



Technology and Innovation Management

4. Innovation Management

Prof. Dr.-Ing. Henrique Rozenfeld

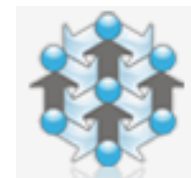
University of São Paulo

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 main elements of the innovation management theory

- Invention versus innovation versus idea
- Types of innovation
- Generations of innovation
- Core capabilities in managing innovation
- Innovation as a process
- Innovator's dilemma and sources of discontinuity
- Contextual innovation management



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Invention versus Innovation versus Idea

Invention x Innovation

Invention is the unique and novel
tangible good, service, compose, etc.
Based on unique and novel ideas

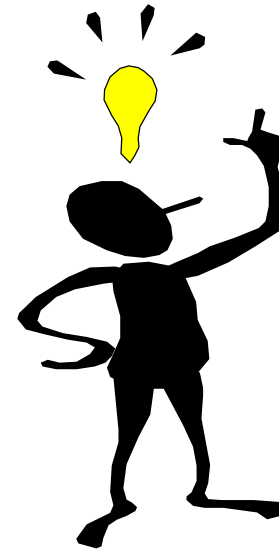
Innovation is the management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new (or improved) product or manufacturing process or equipment.

Innovation = theoretical conception + technical invention + commercial exploitation

Industrial innovation includes the technical, design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or the first commercial use of a new (or improved) process or equipment'

Definition of idea

Simplified form of a product or service

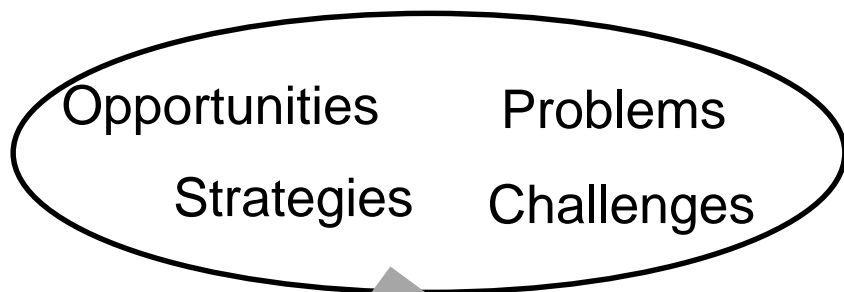


The most embryonic form of a new product or service.
It often consists of a high-level view of the solution
envisioned for the problem identified by the opportunity



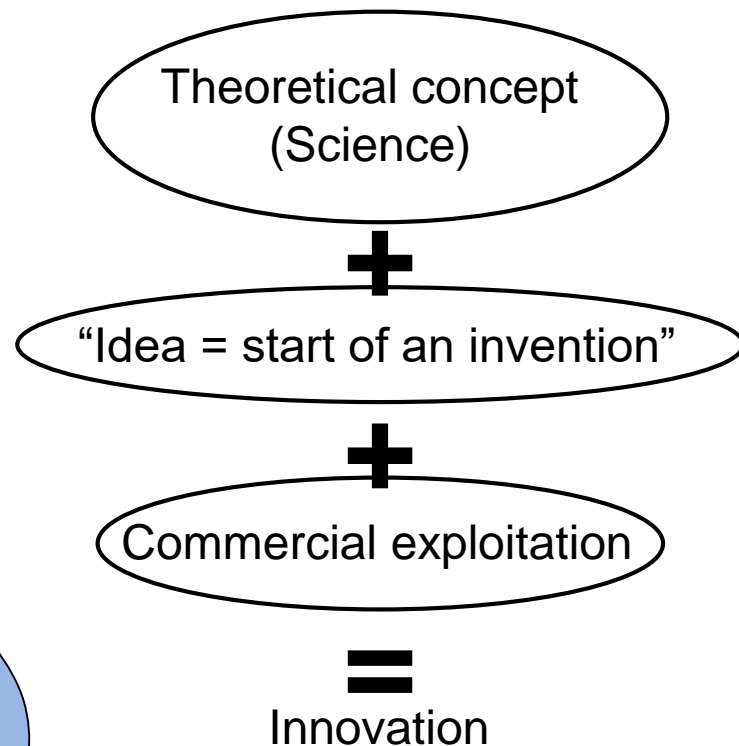
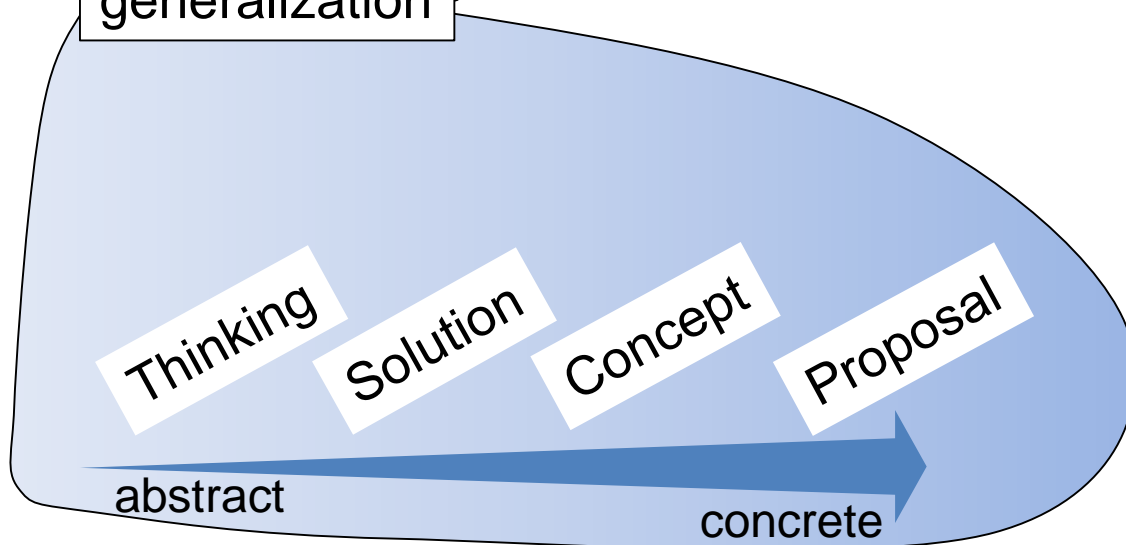
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Definition of idea



IDEA

generalization

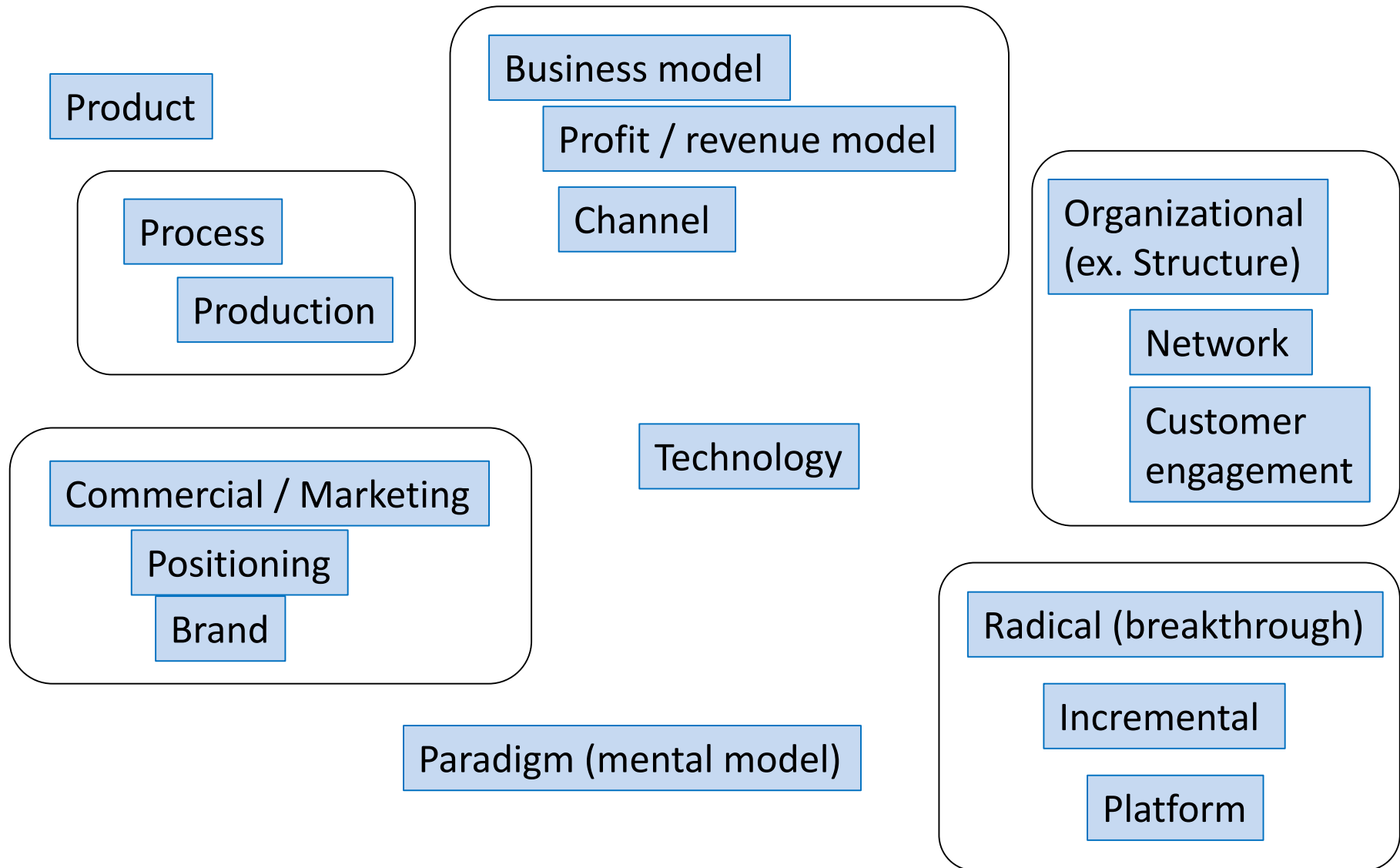




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Types of Innovation

Types of innovation





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Generations of Innovation

1st Generation Innovation Process: 1945-60

Society

Society has a generally favourable attitude towards scientific progress. Governments subsidize R&D in universities and companies to stimulate economic growth and to attain military leadership. Consumer demand exceeds the supply of goods

Organizations

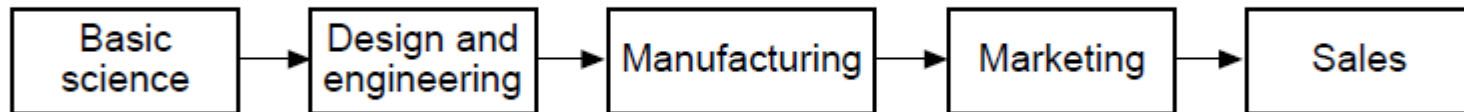
Organizational strategies are generally technology-oriented and focus on innovation and growth. Most organizations are functionally organized

Technology (science) push

The process of commercialization of technology is perceived as a linear progression from scientific discovery to the marketplace. Many R&D-departments are staff departments that are structured like scientific institutions.

Disadvantages

Little attention is paid to the entire process or the role of the market place. Innovation processes serve no strategic goals and commercial aspects are incorporated late. Professional project management practices are not applied



Sources: Ortt, J. R., & Van Der Duin, P. A. (2008). The evolution of innovation management towards contextual innovation. European Journal of Innovation Management, 11(4), 522–538.

Rothwell, R. (1994). Towards the Fifth-generation Innovation Process. International Marketing Review, 11(1), 7–31.

2nd Generation Innovation Process: 1960-78

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Society

This is a period of relative prosperity, although economic growth slows down. Demand more or less equals supply. Many markets are becoming more competitive. Government policies tend to emphasize demand side factors

Organizations

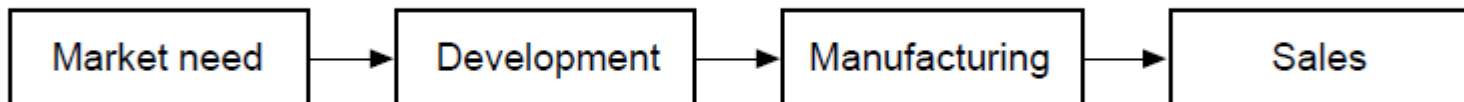
Organization strategies generally focus on growth, to attain economies of scale, and on diversification, to reduce financial risks. Many organizations adopt a multi-divisional structure

Market pull (need-pull)

Technological change is rationalized, needs are considered more important to innovation than scientific and technological progress. Because innovation processes are managed as projects, R&D-institutes are organized in a matrix. Divisions become internal clients that directly fund R&D
Innovation is generally organized in multi-disciplinary projects. Linear sequential process in a project, starting with market need

Disadvantages

Neglect of long-term innovation programs and because of this leads to “incrementalism”
Focuses on evolutionary improvements rather than breakthroughs. Projects are individual units, strategic relationships between these projects and corporate goals are not established



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Rothwell, R. (1994). Towards the Fifth-generation Innovation Process. International Marketing Review, 11(1), 7–31.

3rd Generation Innovation Process: 1979-90

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Society

This is a period with two oil crises, inflation and demand saturation. Supply exceeds demand and unemployment figures rise

Organizations

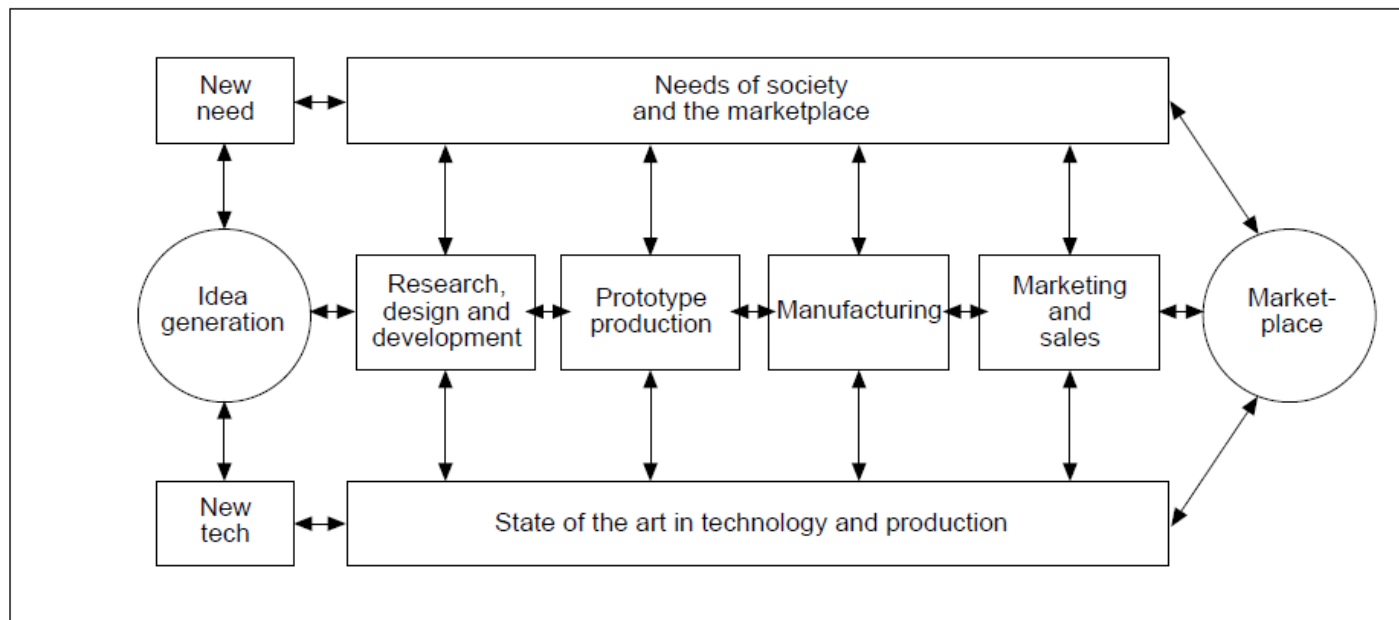
Company strategies generally focus on cost control and reduction. Organizations become more flexible and less hierarchically organized. Responsibilities are delegated to business units

Market pull and technology push combined

Knowledge about technology and market needs is used throughout the innovation process. To obtain this knowledge (communication) networks are formed with internal and external partners. Innovation projects become part of a portfolio of projects aligned with the corporate strategy
Model of an essentially sequential process with feedback loops and interaction with market needs and state of the art technology

Disadvantages

Focuses on product and process innovations rather than market and organizational innovations
Focuses on the creation of innovations rather than the exploitation



Sources: Ortt, J. R., & Van Der Duin, P. A. (2008). The evolution of innovation management towards contextual innovation. *European Journal of Innovation Management*, 11(4), 522–538.
Rothwell, R. (1994). Towards the Fifth-generation Innovation Process. *International Marketing Review*, 11(1), 7–31.

4th Generation Innovation Process: 1990-2000

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Society

Globalization is important in this period, international competition increases.

Organizations realize the strategic importance of technologies. Information and communication technologies influence internal and external business processes

Organizations

Company strategies generally concentrate on core competences. Strategic alliances, and external networking become important. Time-to-market becomes more important. More organizations adopt team-based and project-based structures

Innovation in alliances; parallel and integrated innovation, from innovation to new business development (NBD)

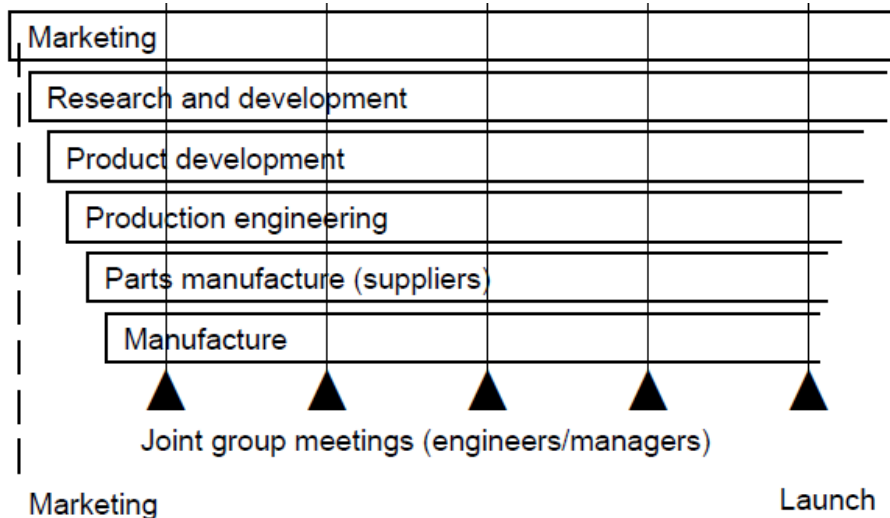
Innovation management means managing research links and external research environments. Parallel processes are used to involve multiple actors and to increase the development speed. The 4th generation includes business and market models in innovation

Coordinated process of innovation in a network of partners. The required coordination is often attained by system integration (with key suppliers and customers) and parallel development (of components or modules of the innovation)

Disadvantages

Innovation processes are becoming too complex and because of this more and more unmanageable

Opening up the innovation process is not suited for any industry and might in general endanger fundamental research which is many cases still the basis for innovation

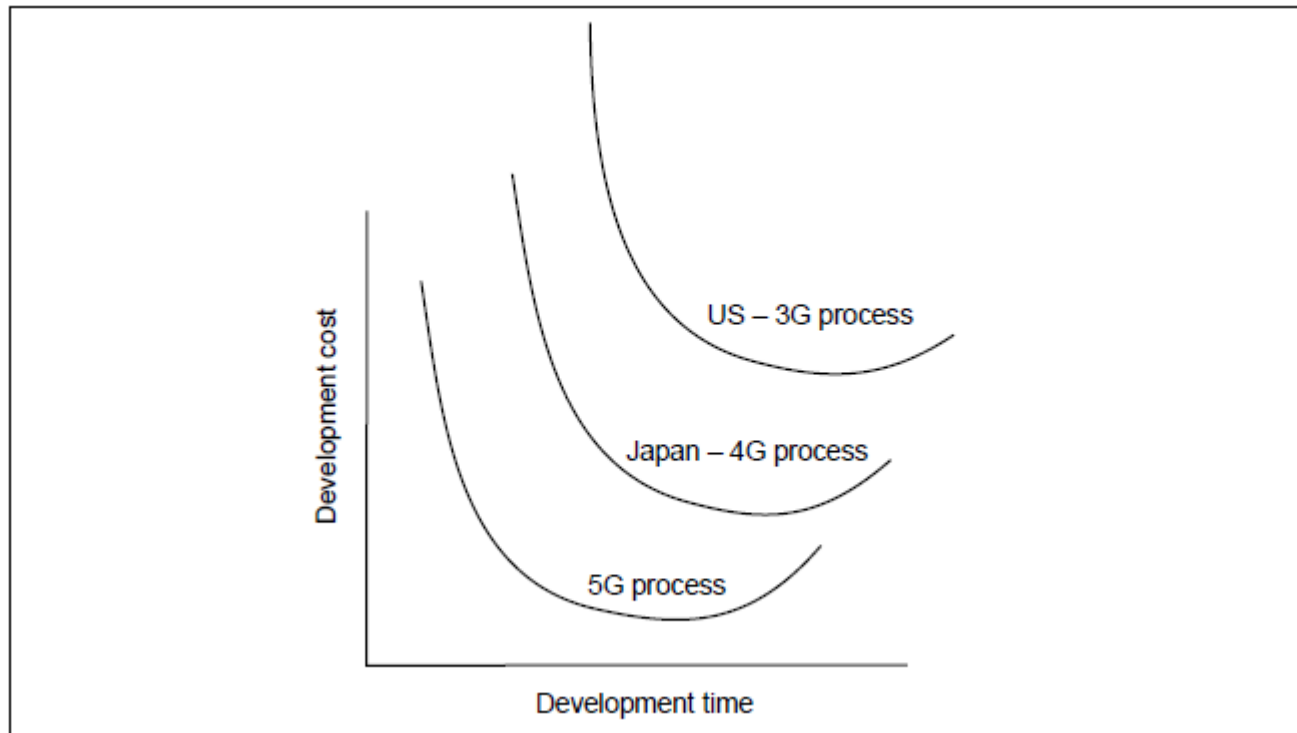


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Product Development Time/Cost Relationships for 3G, 4G and 5G Innovation Processes

G: generation



The process “5G” is essentially a development of the 4G (parallel, integrated) process in which the technology of technological change is itself changing.

Read > 24 factor to increase innovation development speed and efficiency



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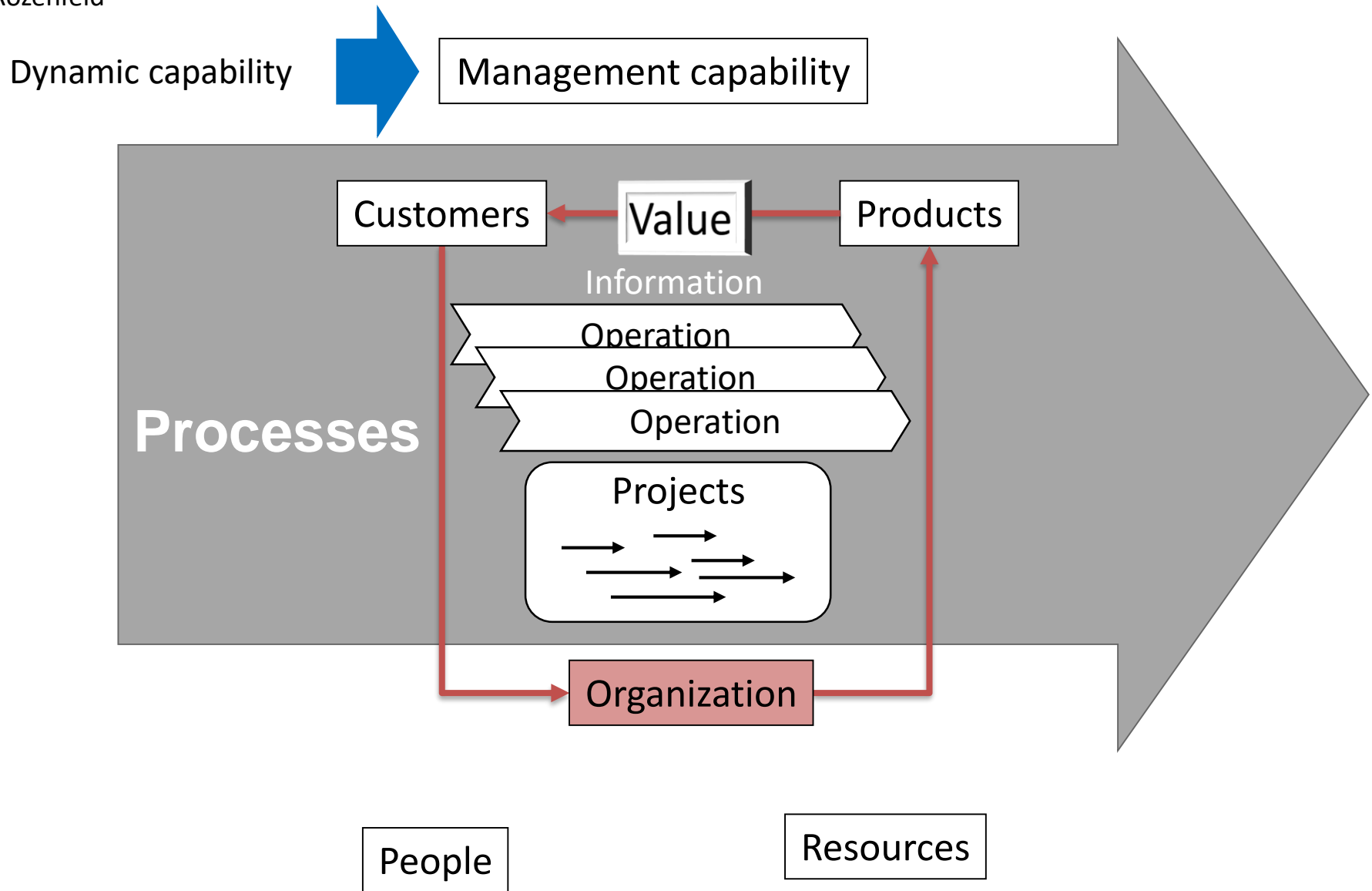
Core abilities in managing Innovation



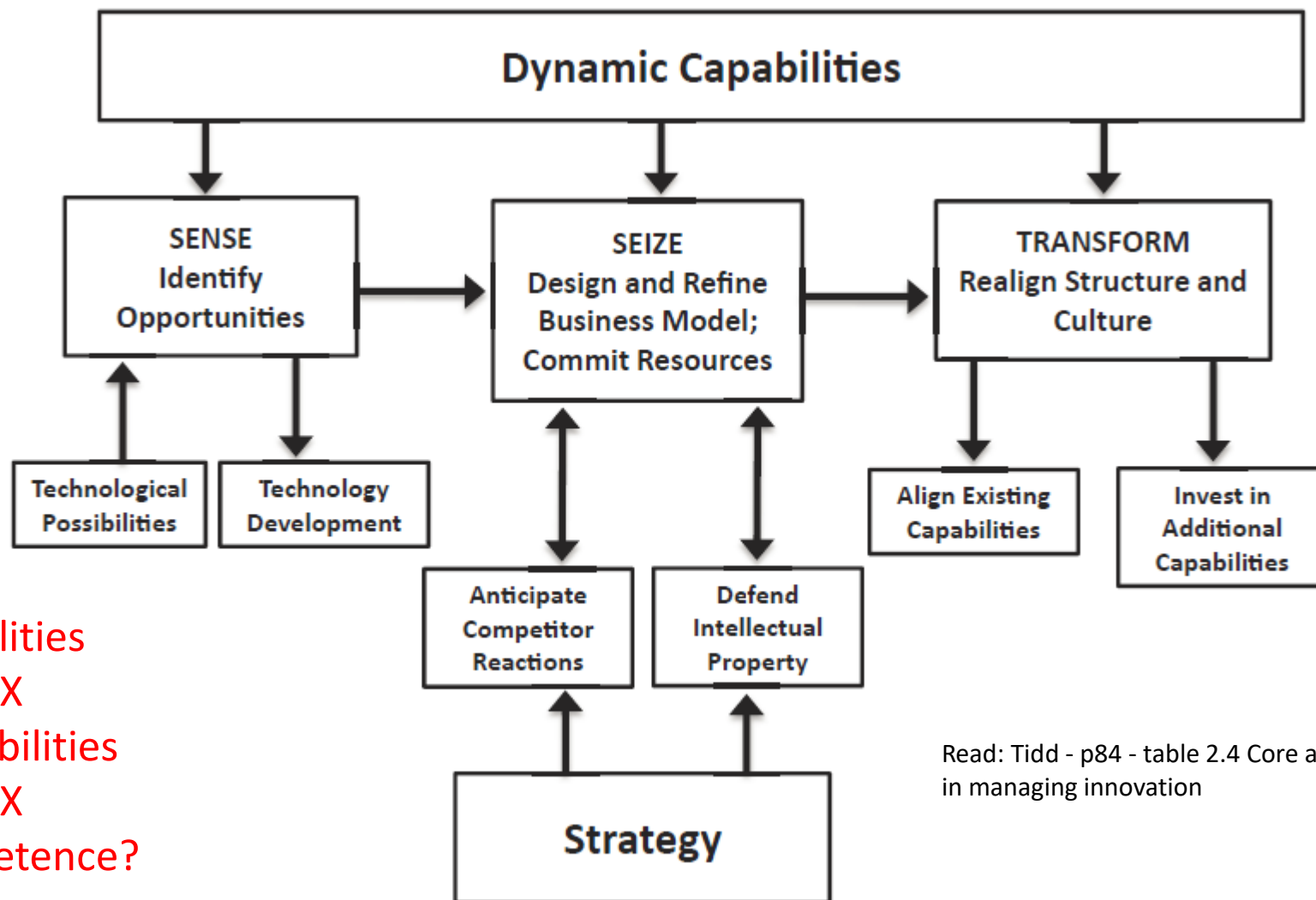
Core abilities in managing innovation

- Recognizing
- Aligning
- Generating
- Choosing
- Executing
- Implementing
- Learning
- Developing the organization

Systemic vision of an organization

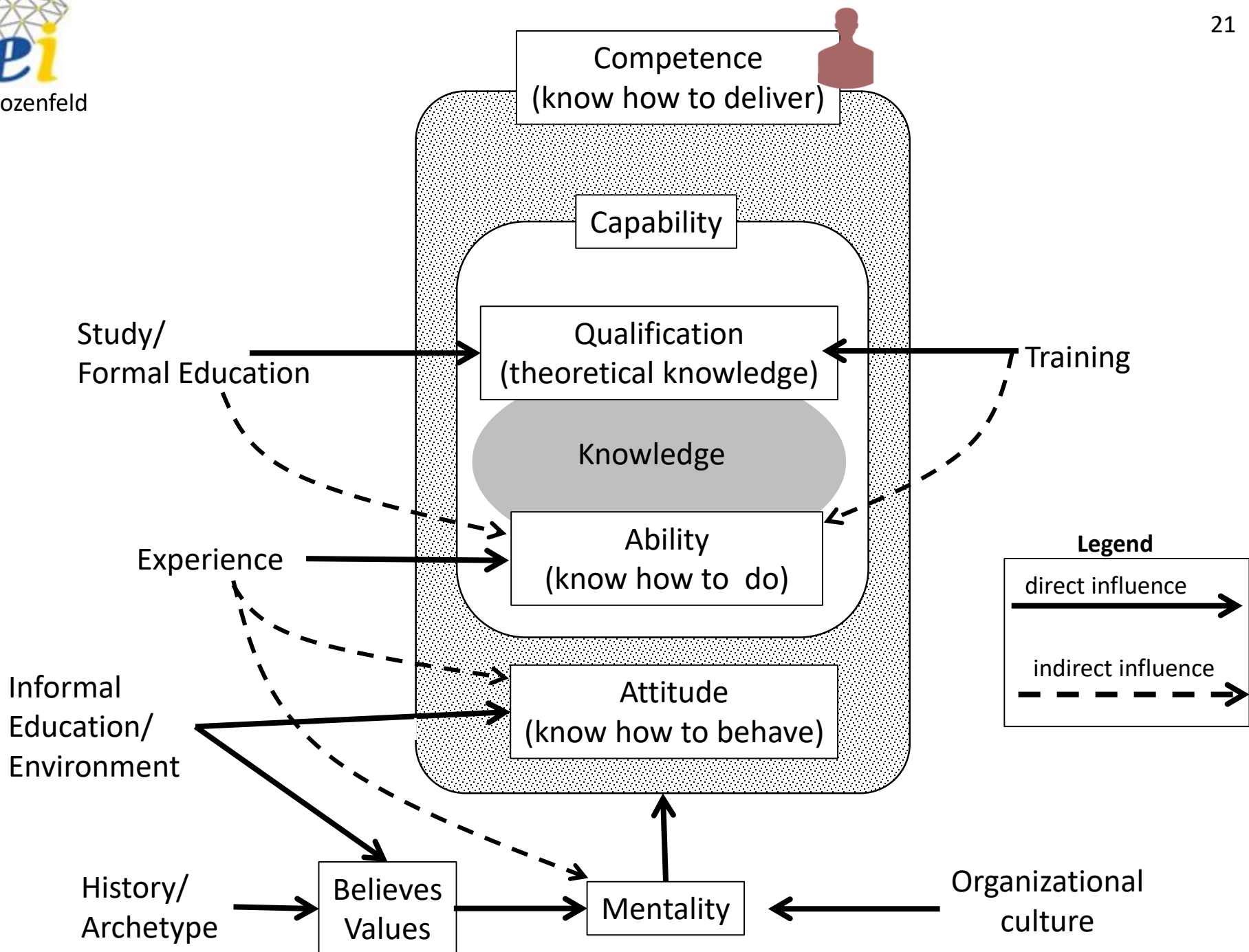


Simplified schema of dynamic capabilities, business models, and strategy.



Abilities
X
Capabilities
X
Competence?

Read: Tidd - p84 - table 2.4 Core abilities in managing innovation





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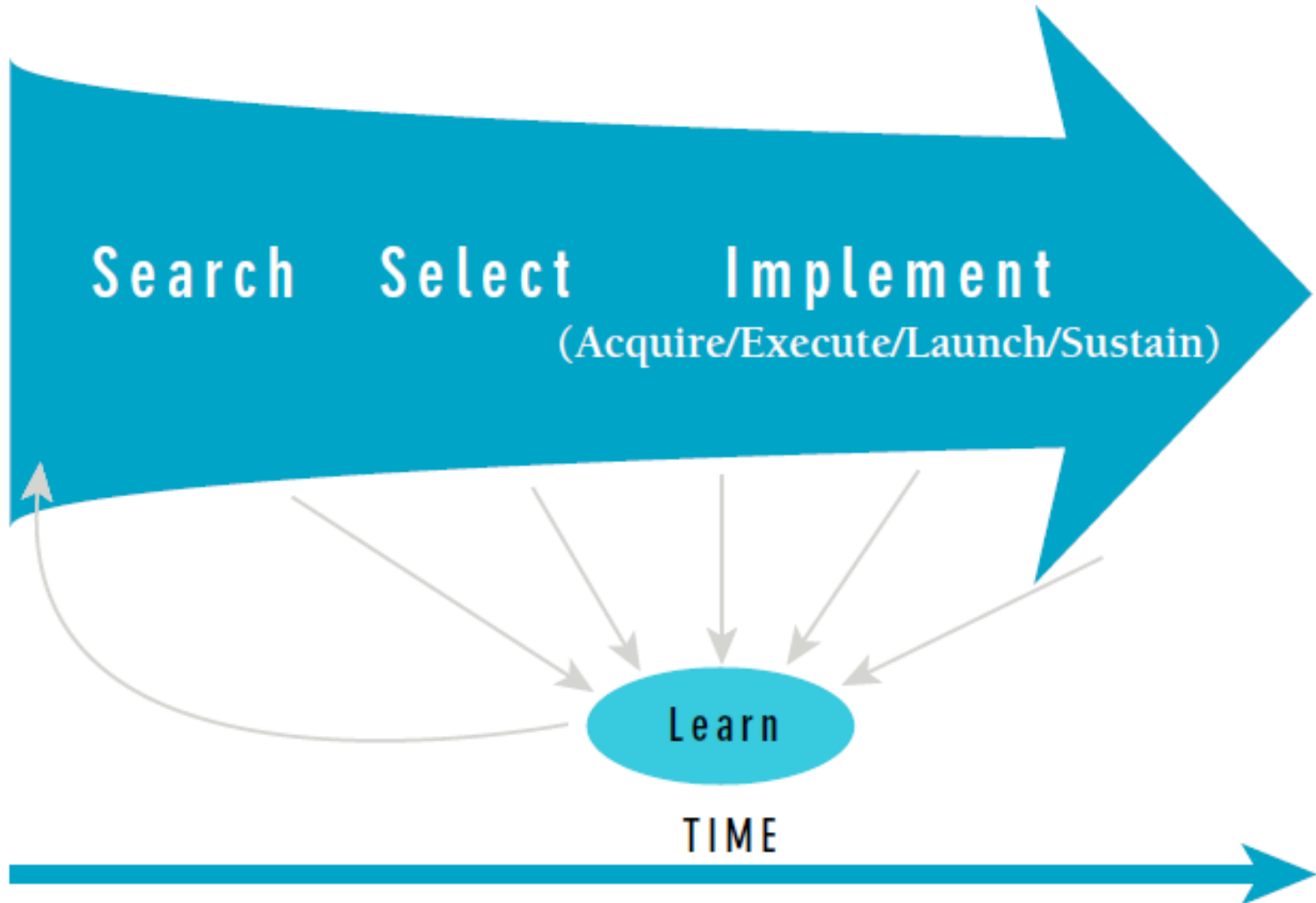
Innovation as a Process

Problems of partial views of innovation



Simple representation of the innovation process

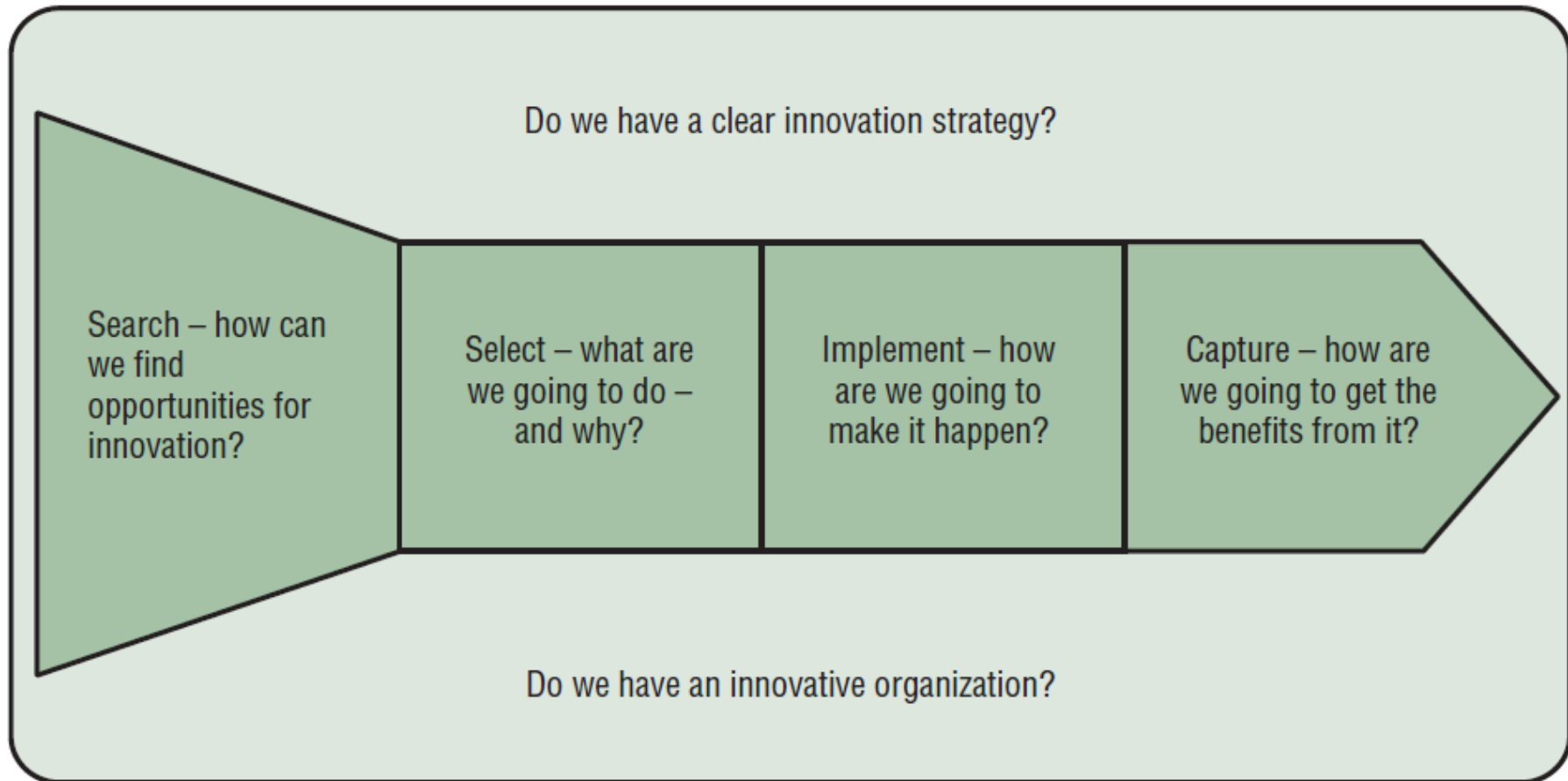
Source: Tidd, J., Bessant, J., Pavitt, K. (2005)- Managing Innovation: Integrating Technological, Market and Organizational Change



Simple representation of the innovation process

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Source: Tidd, J., Bessant, J. (2009)- Managing Innovation: Integrating Technological, Market and Organizational Change





Macro ecossistema

Ambiente de negócio / inovação - ecossistema (externo)

Cadeia de valor

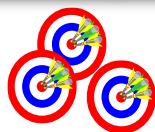
- Parceiro de risco
- Parceiro estratégico
- Co- desenvolvedor
- Fornecedor
- Universidade
- Institutos
- Agências
- Centro de P&D
- Prestador de serviço
- ONGs



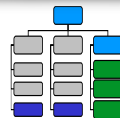
Sistema nacional de
inovação

Empresa

Estratégia



Organização



Processos



Proposição de valor



Pessoas



Recursos



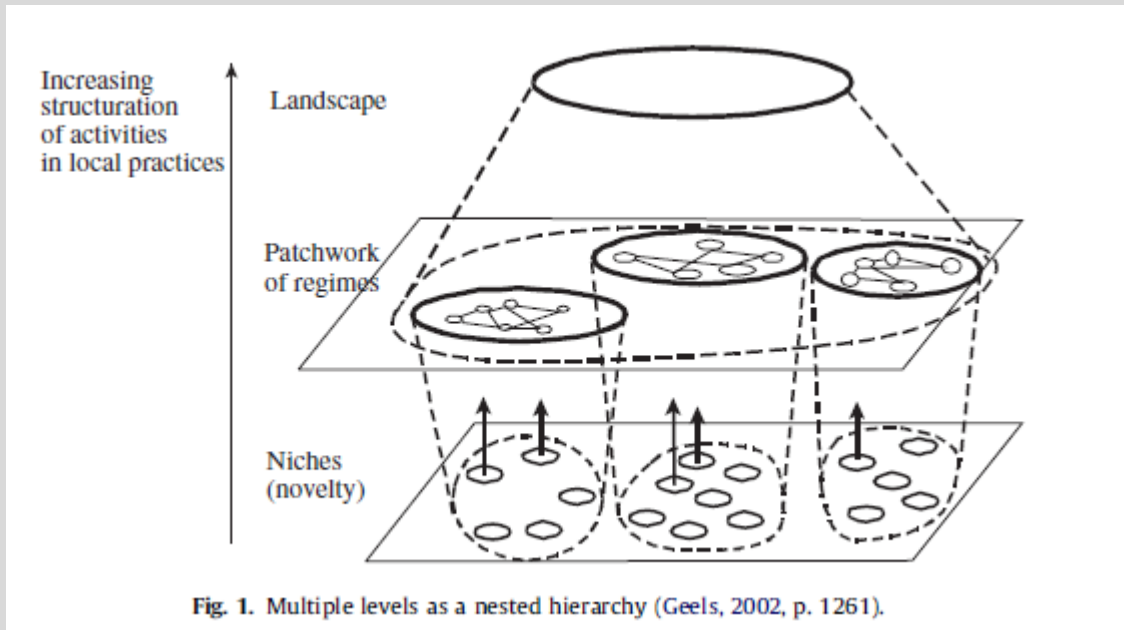
Clientes Stakeholders



Concorrentes
Novos entrantes
Startups

Macro ecossistema

Ambiente de negócio / inovação - ecossistema (externo)

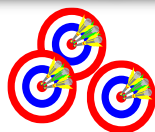


Macro ecossistema

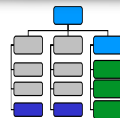
Ambiente de negócio / inovação

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

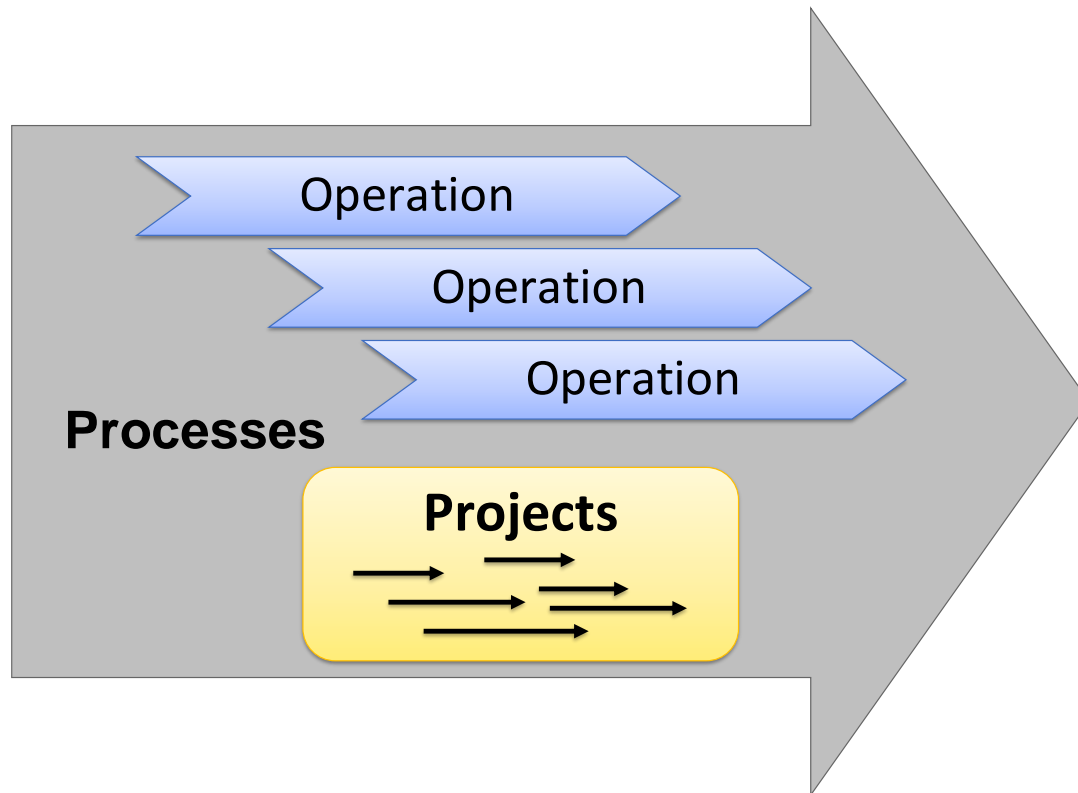
Economia

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

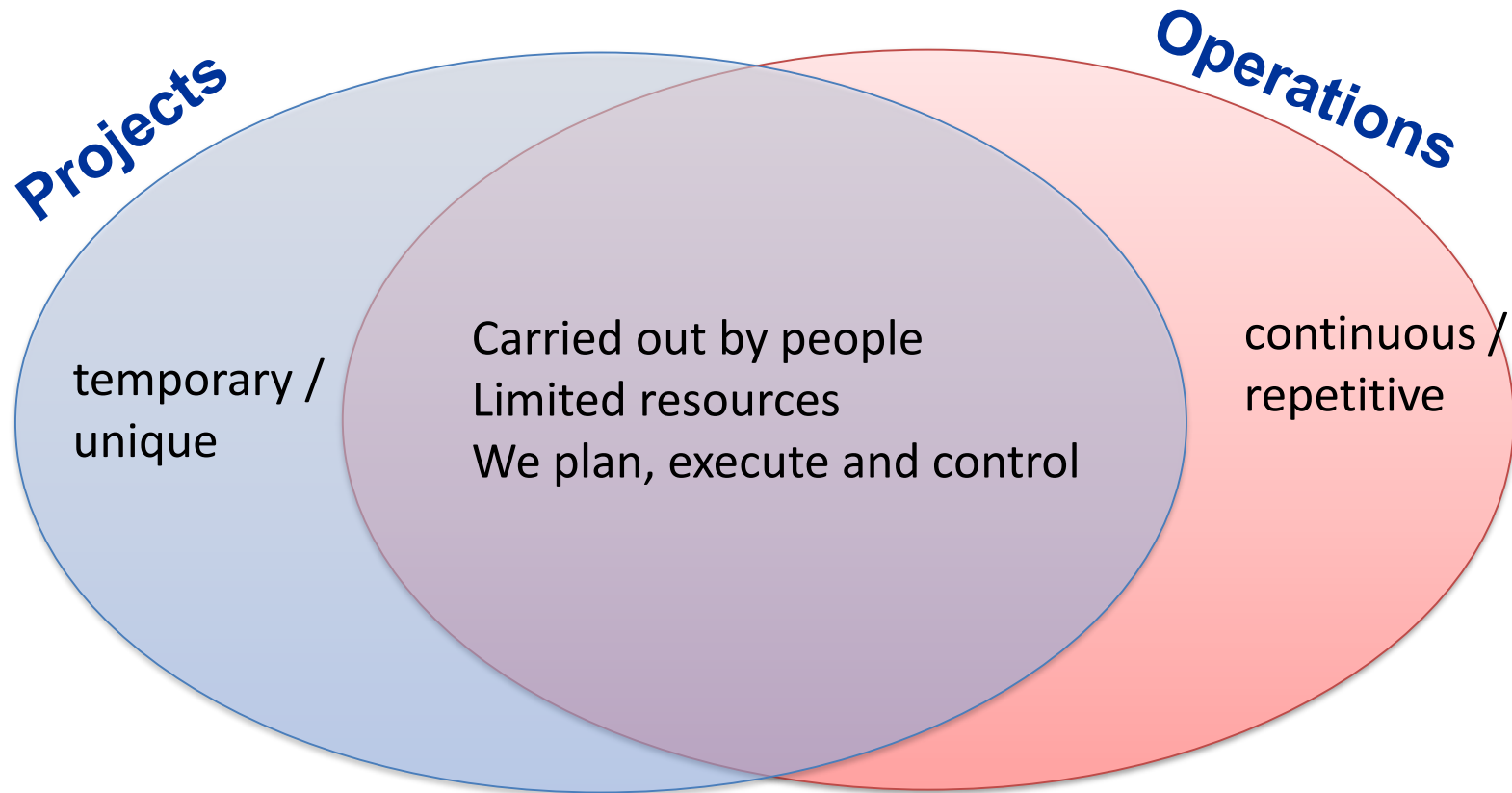
Meio Ambiente

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

To aggregate value with processes
(by operations and projects)



Comparison between operation and project



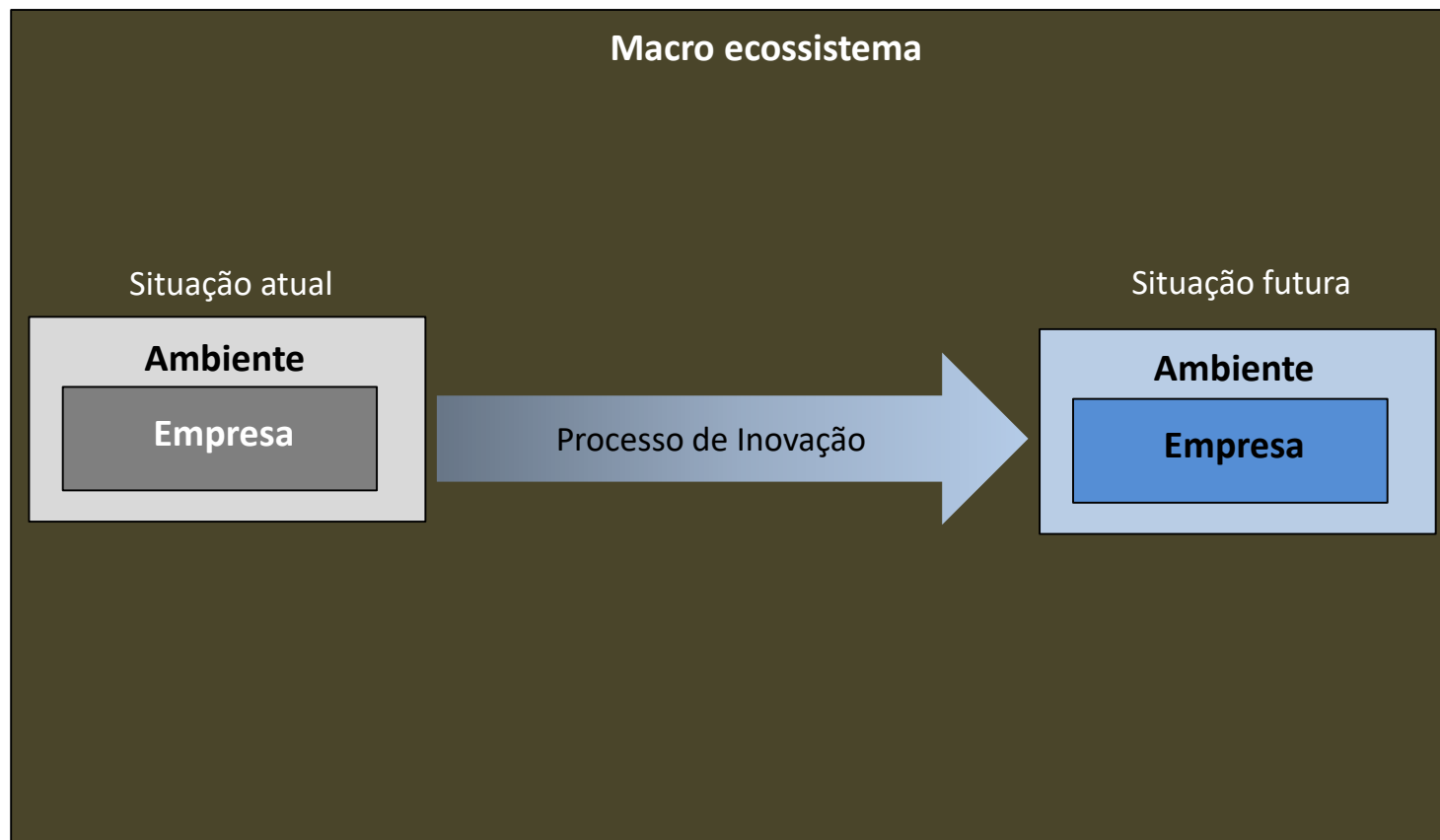


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What is Innovation?



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Macro ecossistema

**What is the
vision of the
future?**

Situação futura

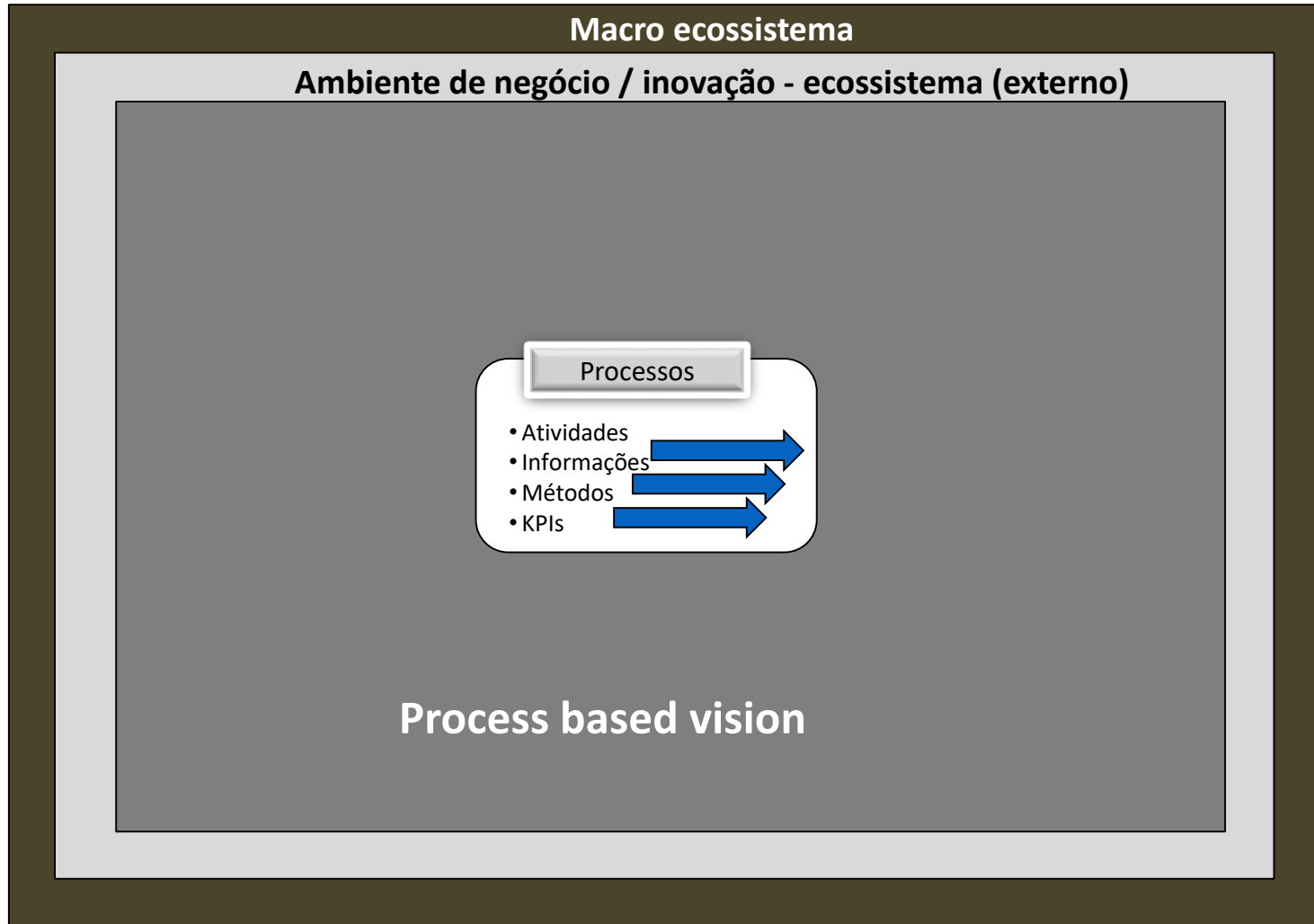
Ambiente

Empresa

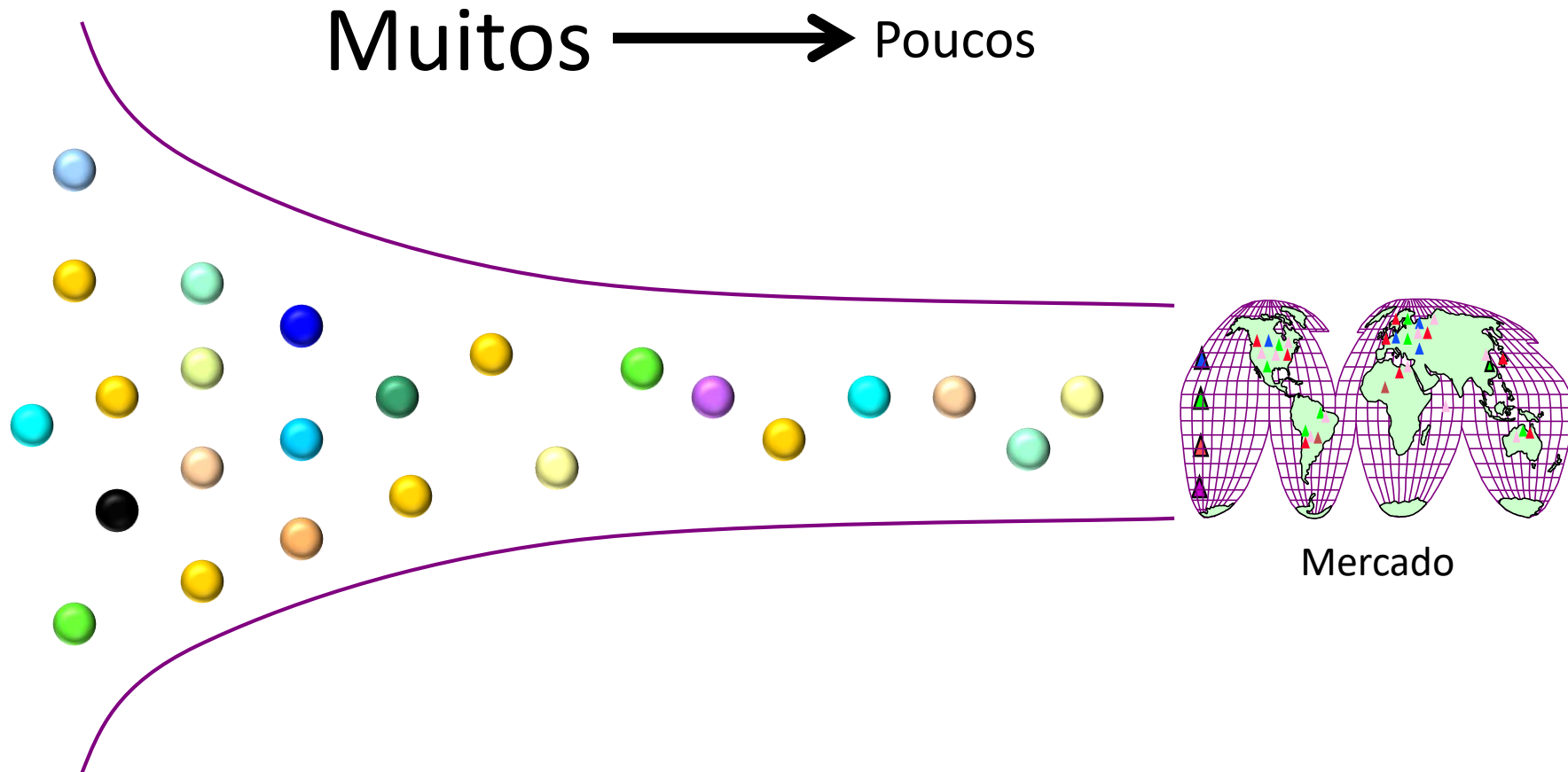




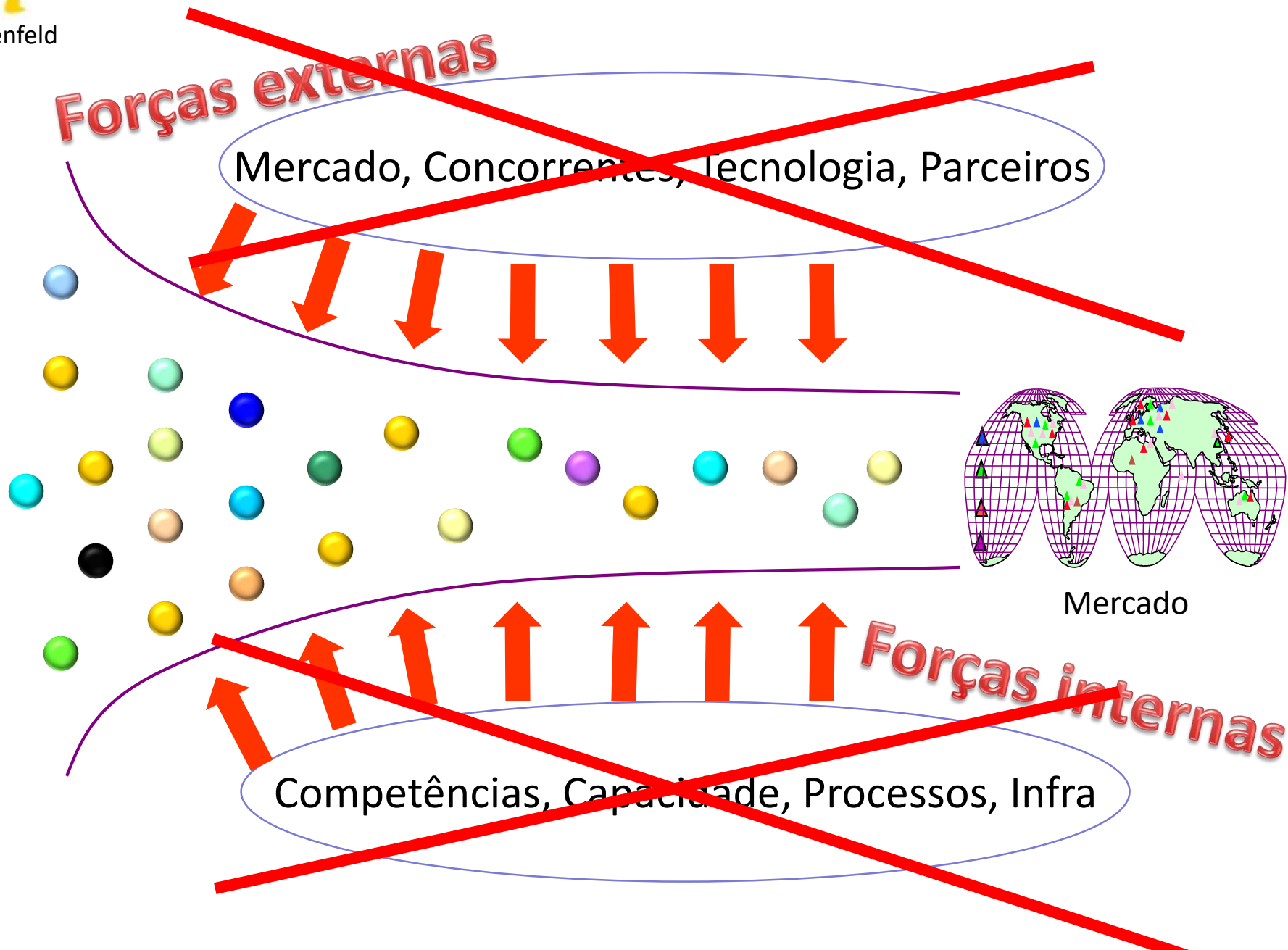
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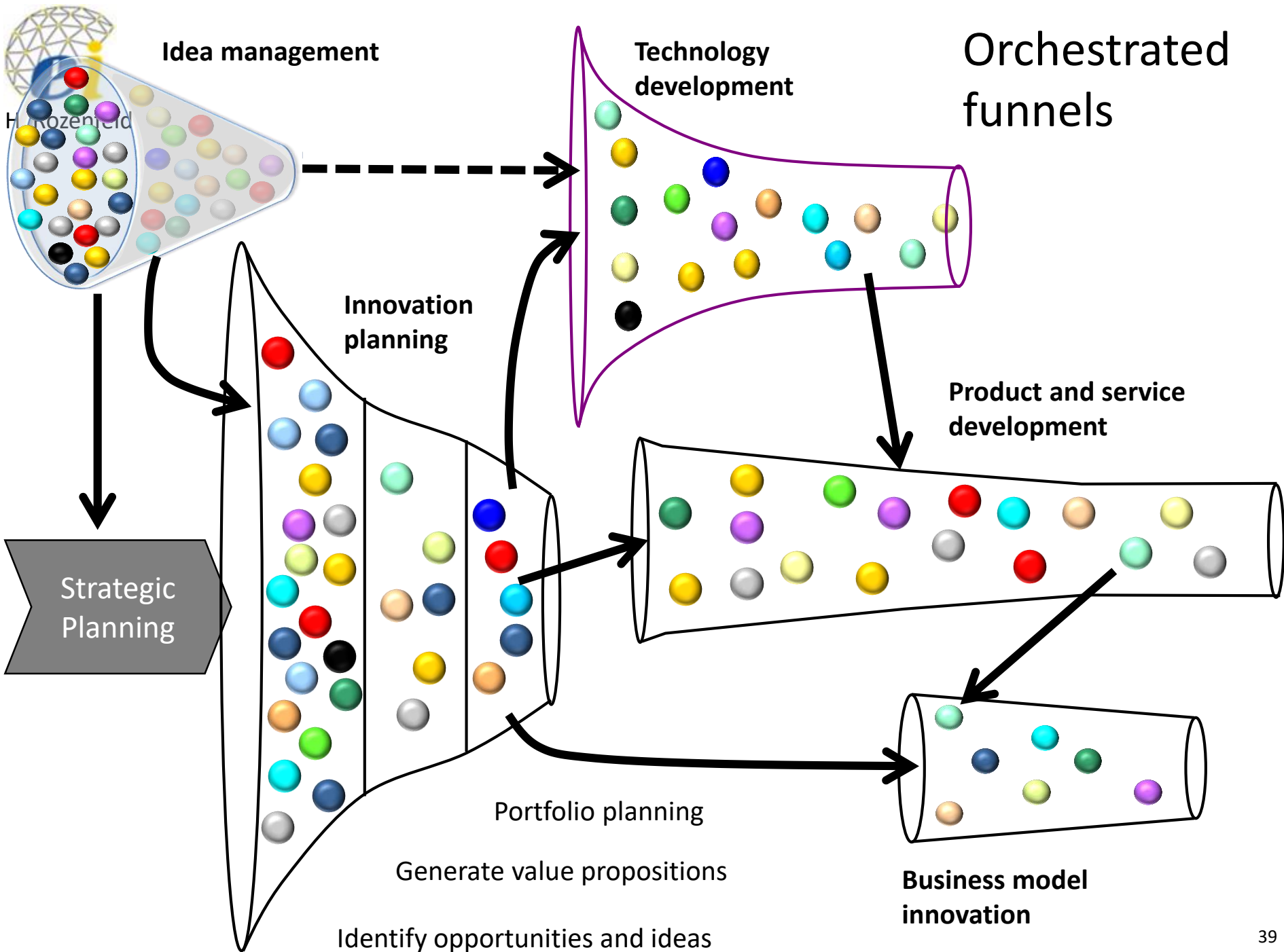


Conceito de funil de desenvolvimento



Visão tradicional







Supporting processes

Monitoramento do Negócio, Mercado, Indicadores, Inteligência Competitiva, Riscos do Negócio e Melhoria do Processo

Gestão da Tecnologia, Propriedade Intelectual, Normas, Legislação e Regulação

Gestão da sustentabilidade

Gestão de Stakeholders, Ideias, Requisitos e Comunicação

Opportunities

Threats

Strengths

Enablers

Weakeness

Gestão de Pessoas, Organização, Mudança, Conhecimento e Competências

Inovação aberta, Gestão de Clientes, Fornecedores e Parcerias

Gestão de Portfólio e Projetos

Gestão Qualidade, Homologações, Confiabilidade

Gestão Financeira, Análise de Viabilidade, Custos, Orçamento e Fluxo de Caixa

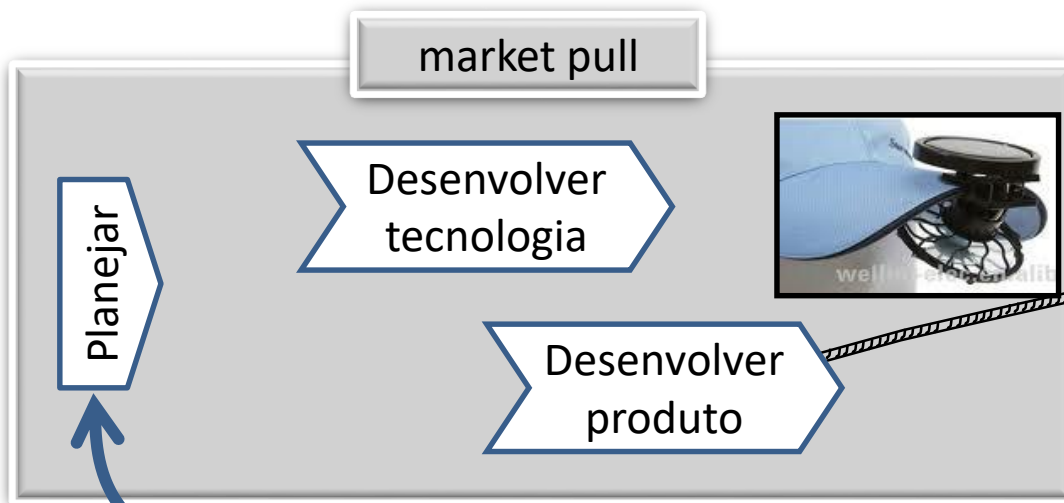
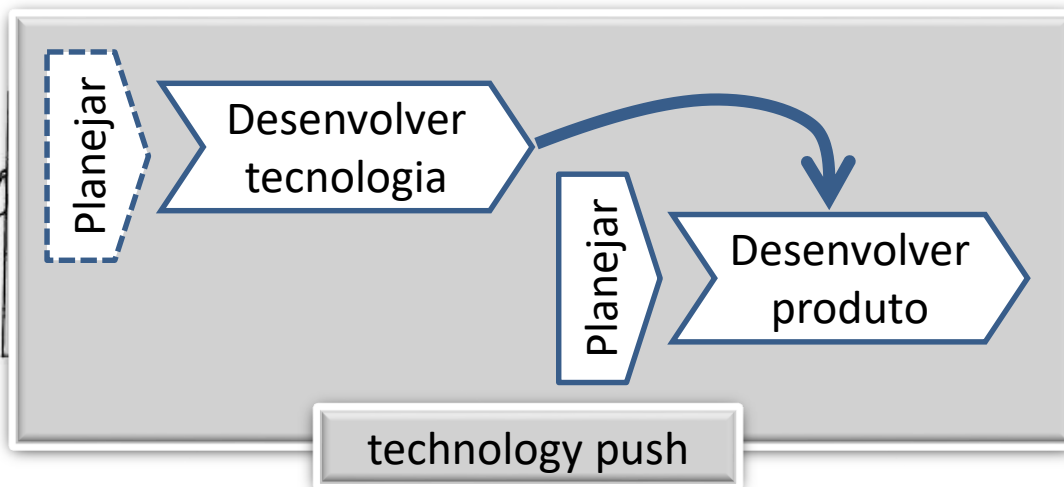
práticas

métodos

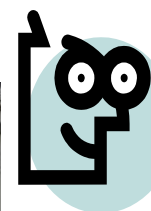
diretrizes

ferramentas

Vamos encontrar aplicações para a tecnologia



Vamos desenvolver produtos para a necessidade

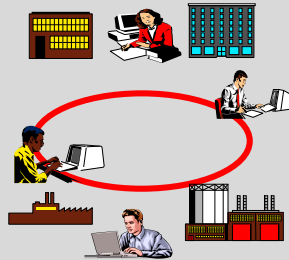


Macro ecosistema

Ambiente de negócio / inovação - ecossistema (externo)


Cadeia de valor

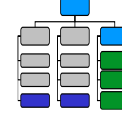
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- ONGs



Concorrentes
Novos entrantes
Startups

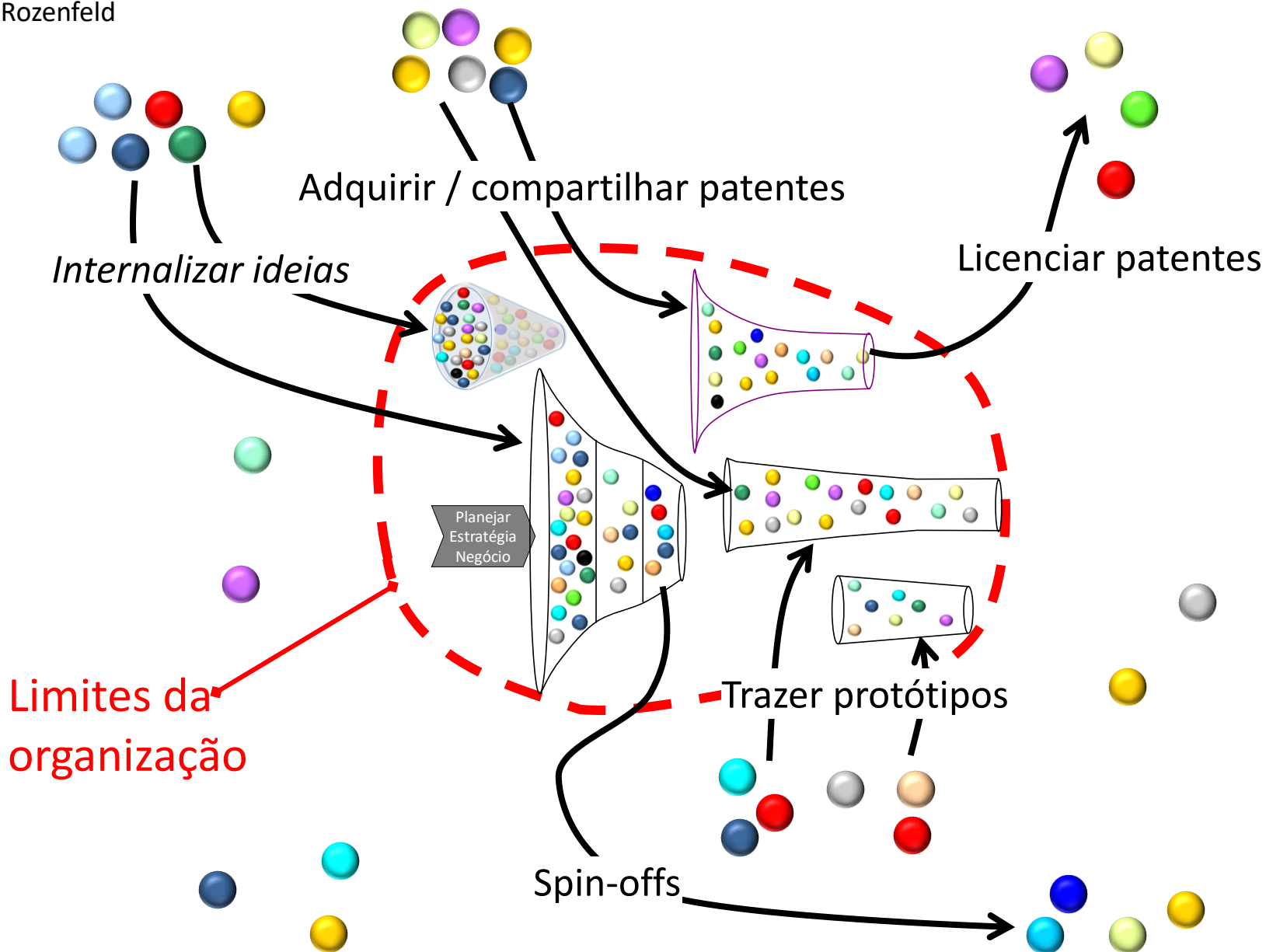
Organização

- Estrutura, papéis
 - Políticas
 - Cultura
 - Jurídico
 - Financeiro
- 



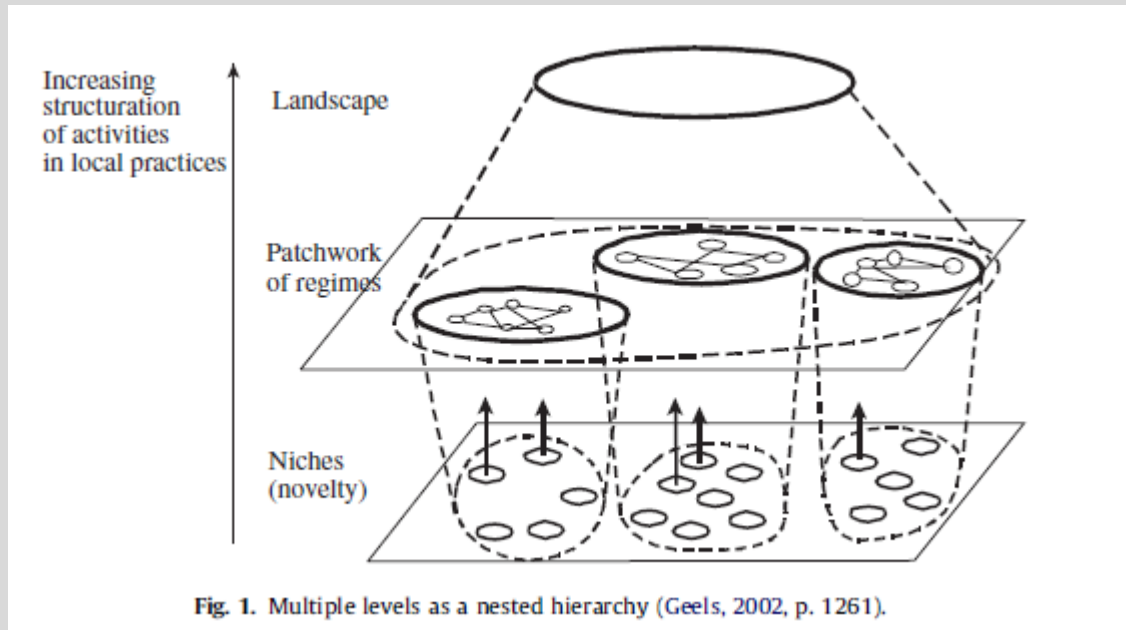
Organizational vision

Inovação aberta



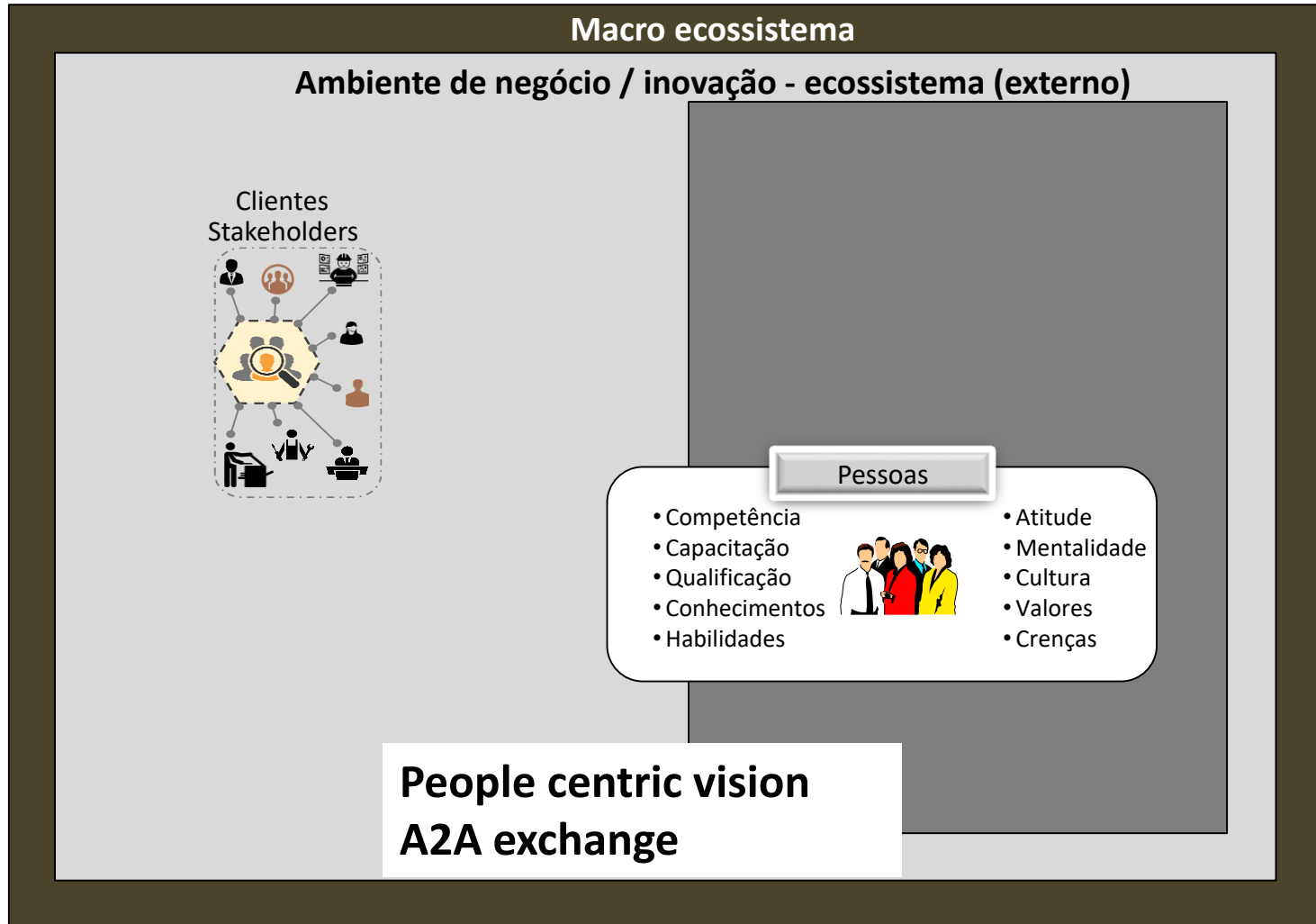
Macro ecossistema

Ambiente de negócio / inovação - ecossistema (externo)





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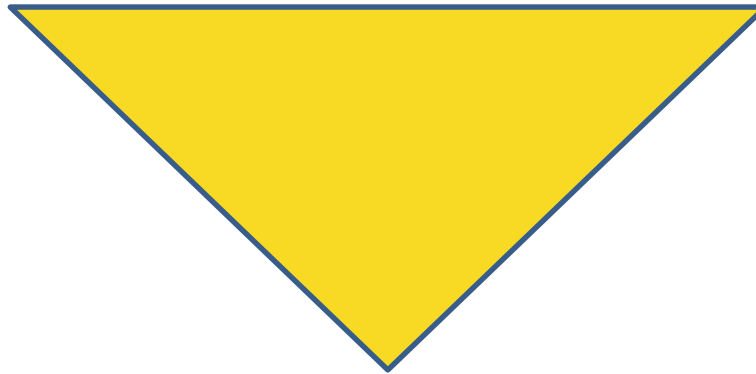
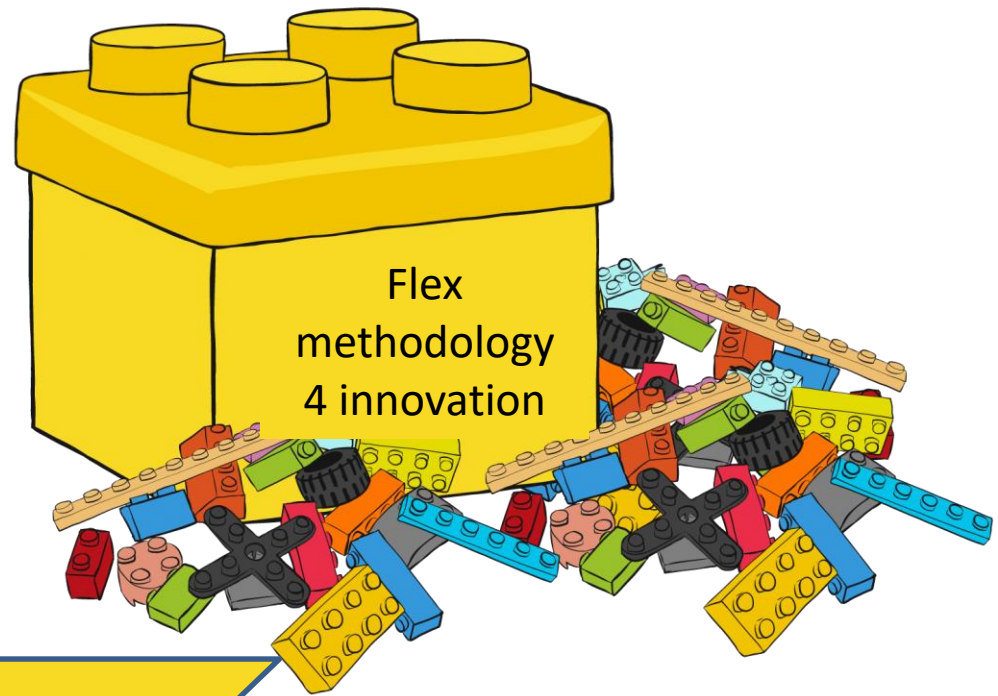
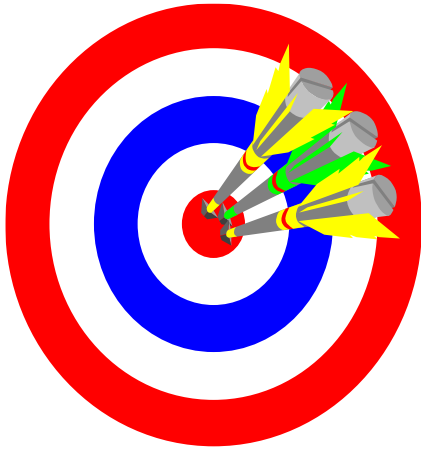




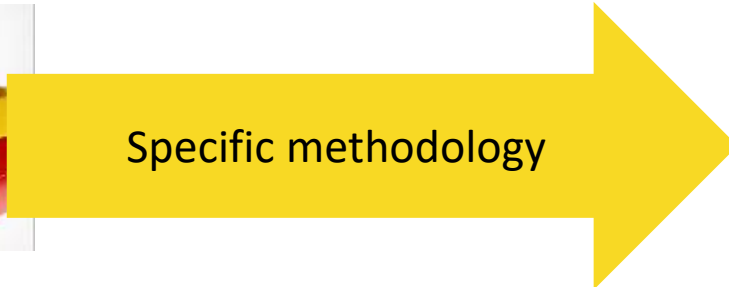
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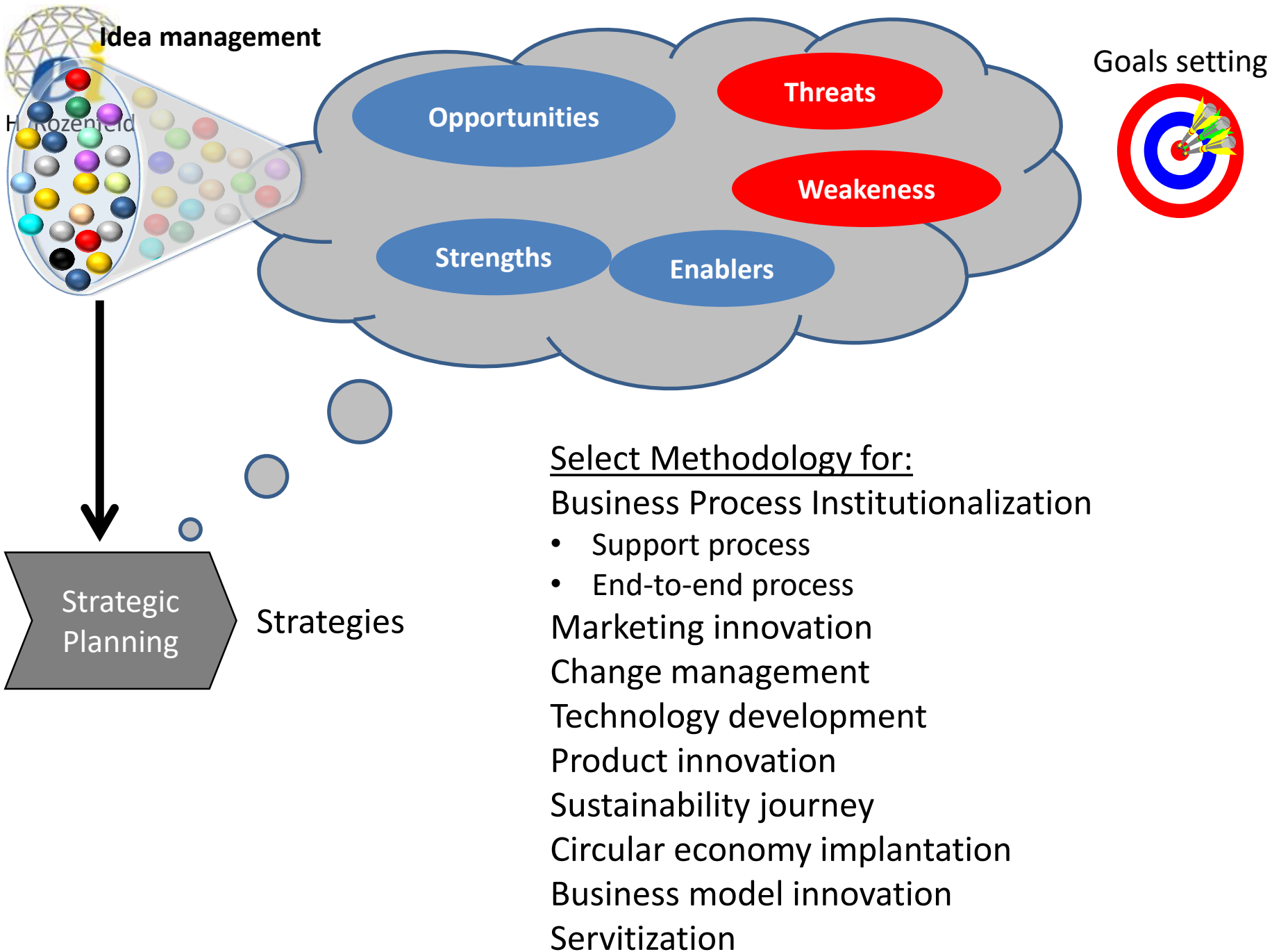


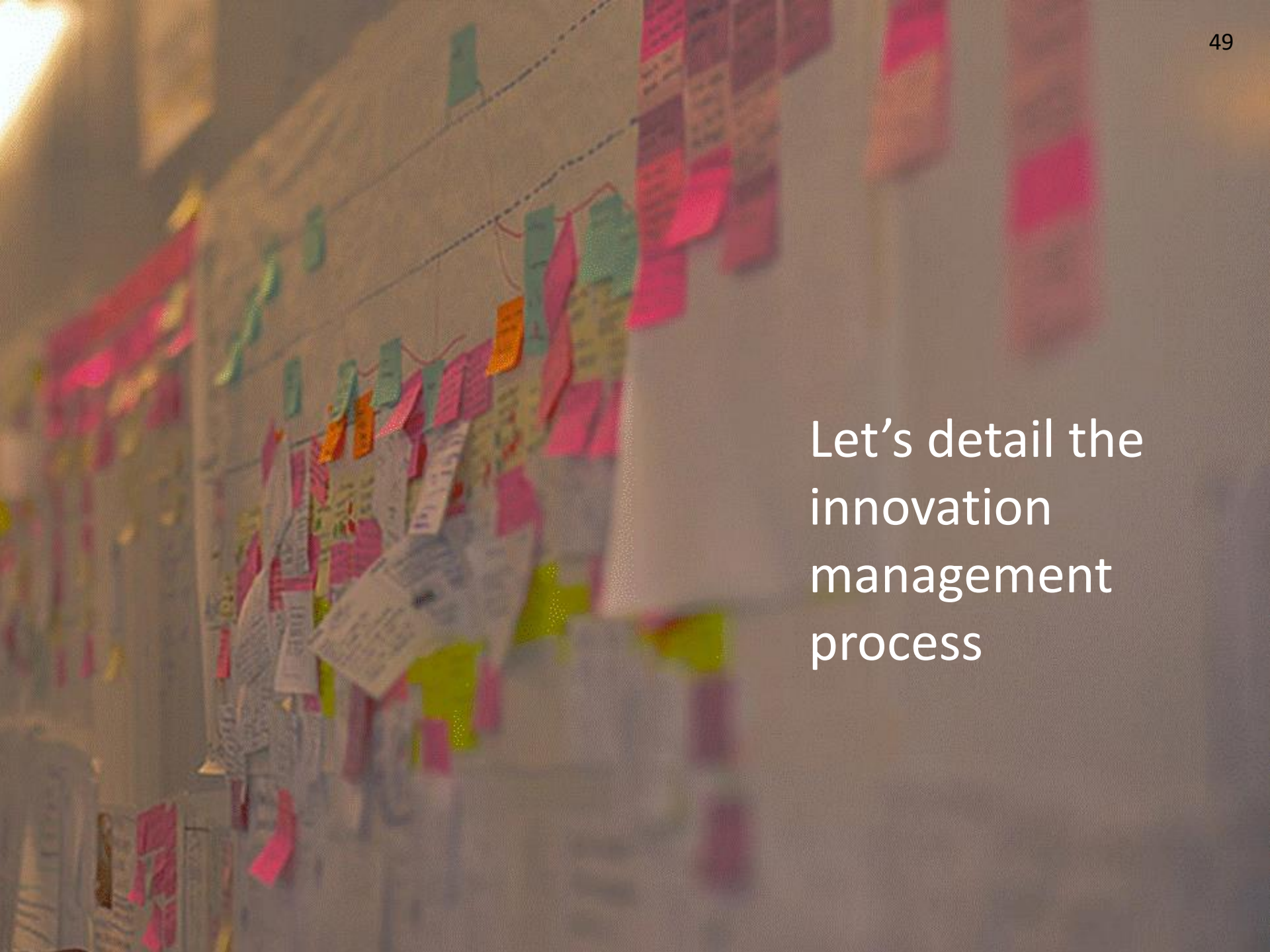
Goals setting



Specific methodology





A photograph of a wall covered with numerous colorful sticky notes and papers, illustrating the innovation management process. The notes are in various colors like pink, yellow, green, and orange, and are attached to the wall with string and clips. The text "Let's detail the innovation management process" is overlaid on the right side of the image.

Let's detail the
innovation
management
process



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Innovator's dilemma and triggers / sources of discontinuity

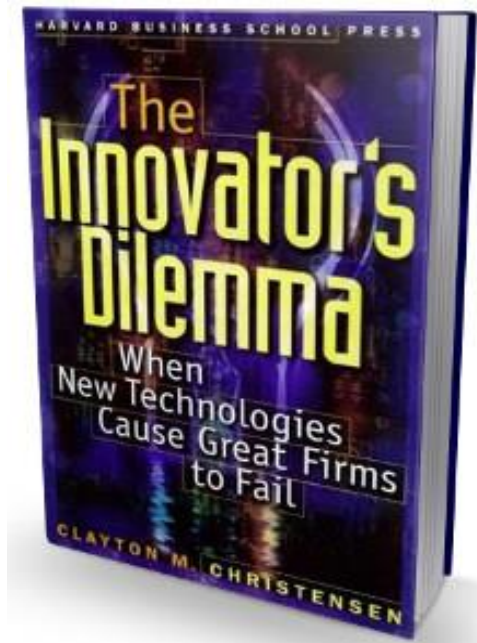


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Traditional

1997



Startup



Limitations of simple models of the innovation process

- Shocks trigger innovations
- Ideas proliferate
- Setbacks frequently arise, plans are over-optimistic
- Restructuring of the innovating through external intervention, personnel changes or other unexpected events
- Top management plays a key role in sponsoring – but also in criticizing and shaping innovation.
- Success criteria shift over time, differ between groups and make innovation a political process.
- Innovation involves learning, but many of its outcomes are due to other events which occur as the innovation develops – making learning often ‘superstitious’ in nature.



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Contextual Innovation Management

Contextual Innovation Management

Contextual factors

- (1) Type of innovation (e.g., incremental, radical, transformational).
- (2) Type of organization (e.g., centralized, decentralized, functional, organic).
- (3) Type of industry (e.g., high-tech, supplier-driven, fast moving consumer goods).
- (4) Type of country/culture (e.g., egalitarian, authoritative).

**There is NO one best way
to manage an organization**

Innovation is about uncertainty and its gradual reduction through investment of resources (and PEOPLE*) into finding out – more research, development of concepts, testing and feed back, etc.