



# A Structured Approach for Implementing Virtual Organization Breeding Environments in the Mold and Die Sector – A Brazilian Case Study

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- Introduction and Motivation
- Basic Concepts of VBE and VE
- Mold and Die cluster of Joinville - Brazil
- Frameworks for Modeling VBEs
- Structured Approach for Implementing VBEs
- Conclusions and Next Steps



## NuFerJ

### *Cluster of Mold and Die Industries of Joinville*

- Composed of mold and die producers around Joinville City, south of Brazil;
- Joinville is a very industrialized medium-sized city;
- NuFerJ has been founded in 1993, having now ~50 members (all SMEs).
- There are ~450 mold makers around Joinville, making it the 2<sup>nd</sup> largest pole of M&D in LA; ~4K direct employees.
- A total turnover of ~US\$ 200 millions in 2009.
- Very low level of exportation: focus on internal market.



- **Labor costs:**
  - BR 7,6 US\$/hour; MX US\$ 3,9; IND US\$ 1,6; CH US\$ 0,8.
  - Loss of business for China (40%).
- **Tougher competition** with other Brazilian poles and with M&D companies from abroad:
  - Bigger and highly variable orders;
  - Shorter delivery times, lower prices, higher quality.
- **Low production capacity:**
  - Very few companies capable to absorb these requirements alone;
  - Cooperation among companies, when exist, is either at “political” level or at too operational / sporadic level.
- **Limited innovation and training capacity;**
- **Traditional business model:**
  - No strategic alliances, or absence of methods on how doing this;
  - Business sector: *passive* → “let’s have a sit and wait for clients”.



The *cluster* type of alliance is no longer providing the current required level of competitiveness to face those problems in a sustainable

**But how ?!?!**

There is a clear need for more *agility, flexibility, production scalability* and *increase of scale*.



NuFerJ has been already invested on advanced manufacturing machines, new manufacturing processes, training, modern ICT, etc.

The economic model based on higher productivity is based on higher productivity. It has reached a point where efficiency has reached a point where efficiency (at least) from the 1980s is no longer adequate (at least in Brazil).

Which Model ?!?!

Answer: the ones which rely

**COLLABORATION**  
among companies !!!

**A new model is needed !**



There are several types of strategic alliances of companies based on collaboration.

Due to their several potential gains, this work exploits and applies the alliances of types *Virtual organization Breeding Environment (VBE)* and *Virtual Enterprises (VE)* as an answer to face NuFerJ requirements.

This paper presents an ongoing work of a supporting methodology to assist managers on how a cluster can be “transformed” into a VBE and hence VEs can be created from it.



A VBE is a long-term strategic alliance of autonomous, geographically dispersed, multi-sectorial and heterogeneous organizations (in terms of governance, expertise, culture, social capital and objectives) that share common policies and rules along the VBE lifecycle in order to better achieve its goals (including the breeding of VEs), and whose interactions are supported by computer networks and collaborative ICTs.





A Virtual Enterprise (EV) is a **opportunity-driven strategic alliance** formed by autonomous, geographically dispersed and heterogeneous organizations **from a VBE, that is dynamically and temporarily** created to attend to a business or collaboration opportunity (its essential common goal), **sharing** resources, information, governance principles, benefits and risks, whose interactions are supported by computer networks and collaborative ICTs, and that acts as it was **one single organization**.

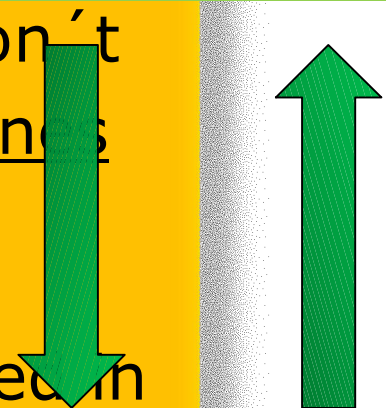




Existing methodologies for a VBE are too generic. They don't provide very concrete guidelines and steps how to do that.

Existing VBEs have been created in an ad-hoc manner, in a bottom up way, very much difficult to replicate.

Top-down approach  
Based on solid theoretical foundations



Bottom-up approach  
Consideration of characteristics of particular sectors and existing companies



## **Top-down:**

Starting from solid theoretical foundations for modeling Collaborative Networks.

- ARCON framework (Camarinha-Matos & Afsarmanesh, 2008)
- VBE methodology (Romero et al., 2008)

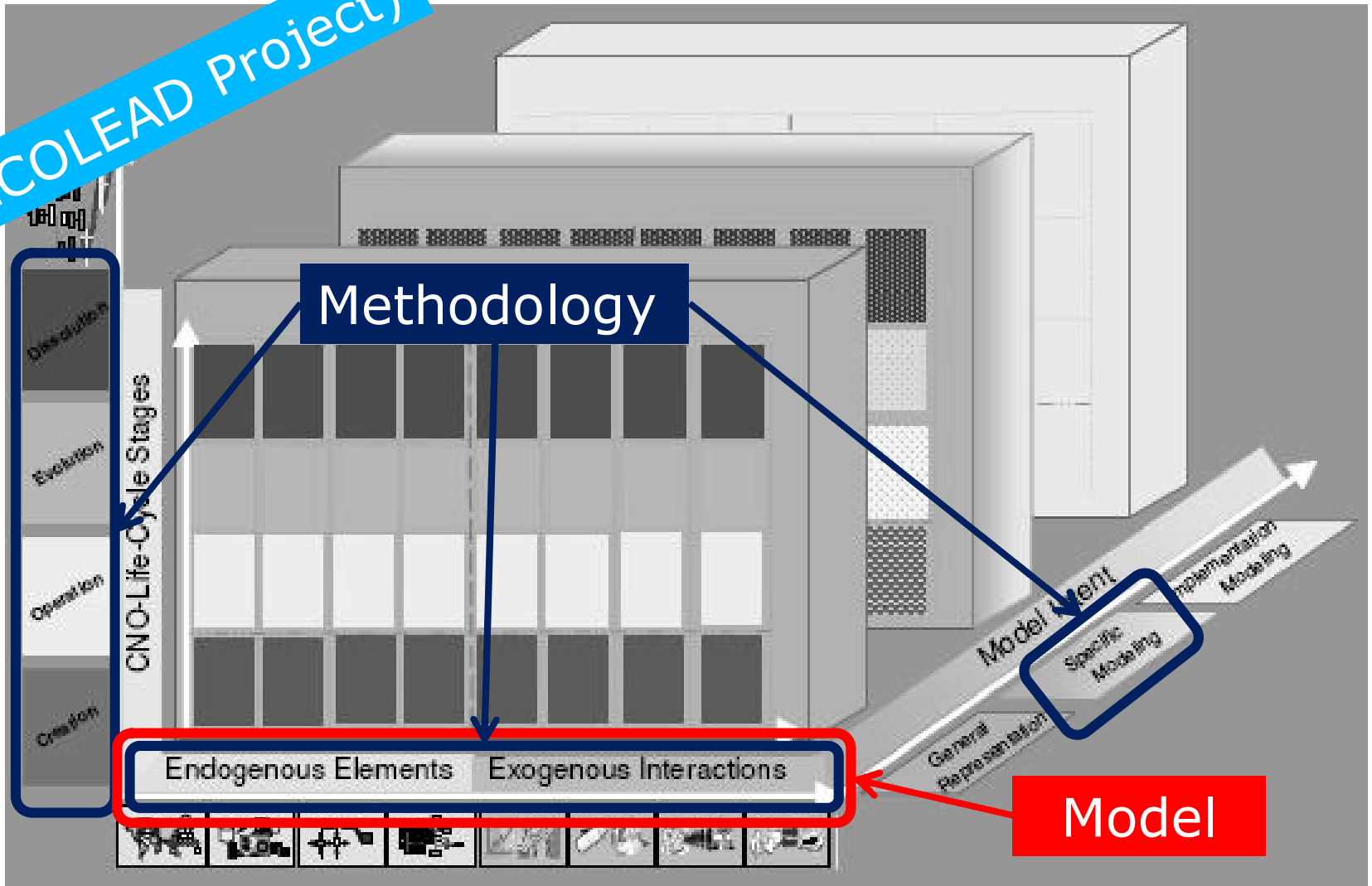
## **Bottom-up:**

Understanding the M&D sector and the clusters' members as well as mapping them against the reference framework.

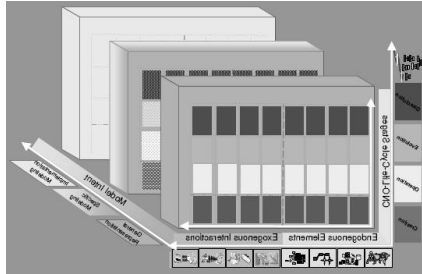


# ARCON Reference Framework

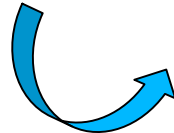
(ECOLEAD Project)



(Camarinha-Matos & Afsarmanesh, 2008)

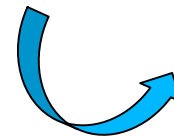


ARCON



Derivation

Romero et  
al., 2008

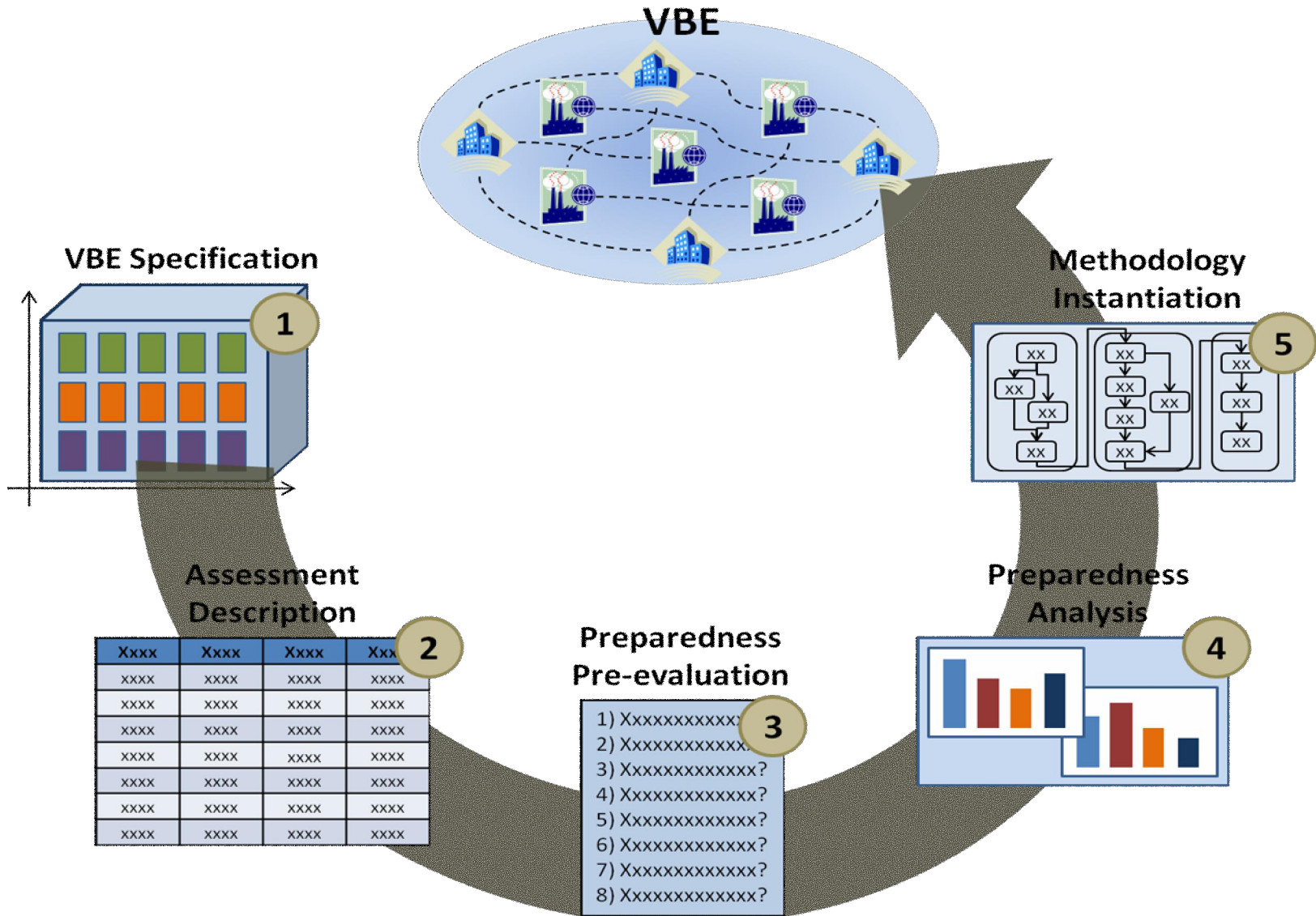


Specialization

**This work**



# Structured Approach





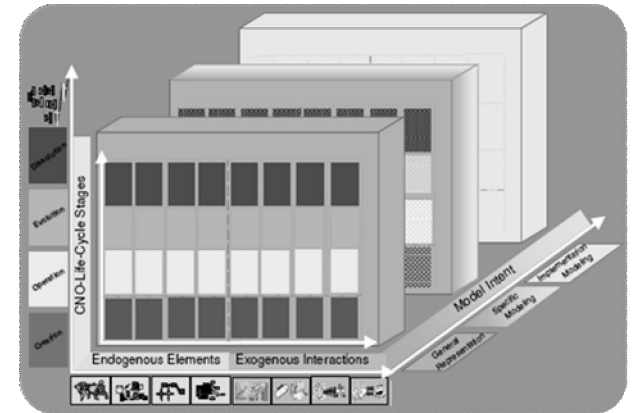
## Summary of identified aspects:

- **Endogenous Elements:**

- 20 Structural;
- 23 Componential;
- 27 Functional;
- 25 Behavioral.

- **Exogenous Interactions:**

- 24 Market;
- 21 Support;
- 17 Societal;
- 10 Constituency.



**Based on ARCON**



## Example of the identified characteristics

Perspective	Characteristic
Business Process	<ul style="list-style-type: none"><li>- Production planning process</li><li>- Production control process and performance data collection</li><li>- Purchase process</li><li>- ...</li></ul>
Organizational Structure	<ul style="list-style-type: none"><li>- Level of roles definition and of organization areas</li><li>- Functions and responsibilities defined</li><li>- Level of work overloading by employees</li><li>- ...</li></ul>
Resources (human and ICT)	<ul style="list-style-type: none"><li>- Level of utilization of ICT</li><li>- Enterprise resource planning system</li><li>- Collaborative systems utilization (e-mail, chat, wflow, forum, etc.)</li><li>- ...</li></ul>
Organizational Culture	<ul style="list-style-type: none"><li>- Resource utilization optimization</li><li>- Quality prioritization</li><li>- Standards and norms utilization (technology and process models)</li><li>- ...</li></ul>
Market	<ul style="list-style-type: none"><li>- Target market well-defined</li><li>- Customer interaction (post-sales)</li><li>- Long-term planning</li><li>- ...</li></ul>

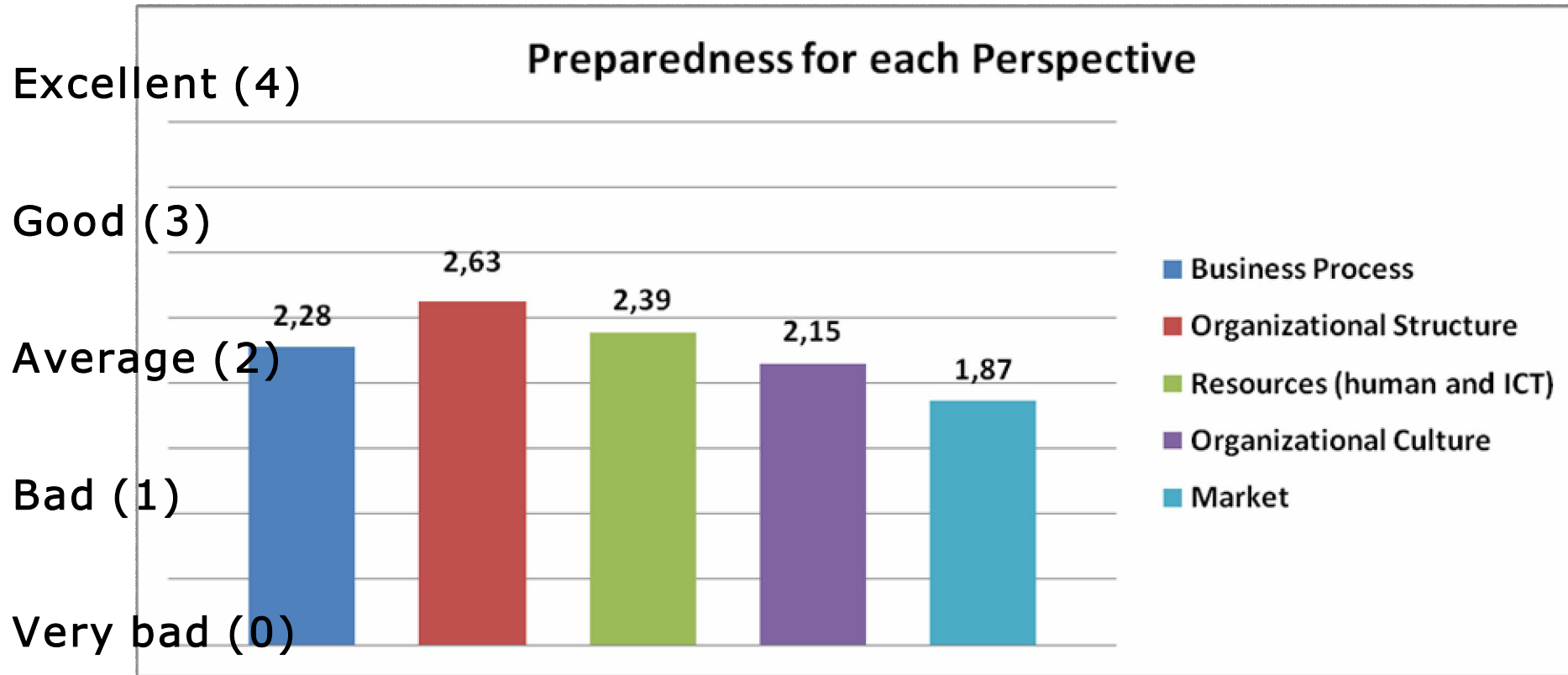




The characteristics to be evaluated have been transformed into 45 questions, associated to those five perspectives:

- Business Process: 9 questions;
- Organizational Structure: 4 questions;
- Resources (human and ICT): 14 questions;
- Organizational Culture: 13 questions;
- Market: 5 questions.

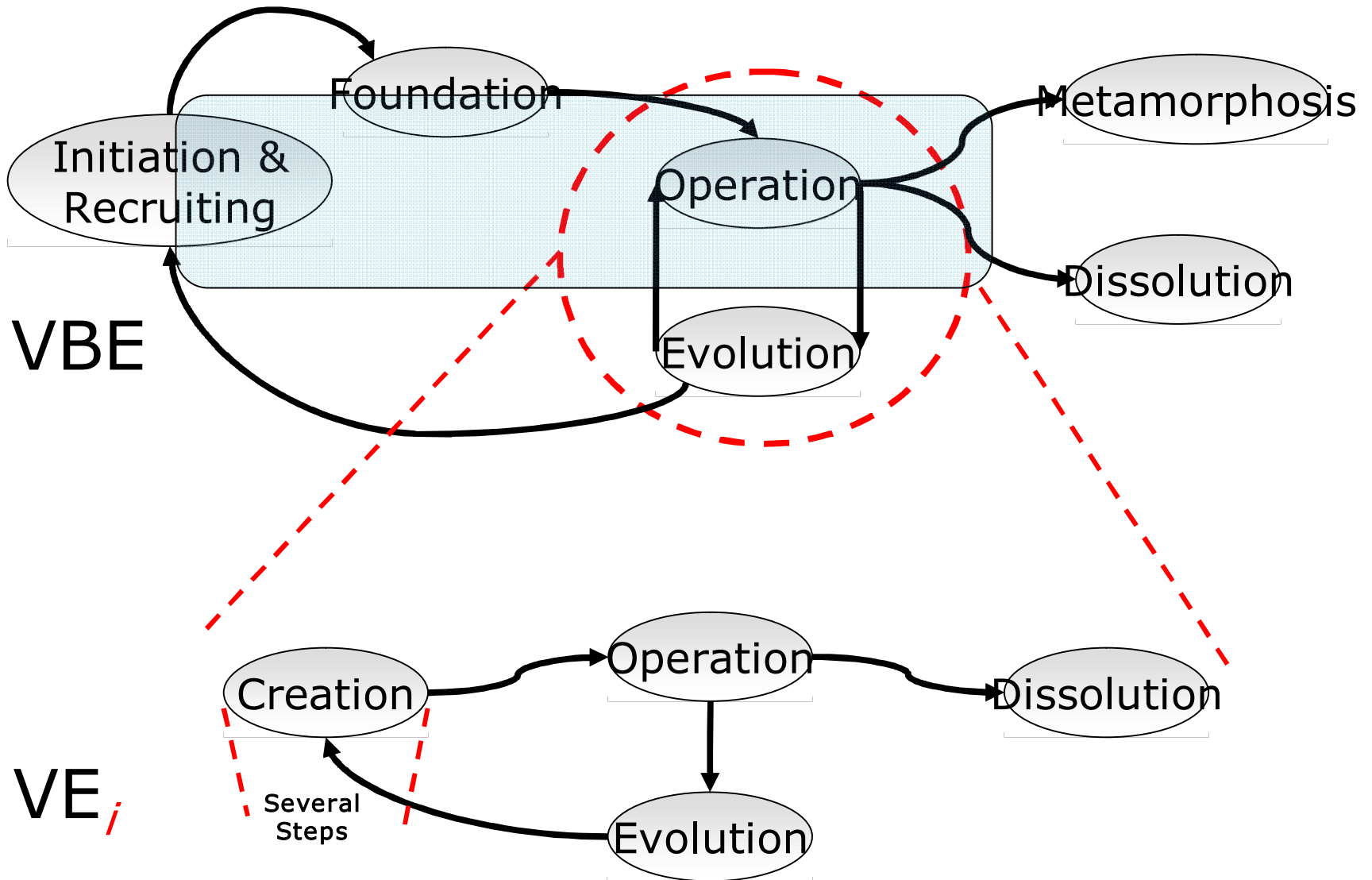


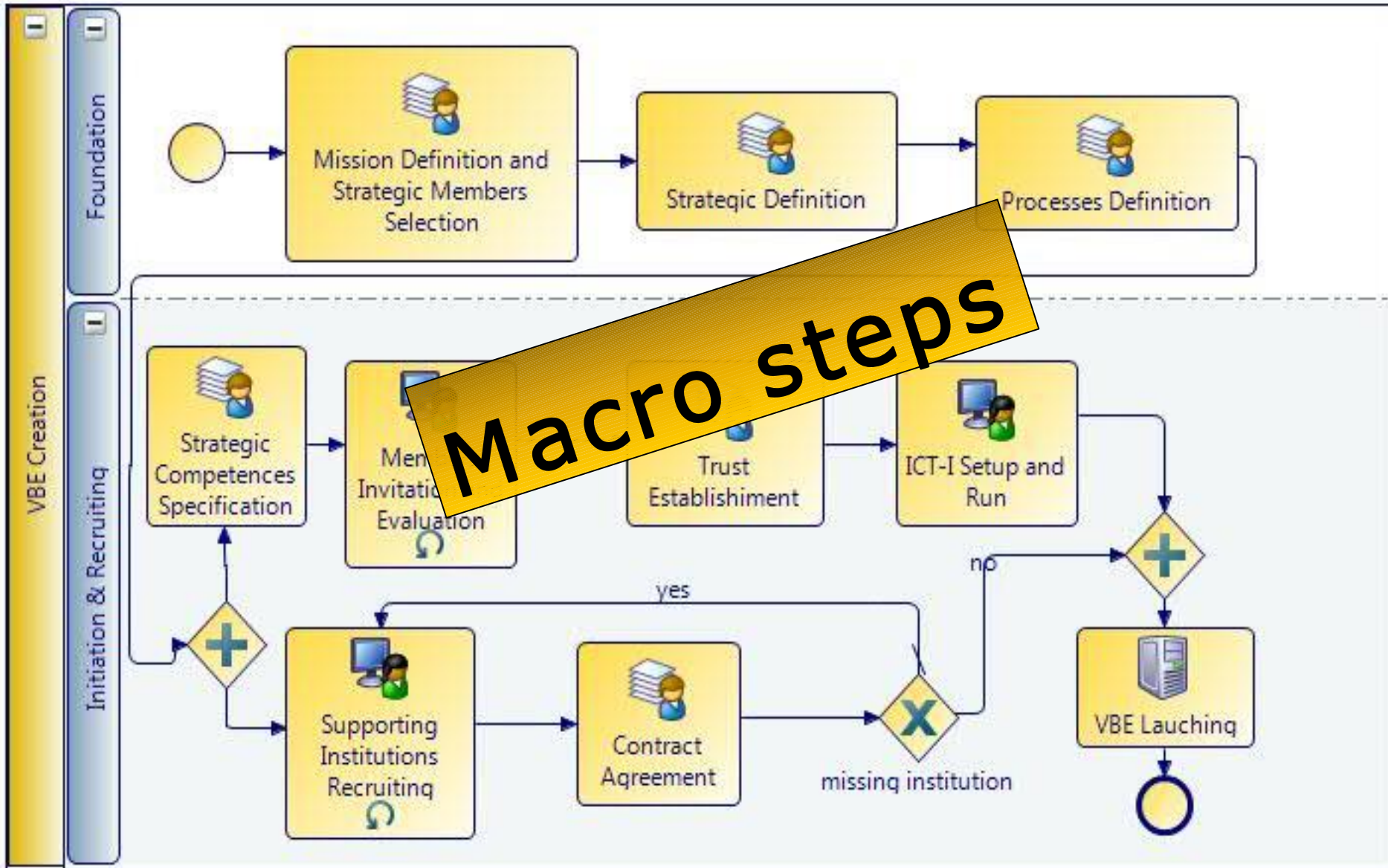


28 companies (of 50)



# VBE and VE life cycles

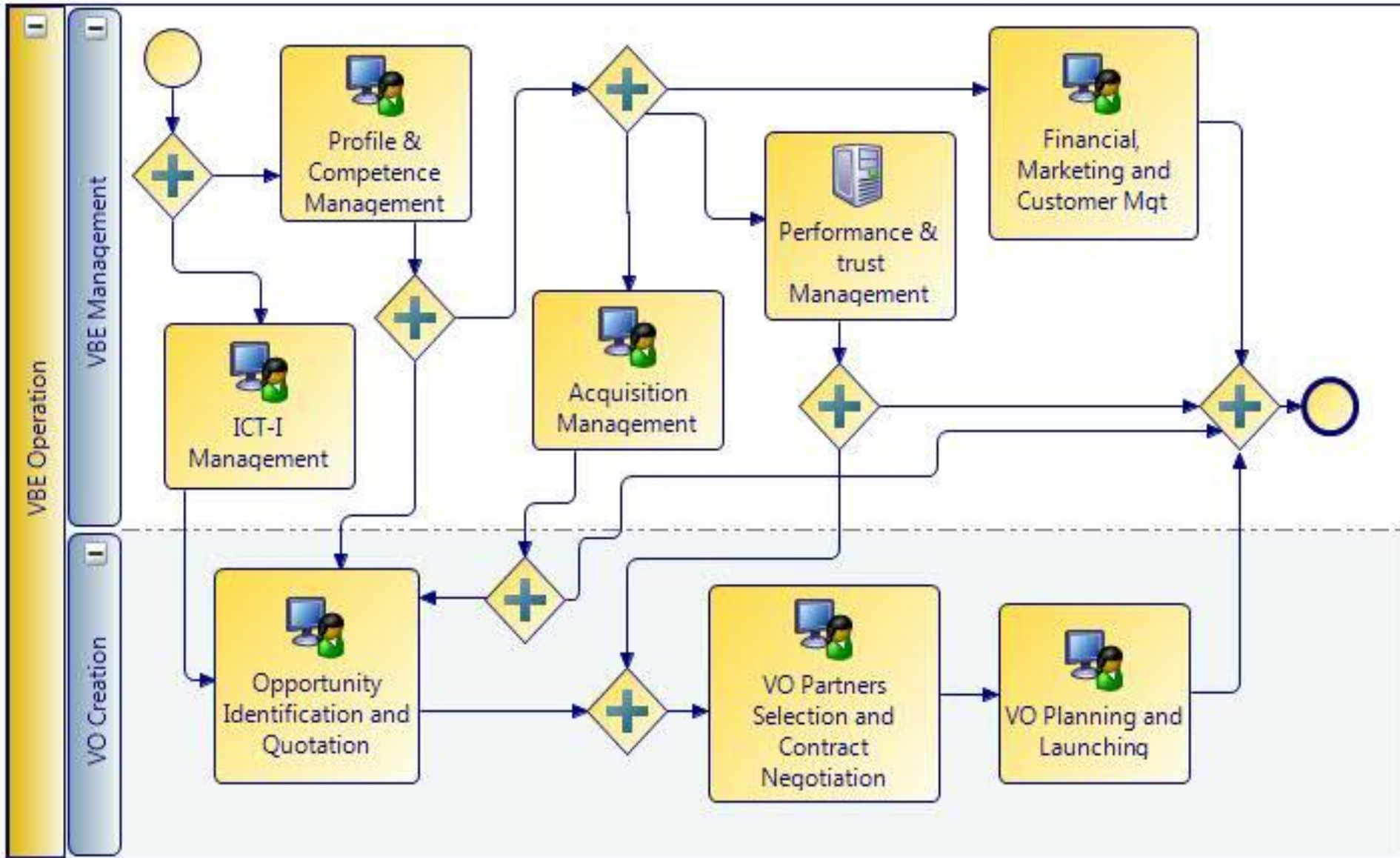






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# VBE Instantiation Methodology





- ✓ 1 : **SWOT analysis and awareness** of NuFerJ members on CNO, VBE and VE foundations .
- 2 : **diagnostic and preparation** of NuFerJ members.
- 3 : conception & refinement of the **methodology for VBE creation** as well as initial evaluation.
- ❖ 4 : impact & risk analysis → **feasibility & business model**.
- ❖ 5 : definition of **operating, governance rules and required ICT** as well as initial evaluation.
- ❖ 6 : conception of the **methodology to create VEs** from the NuFerJ VBE.
- ❖ 7 : creation of hypothetical VEs and **methodology refinement**.
- ❖ 8 : creation of **real VEs** based on real business.

*[~5 years]*



- This paper has presented an **ongoing work** about the development of a **methodology to create a VBE** based on reference models.
- One of the most important outcomes has been the knowledge about the intrinsic high complexity of such task as well as the systematization of the process in a form of a **concrete sequence of steps and aspects** to be considered along the creation of a VBE.
- Although the NuFerJ VBE is not created yet, the general “process” so far carried out inside NuFerJ has **already generated lots of synergies** among partners, which is one of the goals of a VBE.
- The devised methodology **does not** classify (yet) the complexity and criticality of each of its steps as well as it does not define (yet) the governance model.
- There **many challenges to face** along the VBE creation process. In particular, the cultural ones (trust, collaboration [to give and to receive], information exchange, etc.).
- **CNO & VBE areas are relatively new** and many (open) things should be more deeply researched in order to put theory in practice (e.g. economic models, legal frameworks, inter-org. governance modes, IPR).



# Thank you



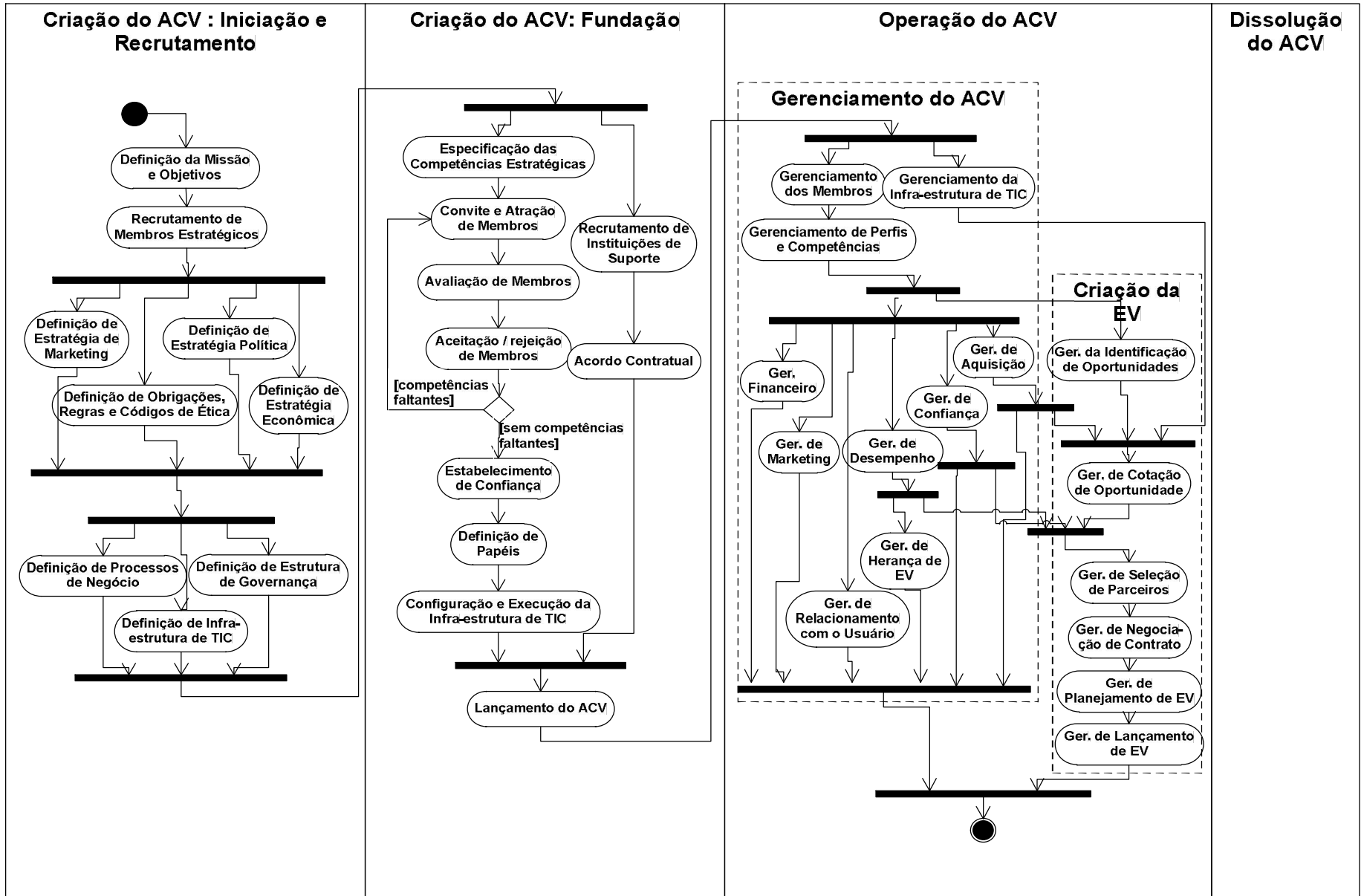
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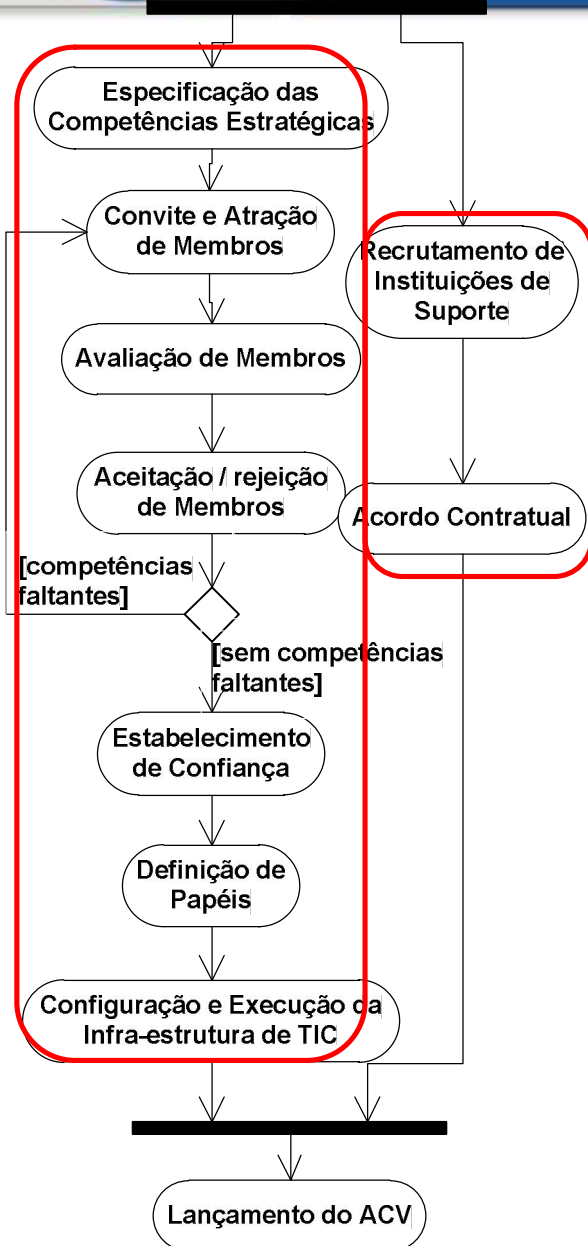
This work has been partially supported by CNPq – The Brazilian Council for Research and Scientific Development.







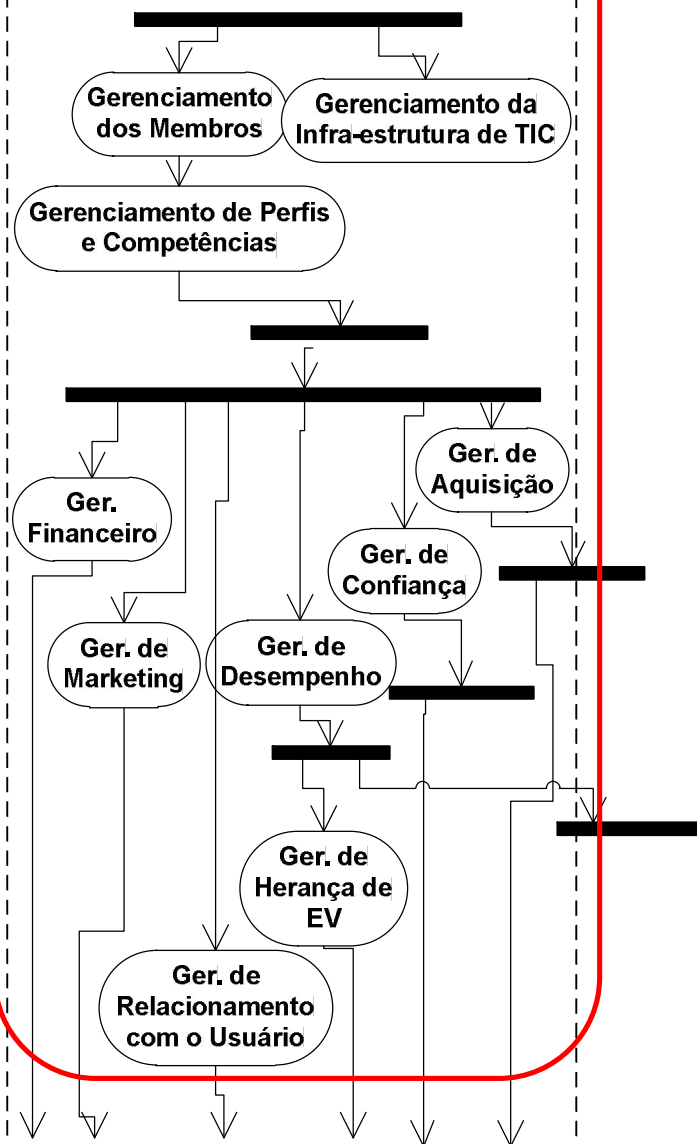
- Inicia-se com a definição da Missão e Objetivos do ACV;
- Então, os Membros Estratégicos são selecionados. Isso é conduzido por uma comissão.
- Depois, em paralelo, são definidas as estratégias Políticas, de Marketing, Econômicas e as Regras de Operação.
- Por fim, são definidos os Processos de Negócios, Infra-estrutura de TIC e Estrutura de Governança.



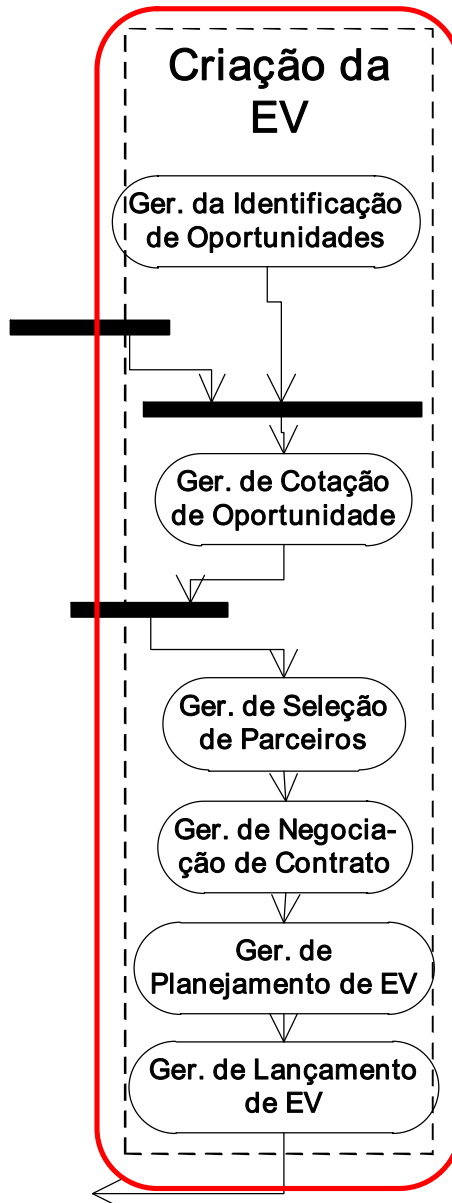
- Duas atividades principais:
  - Recrutamento de membros e
  - Instituições de suporte.
- Antes de recrutar, as competências estratégicas precisam ser definidas.
- Cada candidato deve ser avaliado.
- Caso o candidato seja selecionado, seus papéis são definidos e sua infra-estrutura de TIC é implantada.
- Tendo tudo isso preparado, o ACV pode ser lançado.



## Gerenciamento do ACV



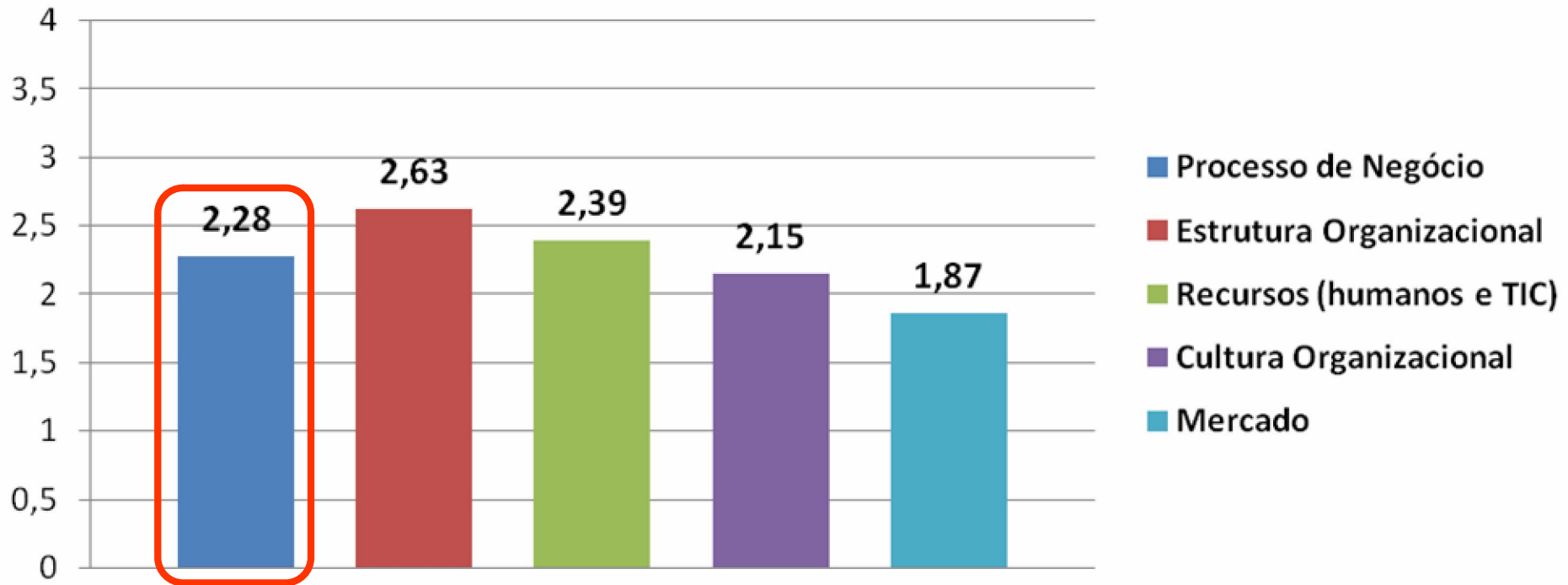
- Gerenciamento do ACV:
  - Inicia-se implantando o gerenciamento de Membros e TIC.
  - Após, implanta-se a atividade de gerenciamento de Competências e Perfis.
  - Por fim, em paralelo, são implantadas atividades de gerenciamento Financeiro, de Marketing, Desempenho, Aquisição, Confiança, etc.



- Criação da EV:
  - Inicia com o gerenciamento de Oportunidades de Colaboração.
  - O gerenciamento de Cotações é a próxima atividade.
  - As atividades restantes são implantadas e paralelo: Seleção de Parceiros, Negociação de Contratos, Planejamento e Lançamento da EV.



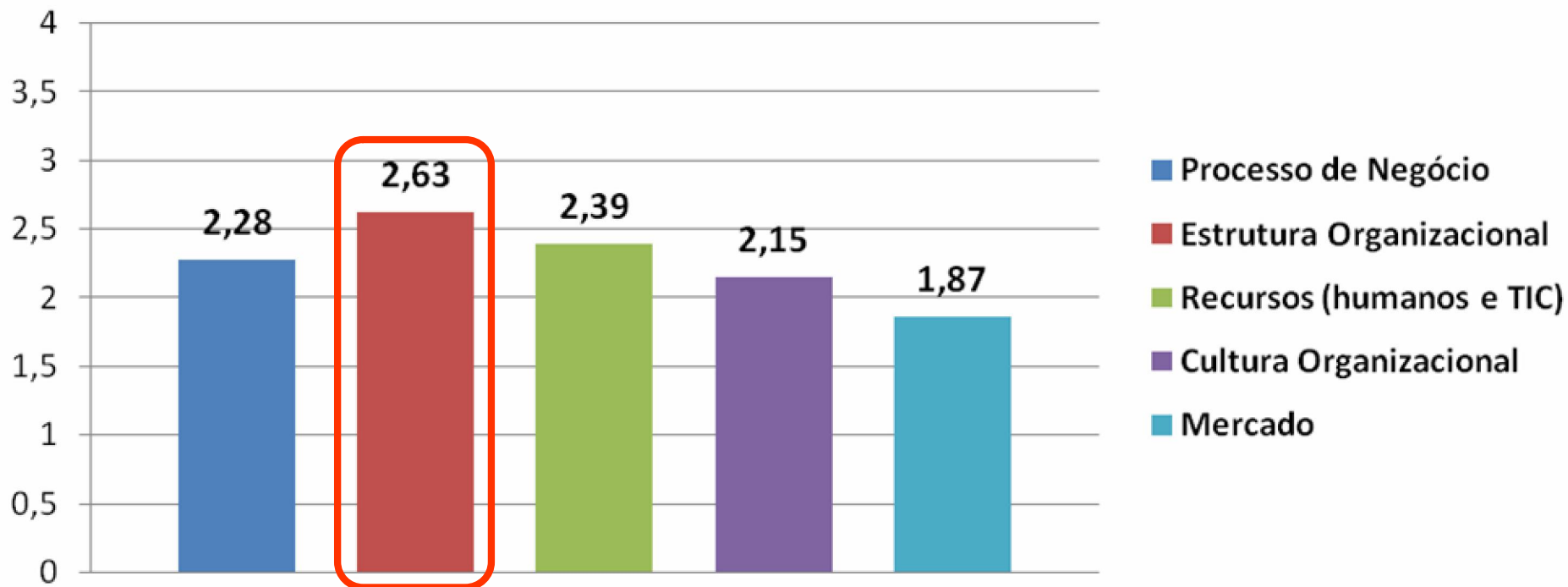
## Grau de Preparação em cada Perspectiva



- Preparação ruim
- Grau de preparação heterogêneo
- Aspecto fundamental na implementação do ACV



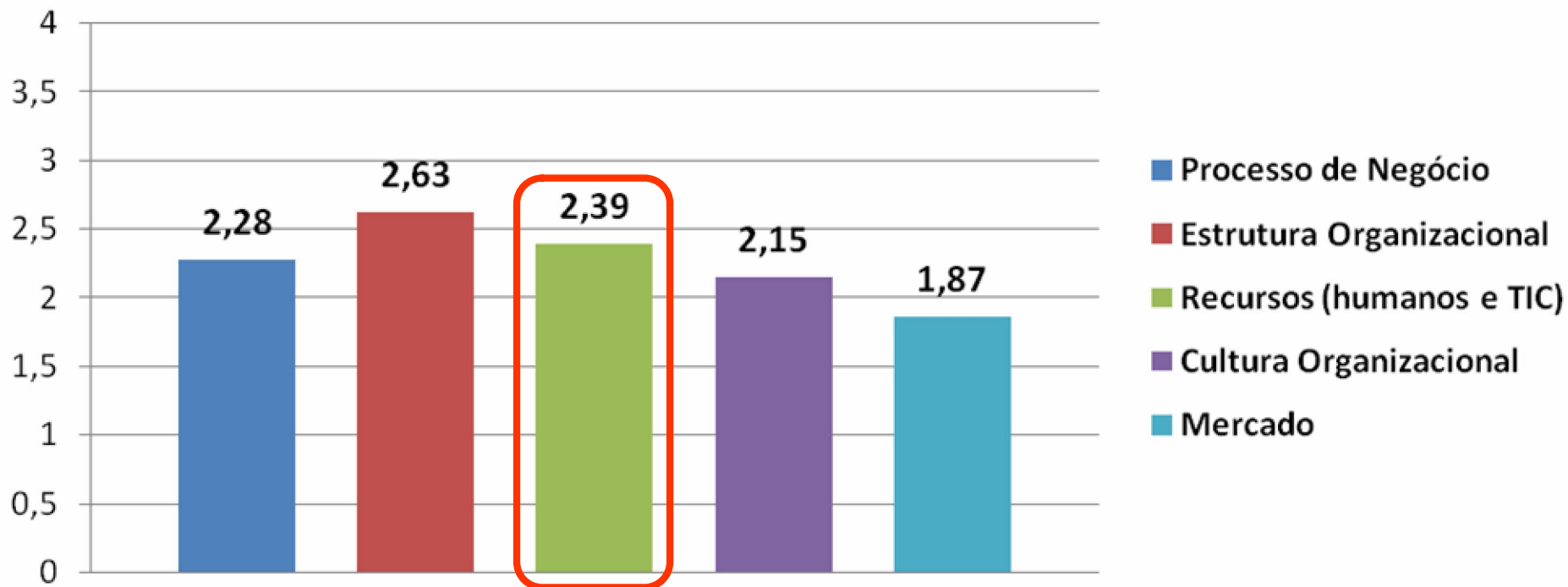
## Grau de Preparação em cada Perspectiva



- Melhor grau de preparação
- A maioria tem preparação próxima da média
- Aspecto pouco relevante para a implementação do ACV



## Grau de Preparação em cada Perspectiva

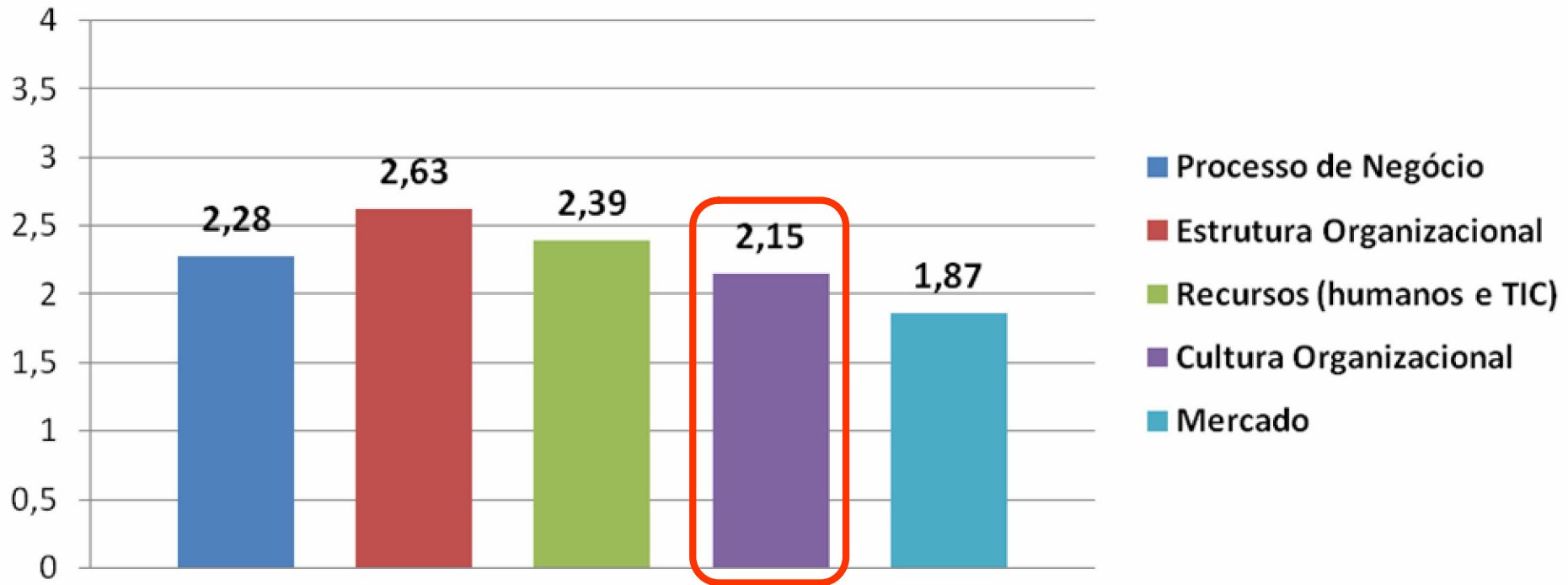


- Preparação razoável
- Grau de preparação muito heterogêneo
- Dificuldade de implantação do ACV devido à disparidade de preparação





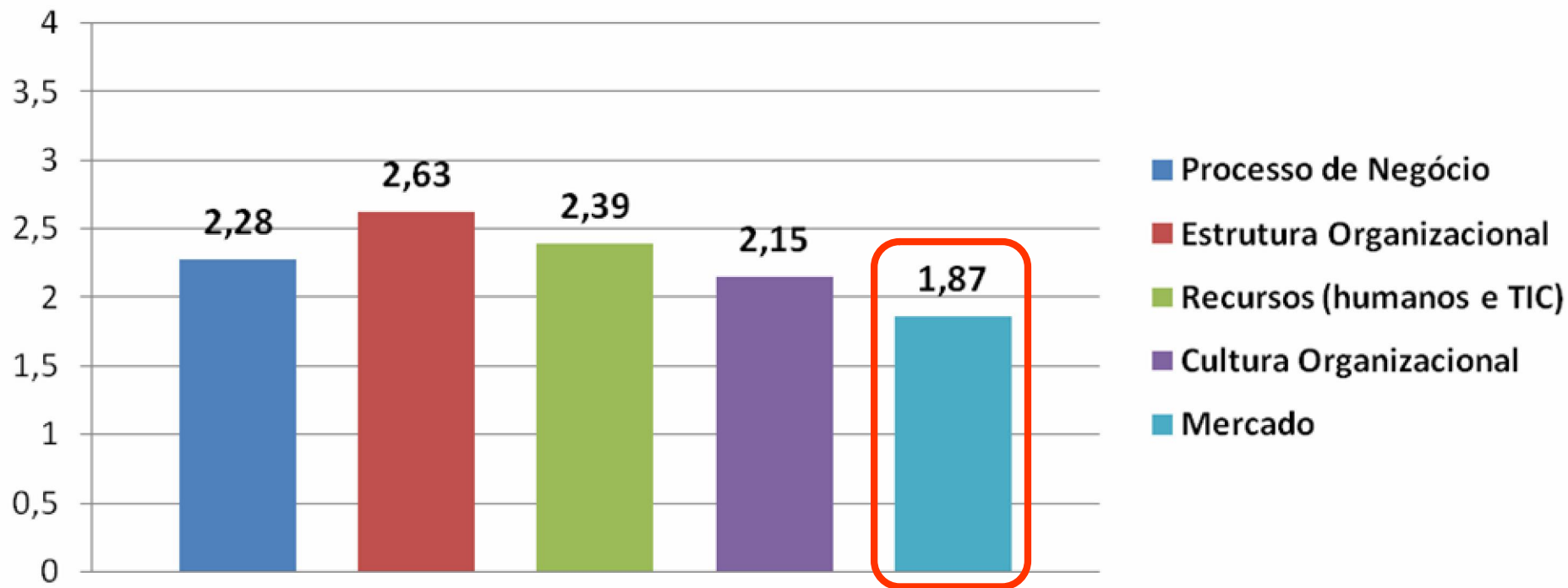
## Grau de Preparação em cada Perspectiva



- Preparação ruim
- Pouco estímulo a colaboração entre empresas
- Melhorias visíveis apenas a longo prazo



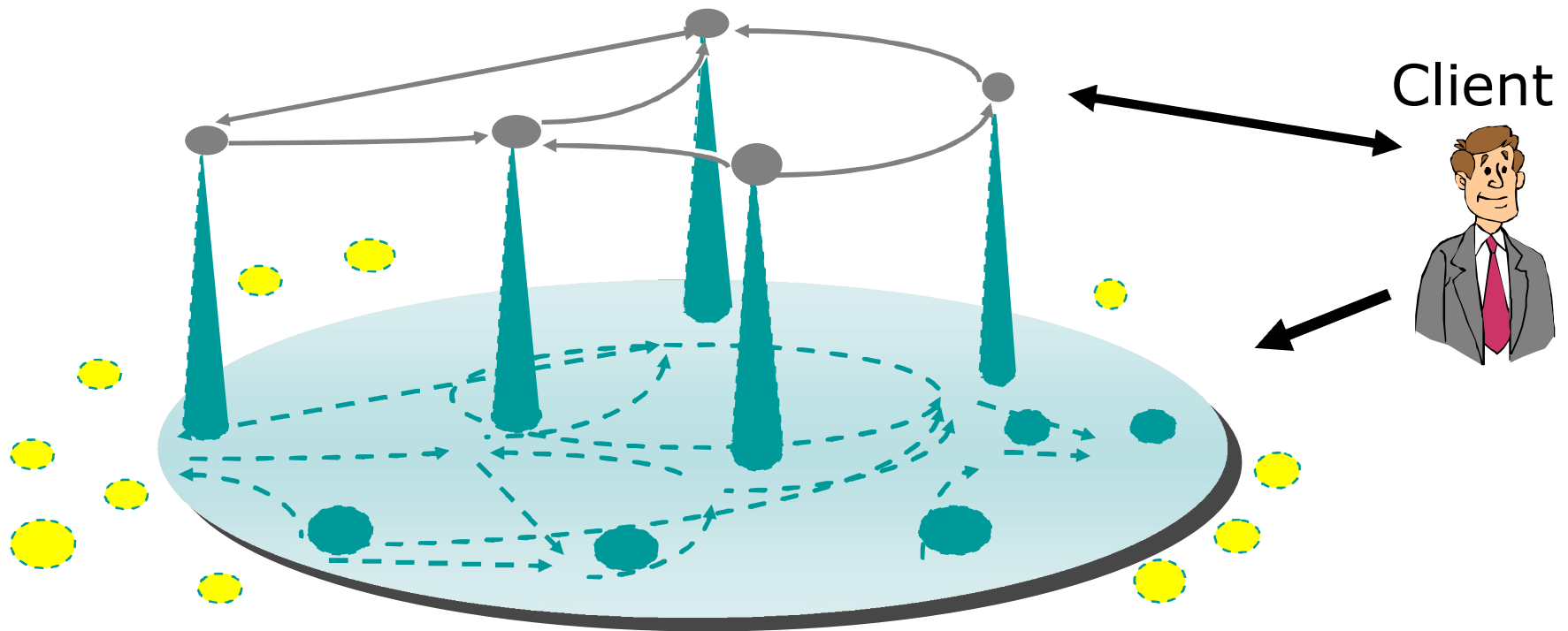
## Grau de Preparação em cada Perspectiva



- Preparação péssima
- Não existe planeamento estratégico
- Melhorias visíveis a curto prazo



## Virtual Enterprise (VE)



## Virtual Organization Breeding Environment (VBE)



## Benefícios de Atuar em um ACV & EV

- Compartilhamento de recursos com outras empresas e atuação como uma única empresa (a EV) perante o cliente;
- Compartilhamento de gastos, ganhos e riscos entre os membros;
- Tirar melhor proveito de economia de escala e do seu tamanho;
- Acesso e troca de conhecimentos acerca de novas tecnologias e melhores práticas;
- Acesso a novos mercados através das alianças criadas e da flexibilidade de entrar/sair em/de delas;
- Maior e melhor percepção de novos nichos de mercado.
- ... e muitos outros ...