



# Technology and Innovation Management

## 6. Integrated Technology and Innovation Management

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Production Engineering Department

Advanced Manufacturing Nucleus

Integrated Engineering Group





## Goals of the lecture

To explore  
basic  
knowledge  
and  
capabilities  
on TIM

To present  
approaches,  
tools,  
methods and  
concepts  
useful for  
TIM

TIM: integrated  
Technology and  
Innovation Management



# Lecture Content

## Theory

- Basic definitions
- Innovation management
- Technology management



## Hands-on activities

- Roadmapping
- Design thinking (value proposition)
- Portfolio management
- Business Model Innovation

Integrated technology and innovation management (TIM)

## Objective of this presentation

- To present the integrated vision of innovation management and technology management =
- TIM: technology and innovation management



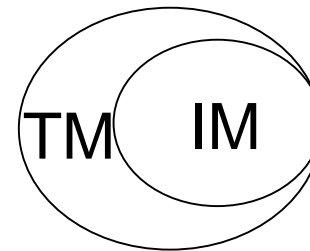
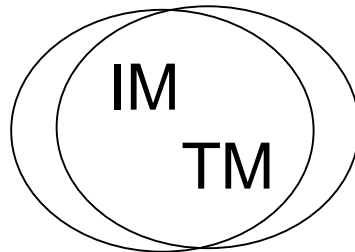
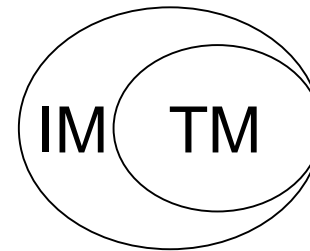
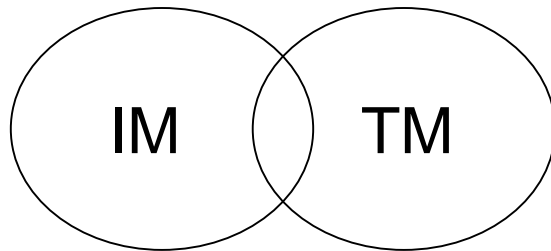
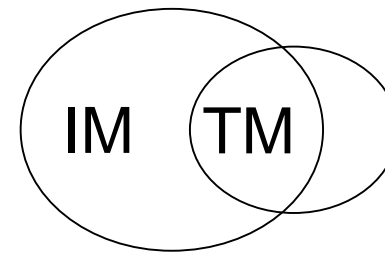
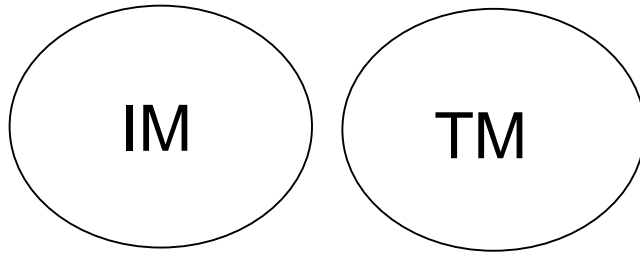


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How are technology  
and innovation  
management  
integrated?



# How are technology and innovation management integrated?

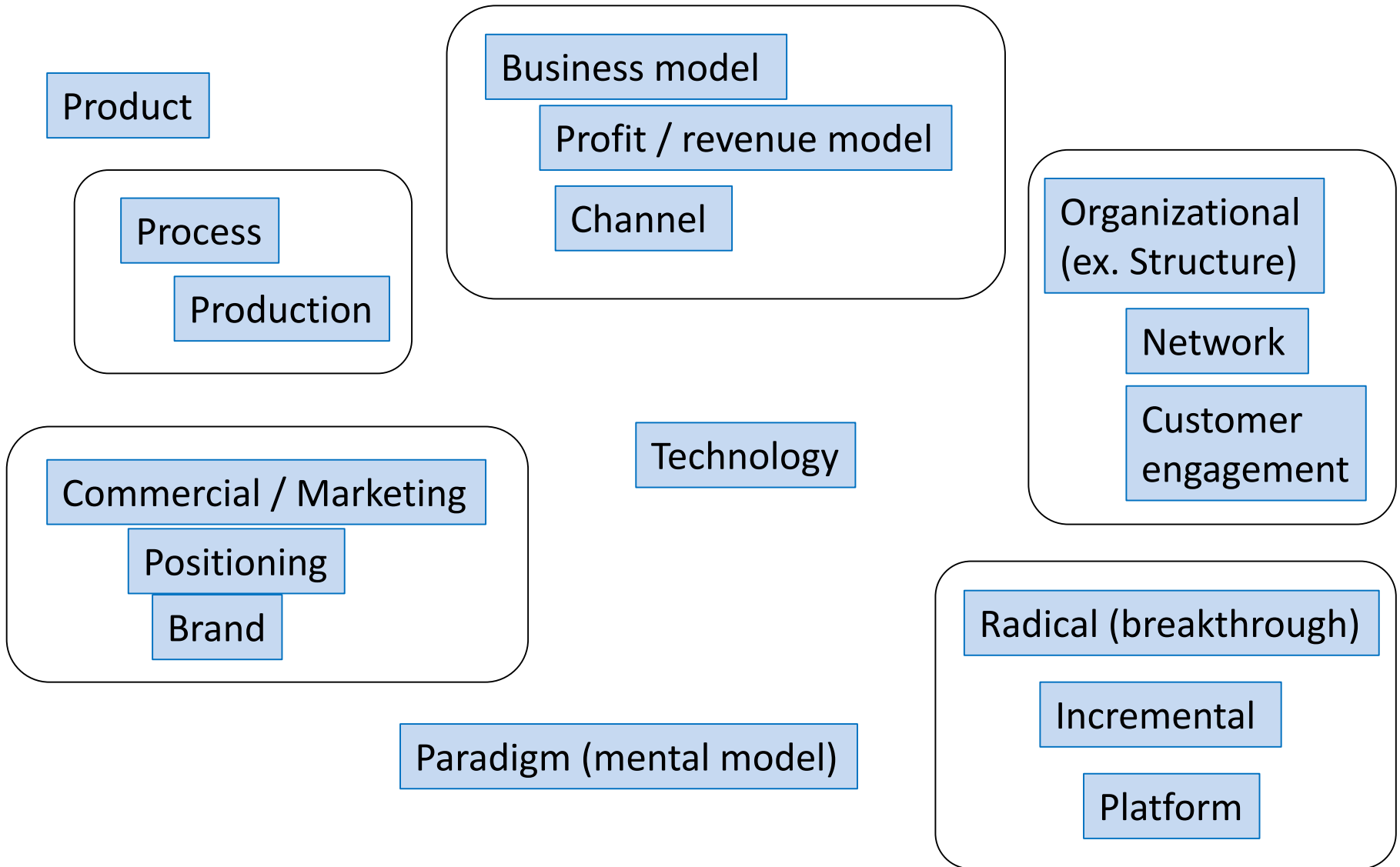


IM: innovation management

TM: technology management

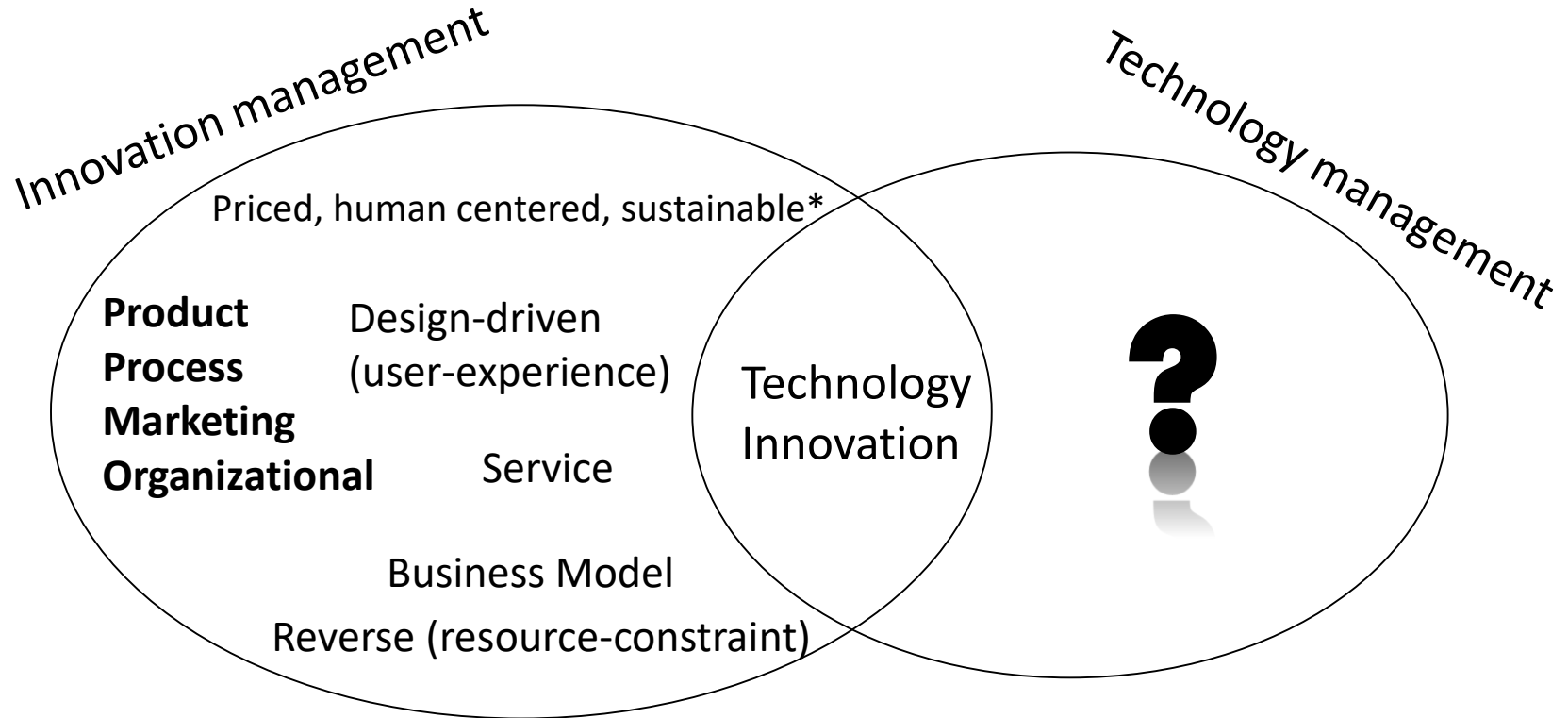


# Types of innovation





# Innovation and Technology Management



(\*) Novel and competitively priced goods, processes, systems, services and procedures that can satisfy human needs and bring quality of life to all people with minimal use of natural resources per unit output, and a minimal release of toxic substances





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# Pragmatic vision

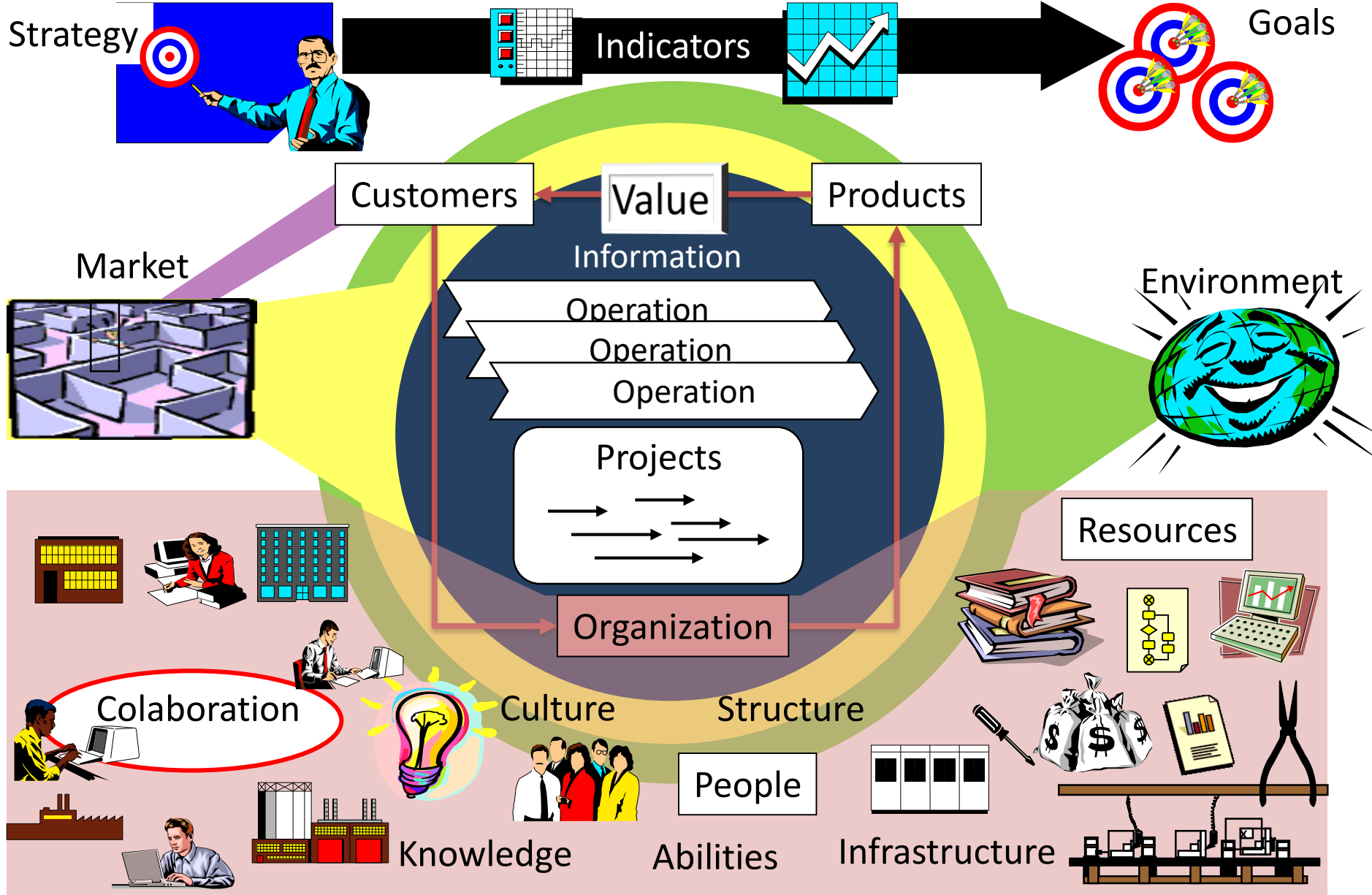


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How is the systemic  
vision of an  
organization ?

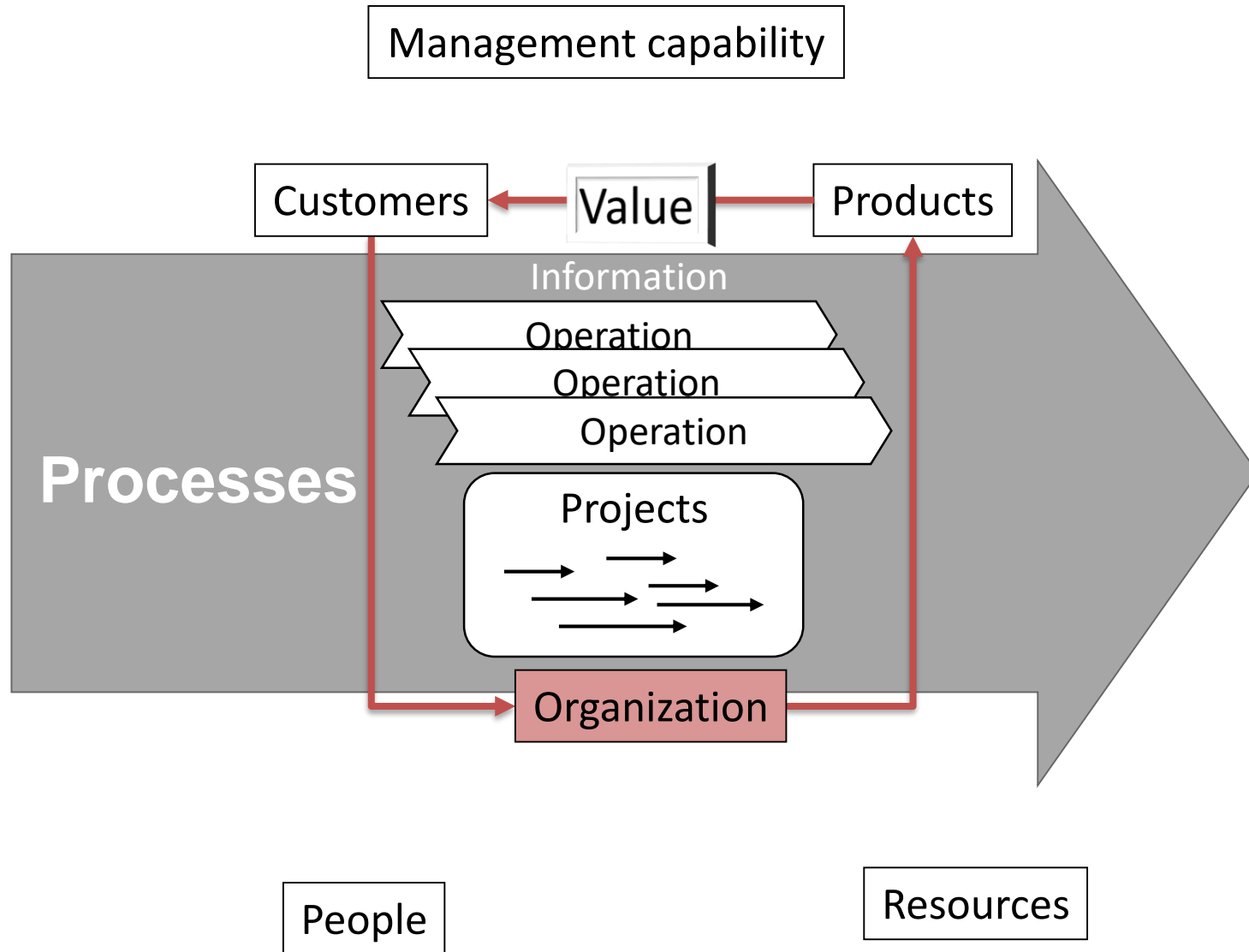
# Systemic vision of an organization

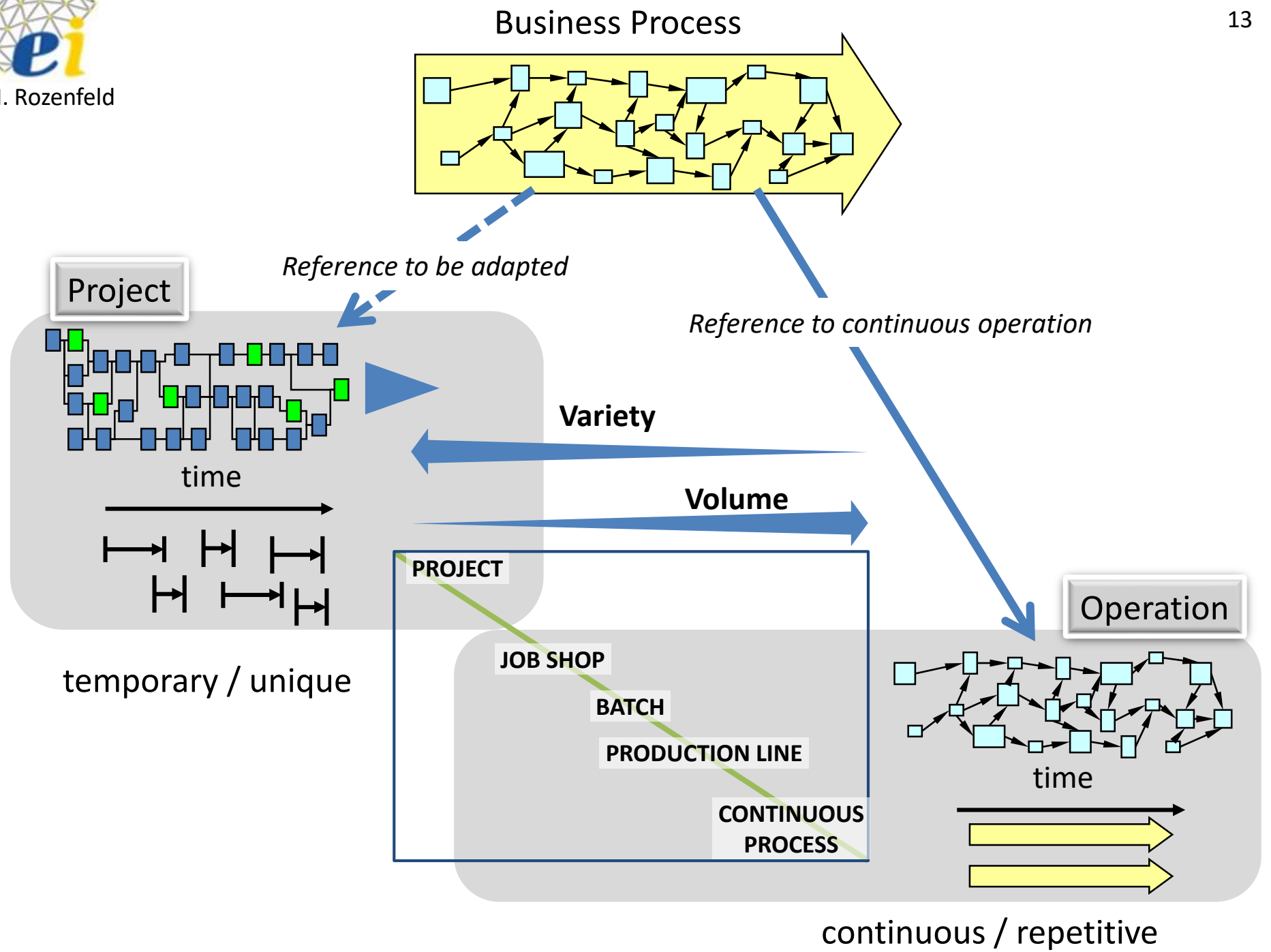
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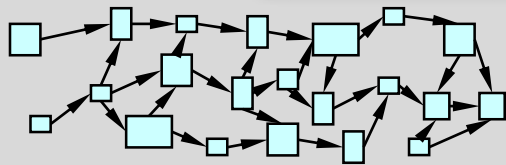
# Systemic vision of an organization





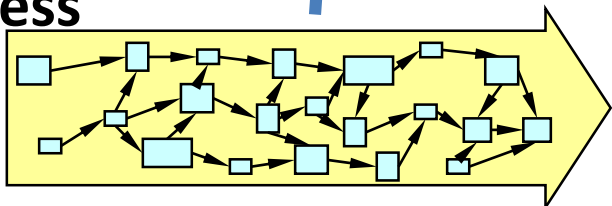


Operation



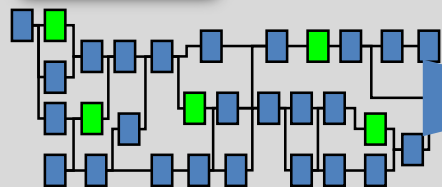
can represent

Business process



can be reference to

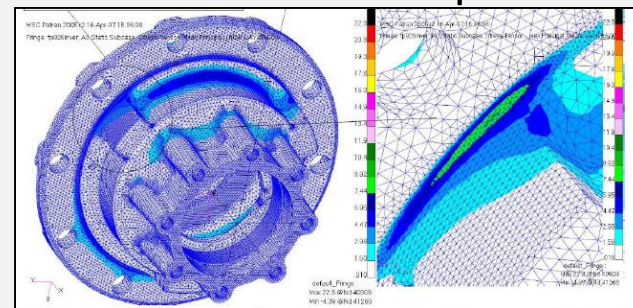
Project



... however, a lot of work performed is like art...



... and practice.



that we are not able to represent in a business process



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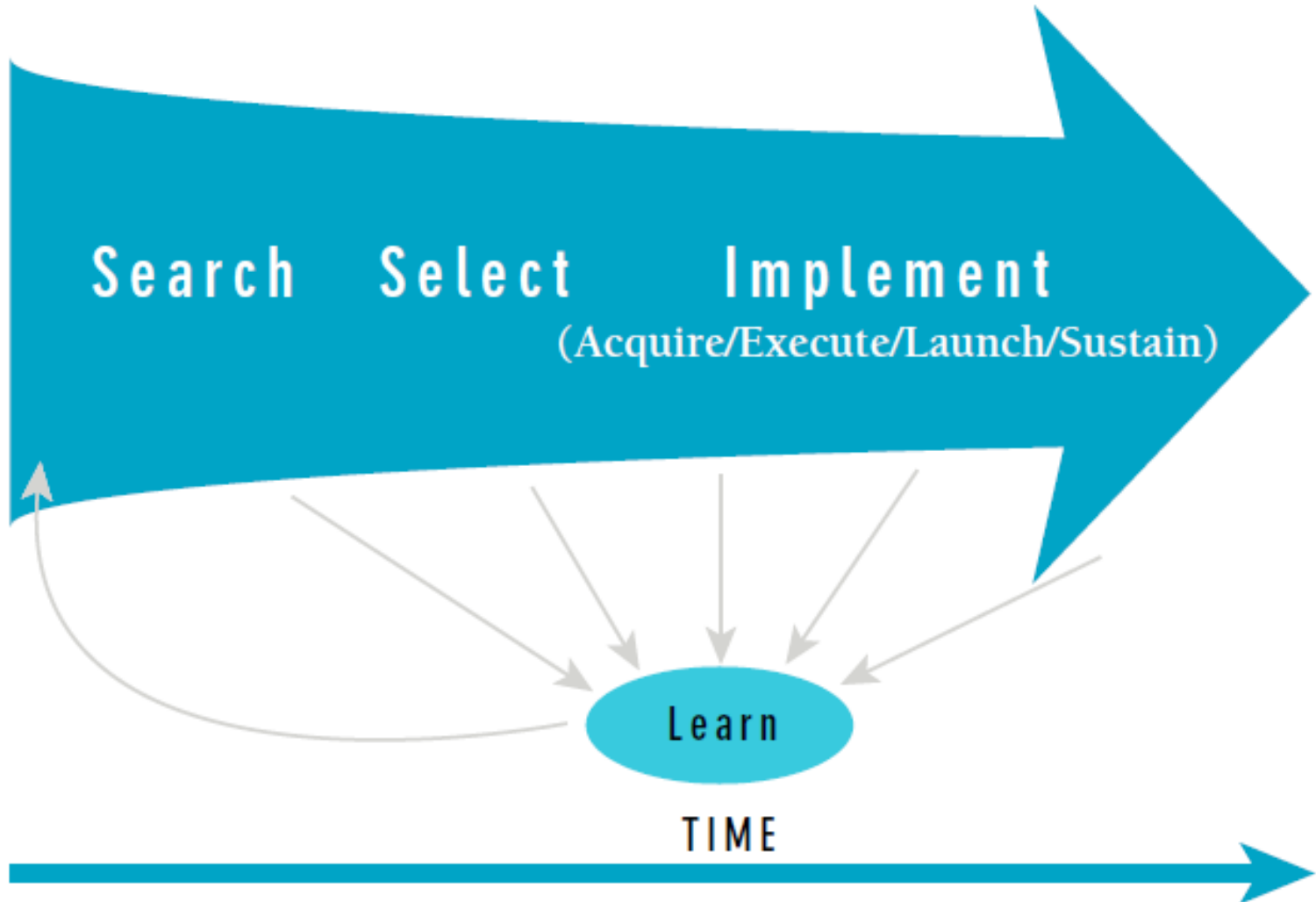
Which activity belong  
to an operation an  
which to a project?



# Simple representation of the innovation process

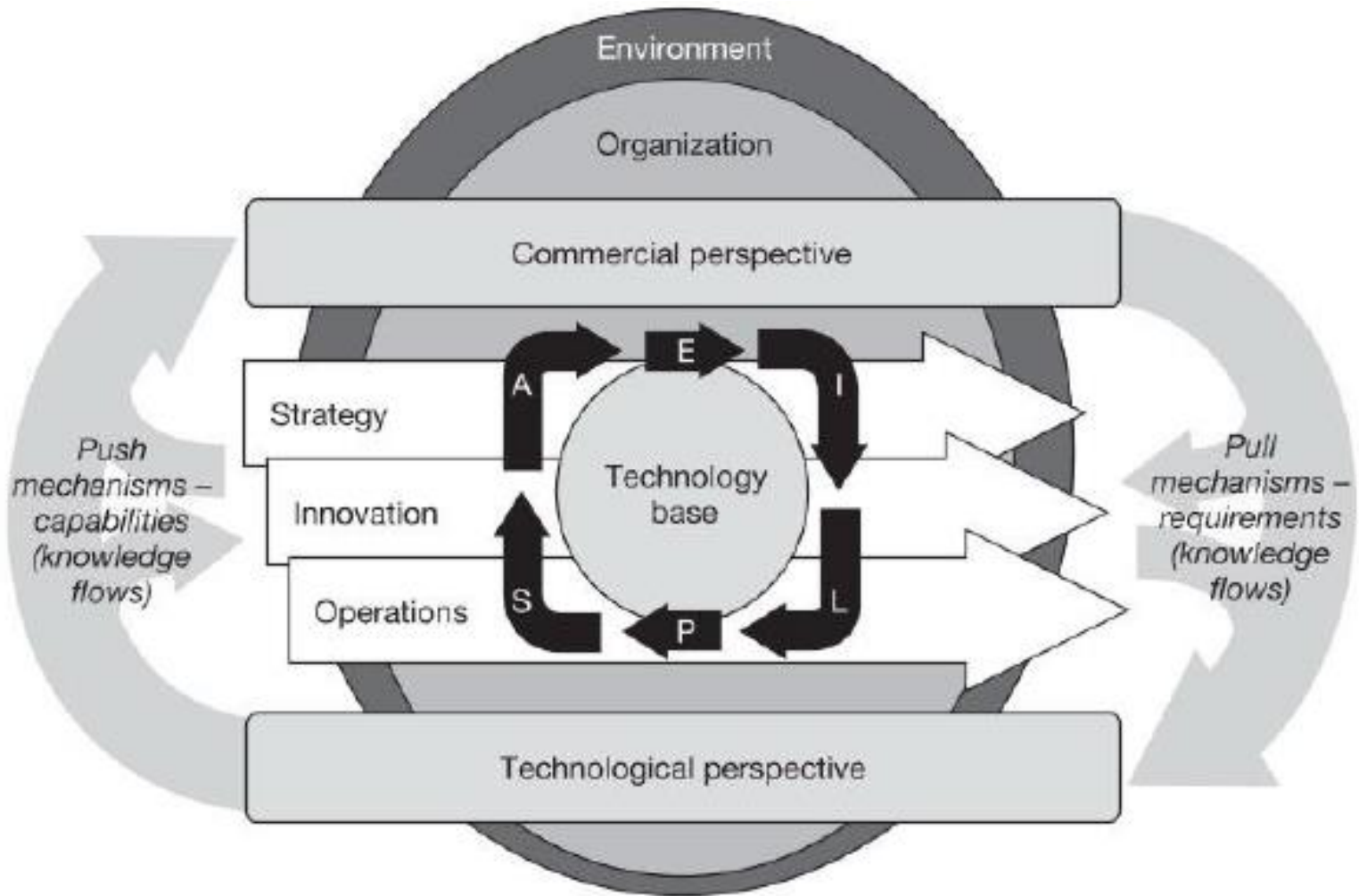
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Source: Tidd, J., Bessant, J., Pavitt, K. (2005)- Managing Innovation: Integrating Technological, Market and Organizational Change

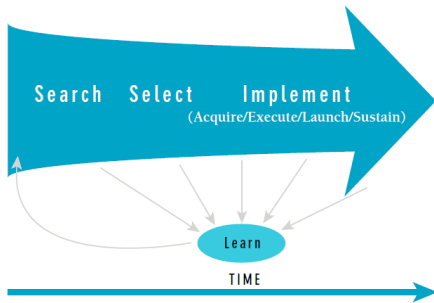


# Technology management framework - 2016

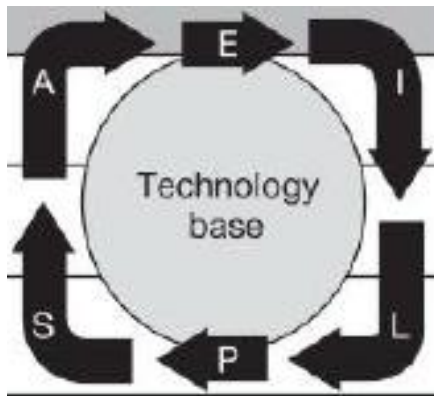
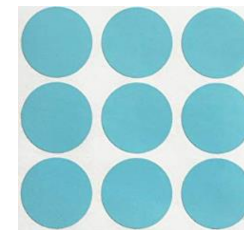
A: acquisition  
 E: exploitation  
 I: identification  
 L: learning  
 P: protection  
 S: selection



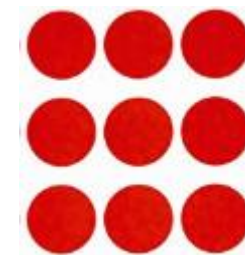
# Let's identify operation's and project's activities



## Operation



## Project





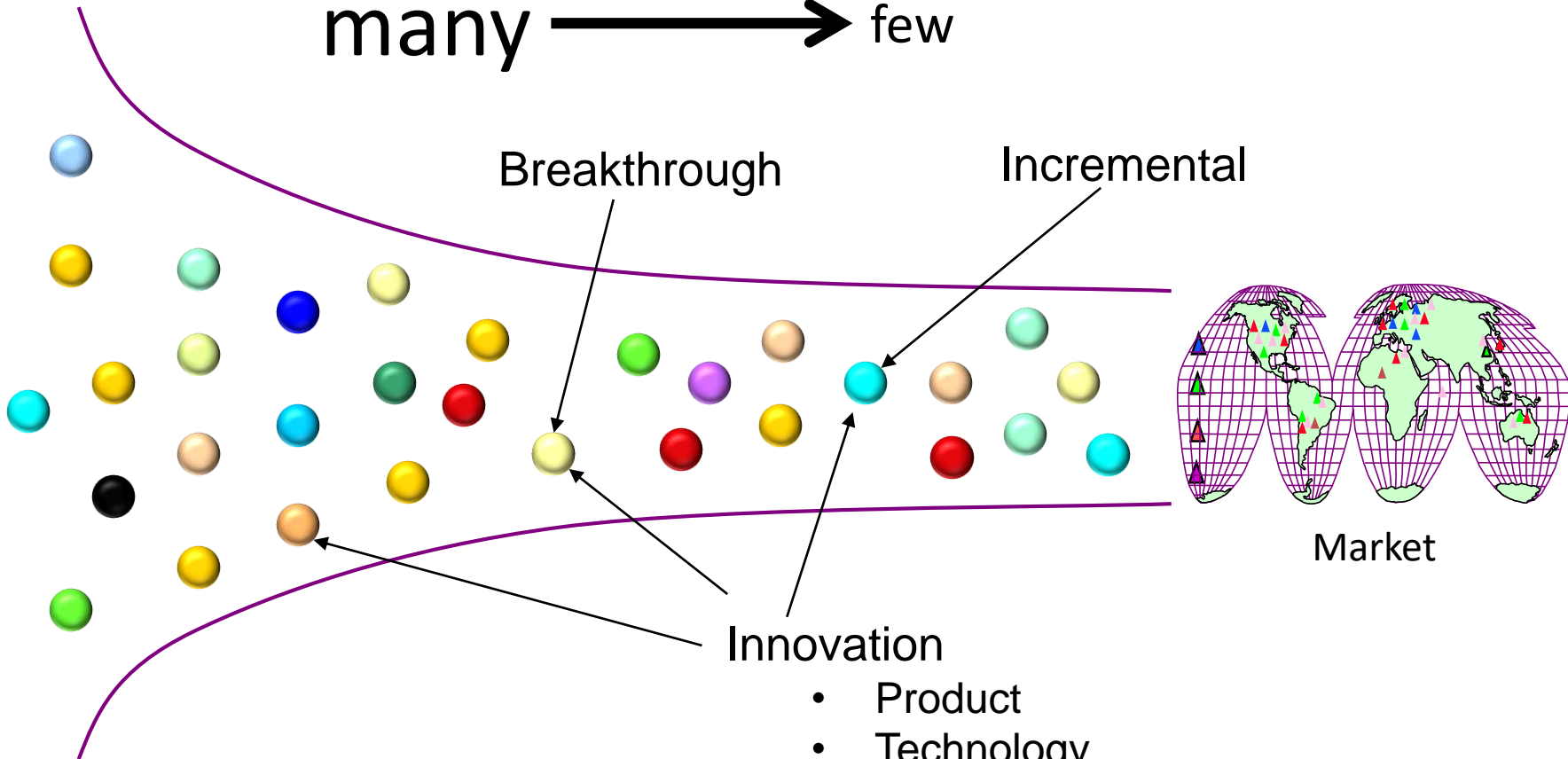


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# Innovation development funnel(s)

# Innovation Funnel

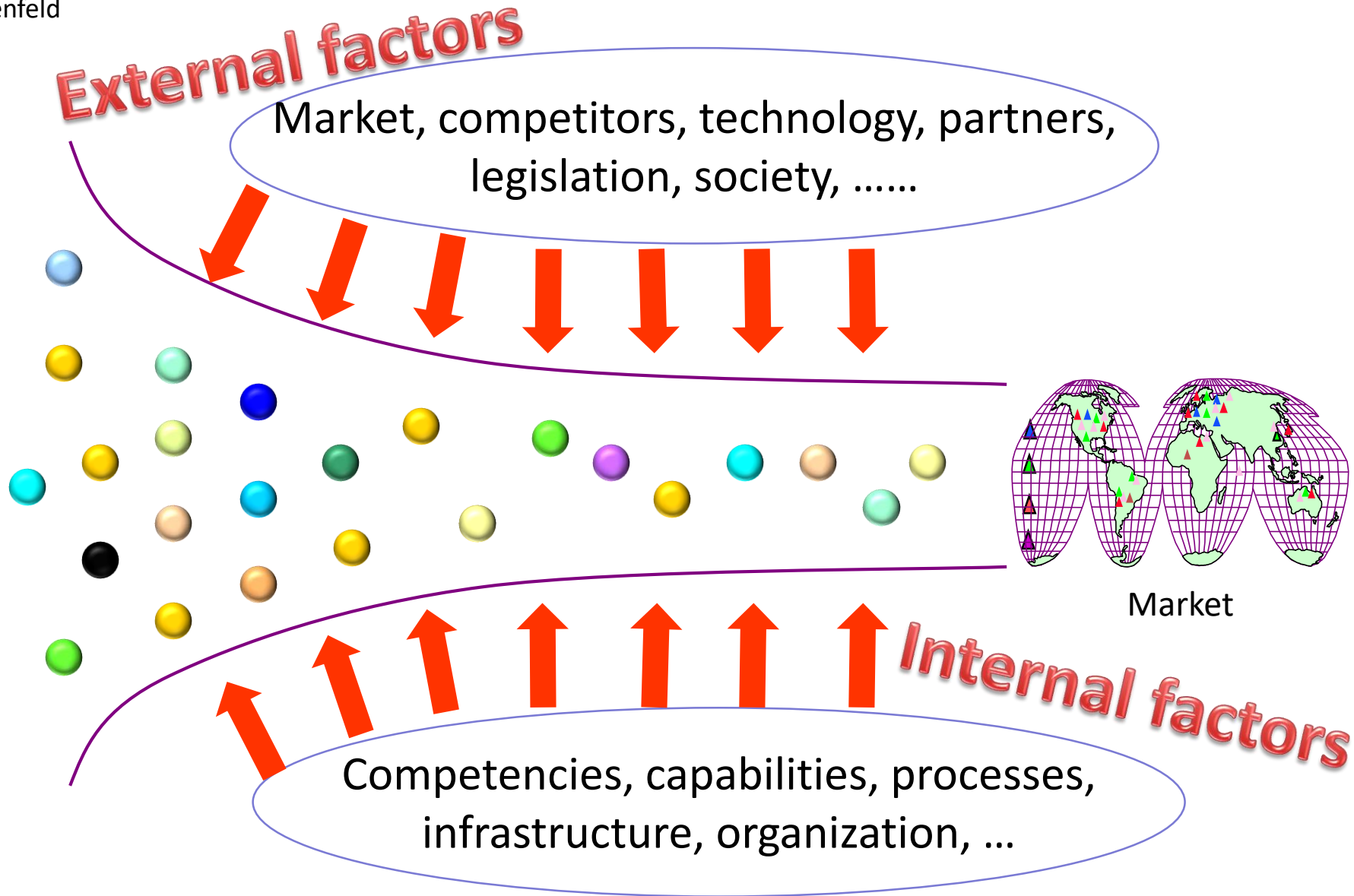
many  $\longrightarrow$  few



Innovation

- Product
- Technology
- Process
- Service
- Business model
- Product-service system
- Infrastructure

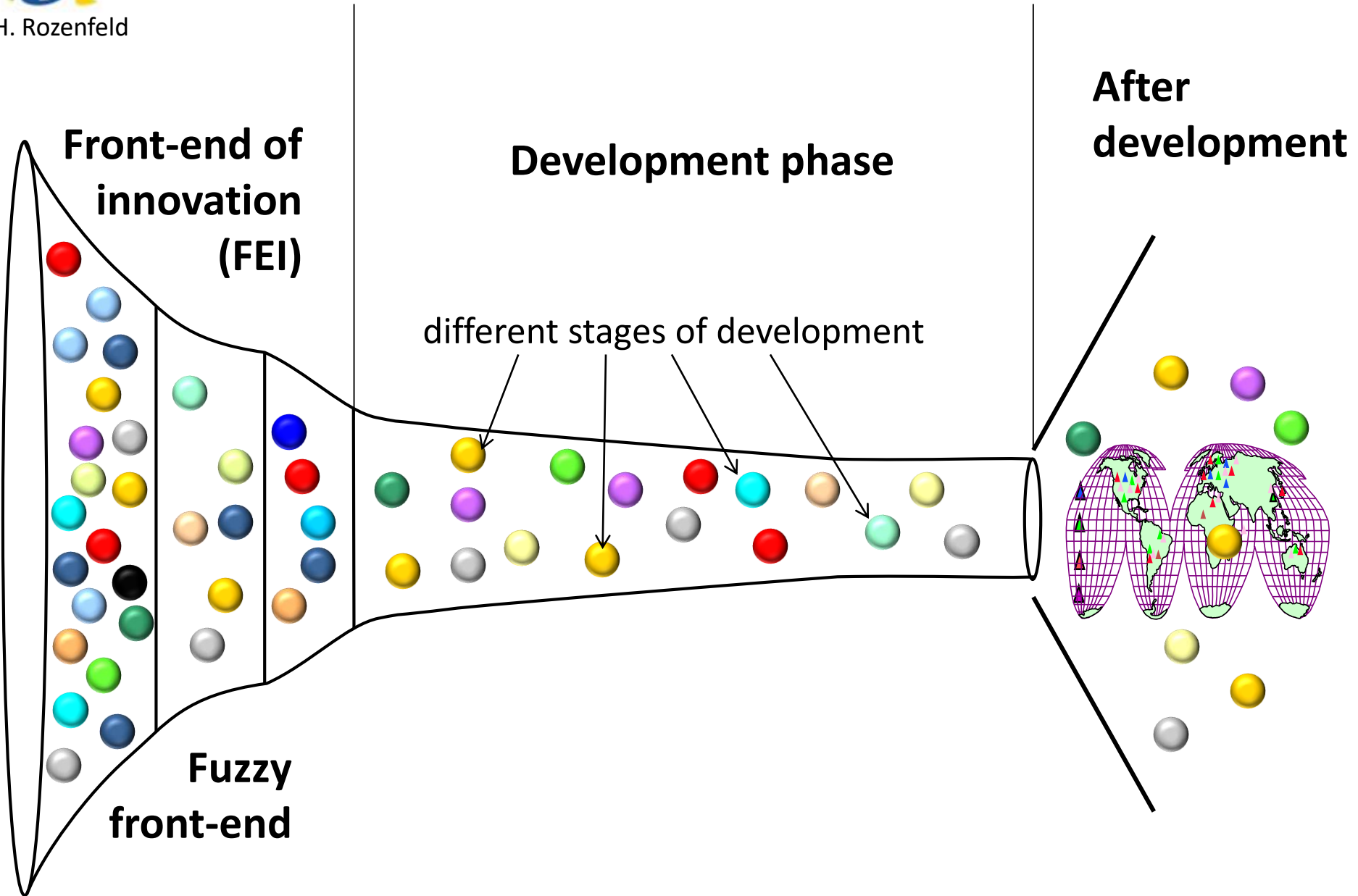
# What does “pressure” the funnel?



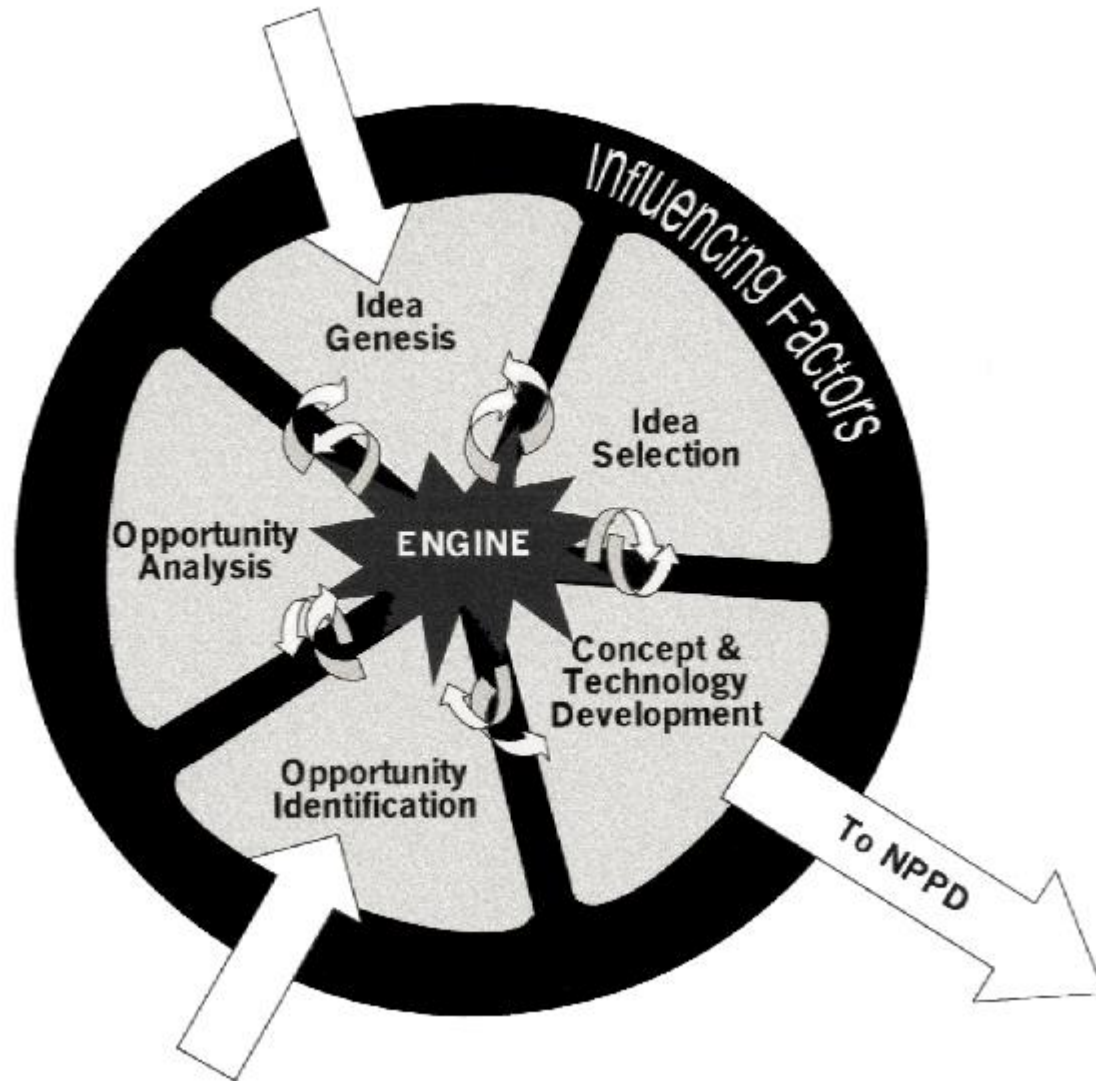


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# Innovation development



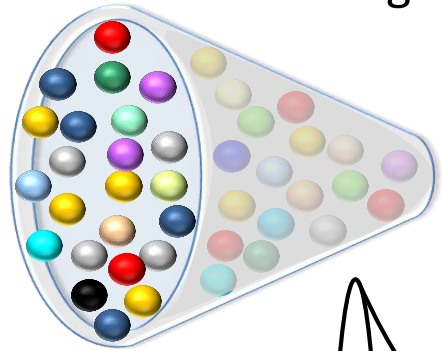
# Example of fuzzy front-end model



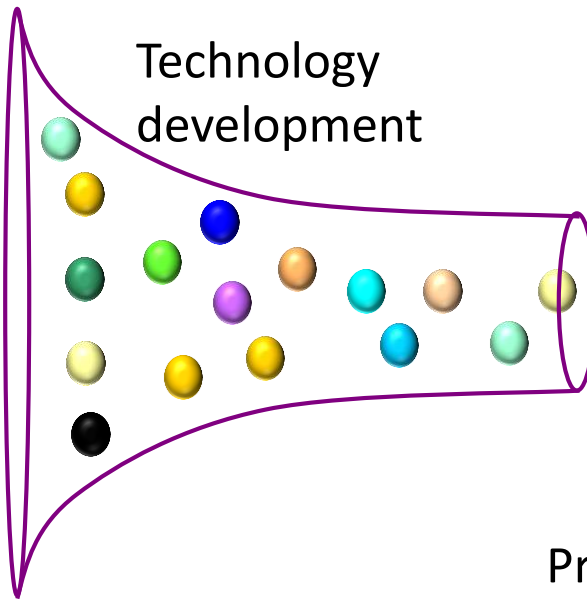
NPPD: New Product and Process Development



Idea management

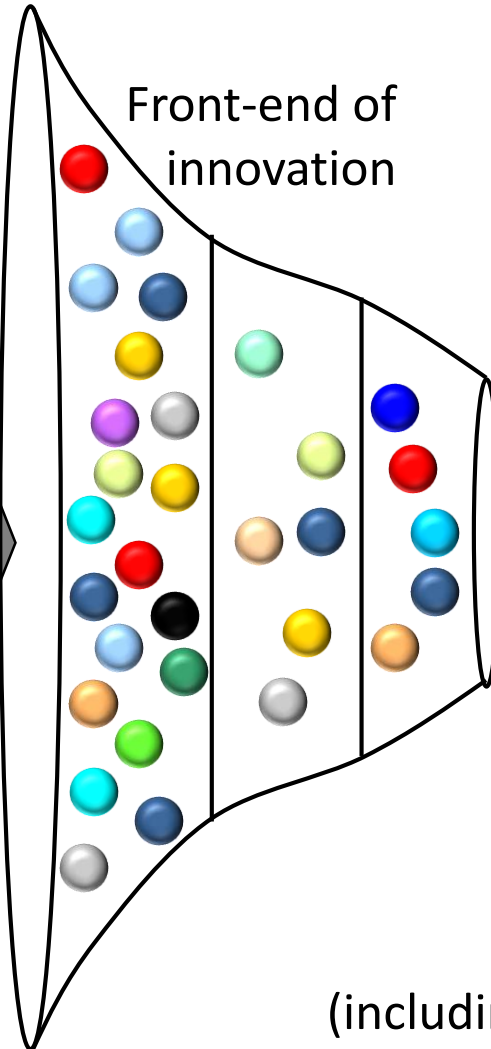


Technology development

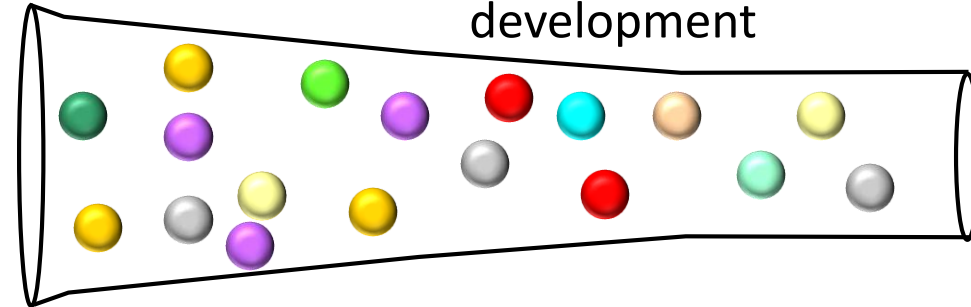


Indeed there are many funnels

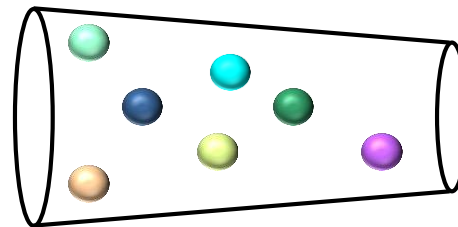
Front-end of innovation



Product and service development



New business development  
(including business model innovation)

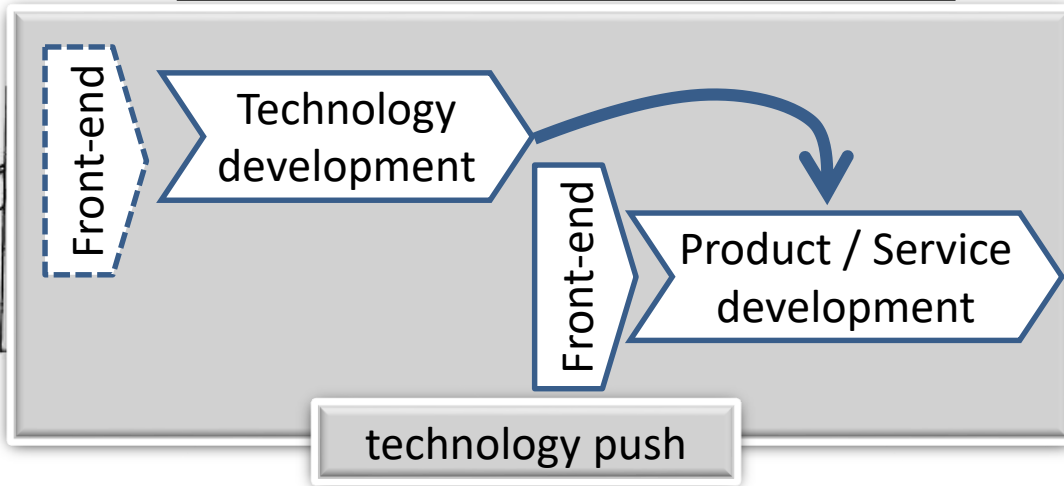




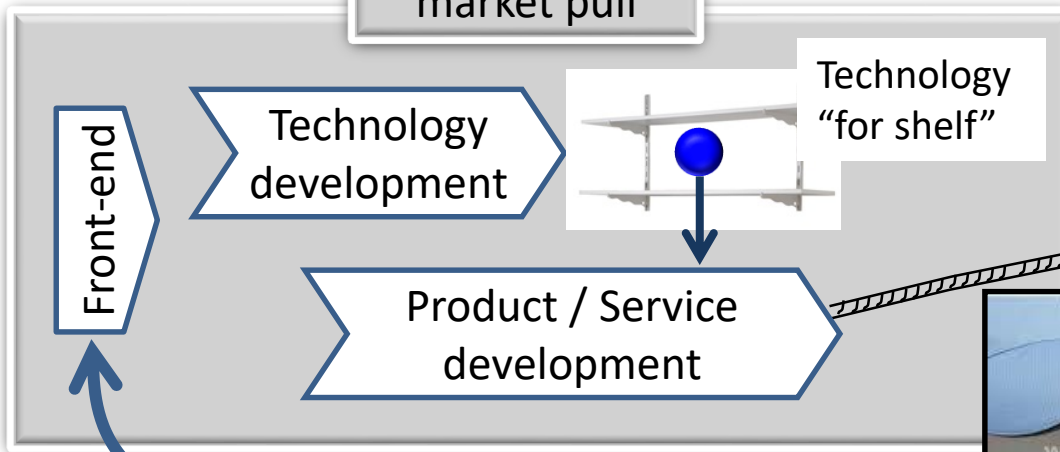
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# Development strategies and the relations among funnels

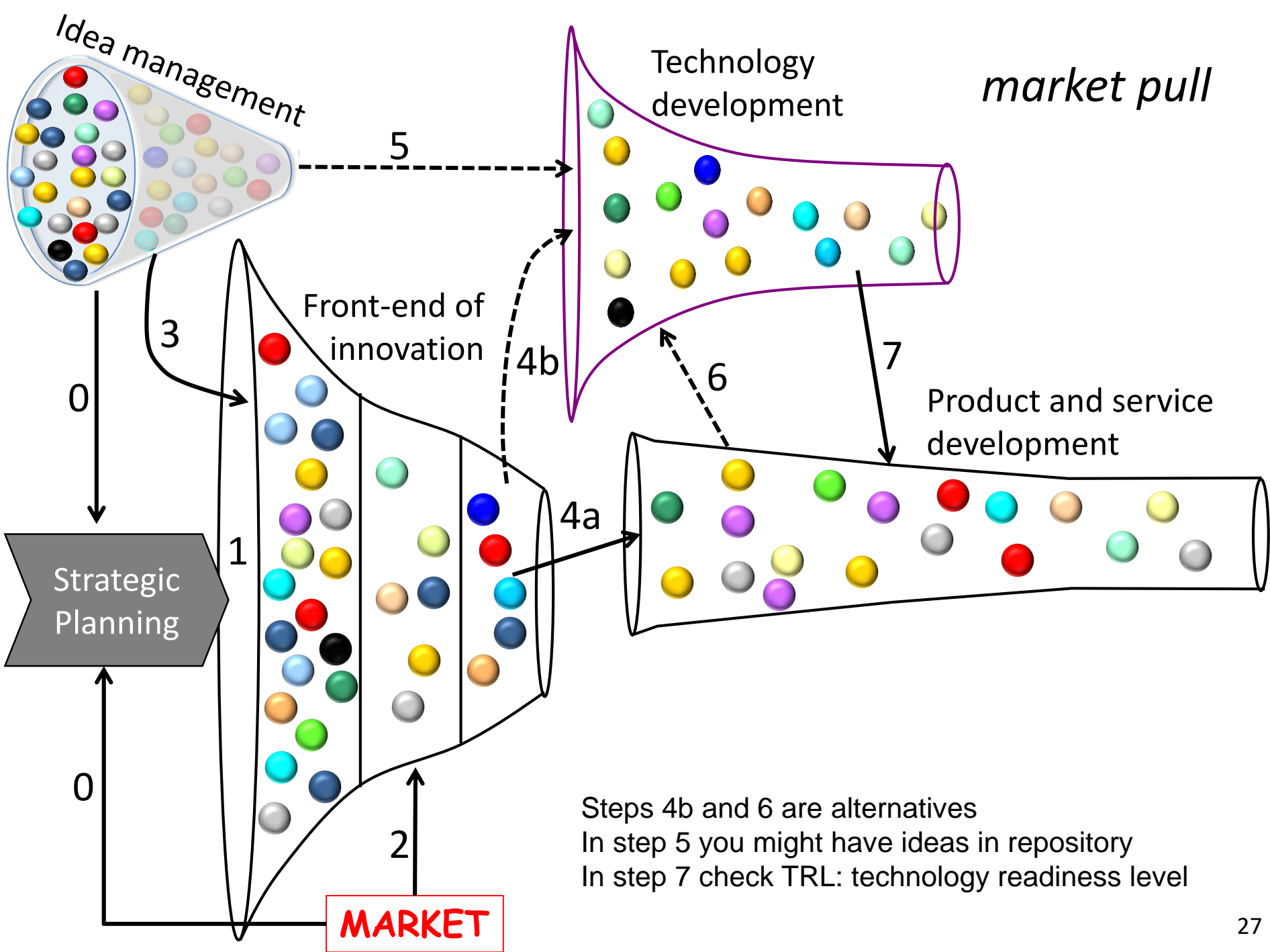
“find” applications for the technology

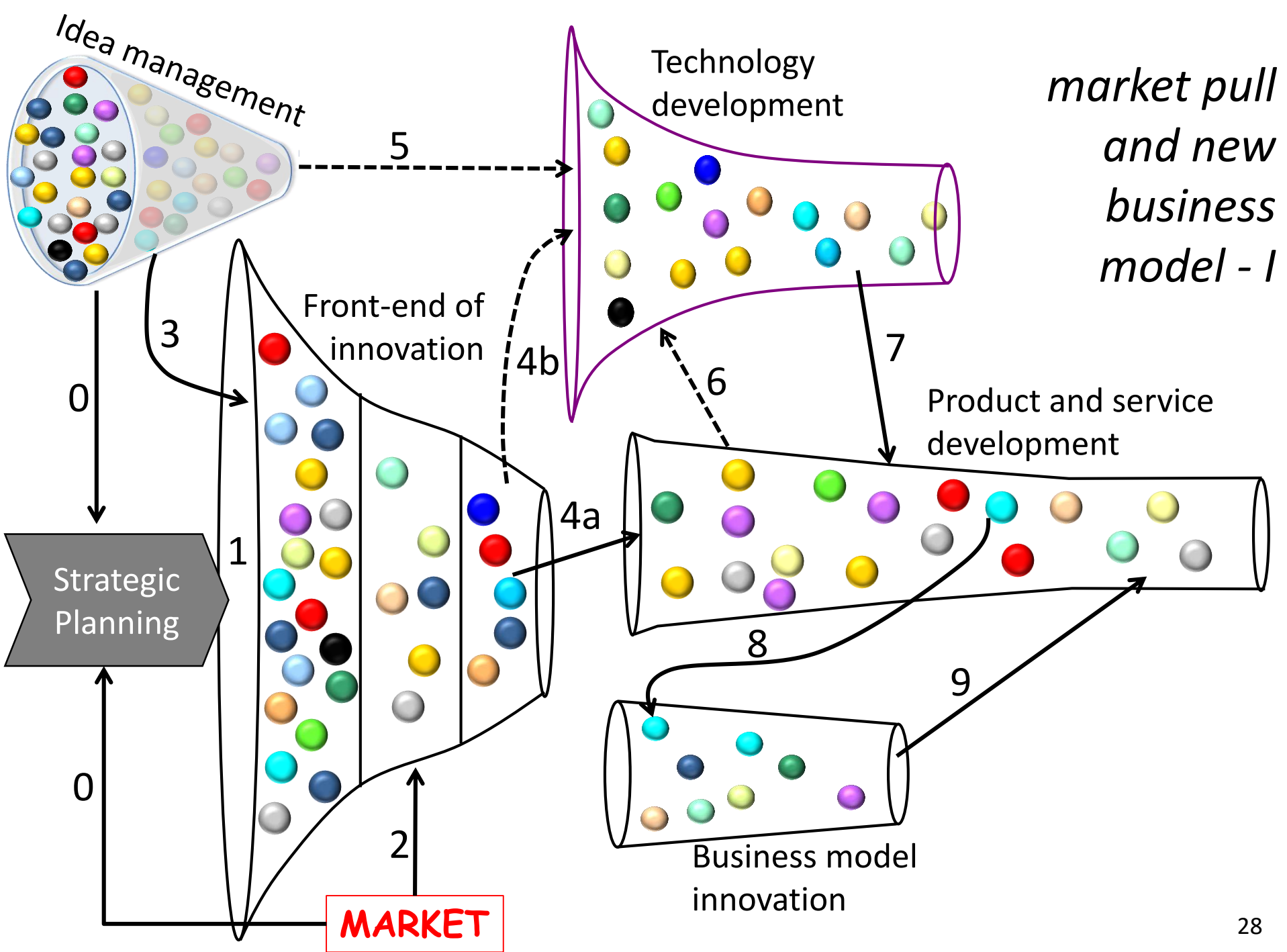


market pull

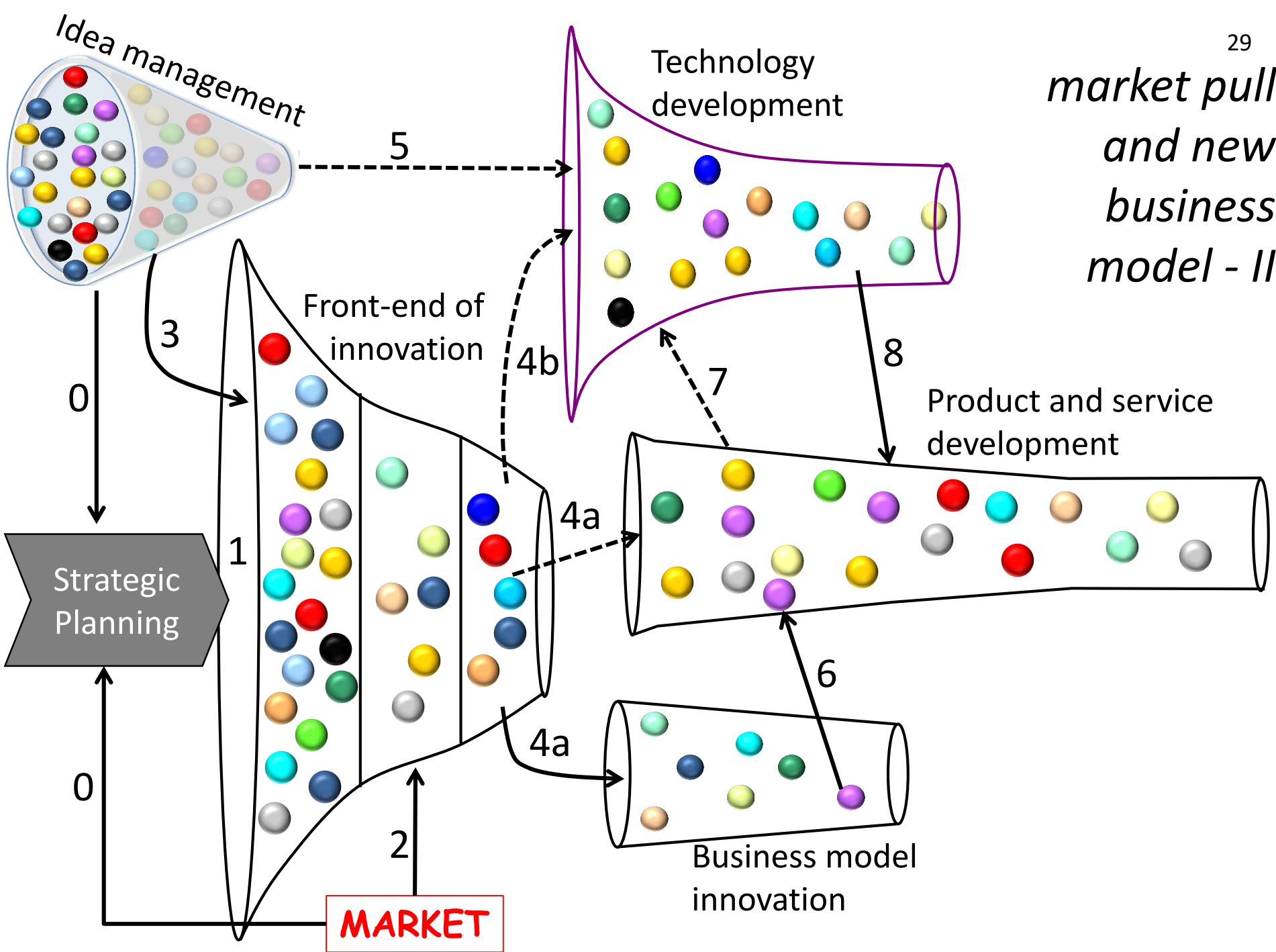


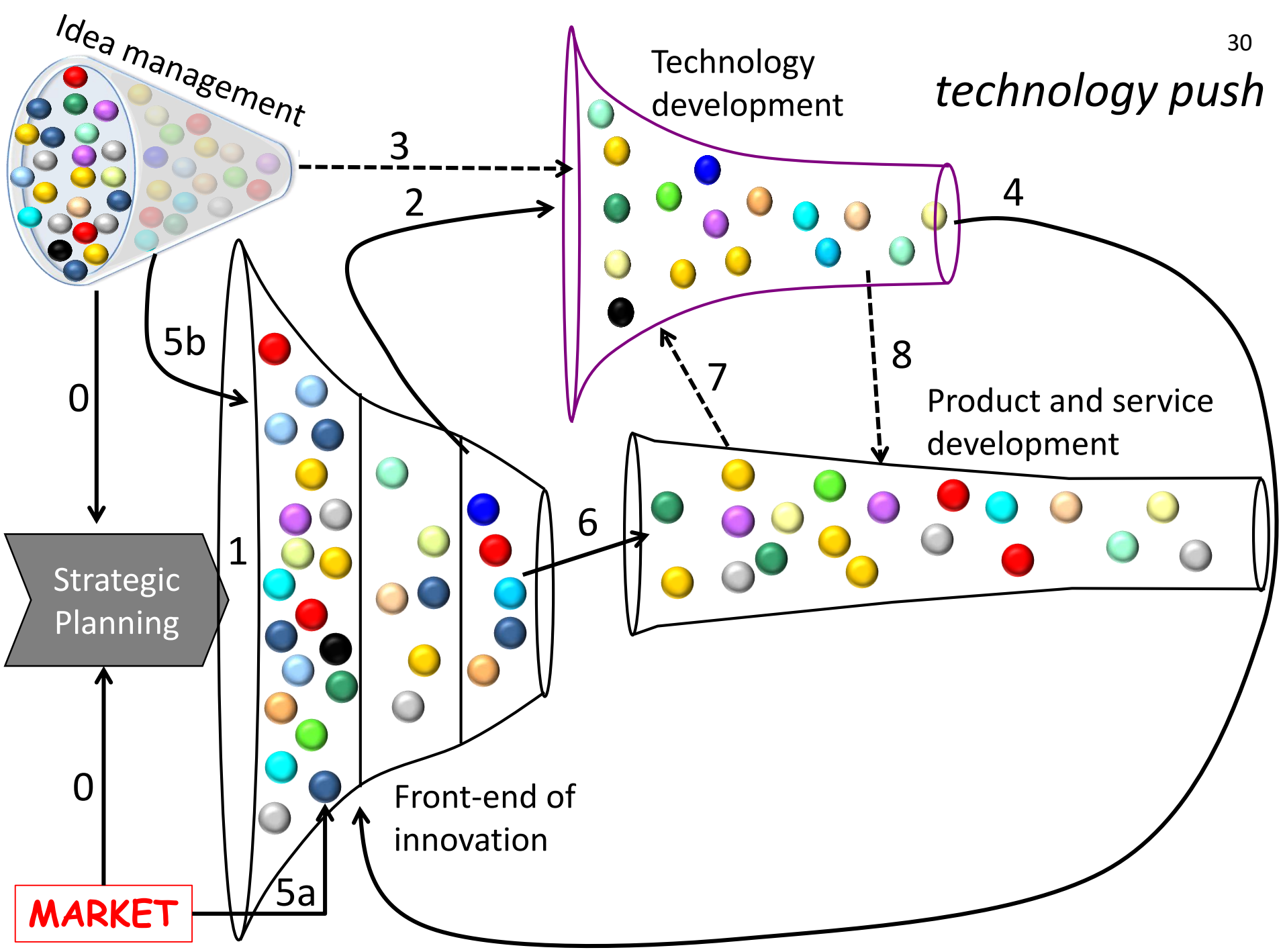
Development solutions for the customer needs



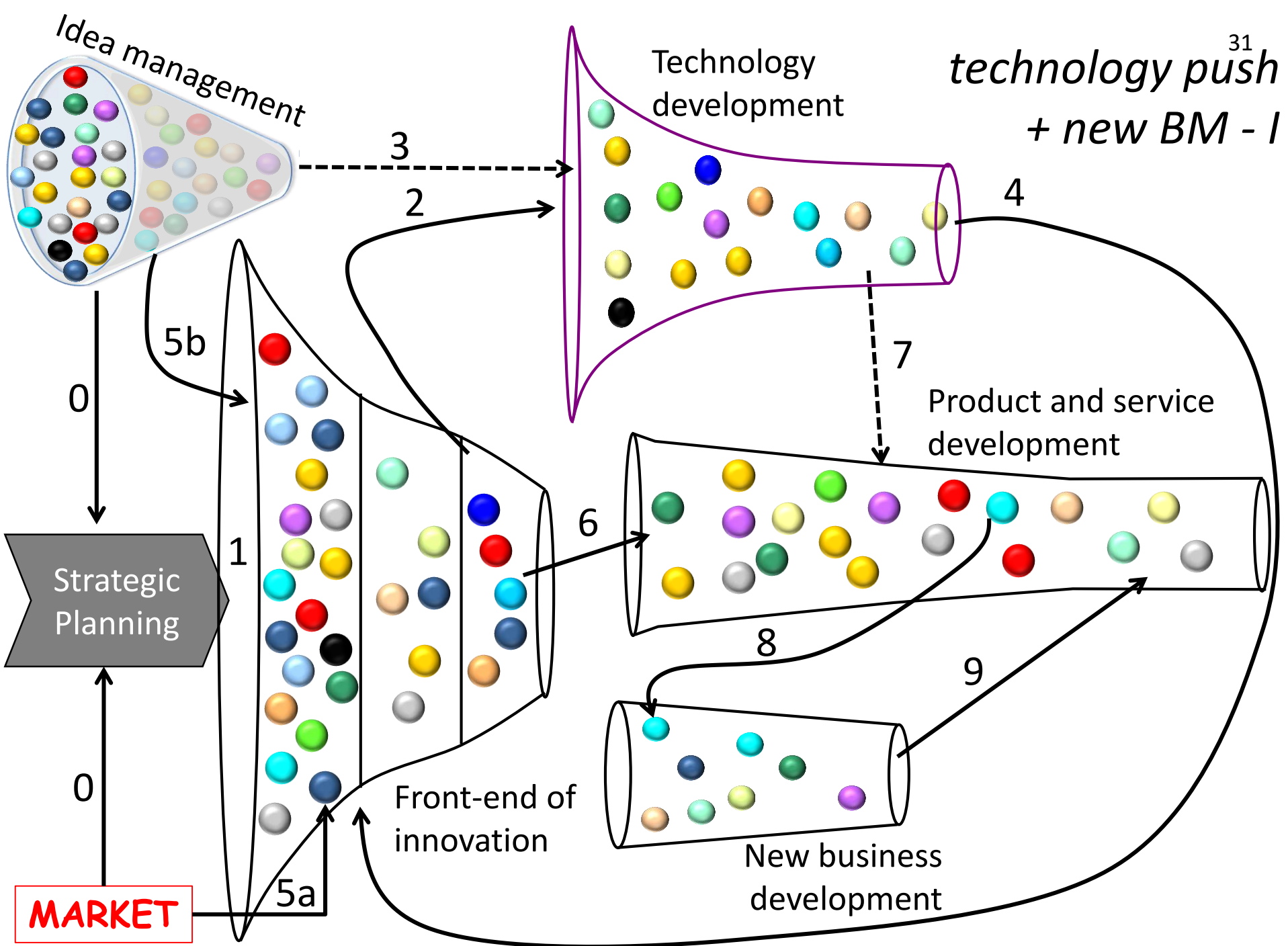


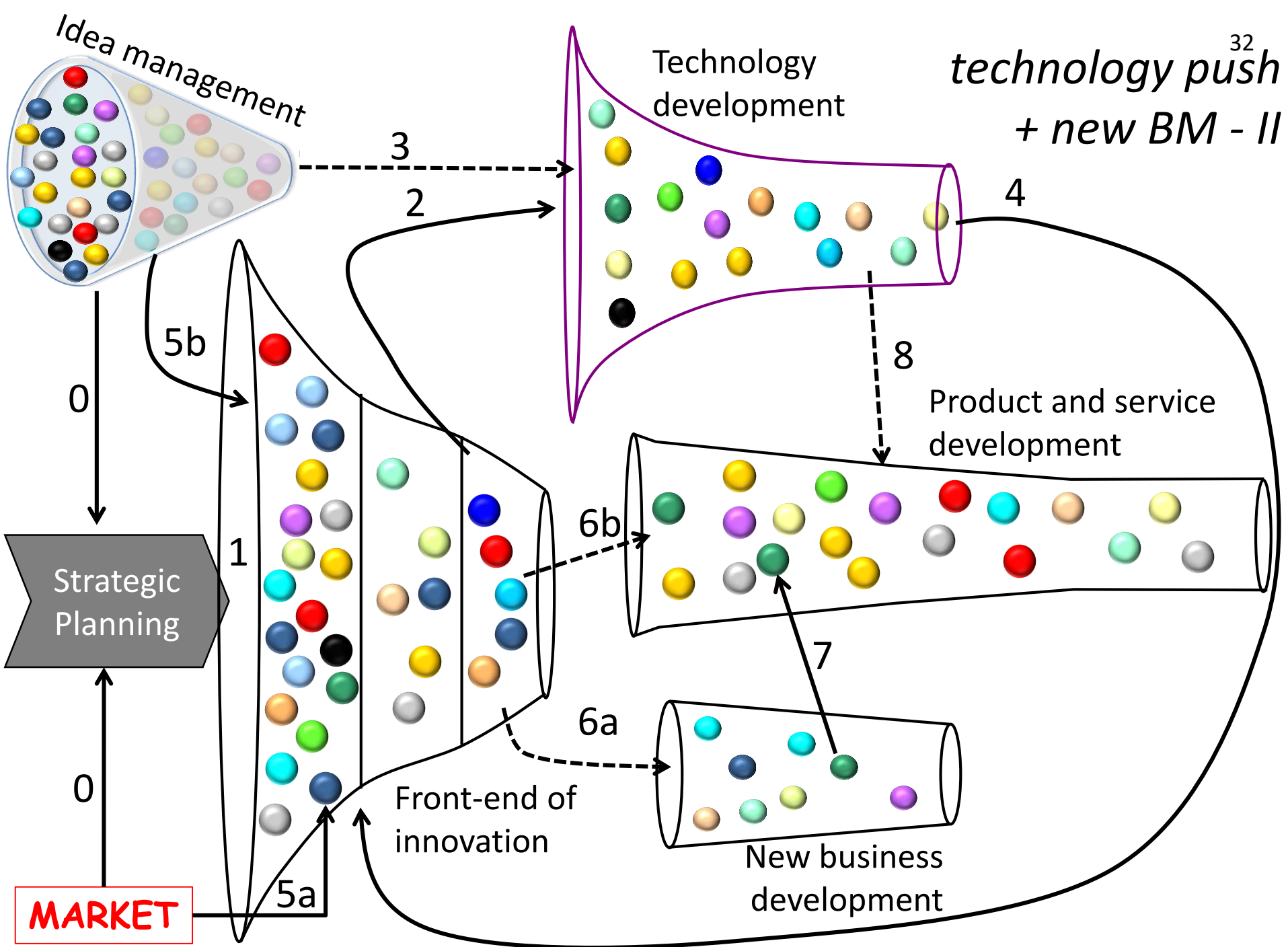
*market pull  
and new  
business  
model - II*









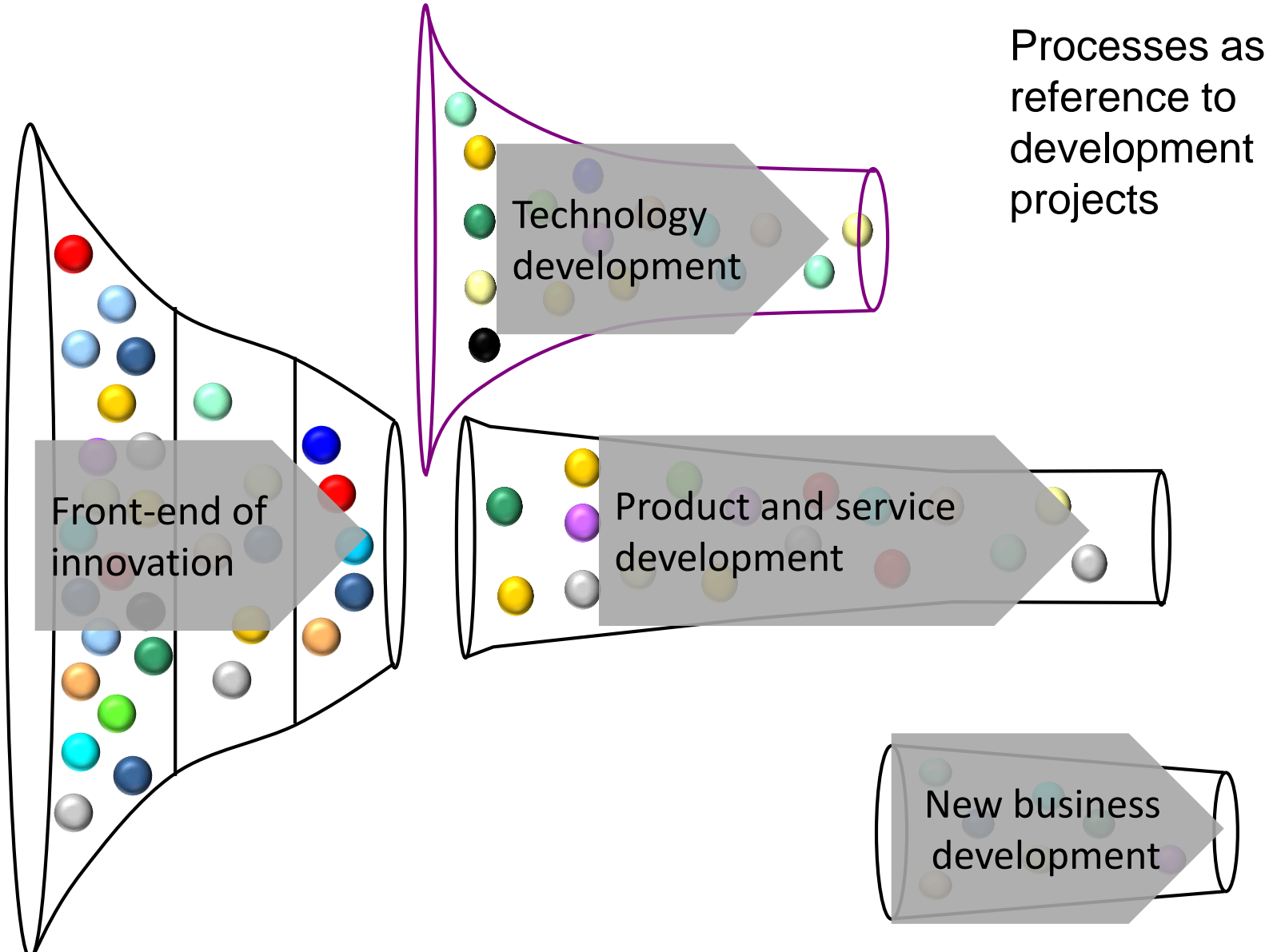




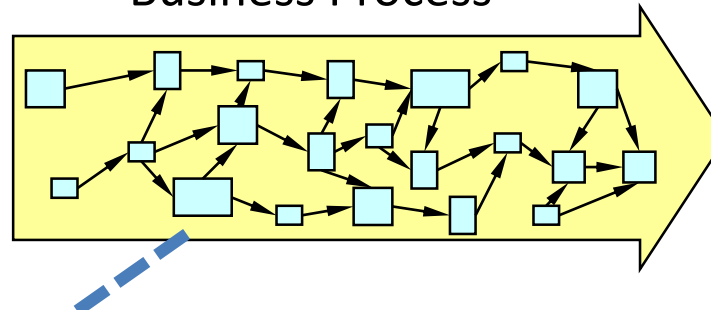
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# Innovation development processes

# These funnels can be represented by processes

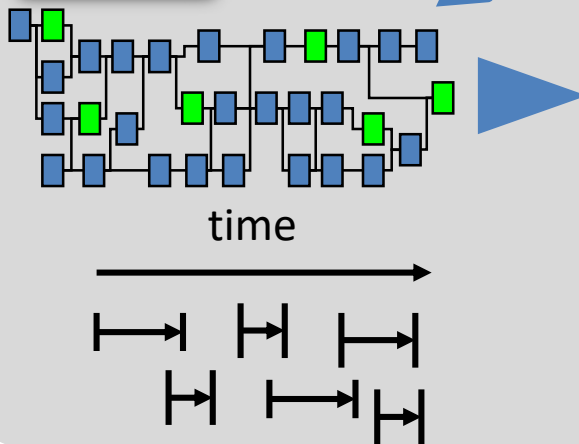


## Business Process



*Reference to be adapted*

## Project



Processes as reference to development projects of:

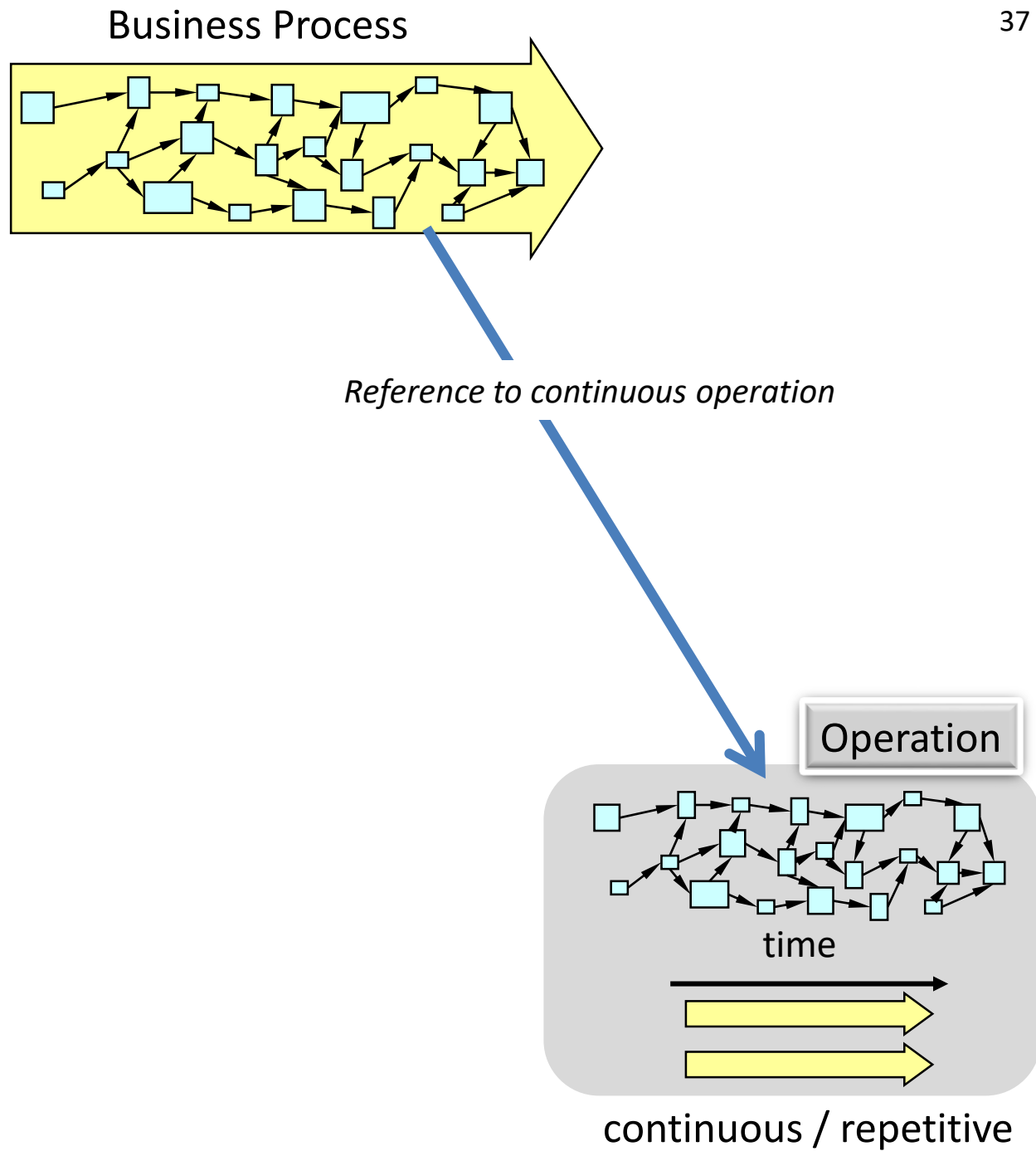
- Product
- Technology
- Process
- Service
- Business model
- Product-service system
- Infrastructure

temporary / unique



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How about the  
operational  
supporting processes?





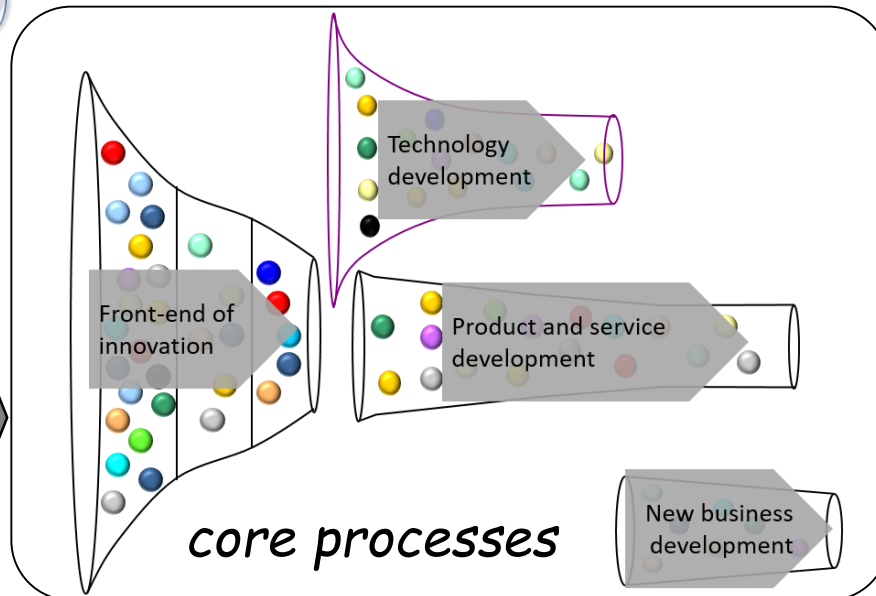


# Overview of the main business processes involved with innovation management



Idea management

*management process*



(\*) without acquisition and exploitation

	operational processes (repetitive, continuous)
	project oriented





# Relations between innovation management and processes

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	<b>Technology management (*)</b>					<b>strategic planning</b>	<b>Core processes</b>					<b>Supporting processes (partially)</b>					
	<b>identification</b>	<b>selection</b>	<b>acquisition (*)</b>	<b>exploitation (*)</b>	<b>protection</b>		<b>learning</b>	<b>front-end of innovation</b>	<b>technology development</b>	<b>product / service development</b>	<b>business model innovation</b>	<b>change management</b>	<b>idea management</b>	<b>business intelligence</b>	<b>market research</b>	<b>competence management</b>	<b>partner/alliance management</b>
<b>Innovation management</b>																	
search	strong	medium					strong				medium	strong		medium			medium
select	medium	strong	medium					strong			medium		medium		medium	strong	medium
implement																	
acquire	medium		strong	medium	strong			strong	medium	medium	medium		medium		strong	strong	
execute				strong	strong				strong	strong	strong				strong	strong	strong
launch				medium	medium				medium	medium	medium			medium	strong	strong	medium
sustain				medium	medium						medium		medium	medium			medium
learn	medium	medium			medium		strong	strong	medium	medium	strong	strong	strong	medium	strong	medium	strong

(\*) TM without acquisition and exploitation, which are distributed in other processes, is considered a support process

relation level	
strong	dark gray
medium	medium gray
weak	light gray
none	white



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there are other  
processes ... not focus  
of this lecture



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# Cross industry process classification framework



VERSION NUMBER 7.2.1  
GENERATED ON 9/17/2018

For more information about the PCF, visit [www.apqc.org/pcf](http://www.apqc.org/pcf)

## OPERATING PROCESSES



## MANAGEMENT AND SUPPORT SERVICES





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# Importance of the partner / alliance management process



# Example of partners in a supply chain

Samsung Eletronics + ARM Holding

Balda + TPK Holding

Epson

Sharp



NXP Semiconductors

Skyworks Solutions

Linear Technology

Broadcom

CSR

Infineon

RF Microdevices

Toshiba Matsushita

Wolfson Microelectronics

Marvell technology Group

Texas Instruments

Micron Technology

STMicroelectronics

National Semiconductor

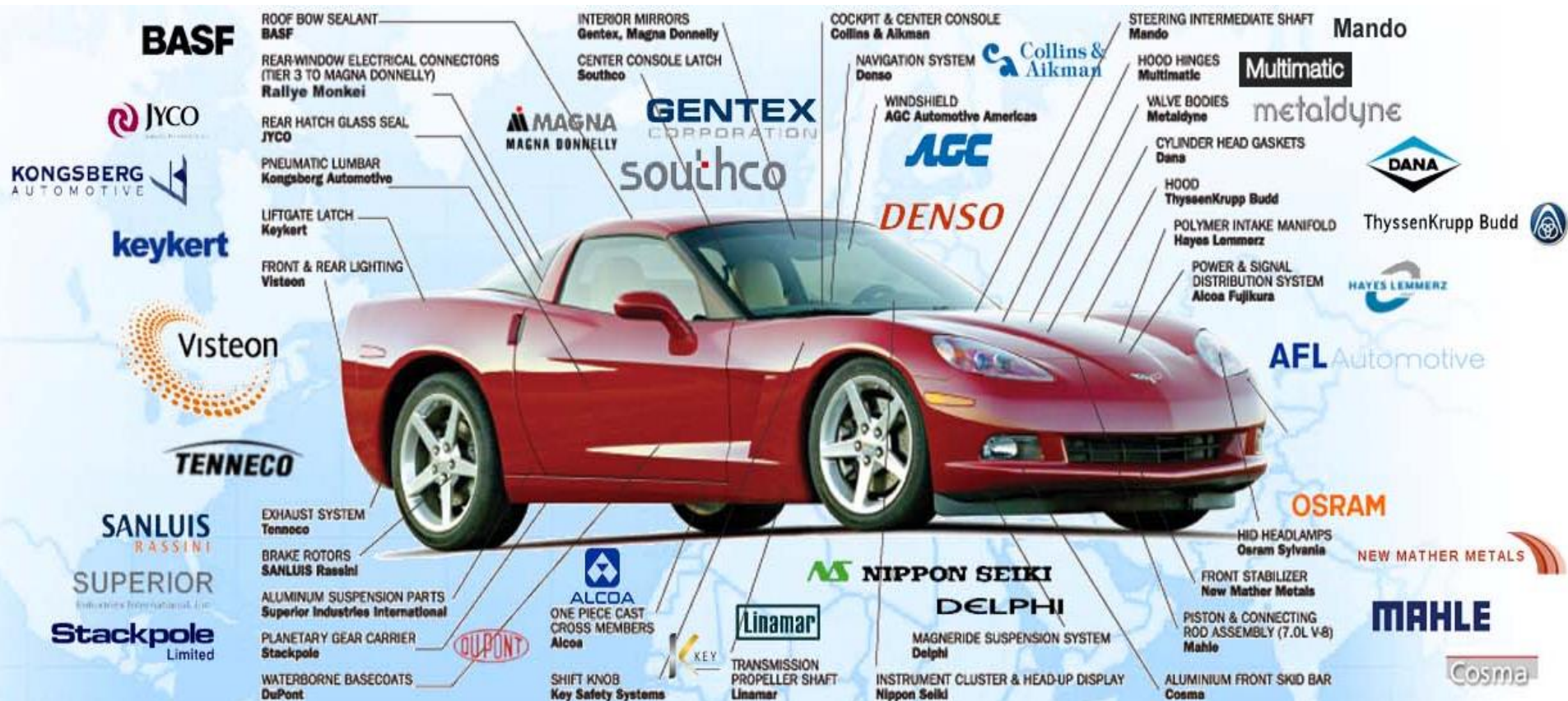
Silicon Storage Technology





# Example of partners in a supply chain

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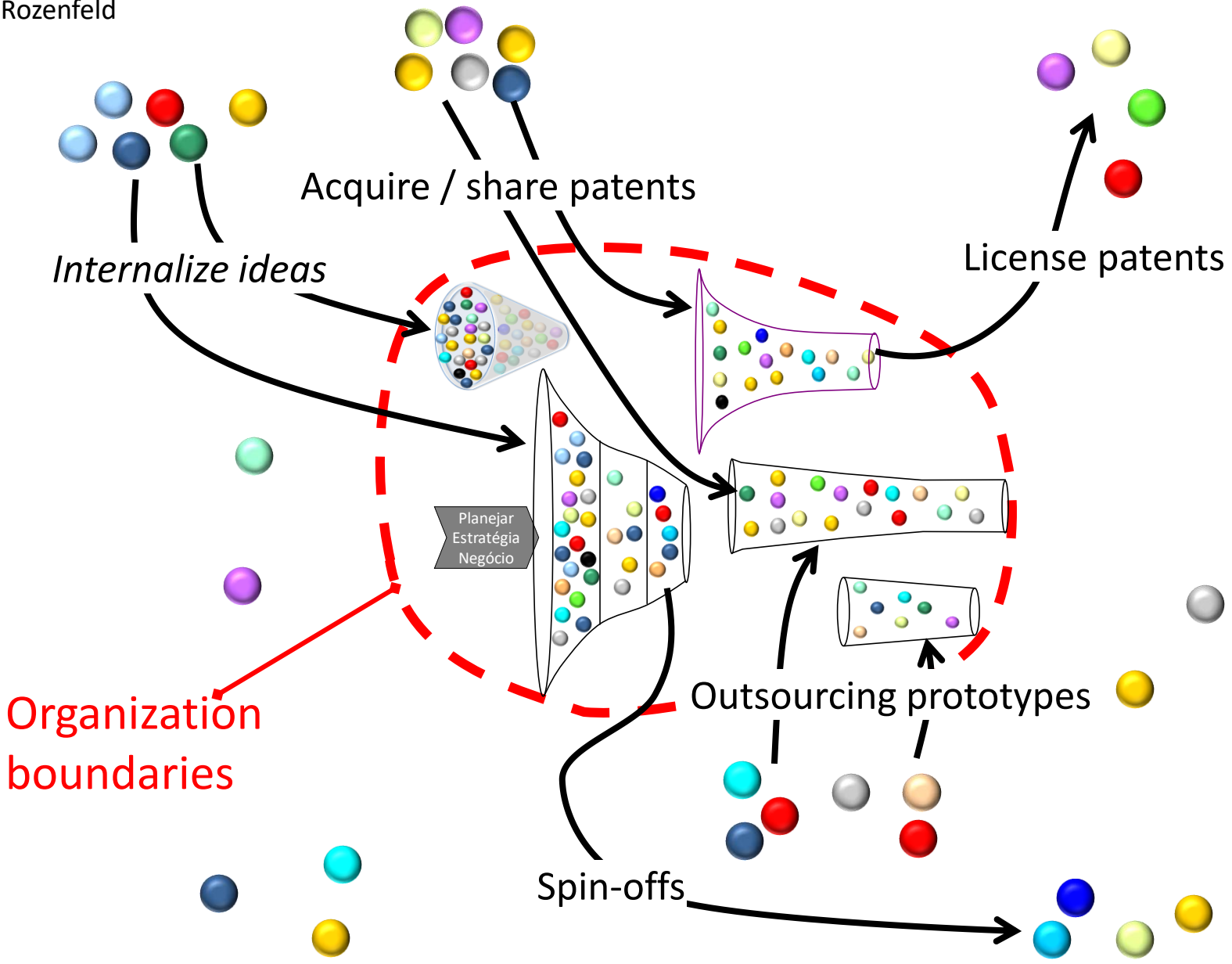




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# Open innovation strategy

# Open innovation



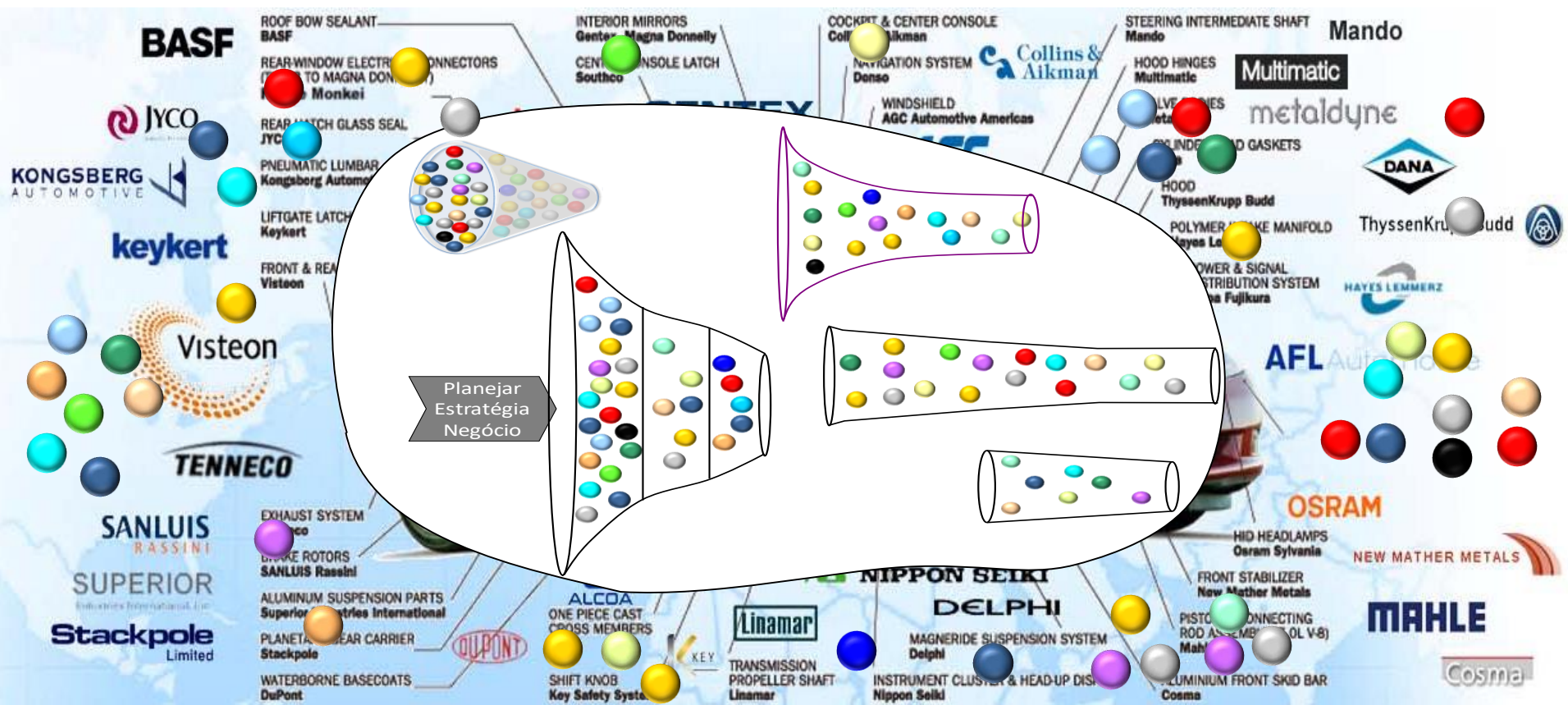
# Types of partnership, alliances and suppliers

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Risk partners

Strategic partners

Technology partners



Co-developers

Service suppliers

1<sup>st</sup> tier (system) suppliers

Part, component, material suppliers

# Models of innovation

Date	Model	Characteristics
1950/60s	Technology-push	Simple linear sequential process; emphasis on R&D; the market is a recipient of the fruits of R&D
1970s	Market-pull	Simple linear sequential process; emphasis on marketing; the market is the source for directing R&D; R&D has a reactive role
1970s	Dominant design	Abernathy and Utterback (1978) illustrate that an innovation system goes through three stages before a dominant design emerges
1980s	Coupling model	Emphasis on integrating R&D and marketing
1980/90s	Interactive model	Combinations of push and pull
1990	Architectural innovation	Recognition of the role of firm-embedded knowledge in influencing innovation
1990s	Network model	Emphasis on knowledge accumulation and external linkages
2000s	Open innovation	Chesbrough's (2003) emphasis on further externalisation of the innovation process in terms of linkages with knowledge inputs and collaboration to exploit knowledge outputs



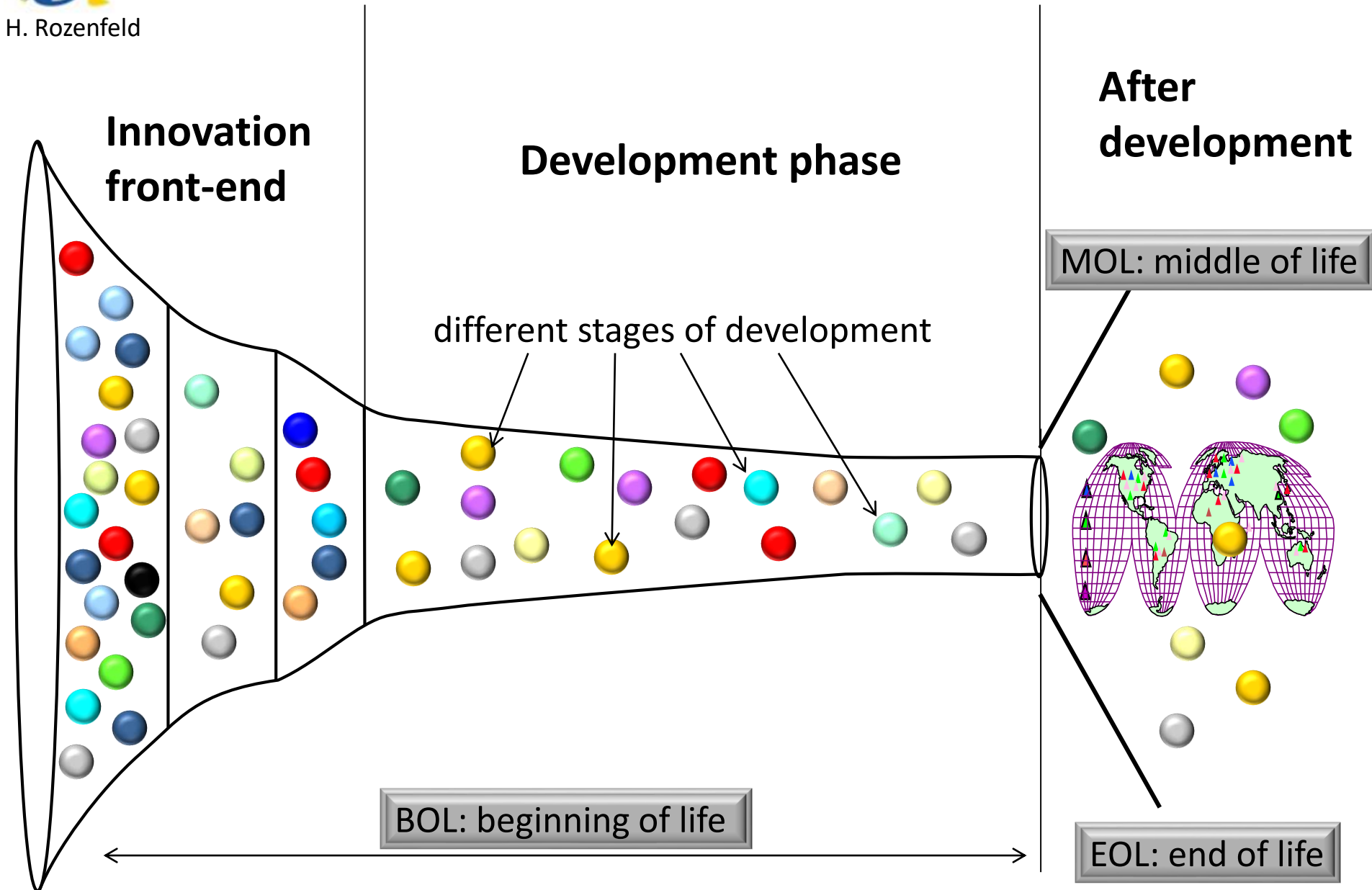
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# Sustainability and lifecycle thinking



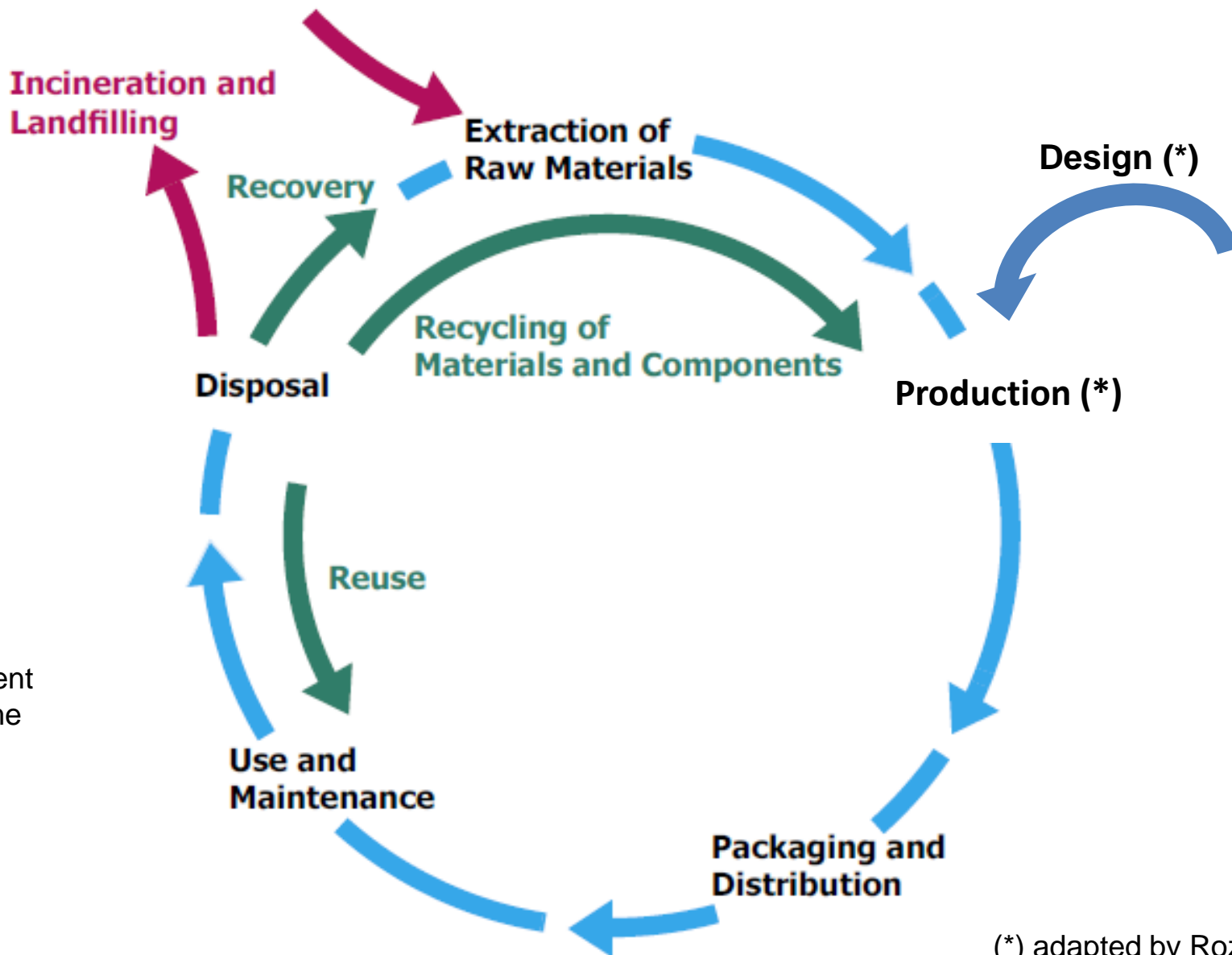
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# Lifecycle phases (of information)





# UNEP (material / product) lifecycle vision (environmental perspective)



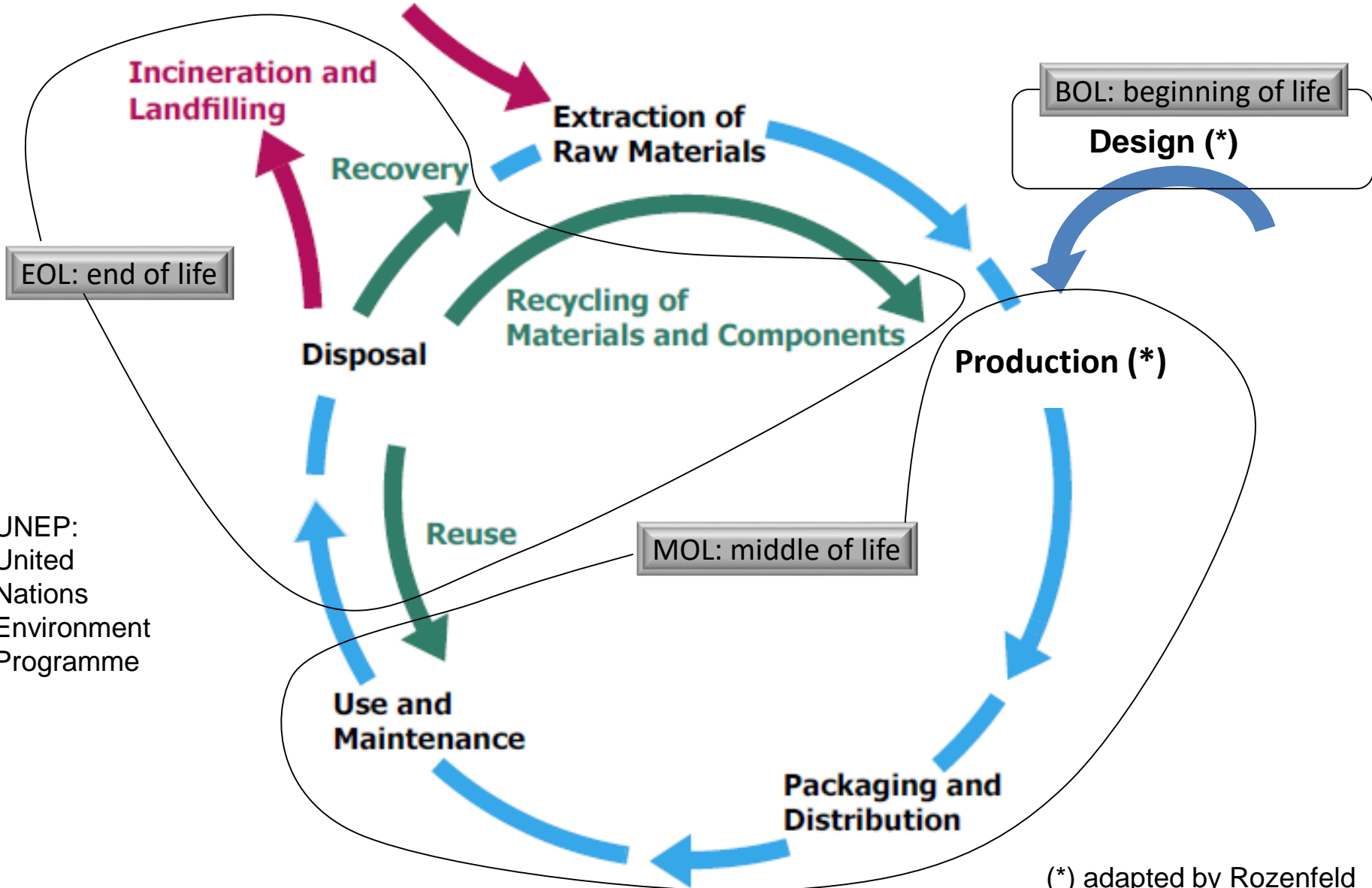
UNEP:  
United  
Nations  
Environment  
Programme

(\*) adapted by Rozenfeld





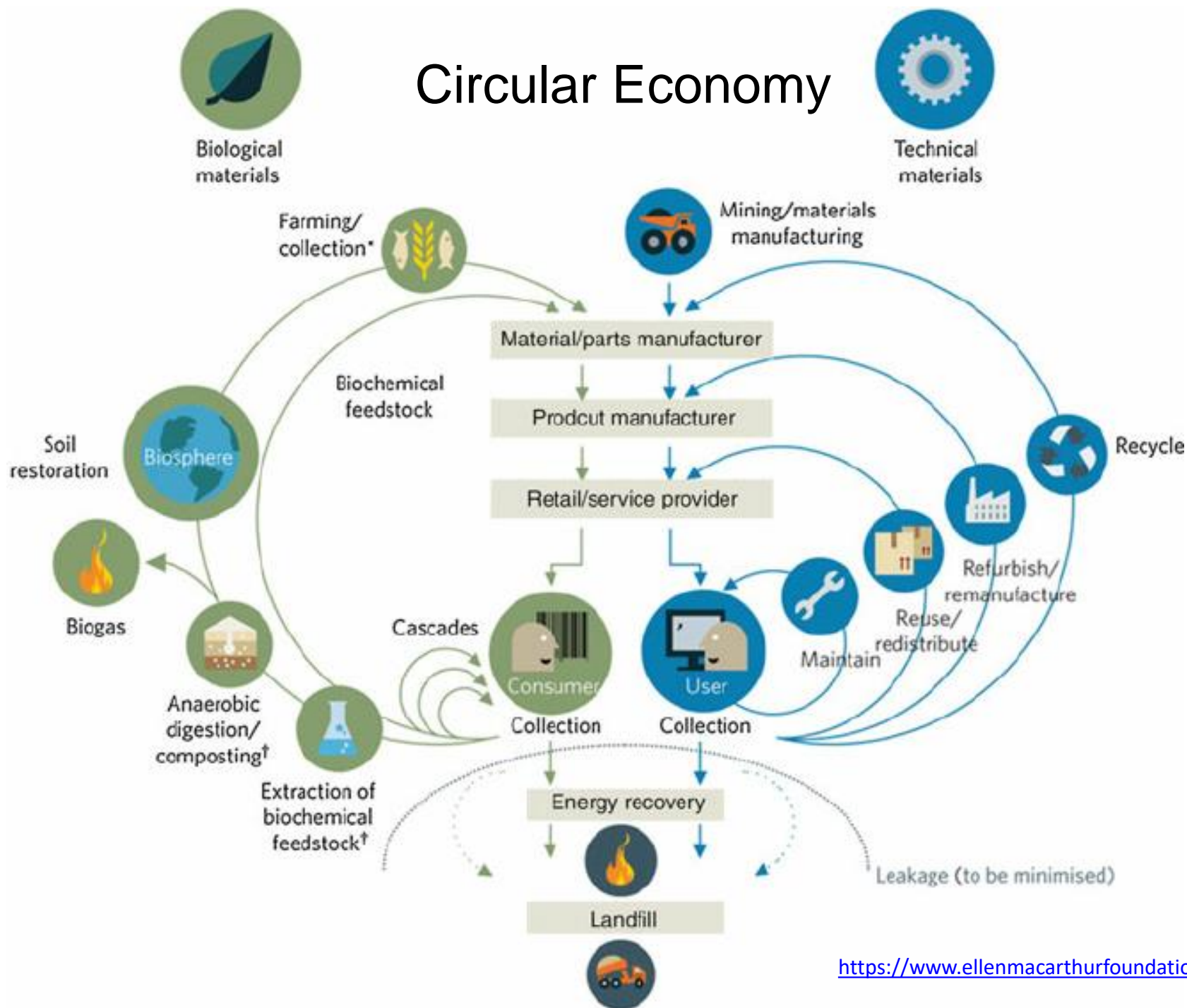
# UNEP (material / product) lifecycle vision (environmental perspective)



UNEP:  
United  
Nations  
Environment  
Programme

(\*) adapted by Rozenfeld

# Circular Economy





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**ACTIVITIES**


---

- Frame project objectives
- Test preliminary business ideas
- Plan
- Assemble team

---

**ACTIVITIES**


---

- Scan environment
- Study potential customers
- Interview experts
- Research what has already been tried (e.g. examples of failures and their causes)
- Collect ideas and opinions

---

**ACTIVITIES**


---

- Brainstorm
- Prototype
- Test
- Select

---

**ACTIVITIES**


---

- Communicate and involve
- Execute

---

**ACTIVITIES**


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8

- Scan the environment
- Continuously assess your business model
- Rejuvenate or rethink your model
- Align business models throughout the enterprise
- Manage synergies or conflicts between models