



# Technology and Innovation Management

## 3. Basic Definitions

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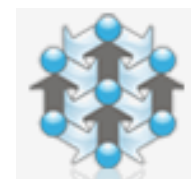
University of São Paulo

São Carlos Engineering School

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 basic definitions of terms used in the course:

- Product
- Service
- Product-service system (PSS)
  - Benefits
  - Challenges
  - Developments
- Systemic vision of an organization
- Project
- Operation
- Process and business process
- Reference of business processes



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# What is a product?



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# What is a product? From different perspectives and communities

- Good or service we sell and the customer pays because she/he perceives benefits
  - Some differentiate product as the “physical good” from service (intangible)
  - It could be associated with services in a bundle offering (product-service system – PSS)
  - It has a lifecycle
  - It is the result of a project
- Something that customer dreams of OR needs
  - It should delight customers (innovation)
  - Deliver VALUE to the customer



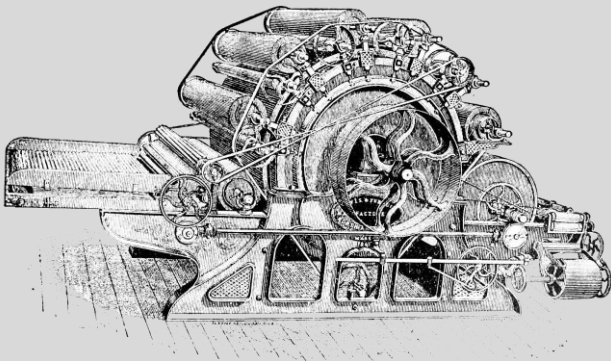
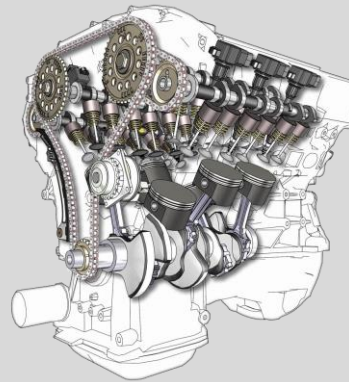
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# Examples of products

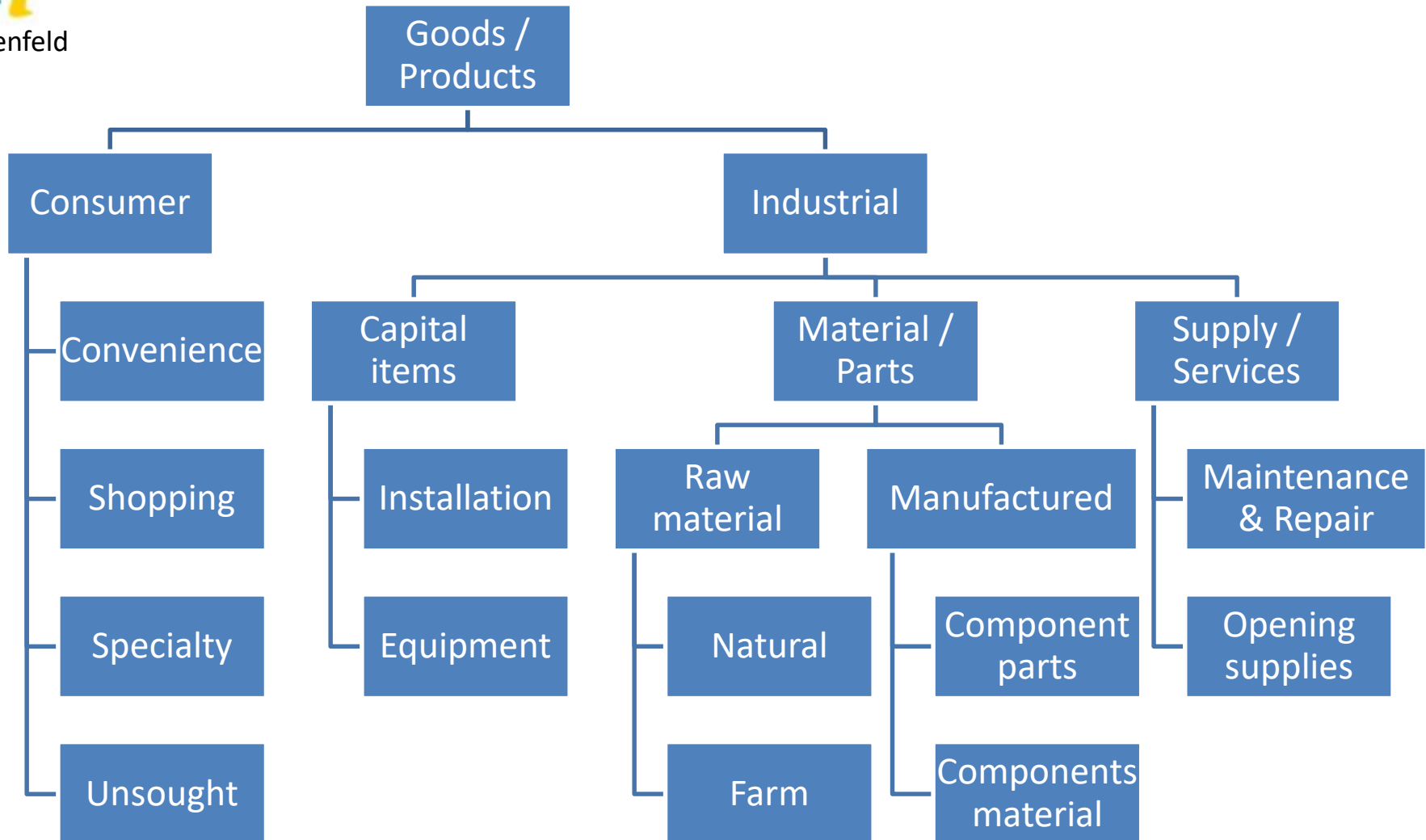
Product



Customer



# Classification of products



<https://profprakashsingh.wordpress.com/2018/09/15/goods-classification-product-classification-product-types-classification-of-products-types-of-products-dr-prakash-singh/>

According to durability & tangibility: durable goods, non-durable goods, services





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# Examples of consumer products

Product



Customer



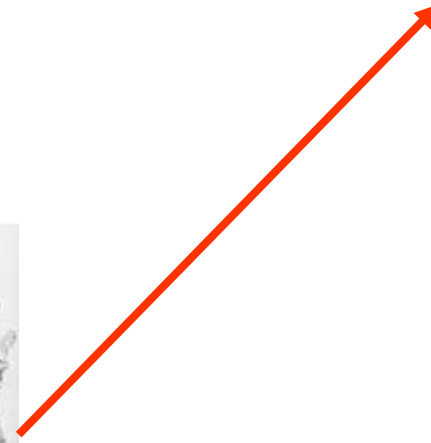


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# Examples of industrial products



Product



Customer



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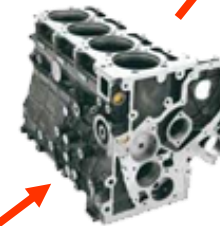
# Examples of industrial products



Product



Capital goods



Customer

# Product's characteristics

- Service level (SLA: service level agreement)
- Complexity (structure, technology, use,..)
- Innovation level
- User interface
- Type of technology
- Market
- Lifecycle
- Supply chain
- Environmental impact
- Social impact
- Economic impact

Product



Customer



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# Examples of products classified based on interface and technological complexity

User  
interface  
complexity



Technological complexity

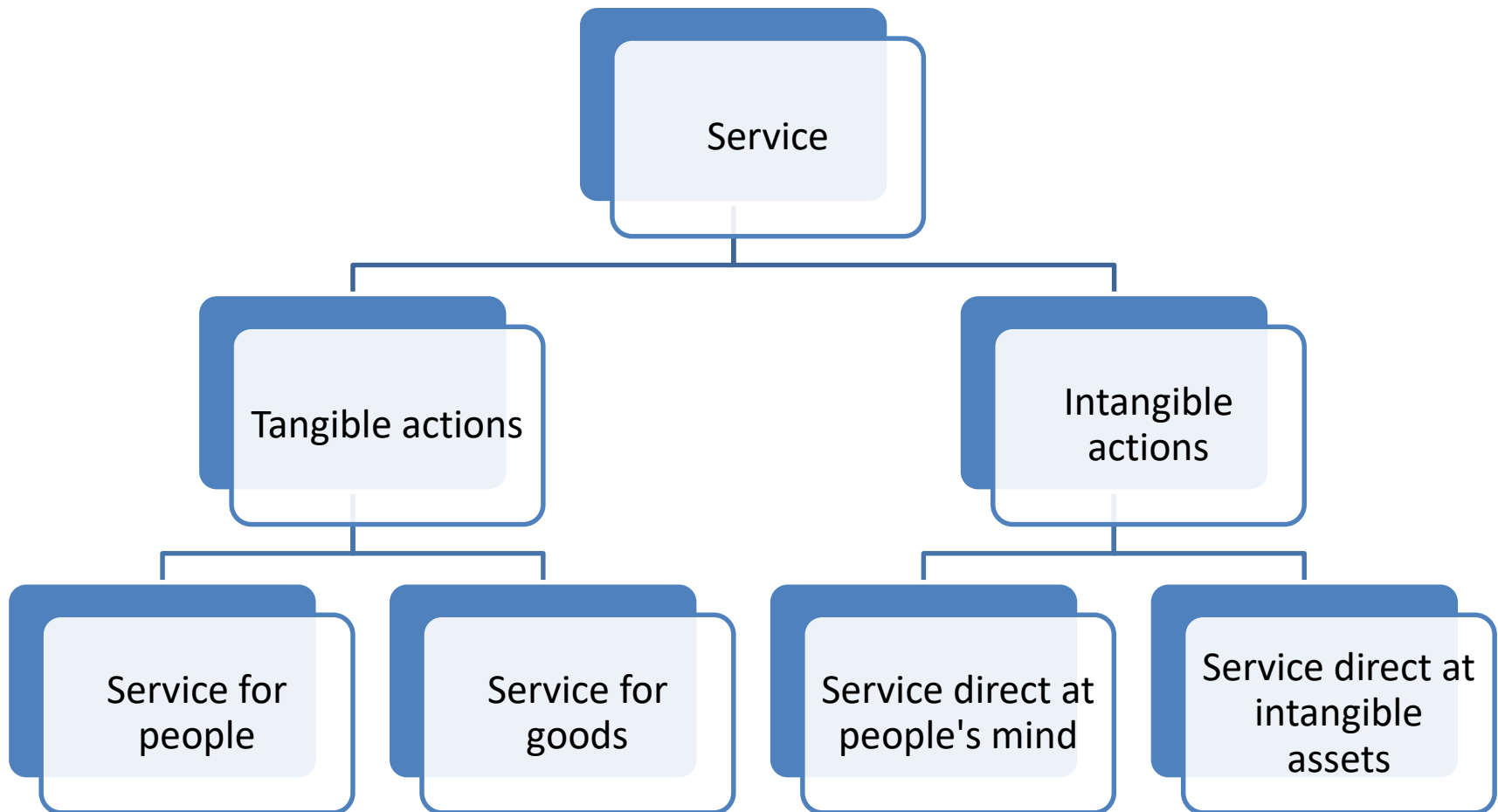




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# What is a service?

# Classification of service





## Service classification based on function

- Business services.
- Communication services.
- Construction and related engineering services.
- Distribution services.
- Educational services.
- Environmental services.
- Financial services.
- Health-related and social services.
- Tourism and travel-related services.
- Recreational, cultural, and sporting services.
- Transport services.
- Other services not included elsewhere.



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# Example of service



Intangible (but can result from tangible action), customer pays, receives the service, but cannot own the service ....

# Example of service



.... it is heterogeneous ....





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# Example of service

Production



Sell / deliver



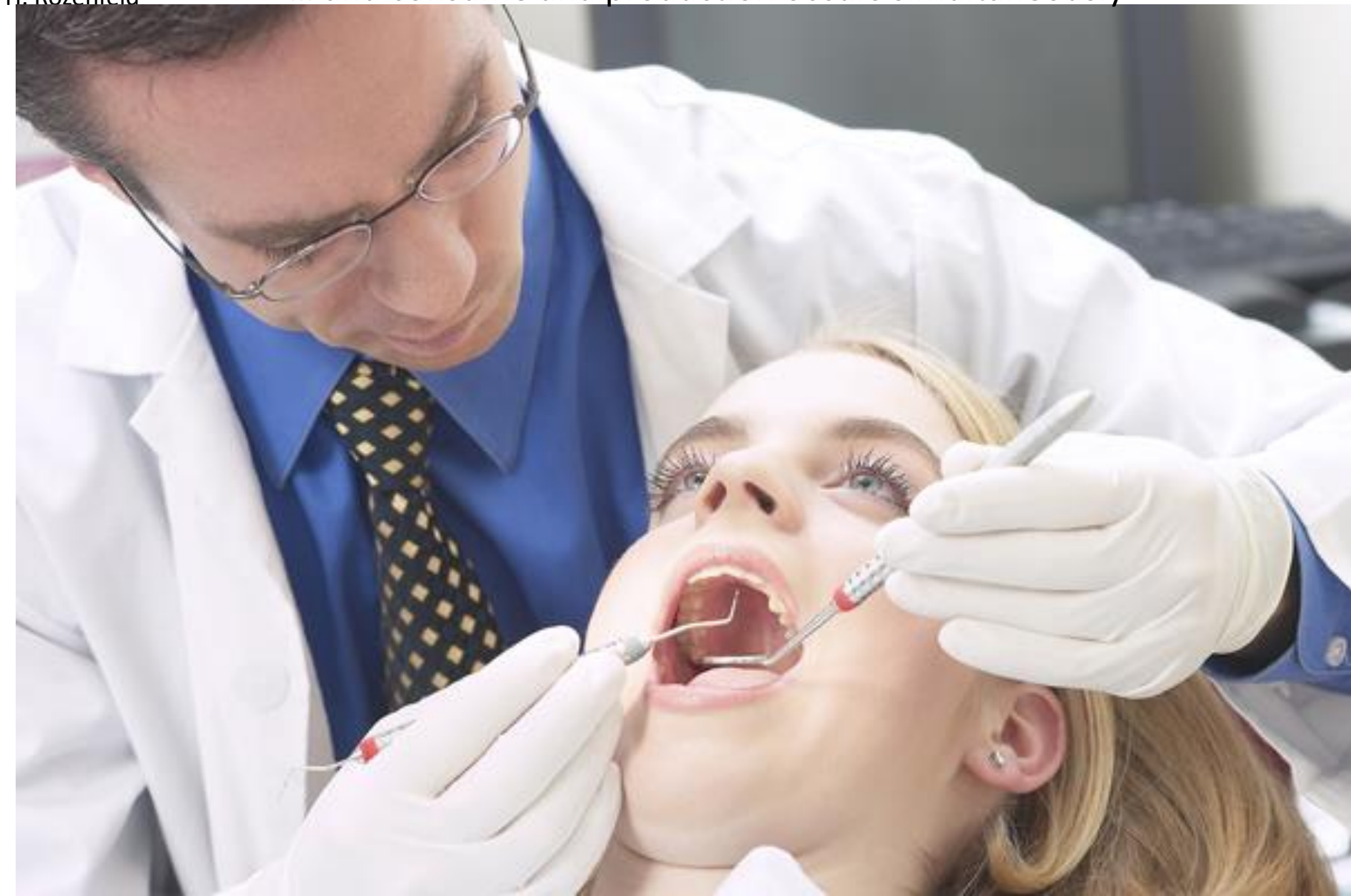
Consume



... and consume and production occurs simultaneously

## Example of service

... and consume and production occurs simultaneously





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# What is a PSS?

PSS: product-service system

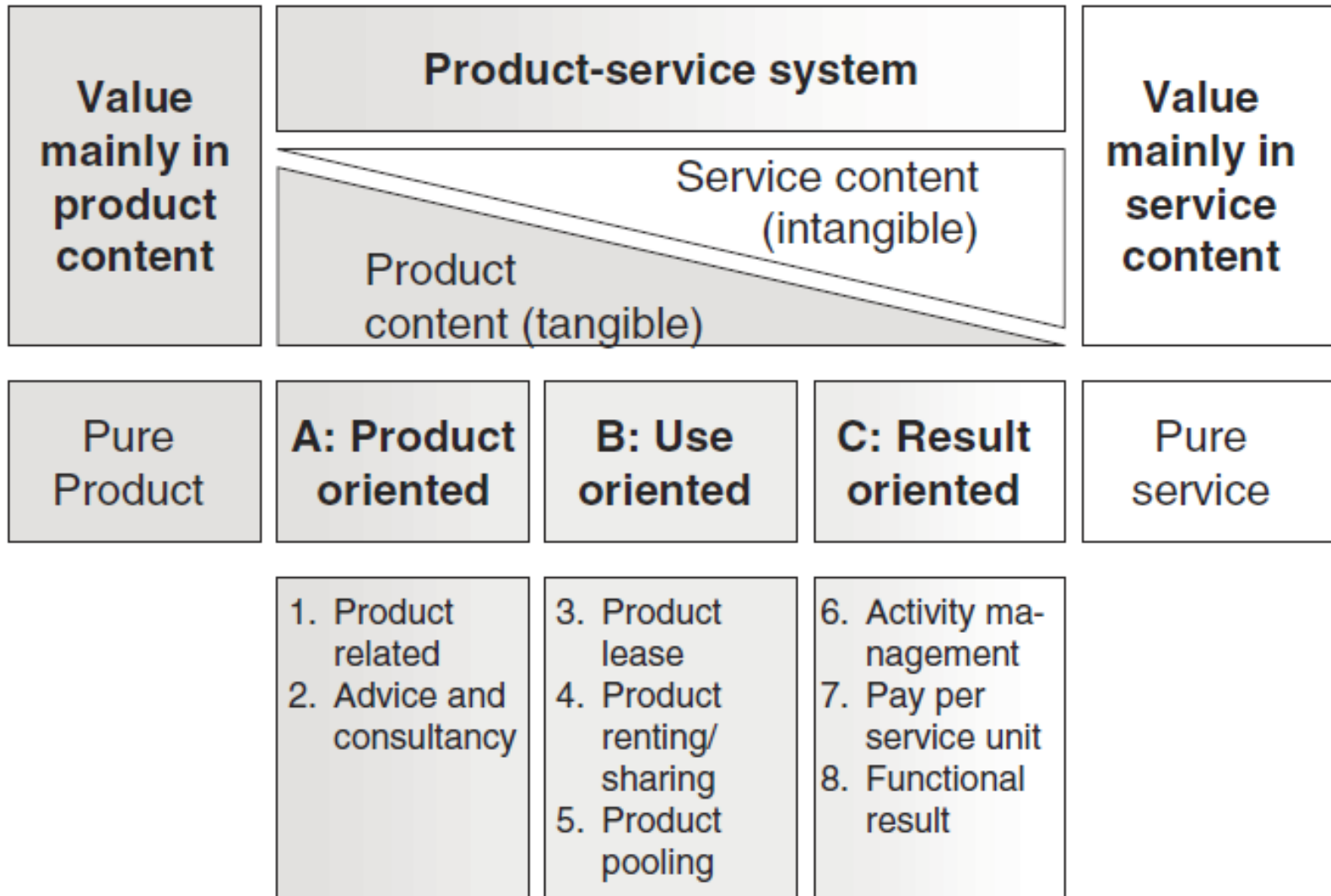


functional  
service-dominant  
service-oriented  
product-service  
care  
infusion  
service-oriented  
covalent  
product/service  
servicification  
bundling  
productization  
offering  
system  
products  
hybrid  
integrated  
services  
servitization  
industrial  
value  
logic  
engineering  
related  
manufacturing  
sales  
integration  
servicing  
companies  
bundle  
total  
service  
PSS  
product  
service  
extended  
systems



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# PSS classification



Source: Eight types of product service system: eight ways to sustainability (TUKKER, A., 2004)



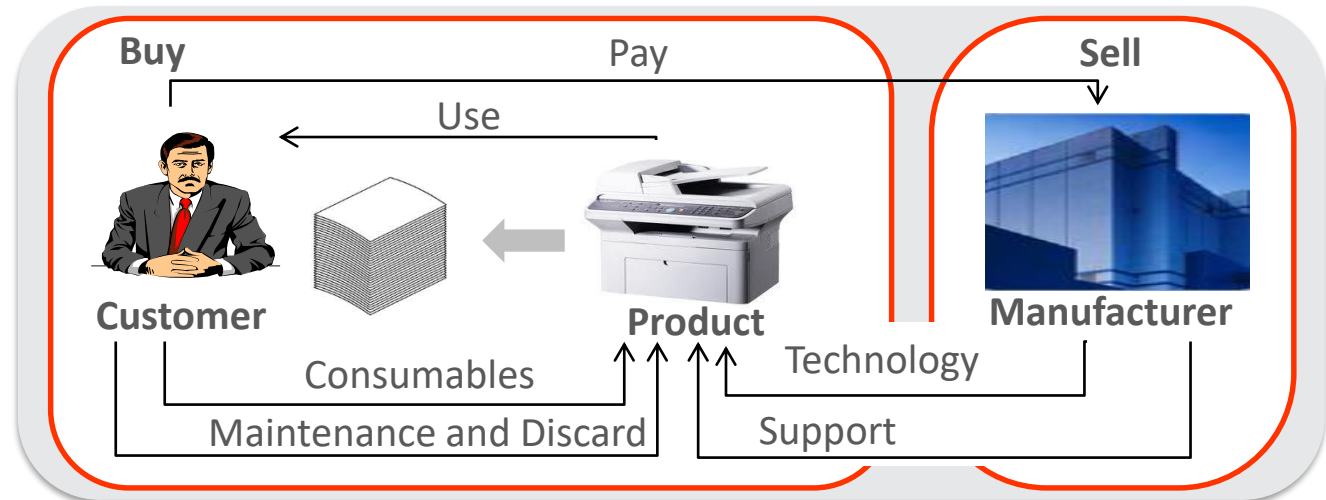
## Example of PSS

Buy or rent  
or leasing  
or...????

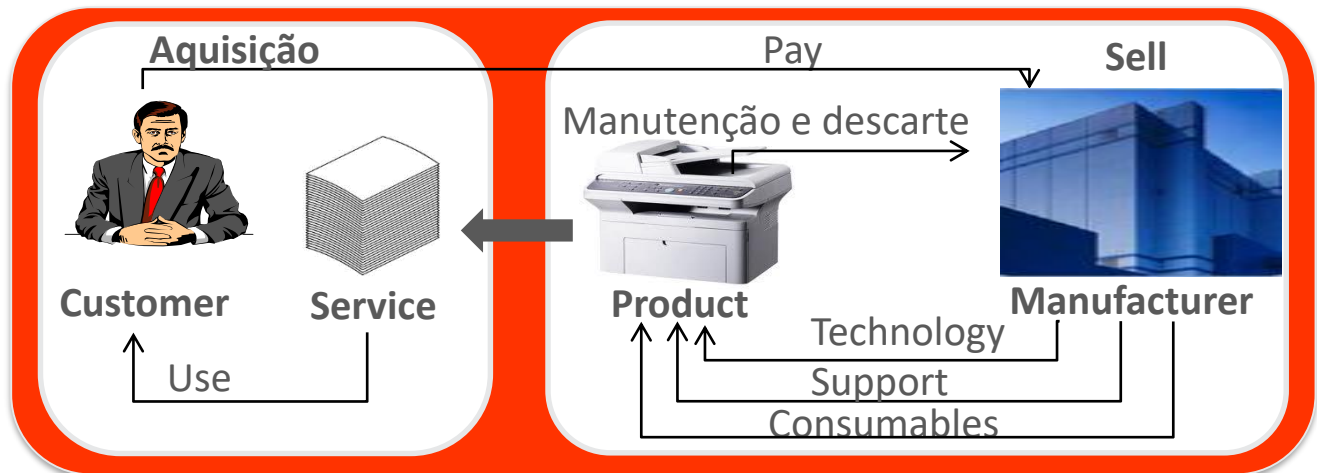


# Example of PSS

Traditional model



PSS  
(use oriented)



# Benefits



# Benefits for the customer

- Access to solutions not possible before
- Offerings with more value aggregation
- Shared solution;
- New vision of risks, responsibilities and costs associated to property
- Better user experience along the life-cycle





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# Benefits for companies

- New approach available for innovating
- Creation of recurrent revenue;
- Increase of market share and brand
- Services increase value proposition;
- Possibility of influencing user experience
- Less production needed
- Higher resource efficiency >>  
lower production costs





# Benefits for job market

- Hiring and training people for providing service
- Creation of small companies (even start up) around the PSS offering



# Benefits for environment

- Lower environmental impact:
  - Production with less
  - Closing the material cycle;
  - Product last longer due to robust design (for example)
- Share with customer the sustainability culture



# Challenges



# Challenges for servitization

- Mindset of focus on service
- How to design a new business model
- Economic evaluation
- Lower profits
- Longer payback
- Reliability – robustness
- Partner's network and customer involvement
- Assets
- Vendor's mindset
- Customers want to own the product
- Life-cycle assessment and management





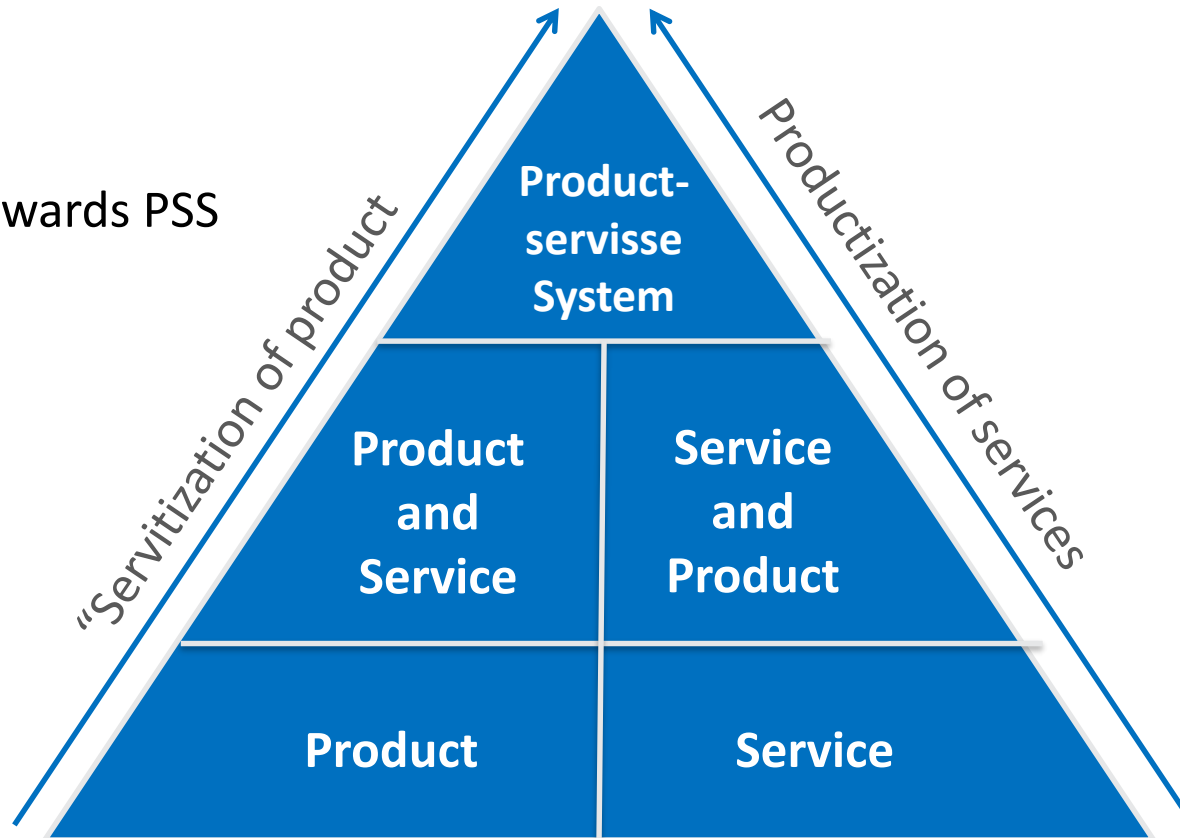
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# How to develop a PSS?

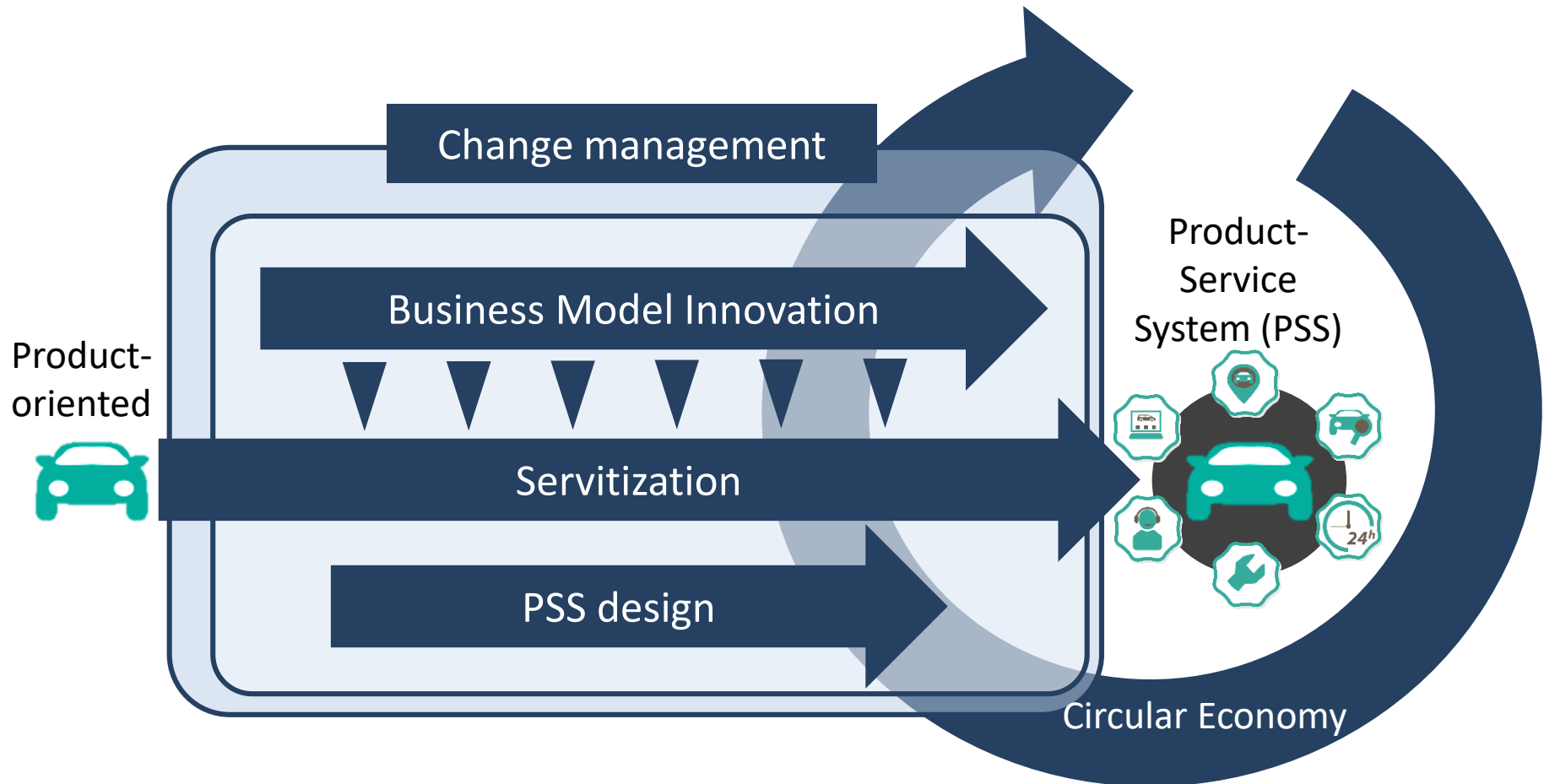


# Evolution paths to Product-service System (PSS)

Evolution towards PSS



# PSS design, change management or business model innovation?





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# How do we see the organization ?



## Theory of firms – economy (pdf) – 18 theories

Microeconomics  
Macroeconomics  
Ecological / human system theory  
Ecosystem levels of organization  
Knowledge-based theory  
Service-dominant logic - SDL  
Process thinking – BPM  
Theory of constraints – TOC  
Dynamic Capabilities  
Theory of ecosystems  
Human centered theory  
Circular economy vision  
Value constellation theory  
Lean thinking  
Systemic vision in business  
Systems thinking – System Dynamics  
Systems Theory - Soft system methodology

Theories of the firm are conceptualizations and models of business enterprises which explain and predict their structure and behaviors.

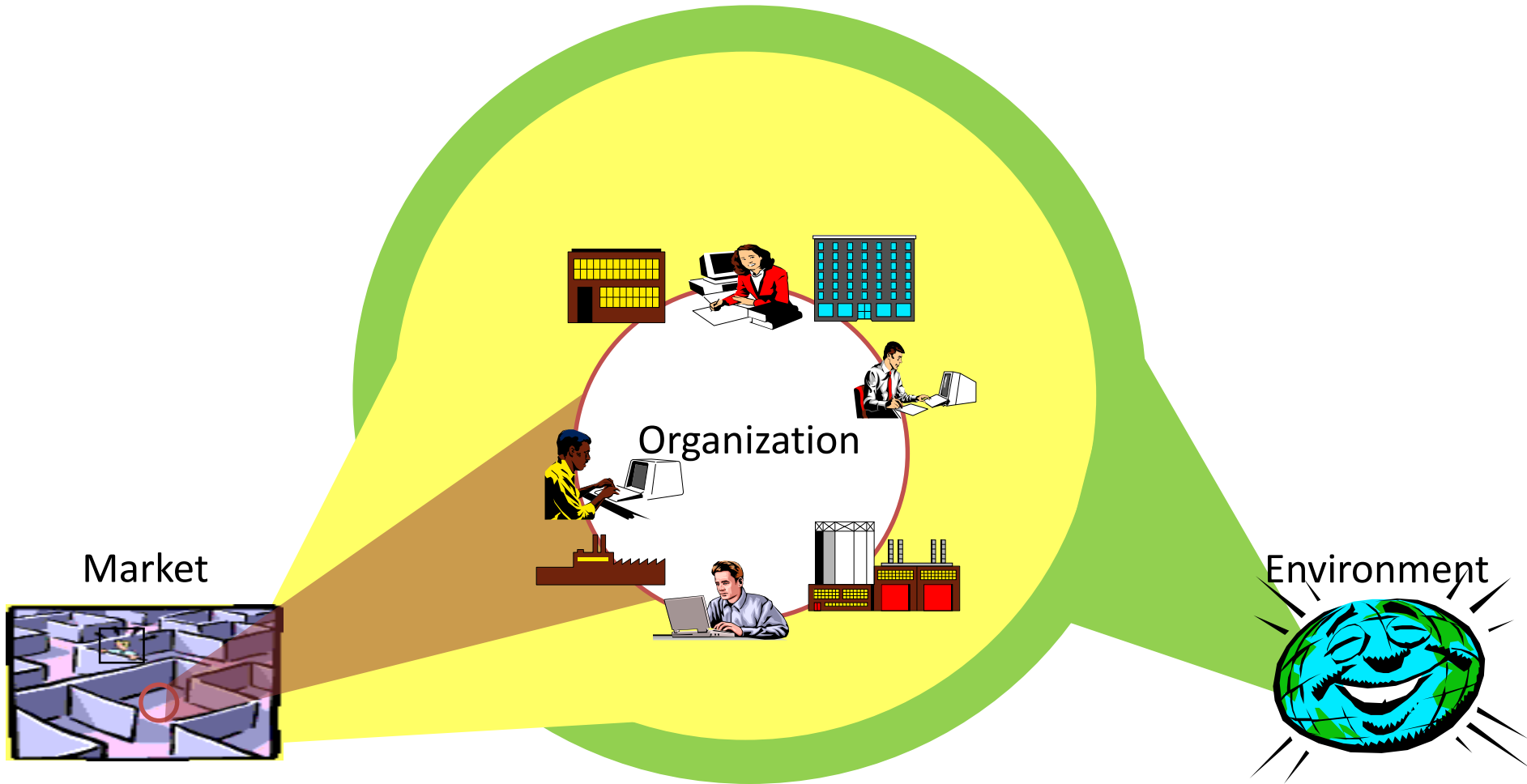


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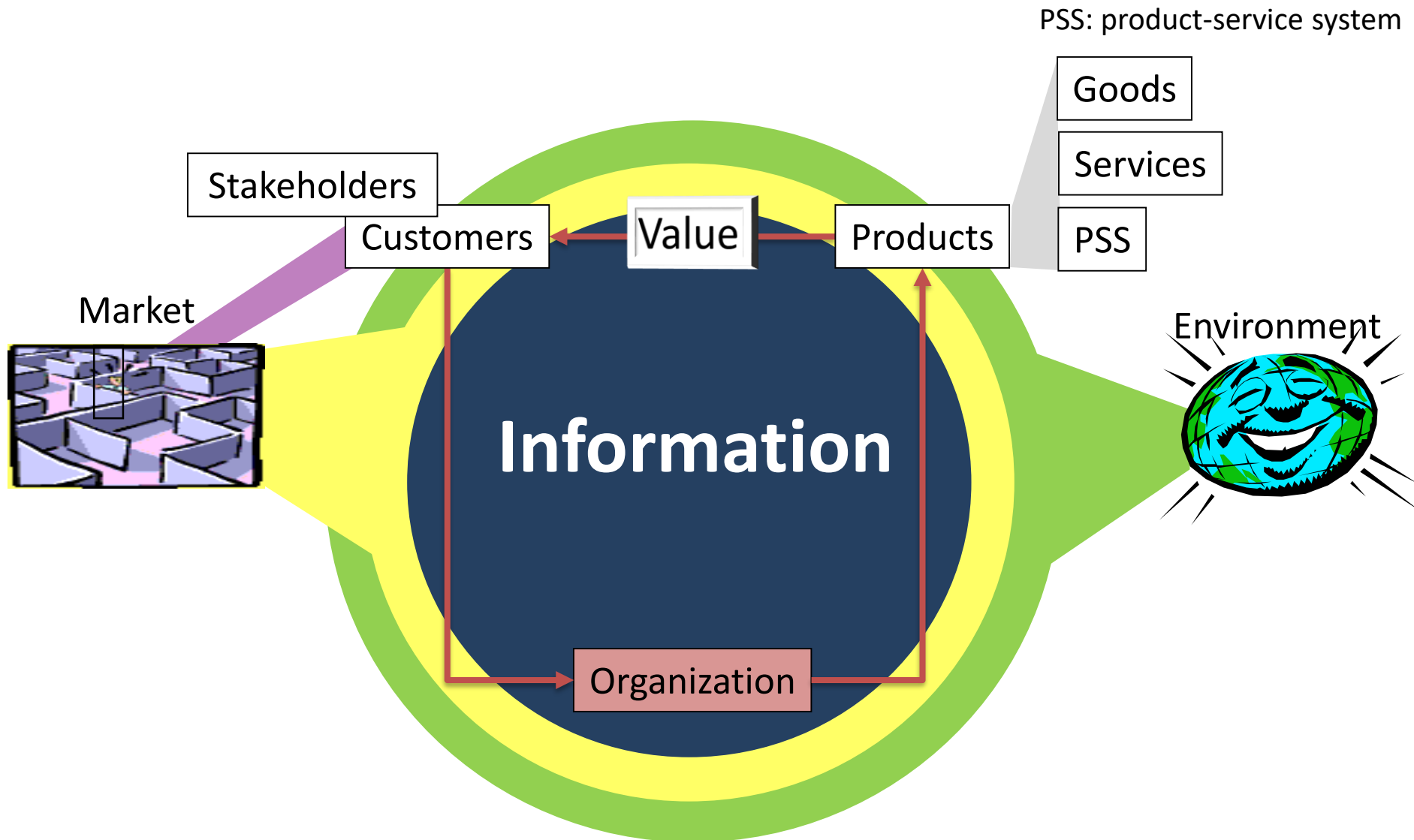
# Systemic vision of an organization



# Systemic vision of an organization



# Organization, products, stakeholders



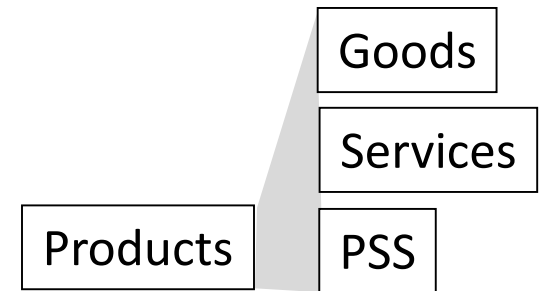
# Value X Value Proposition

Value

A broad set of benefits perceived by stakeholders according to their goals and purposes through interactions with products and services

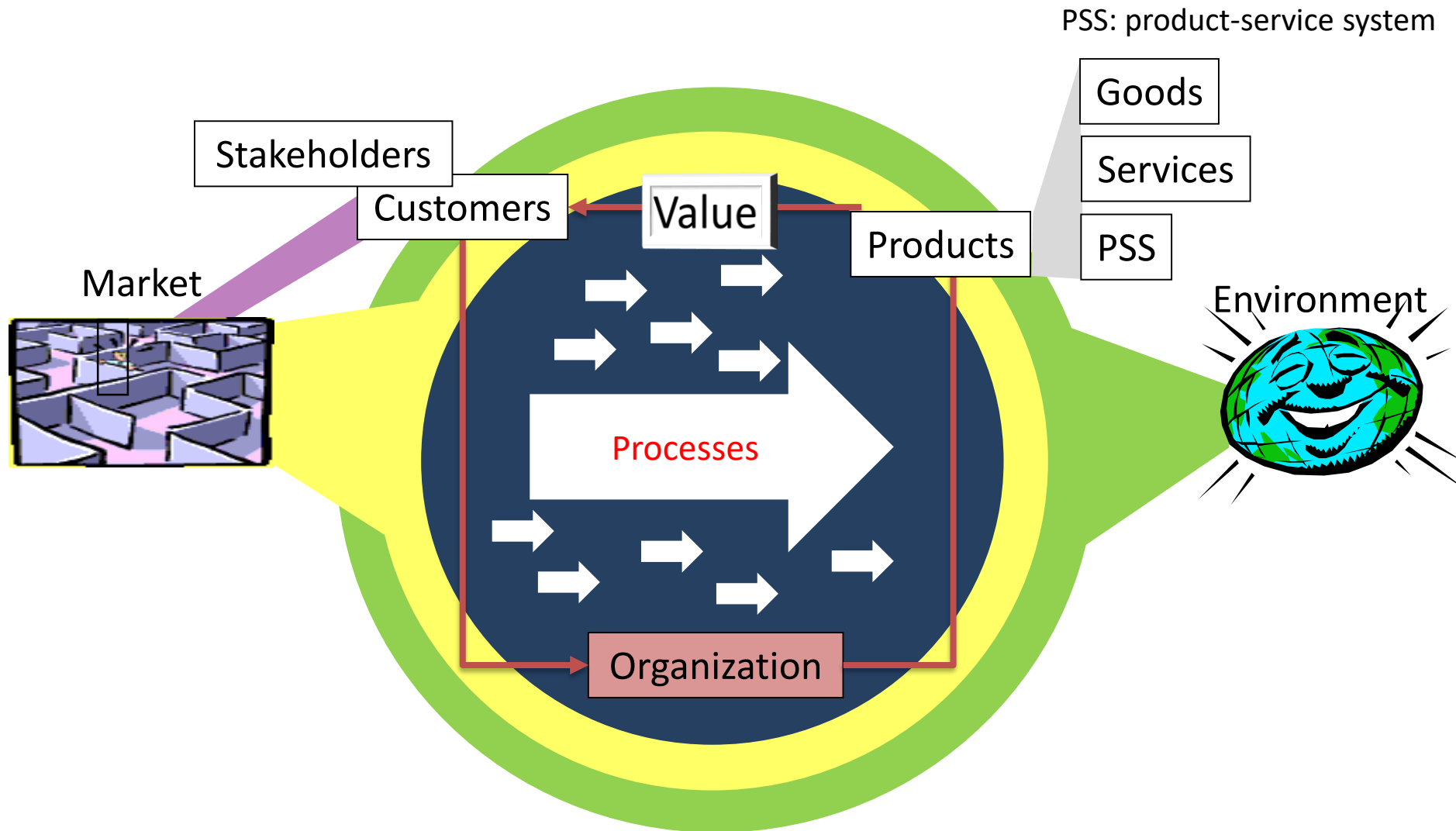
Value propositions

Value proposition is a promise of a combination of products and services, containing what benefits they will provide, that a provider makes to stakeholders by means of a cooperation in an equitable exchange to fulfill their needs



PSS: product-service system

# Role of the processes in organizations



# Definition of process (ISO 9000)

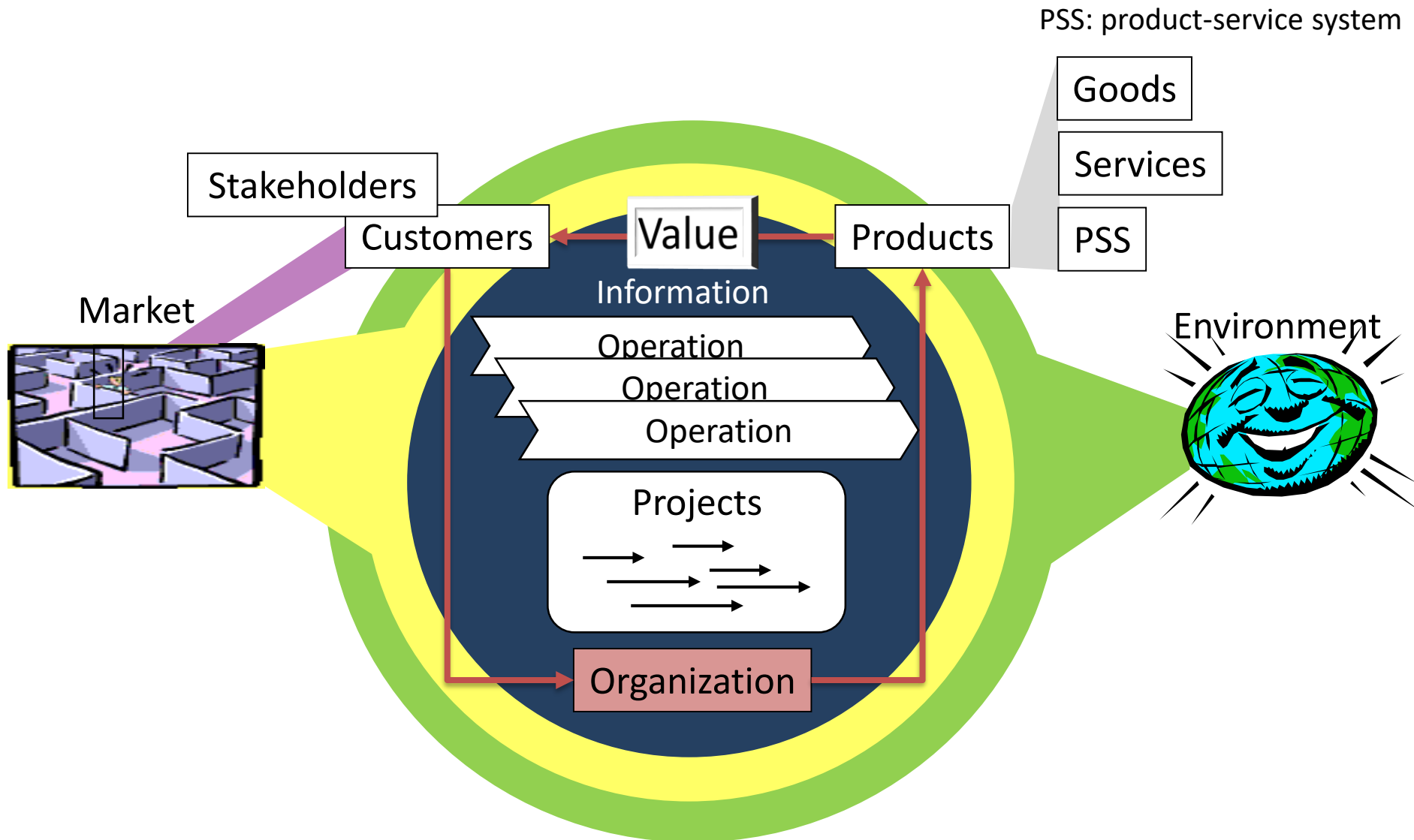


A process is a set of activities that uses resources (people, machines, etc.) to transform inputs into outputs. (*ISO 9000*)

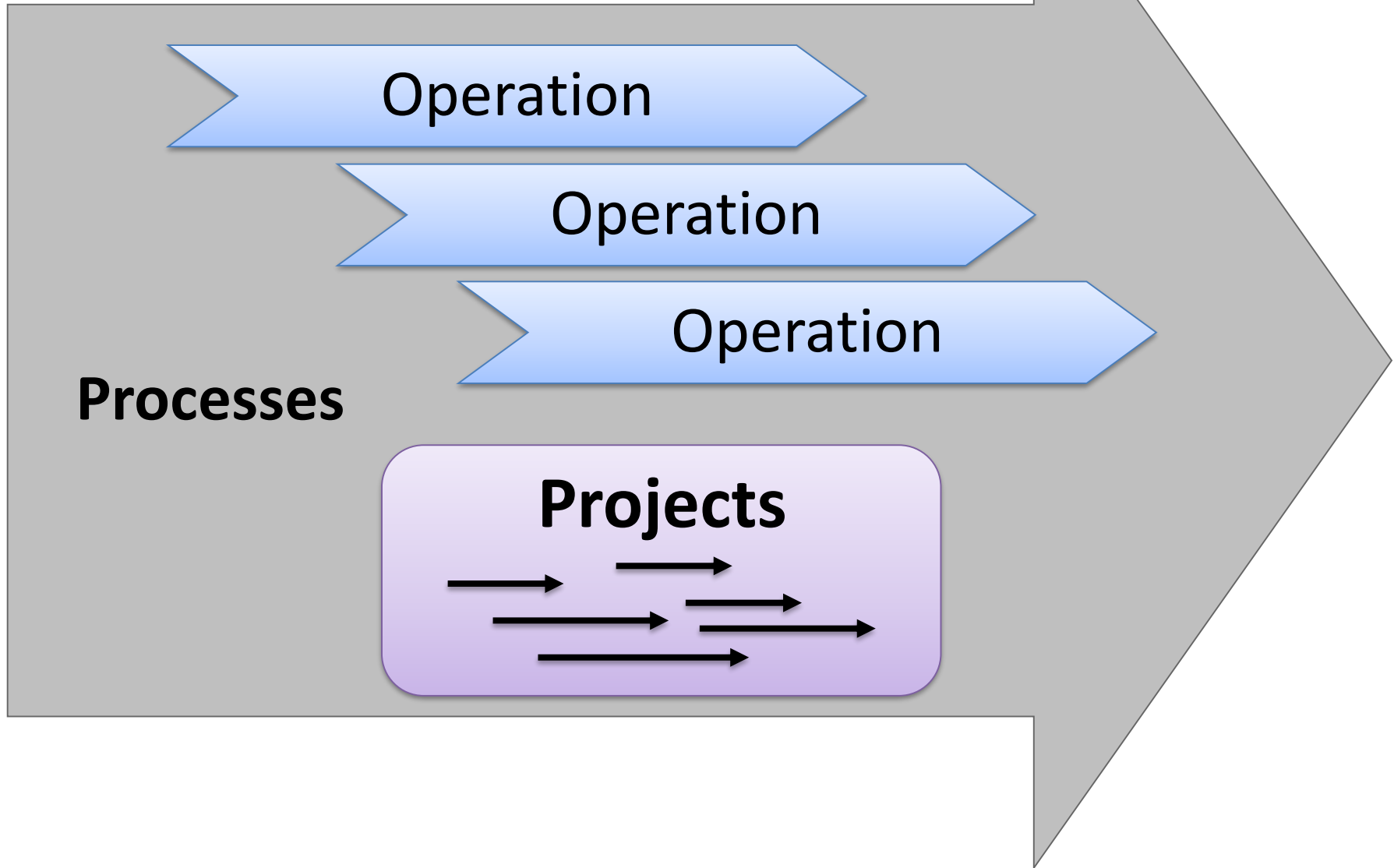
A process approach means an organization manages their business as a system of processes – not departments or people or products.



# How does an organization aggregates value?



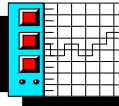
To aggregate value with processes  
(by operations and projects)



# How to manage?

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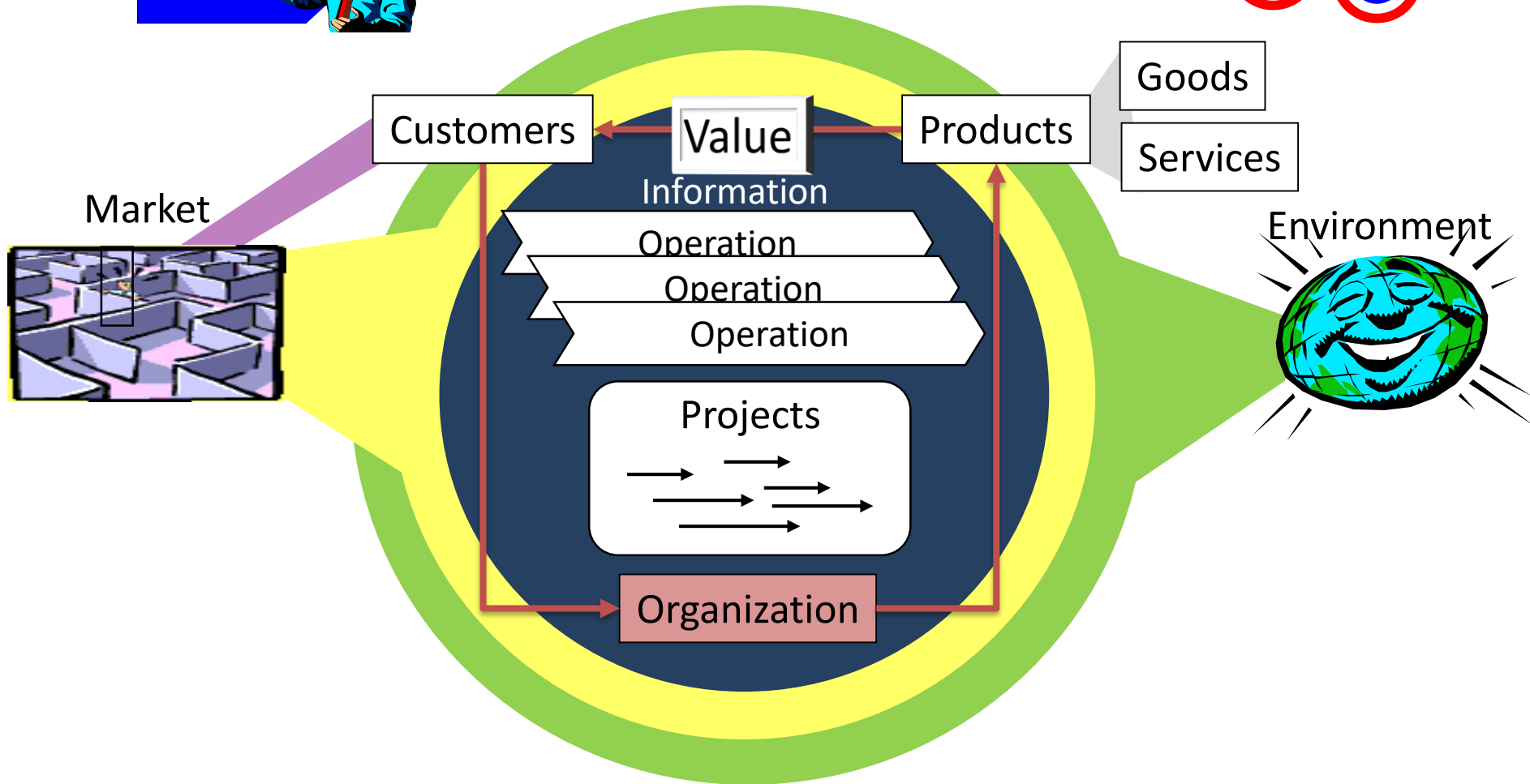
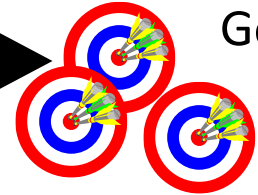
Strategy



Indicators

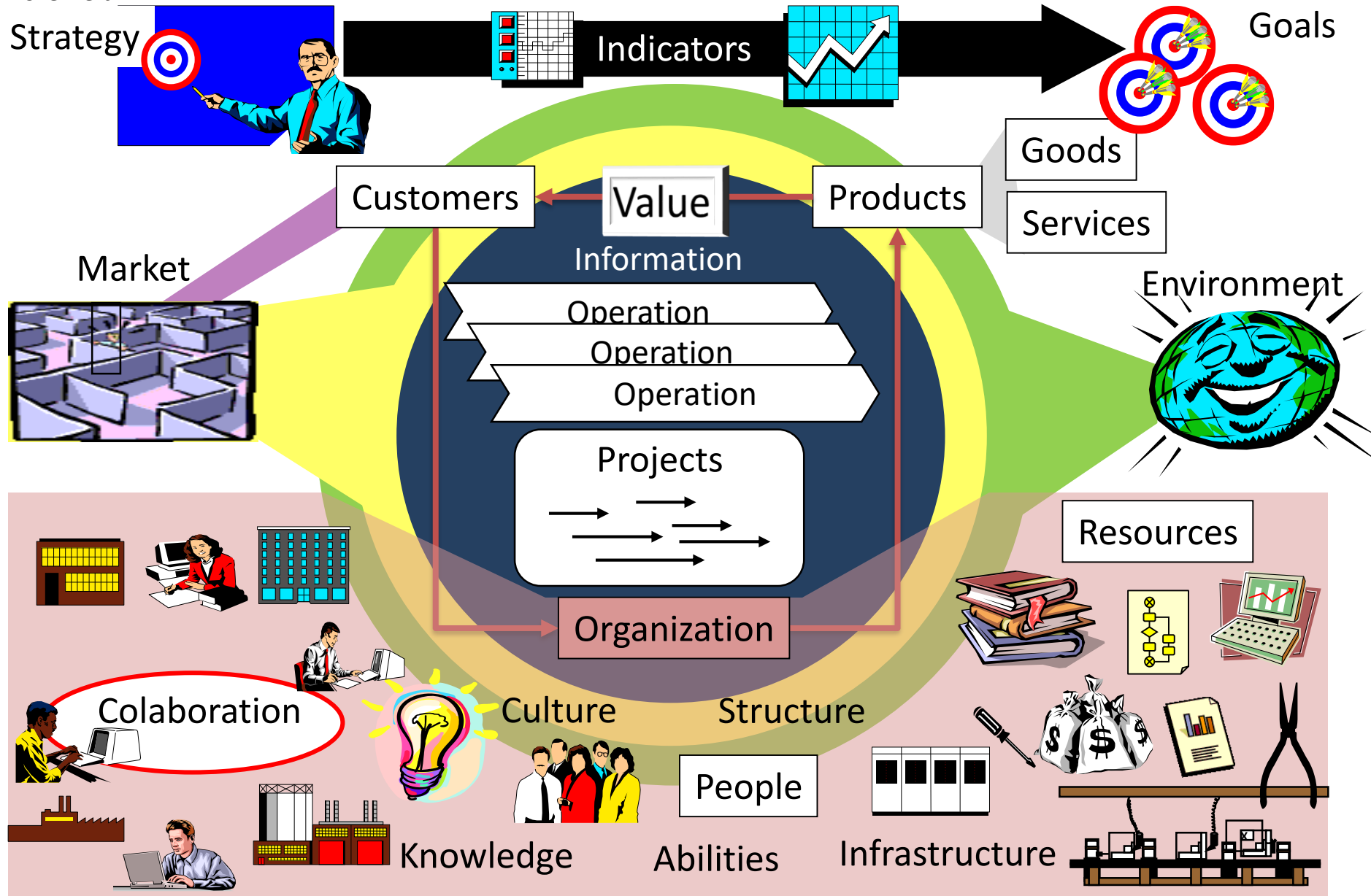


Goals



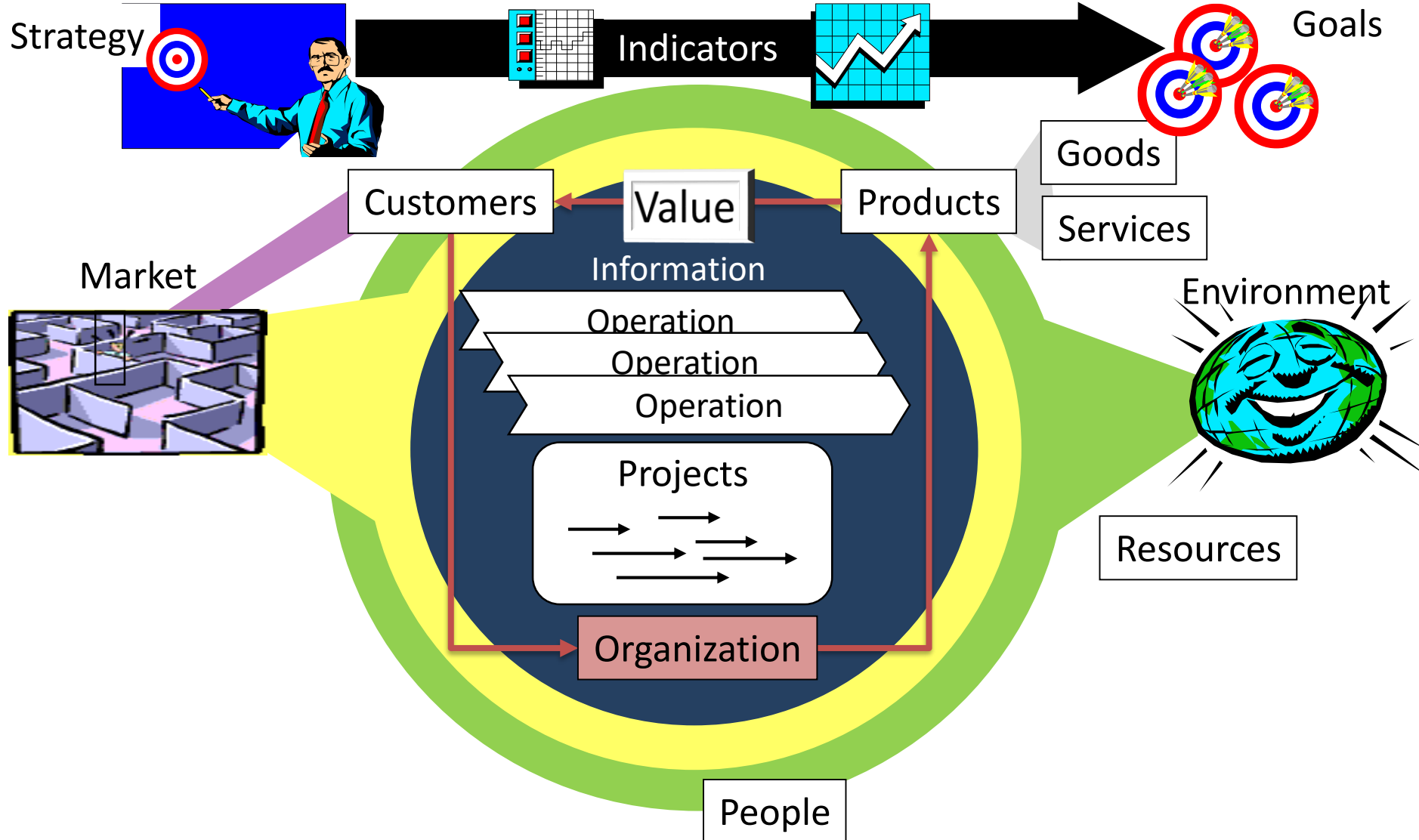
# Systemic vision of an organization

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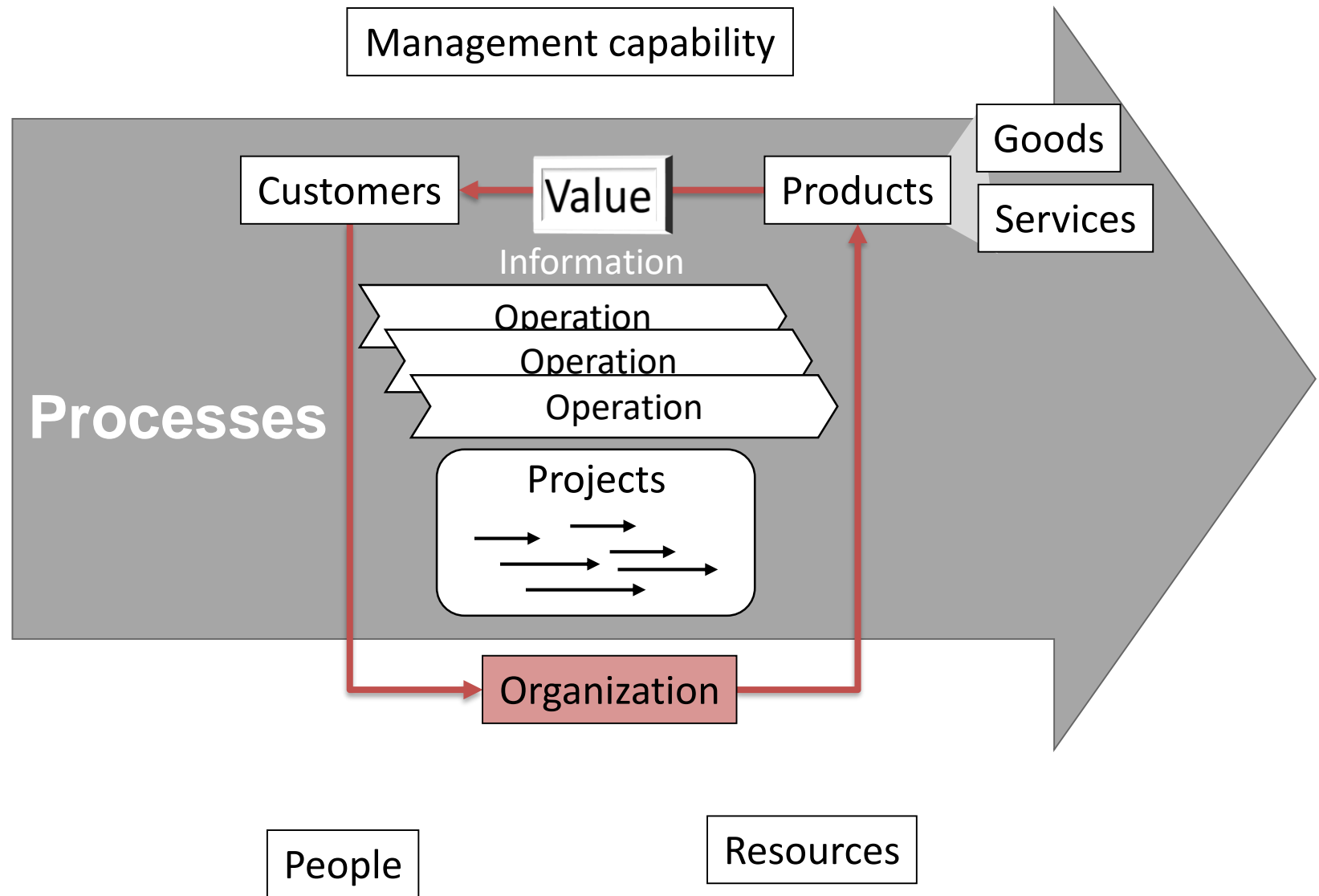


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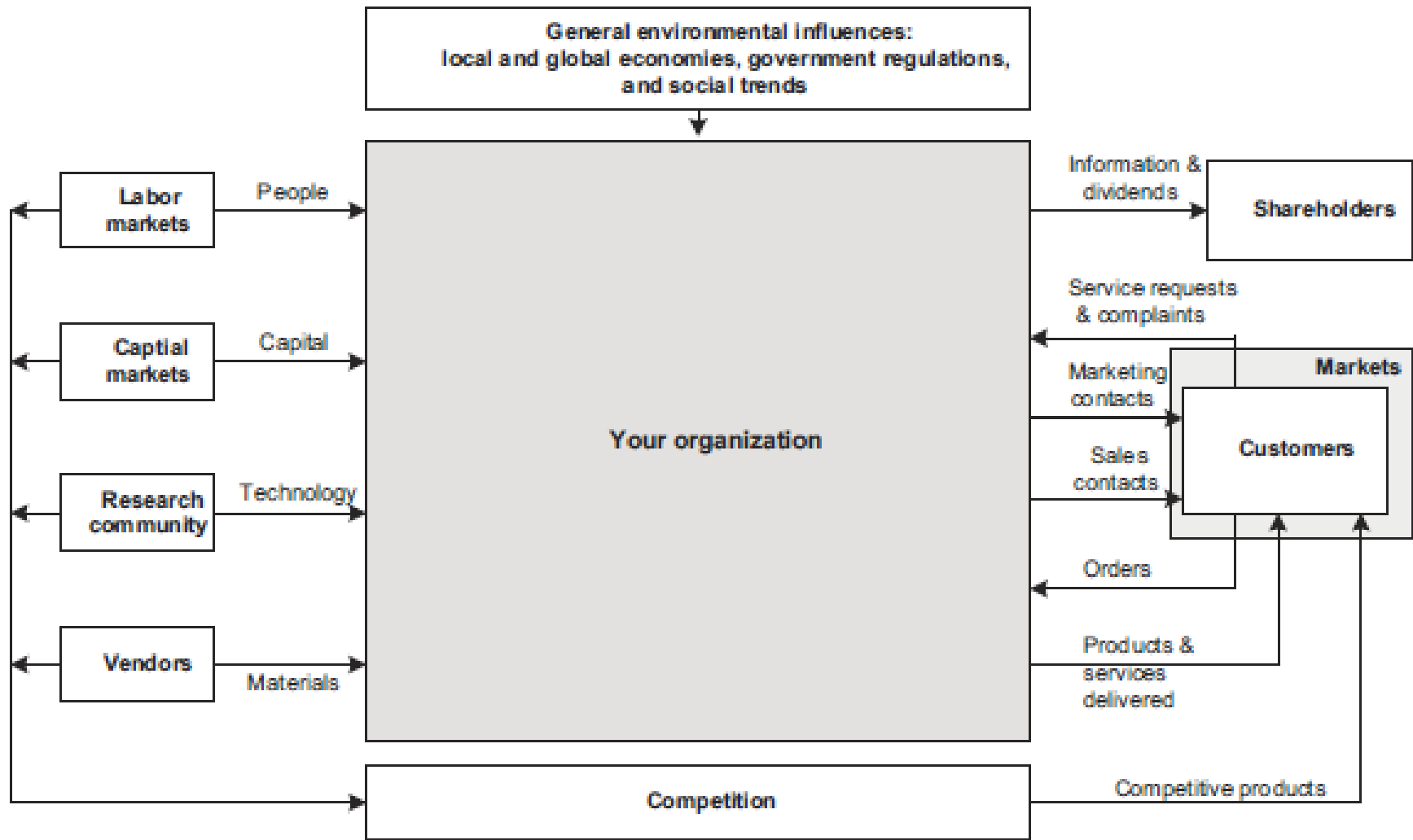


# Systemic vision of an organization

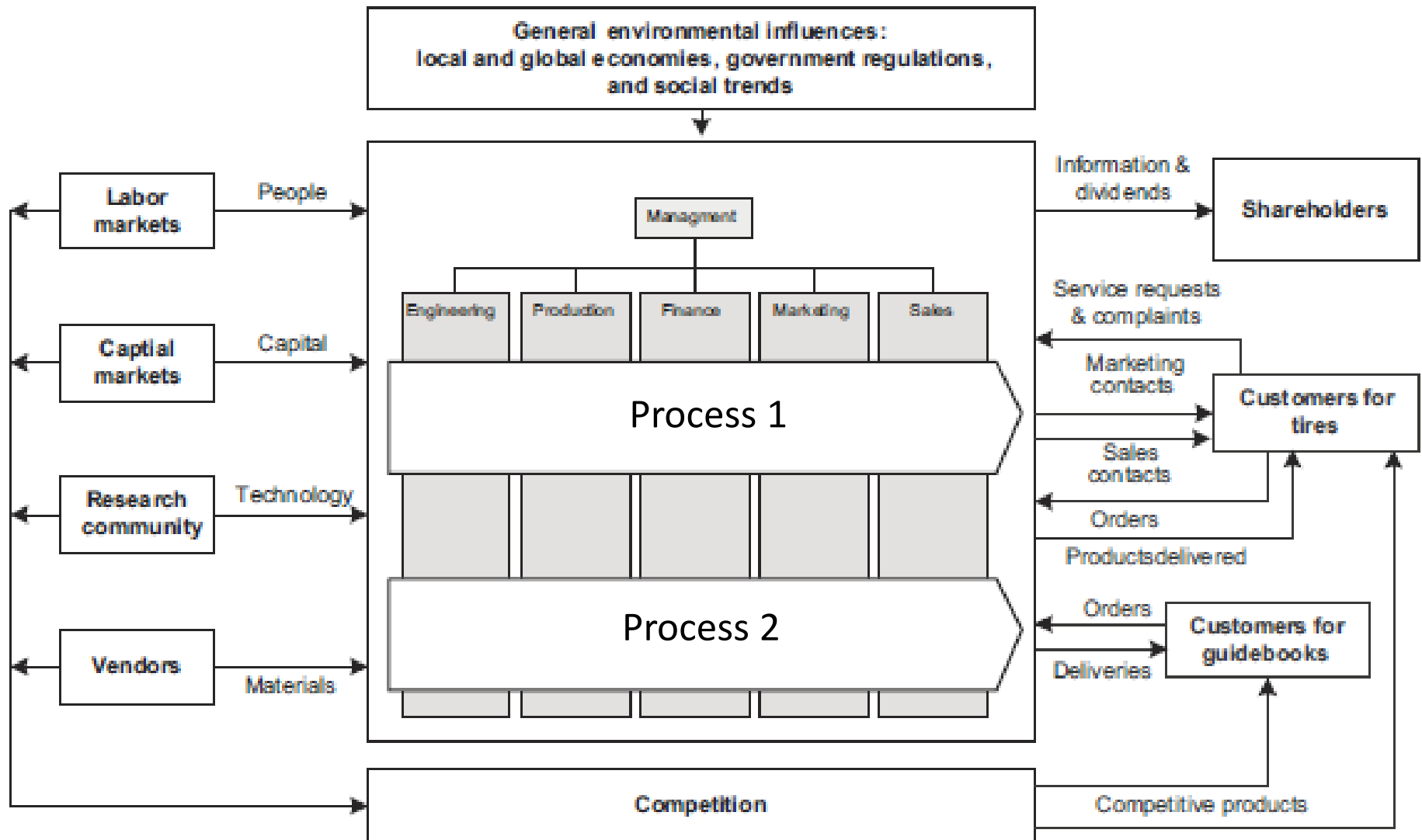




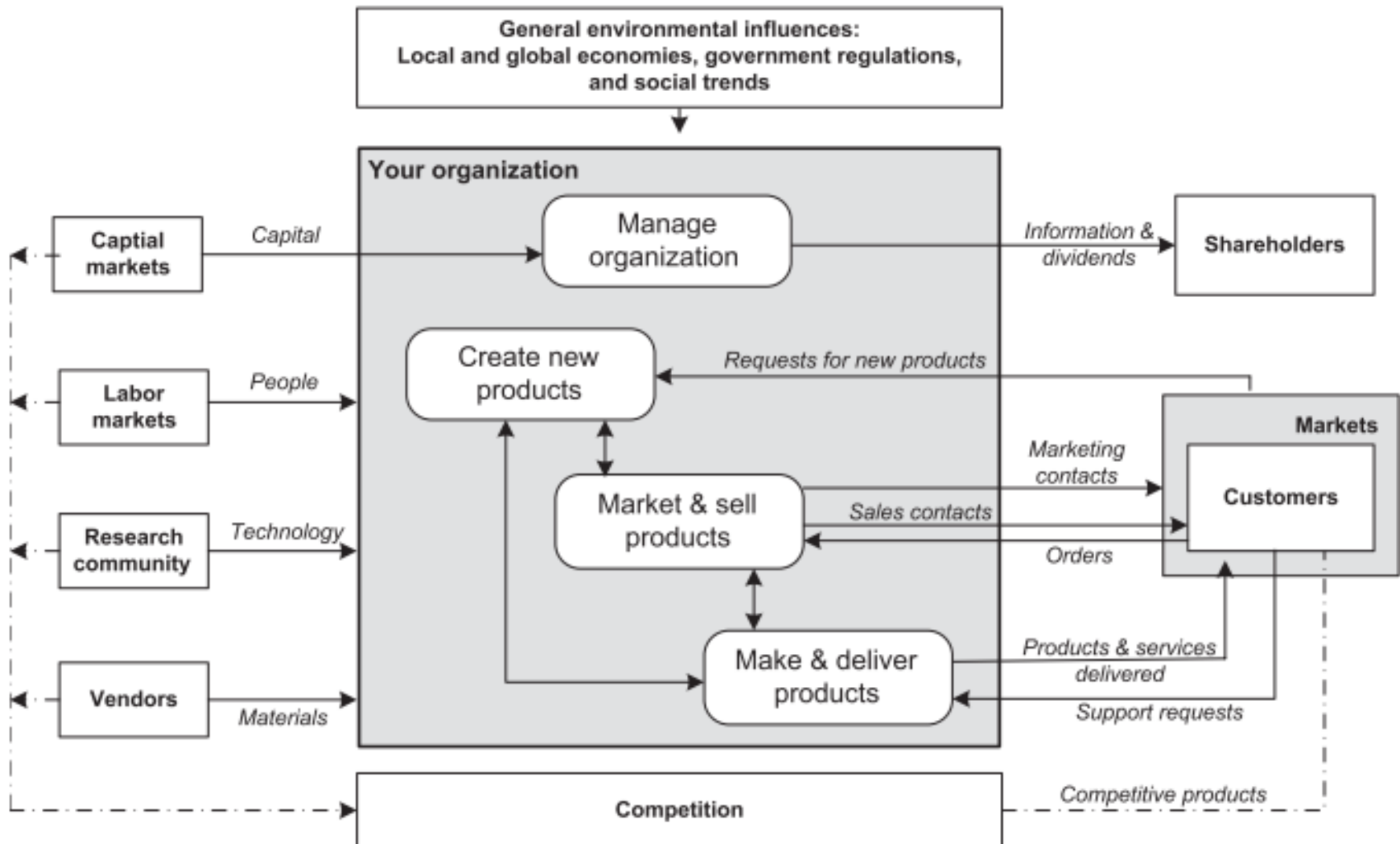
# Systems view of organization: external relationships with the organization



# Systems view of organization: processes versus organizational structure



# Systems view of organization: sample of processes





## Macro ecossistema

### Ambiente de negócio / inovação - ecossistema (externo)

#### Cadeia de valor

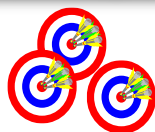
- Parceiro de risco
- Parceiro estratégico
- Co- desenvolvedor
- Fornecedor
- Universidade
- Institutos
- Agências
- Centro de P&D
- Prestador de serviço
- ONGs



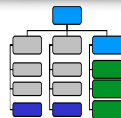
Sistema nacional de  
inovação

#### Empresa

Estratégia



Organização



Processos



Proposição  
de valor



Pessoas



Recursos



Clientes  
Stakeholders



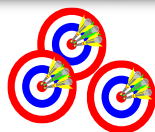
Concorrentes  
Novos entrantes  
Startups

## Macro ecossistema

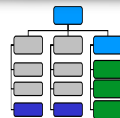
### Ambiente de negócio / inovação

#### Empresa

##### Estratégia



##### Organização



##### Processos



##### Proposição de valor



##### Pessoas



##### Recursos



#### Política

- Política industrial
- Planos de inovação
- Estabilidade governamental
- Incentivos

#### Tecnologia

- Produtos inovadores
- Novos materiais
- Novas energias
- Novas tecnologias
- Infraestrutura tecnológica
- Transferência tecnológica
- Avanços em comunicação e informática

#### Ambiente jurídico

- Relações trabalhistas
- Leis do consumidor
- Leis fiscais e contábeis

#### Sociedade

- Taxa de nascimento
- Mobilidade
- Consciência ambiental
- Comportamento
- Nível de consumo
- Nível de instrução
- Valores e crenças
- Segurança

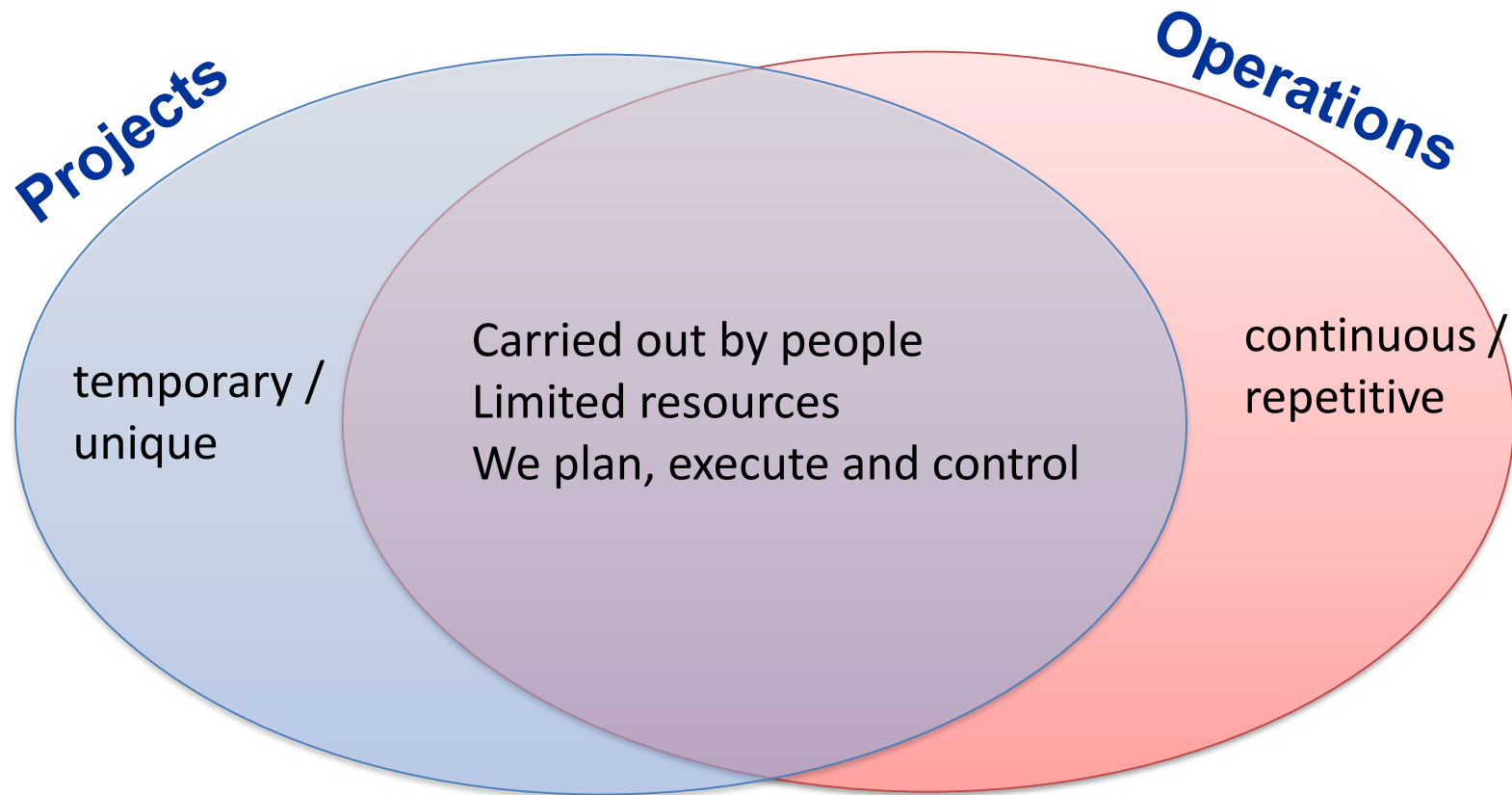
#### Economia

- Inflação
- Renda
- Taxa de juros
- Cambio
- Taxa de crescimento
- Desemprego
- Desigualdade
- Expectativas

#### Meio Ambiente

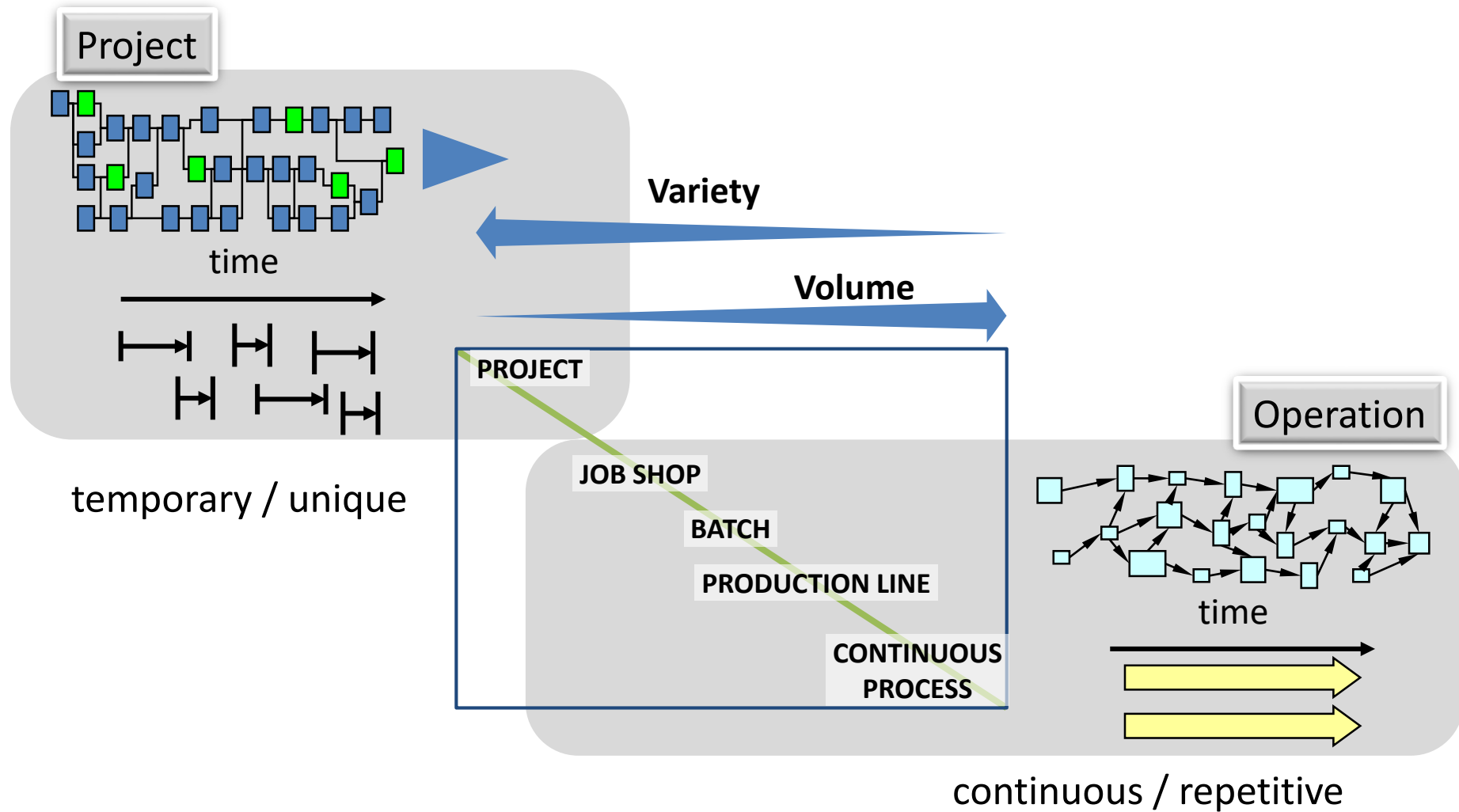
- Leis ambientais
- Mudança climática
- Fontes de energia
- Poluição
- Desmatamento

# Comparison between operation and project





# Comparison between project and operation



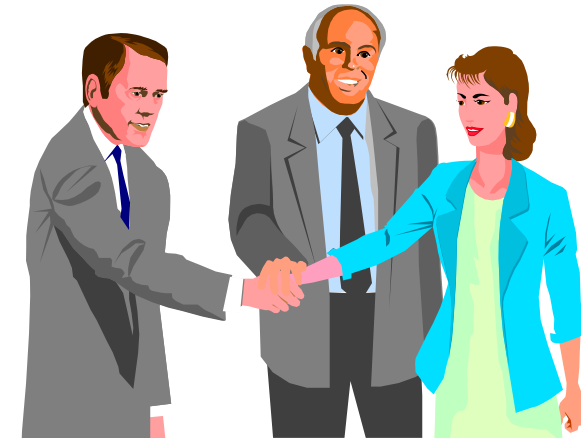
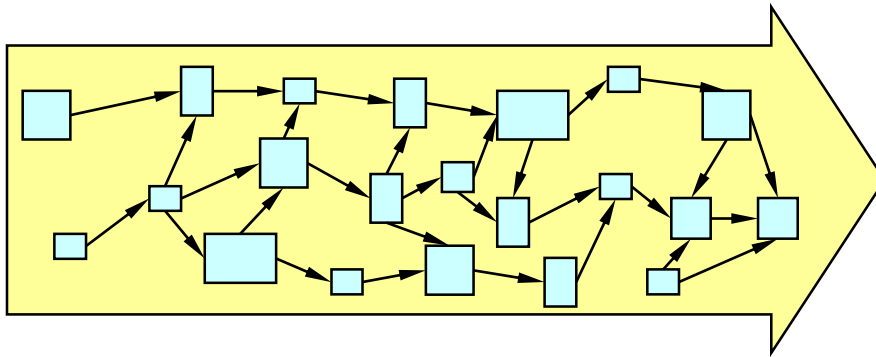
# Definition of process (ISO 9000)



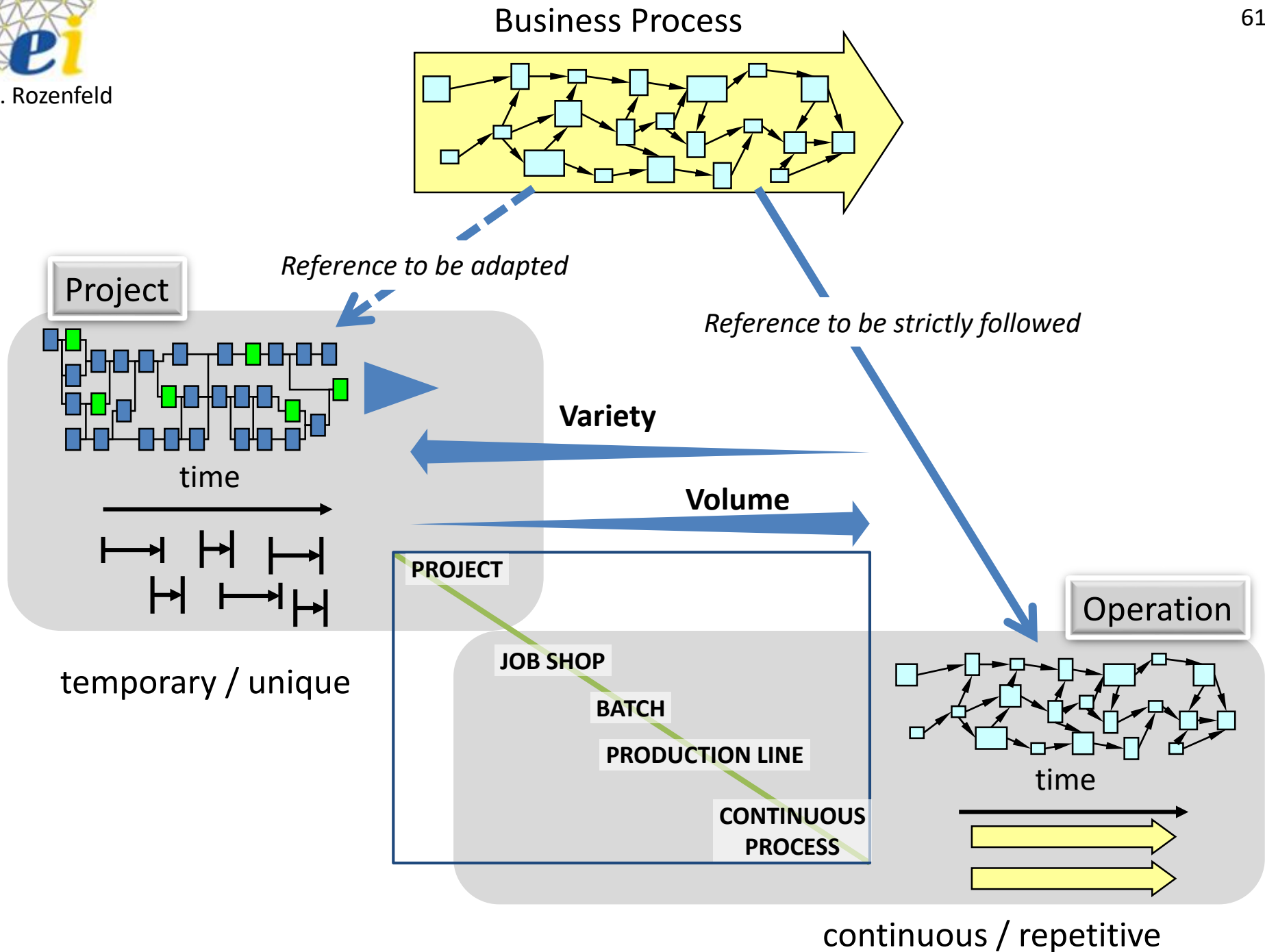
A process is a set of activities that uses resources (people, machines, etc.) to transform inputs into outputs. (*ISO 9000*)

A process approach means an organization manages their business as a system of processes – not departments or people or products.

# Business process definition

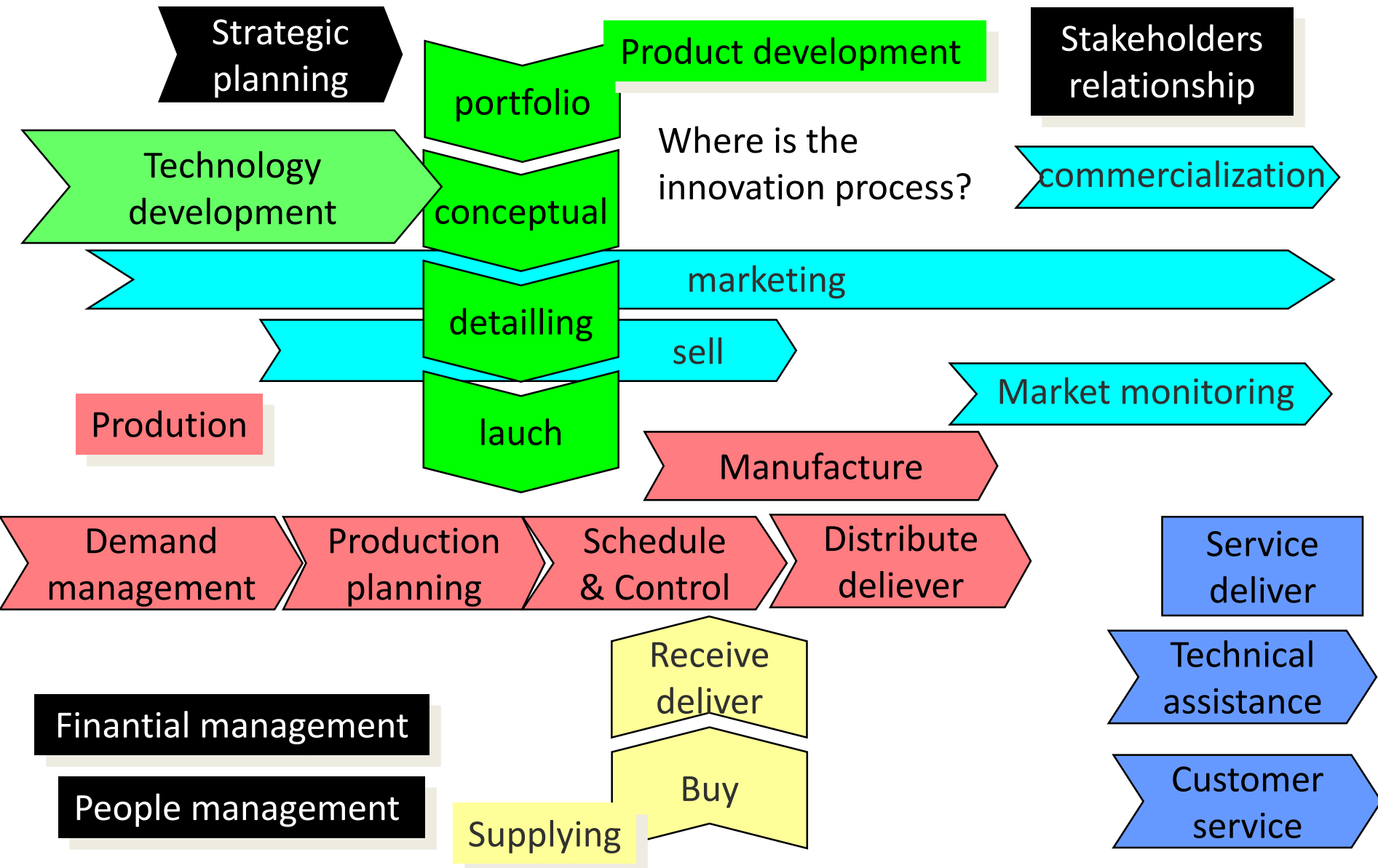


Group of activities perform in a logic sequence aiming at produce a good or service that delivers value to a specific customers



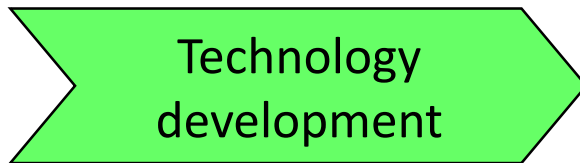
# Business process related to products and services (each organization has its own definition)

62



# Questions about technology and innovation management

Only this process?



Technology management

Where is the innovation process?



Innovation management



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# Cross industry process classification framework

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GENERATED ON 9/17/2018

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## OPERATING PROCESSES



## MANAGEMENT AND SUPPORT SERVICES

