.	
a. Crowd funding strategy	(drones-pre funding)
b. Sell (shares in) company strategy.	Genentech (when? Radical promising technology)
c. Made-to order funded by client.	(ASML)(when? If company has good track record)
5. Sell idea, concept or design	(Medical molecule creation)
a. License out strategy	
b. Sell design strategy.	
6. Demo experiment strategy.	(telegraph, video telephone)
a. Living lab strategy.	
7. Wait & see strategy.	

Strategies during the innovation phase

4. Pre-funding development-strategy.





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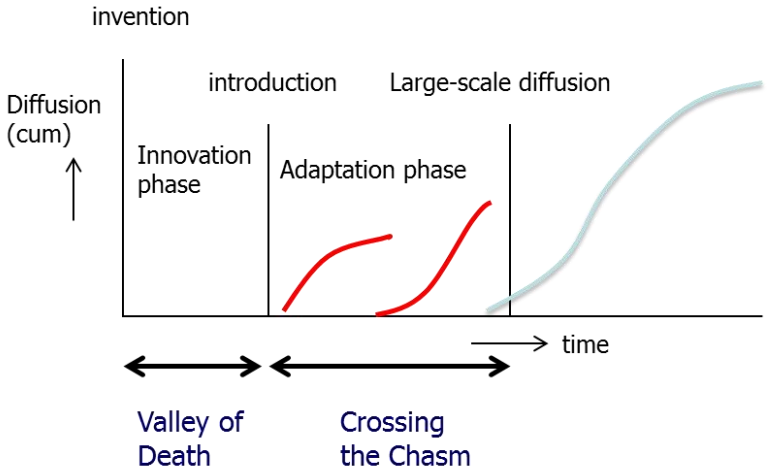
Strategies during the innovation phase

5. Sell idea, concept or design



7. Wait and see strategy (buy company)

Research **Case-study** with 4 medical diagnostic technologies (X-ray, MRI, CT and Ultrasound) to find out relation between size of the company and phase of the pattern.

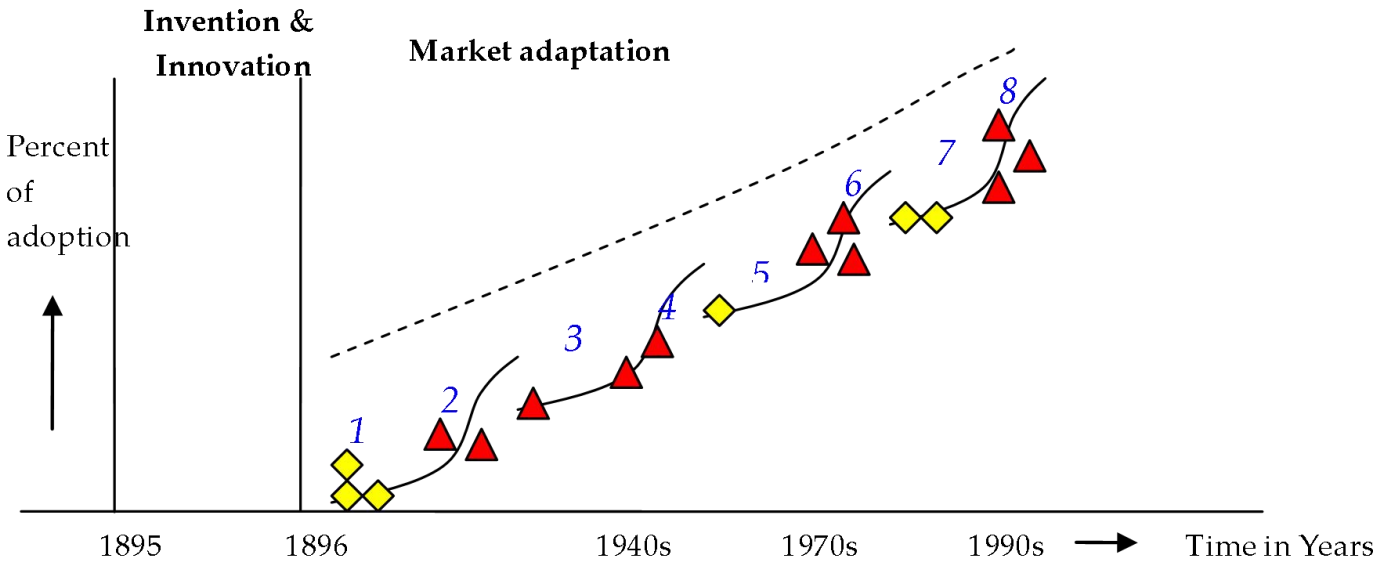


Figure 11: *Companies in the X-ray development and diffusion pattern.*

1: C.H.F. Müller, RGS, Harlow, Shimadzu
2: Philips, Siemens
3: Philips
4: Philips, Siemens, Litton
5: FUJIFILM Medical Systems
6: Philips, Siemens, Picker, Marconi, Thomson, etc.
7: Varian medical systems, Canon medical systems
8: Philips, Siemens, GE Medical Systems

Strategies during the innovation phase

7. Wait and see strategy (buy company)

Conclusions:

1. In all cases small companies invented and introduced the technology.
2. In all 4 cases large actors just adopted a wait and see strategy and took over the small companies afterwards.

Strategies during the innovation phase

Effect on problem Name problem cause	1 Funding problem	2 Problem with techn principle	3 Shared vision problem	4 Network formation problem
1 In house-development strategy (See Markham how this can be organized)	Large corporation required	Long-term research agenda	No problem	No problem
2 Joint development strategy (See Markham how this can be organized)	Funding shared	Competences, knowledge shared	Can be problem	Can be problem
3 Subsidy development strategy	Funding external (government)	More funds available	Can be problem	Can be problem
4 Funding development strategy	Funding external (customer)	Can be problem	"	"
5 Sell idea, concept or design	"	"	"	"
6 Demo experiment strategy	Funding can both internal/external	Improvement while experimenting	No problem	No problem
7 Wait & see strategy	Limited funding required	No problem	No problem	No problem

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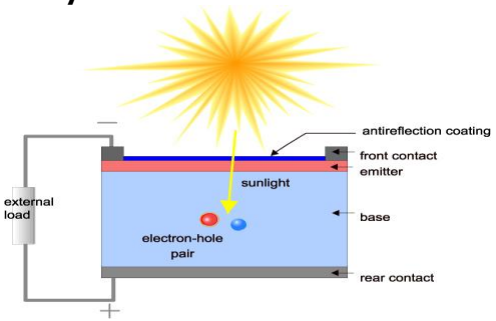
4. Strategies during the innovation phase.
5. **Strategies during the adaptation phase.**
   - Systematic literature review (article 2).
   - Data on niches (combined research).
   - Ten niche strategies (article 3).
6. Strategies during the stabilization phase.
7. Conclusions

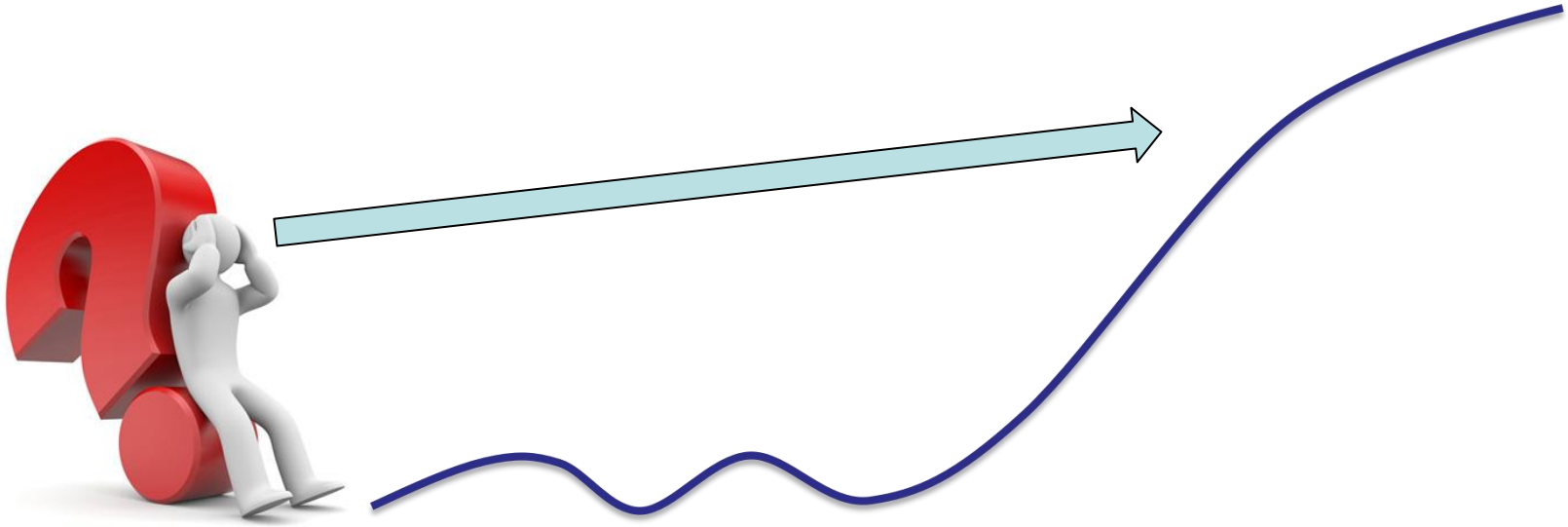
Cases

Why was Nylon first introduced in tooth brushes (and later on in lady stockings)?

Why were solar cells first introduced as light sensor (later electricity generation)?



Why those niche strategies?



Niche strategies:

- specific product(version)-market(segment) combi to start diffusion and survive the first hurdles before mass market.

Learning goals:

- Why these niche strategies?
- What type of niche strategies?
- When to apply each of these strategies?

Market Creation for Radically New Technologies: a Literature Review on the Role of Market Niches

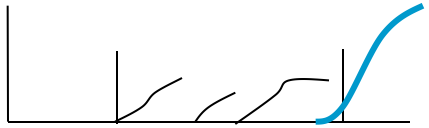
Article

Faculty Technology, Policy and Management
Delft University of Technology
(The Netherlands)

Examples

Nylon: Tooth brush, lady-stockings

Contracept pill: Skin irregularities



Message:

Niche applications prior to large-scale production and diffusion of radically new high-tech products. Niche is not just a slow start of diffusion.

Method and Research questions

Systematic literature research to find in extant literature

1. Types of niches?
2. Sequences of niches?
3. Niche strategies?

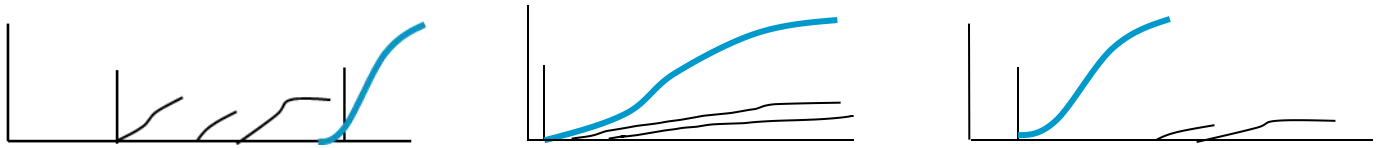
Definition of niche markets for new high-tech products

Niche

A niche is a combination of a specialized version of a product specifically for a small group of customers.

- Niche next to a mass market (car mass market, handmade car niche)
- Niche before a mass market has emerged (focus of our work)
- Niche after a mass market has emerged (vacuumtube amplifier for audio-enthusiasts)

Pattern



Managerial Relevance of niche markets for new high-tech products

Problem: Success rate for pioneers of radically new products is much lower than for incrementally new products.

- Min et al. (2006): pioneer failure rate radical/incremental: 77/39%
- Tellis & Golder, (1996): pioneers out of business before success: 75%

Solution (?): Niche players are relatively successful
(Lynn et al., 1996; Hultink et al., 1997; Moore, 2002;)
For managers it is important to realize that targeting niche applications can be an important initial step to create a market. Niches can form a transition path to reach a large-scale application (DeBresson, 1995).

Finally: Large-scale introduction (mass market strategy) is often not possible.
Telephone: Infrastructure for intercity use simply not available.
Nylon: Production to make a fine fabric was not mastered yet.

Scientific relevance

So, niche players are relatively successful.
(Lynn et al., 1996; Hultink et al., 1997; Moore, 2002)

But, researchers claiming so, do not specify

1. Types of niches?
2. Sequences of niches?
3. Factors determining emergence of niches?
4. Niche strategies?

Managers need more than the advise to adopt a niche strategy.
Systematic literature research to find in extant literature

Are there different scientific (sub) disciplines regarding niches?

Systematic literature research

Database: Web of Science

Terms:
Niche management
Niche marketing
Niche strategy

Process

search	→	selection	→	analysis
Niche manag* Niche market* Niche strateg*		Title, Abstract, Intro 1 Create (new) market 2 High-tech prod Or 3 Conceptual paper		Template 1 RQs 2 Discipline of article - Journal - Discipl. authors - References - Approach (methodology) - Topic

Preliminary results: **search & selection of articles**

Search terms→ ↓ Subsequent selection	Niche market*	Niche manag*	Niche strateg*
Articles with terms in title	143	28	61
Articles selected and analyzed	**25**	**16**	**22**

Preliminary results: **overlap in 3 subsets of selected articles**

	Niche Market*	Niche Manag*	Niche Strateg*
Market*	**21**	**2**	**2**
Manag*	2	**4**	**10**
Strateg*	2	10	**10**
	25	16	22

→ 49 articles analysed

49 articles
12 distinguish types
- 7 prior to mass market
- 4 next to mature market
- 1 after mature market

Results regarding research questions

RQ1: Types of niches?
RQ2: Sequences niches?

Adamson, 2003 (sustainable techn)

1.	Primary niche	niche unique functionality	no competition
2.	Secondary niche	niche compete other tech	limited competition
3.	Mass market	all market segments	full competition

Schot & Geels, 2008; Tso & Chang, 2003; Monaghan, 2009 (sustainable tech)

1.	Technological niche	governm protected	no competition
2.	Market niche	subsidized	limited competition
3.	Regime shift	multiple niches	substitution

Testing experimental setting; Economies of scale, learning create compl. Prod/serv

Results regarding research questions (2)

RQ1: Types of niches?

RQ2: Sequences niches?

Jorgensen et al, 2007; Little et al, 2010; McFadden et al, 2009 (organic food)

1. Act of idealism of small group sharing an idea of ideal society, food =part
   Barter, alternative systems of payment (in kind)
   Buyers cooperation using home to distribute food from selected farmers
   Culture building: pot luck dinners, recipe swaps
2. Real market segment (chains of specialized shops)
   Comprising the great ideal
3. Mass market supermarkets
   Research institutes, Tests

Implications of results regarding types/sequences of niches

Three niche strategies to handle competition destroying new tech

Adamson, 2003 (sustainable techn)
Market mechanism: choose niche market circumventing mature market

Schot & Geels, 2008; Tso & Chang, 2003; Monaghan, 2009 (sustainable tech)
Government involved to invest and protect before mature market

Jorgensen et al, 2007; Little et al, 2010; McFadden et al, 2009 (organic food)
Circumvent market and government by starting up social movement

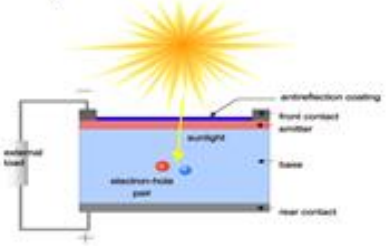
Results regarding research questions

RQ3: Niche strategies?

1. Niche accumulation
   - Build up market by having a sequence of niches to accumulate critical mass
2. Niche hybridization
   - Toyota Prius

Why was Nylon first introduced in tooth brushes (and later on in lady stockings)?

Why were solar cells first introduced as light sensor (later electricity generation)?



Conclusions

- Niche strategies are important to create a market or commercialize radically new (high-tech) products.
- The (scientific) literature about niche strategies is scattered and incomplete.
- In practice, however, many examples of niche strategies can be found.

Discussion: open questions

What are these strategies?
When (in what conditions) to adopt each of these strategies?

MOT131A Lecture

Strategies during the pattern

1. Introduction
2. Product innovation and alternative strategies.
3. Scenario/Strategy combinations.
4. Strategies during the innovation phase.
5. **Strategies during the adaptation phase.**
   - Systematic literature review (article 2).
   - Data on niches (combined research).
   - Ten niche strategies (article 3).
6. Strategies during the stabilization phase.
7. Conclusions

Data about niches

Number and type of niches per industry

Mohammad Suprapto

Across sample

39 of 49 rad. new h-t products (80%) first introduced in niches
10 (20%) directly introduced in a mass market

Per industry

Table 2: Number and type of niches per industry

Industry	N	No of Niches	Av. No niches per case	Governm Public niches (GP)	Governm Military niches (GM)	Business niches (B)	Consumer niches (C)
Chemicals metals and materials	13	34	2,6	4	5	15	10
Pharmaceutical Healtcare equip.	13	5	0,4	-	-	-	5
Telecommunication equipment	11	39	3,5	8	10	13	8
Electronic equipment	12	37	3,1	2	5	25	5
	49	**115**	**2,3**	**14**	**20**	**53**	**28**

- Most Business niches, then Government (military) then Consumer niches
- Significant differences in number and type of niches per industry

Data about niches

Sequence of niche applications

Sandra I Trevino Barbosa

Private-public sequences

Transfer	Materials	Pharma	Telecom	Electronic	Tot
Private-Public	6		5	3	**14**
Public-Private	4		4	4	**12**
Public-Public	1		10	1	**12**
Private-Private	20	5	20	27	**72**
	31	**5**	**39**	**35**	**110**

General

- Most private-private sequences (in all industries)
- Public-private and reverse are almost equal in size (in all industries)

Per industry

- Pharma & Healthcare is different
- Public-public sequences differ per industry

Data about niches

Sequence of niche applications

Focus on Private-Private Sequences: Business Consumer sequences

Transfer	Materials	Pharma	Telecom	Electronic	Tot
B-B	9		10	15	**34**
B-C	3		4	9	**16**
C-B	2		1	1	**4**
C-C	6	5	5	2	**18**
	20	**5**	**20**	**27**	**72**

General

- Most business to business, then Consumer-Consumer and B-C
- Much more business to consumer than the reverse C-B
- Start in B remain in B; Start in C remain in C

Data about niches

Sequence of niche applications

Military Civil sequences

Transfer	Materials	Pharma	Telecom	Electronic	Tot
Military-Civil	2		4	3	**9**
Civil-Military	5		2	2	**9**
Military-Military			5	1	**6**
Civil-Civil	24	5	28	29	**86**
	31	**5**	**39**	**35**	**110**

General

- Most civil-civil sequences (in all industries)
- Almost as often military-civil as the reverse civil-military transfer

MOT131A Lecture

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Ten niche strategies (article 3)

Ten Niche Strategies To Commercialize New High-Tech Products

J. Roland Ortt, David J. Langley, Nico Pals

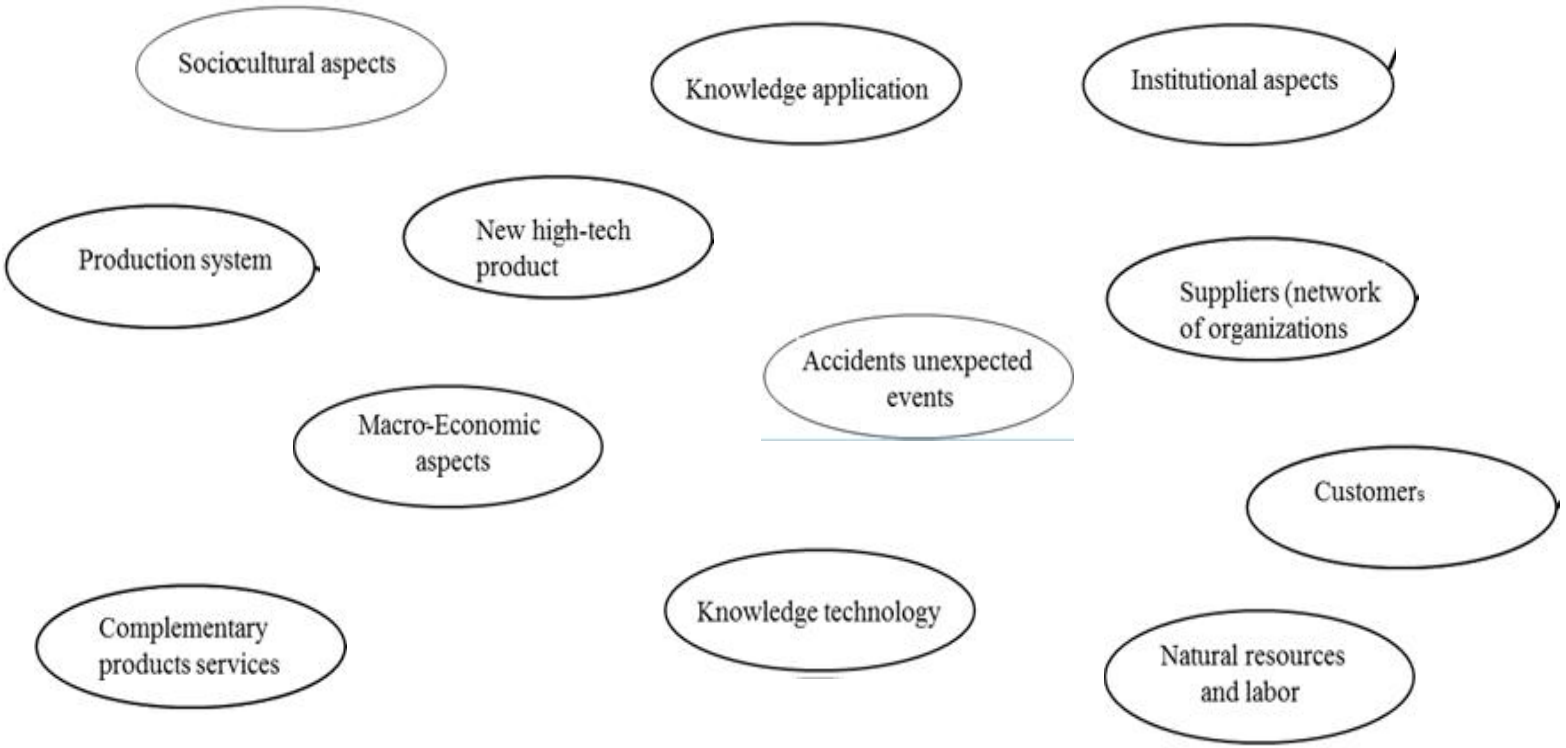
Research questions

1. What are different types of niche strategies?
2. How to assess the market situation and choose a niche strategy?

Many barriers to large-scale diffusion!

Sources

- SNM-literature
  [Kemp et al., 1998]
- Literature Innovation systems
  [Bergek et al., 2008] [Edquist, 2011] [Geels, 2004] [Malerba, 2002]
- Empirical findings factors determining the uptake of diffusion.
  [Ortt and Delgoshaie, 2006]



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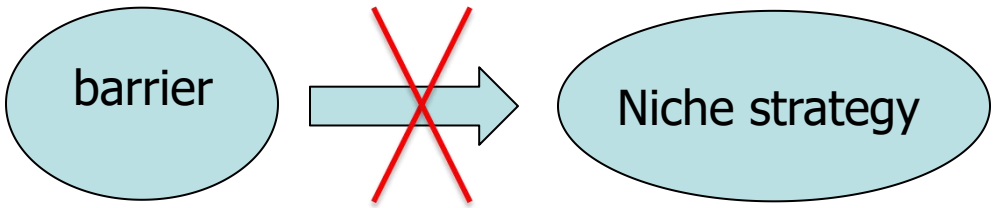
What can you do? (strategies)

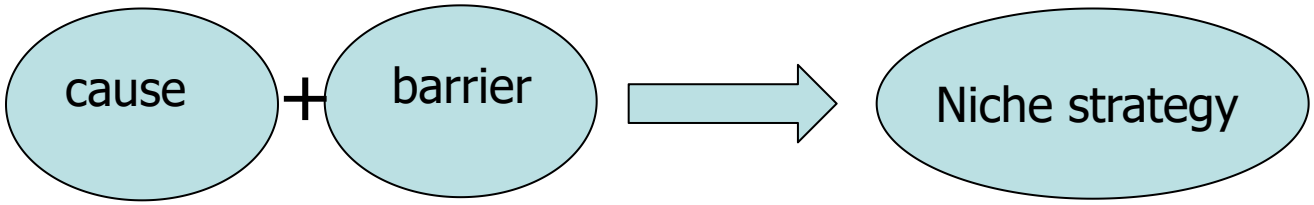
Goal 1: relate barriers ---to--- niche strategies

Steps in our thinking:

1. In extant literature general list of barriers to large-scale diffusion (12)
2. Design strategies to deal with these barriers?



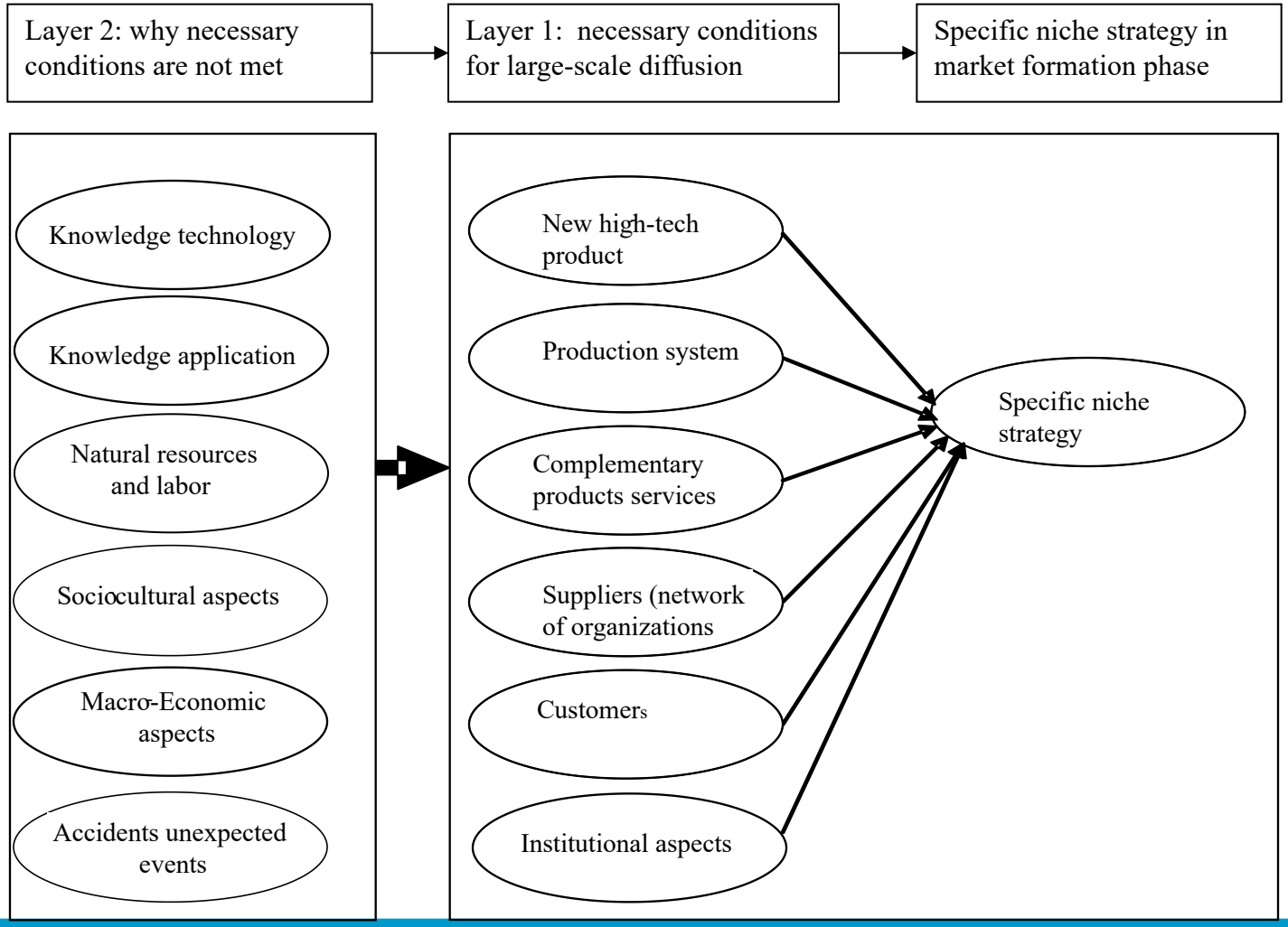
What can you do? (strategies)



The main point:

- The combination of two types of barriers indicates what type of strategy to aim for.

What can you do? (strategies)



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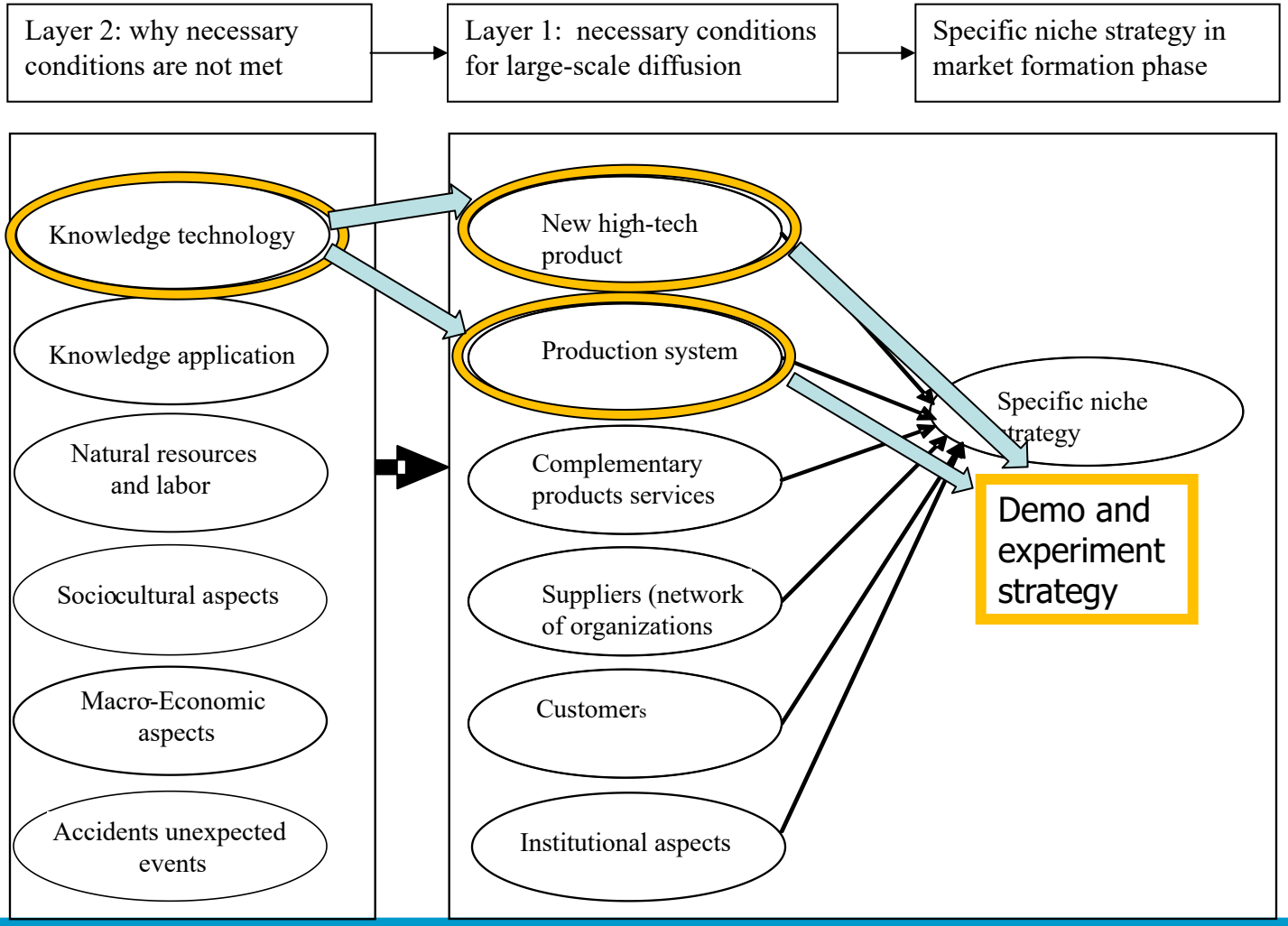
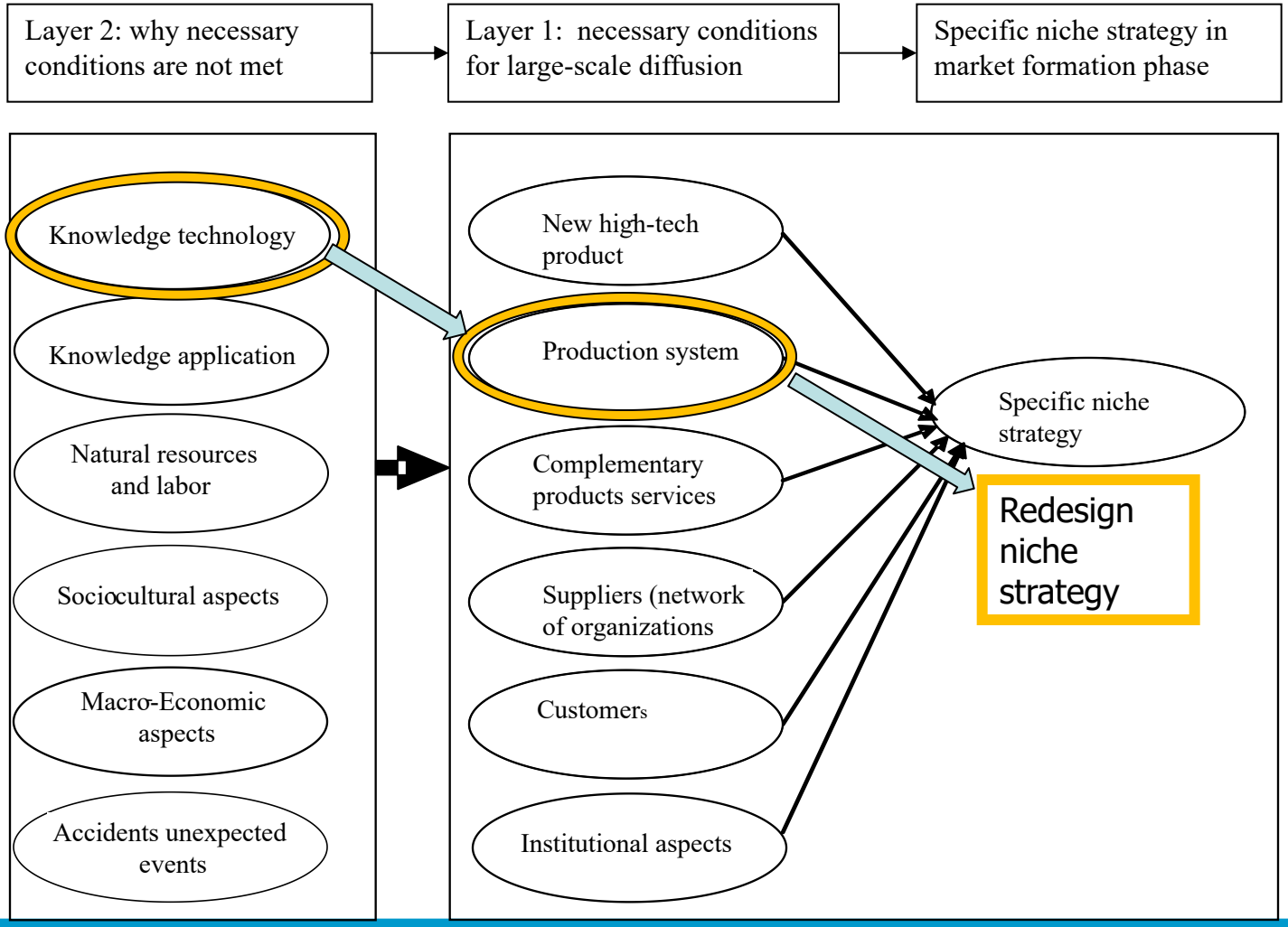
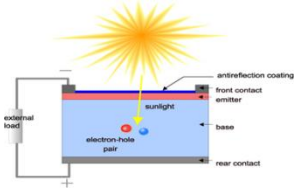
What can you do? (strategies)



What can you do? (strategies)





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What can you do? (strategies)

Ten niche strategies + application

1 Demo, experiment and develop niche strategy
2 Top niche strategy
3 Subsidized niche strategy
4 Redesign niche strategy
5 Dedicated system or stand-alone niche strategy
6 Hybridization or adaptor niche strategy
7 Educate niche strategy
8 Geographic niche strategy
9 Lead user niche strategy
10 Explore multiple markets niche strategy

Questions?

Next lecture:

Development of a discipline;
Innovation process on different levels