



UNIVERSITÀ DEGLI STUDI DI TRENTO  
FACOLTÀ DI ECONOMIA

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## Ontologies as Intra-Organizational Coordination Tools



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## Aims of the presentation

- To introduce the concepts of interdependency between organizations and technologies
- To explain the concept of coordination within organizations
- To underline that:
  - standardization is only one of the most important coordination processes
  - two other coordination processes are needed: by plan and by mutual adaptation.
- To sketch out how ontologies might sustain all the three coordination processes through different types of meaning negotiations



In dynamic environments Knowledge Management should be considered as a crucial asset in knowledge-based organizations with the aim of unveiling, organizing and making knowledge available

Thus knowledge based technology (taxonomies, classifications and ontologies) has been introduced in organizations



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## Considering ontologies, organizations haven't to pray for successful ontology based applications

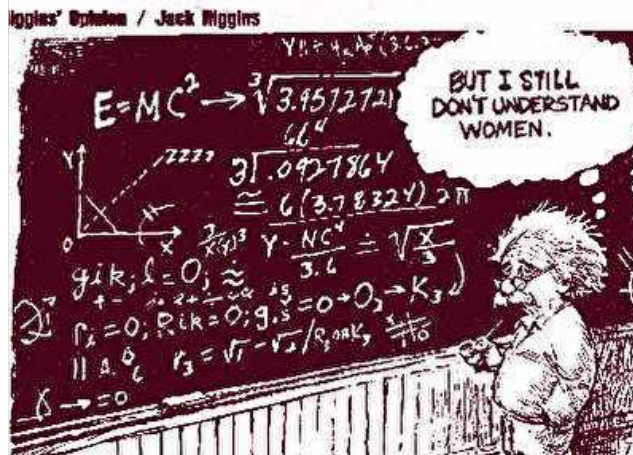
**Please, make “ontologies” work  
and make me rich**





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... awareness of how, ontologies could practically help organizations: delivering new products and services; creating new business value.



Ontologies should be compatible with the industry core technology (technology interdependencies [Orlikovski, 1995] )





## Core technology and coordination processes

- The “**core technology**,” (the system of activities, processes, values, and all the resources needed to obtain organizational aims and changes [March & Simon, 1958; Cyert & March, 1963; Thompson, 1967].) **of firms is based on the coordination of a constellation of units** (i.e. Adm, R&D, specialized outsourcing activities).
- All these units cannot be fully controlled by a unique subject, and might grow and differentiate their activities (technologies) in an autonomous way, coexisting as in a bio-functional system [Maturana & Varela, 1980] (i.e. Networked companies, multinational firms, virtual organizations, virtual value chains, etc.)



## How can organizational units be coordinated in order to sustain innovation?

- Innovation emerges from the continuous and unpredictable encountering of different units and **their knowledge and technologies might enable the creation of an unexpected and innovative combination of processes and products** [Chandler, 1962].
- In organizational studies, coordination processes can be managed through:
  - technologies and high technologies used within firms,
  - different organizational models, such as various level of hierarchies [Galbraith, 1973; Rossignoli, 2004; Lomi, 2003]



## Different types of analysis

- **Based on the information strategy:** anarchy, hierarchy, feudalism, and federalism of information [Davenport, 1998];
- **Based on the types of technology:** continuous flow production, units (or tailored) production, and mass production [Woodward, 1965];
- **Based on the types of interdependencies among units:** standardization; plan; and mutual adaptation [Thompson, 1967];
- etc.



## Coordination...

- **by standardization:** the coordination processes can be managed through routines, scientific analysis, best practices, etc
- **by plan:** the coordination processes can be managed through small changes and choices among a series of routines and standard processes
- **by mutual adaptation:** the organizational units are completely interdependent and need to communicate and share knowledge in a semi-casual mode, or by non predefined processes.



## Formal ontologies

- *“the systematic, formal, axiomatic development of the logic of all forms and modes of being” [Cocchiarella, 1991].*
- a formal ontology provides an explicit specification of a shared conceptualization which describes semantics of data, providing a shared and common understanding of a domain [Gruber, 1998; Jasper & Ushold 1999].



## Formal ontology in action

- FO allows to develop a shared viewpoint as the result of a meaning negotiation process.
- Thus, it seems natural to think about **ontology as the shared and stable result of meaning negotiation, as the common conceptualization that people and units will consider as standard in a coordination process.**



## Coordination processes

✓ **By standardization**

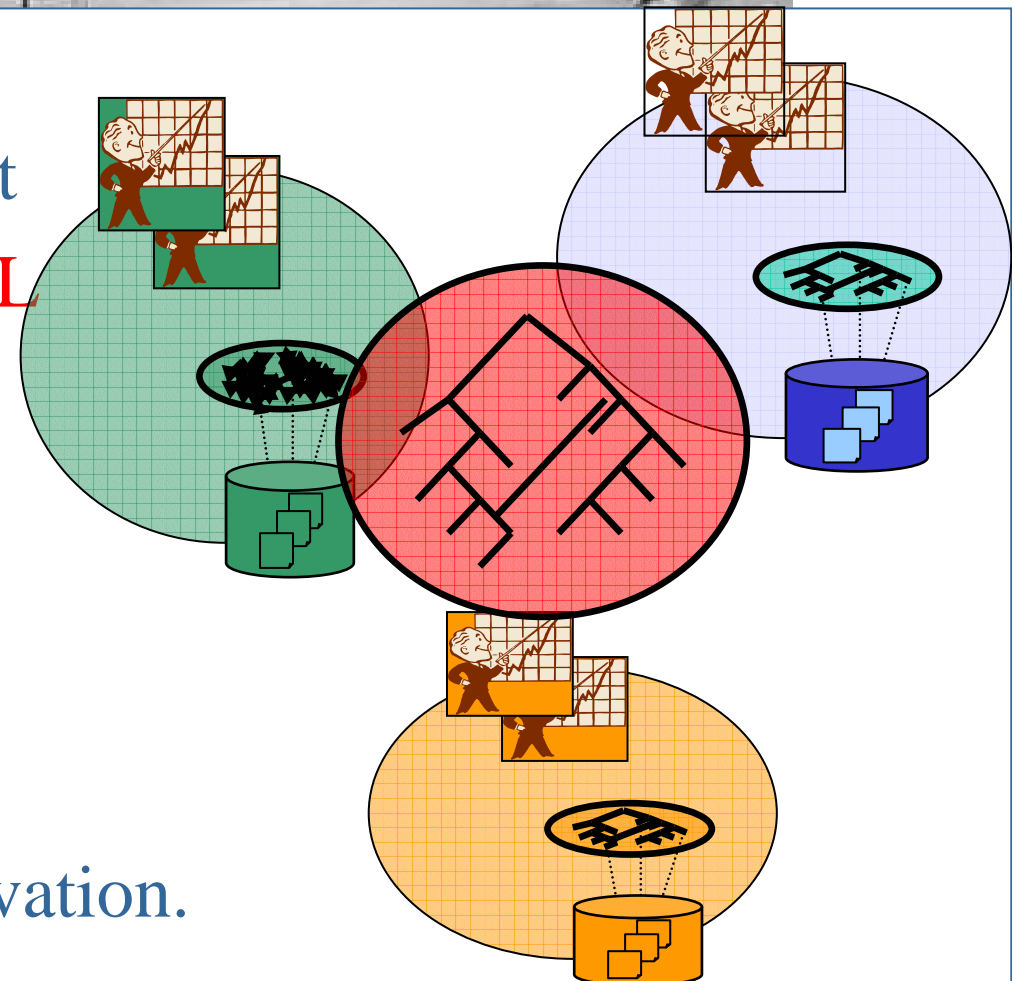
? **By plan**

? **By mutual adaptation**



## Coordination processes are difficult (complexity increases and technological solutions become inadequate)

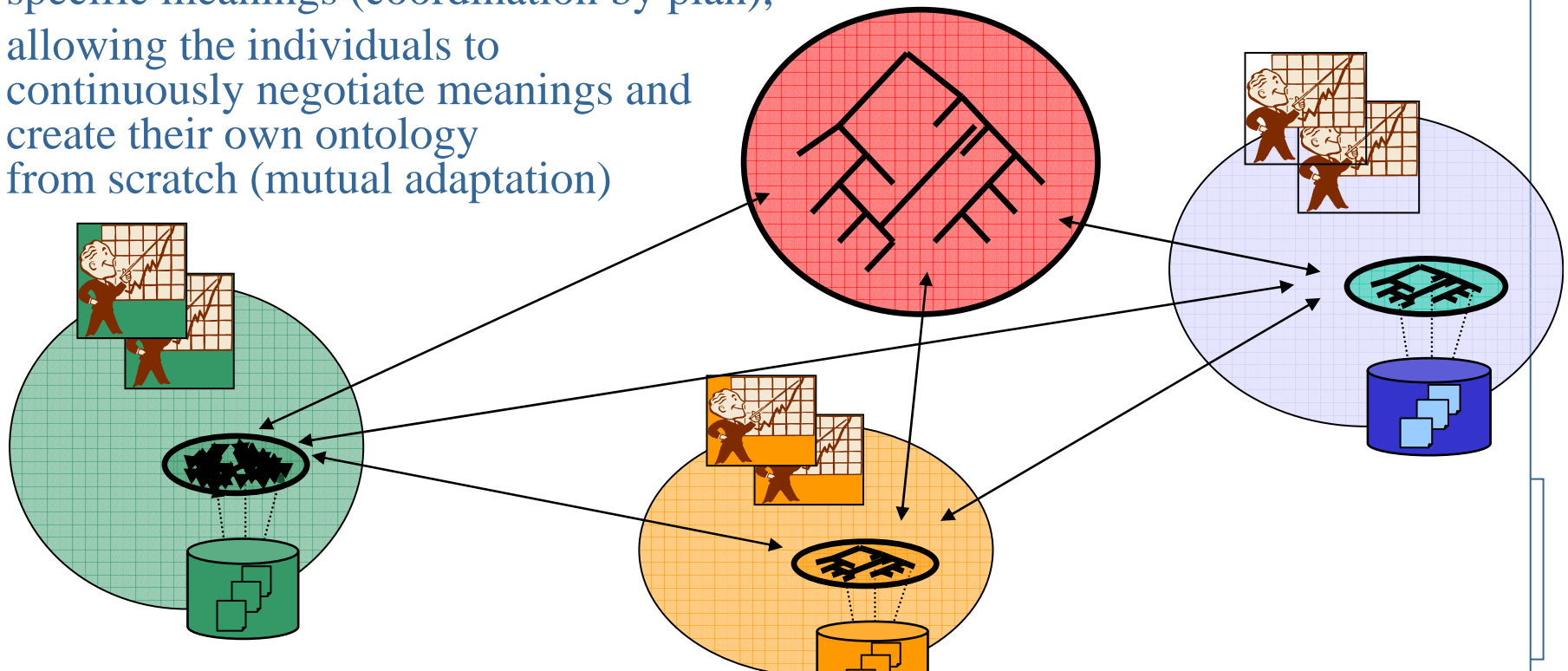
It became anyhow clearer that it is **NOT ALWAYS USEFUL** to have meaning negotiation processes whose result is **A SINGLE AND STABLE CONCEPTUALIZATION**, since this violates the assumptions of KM and innovation.





## What is really necessary?

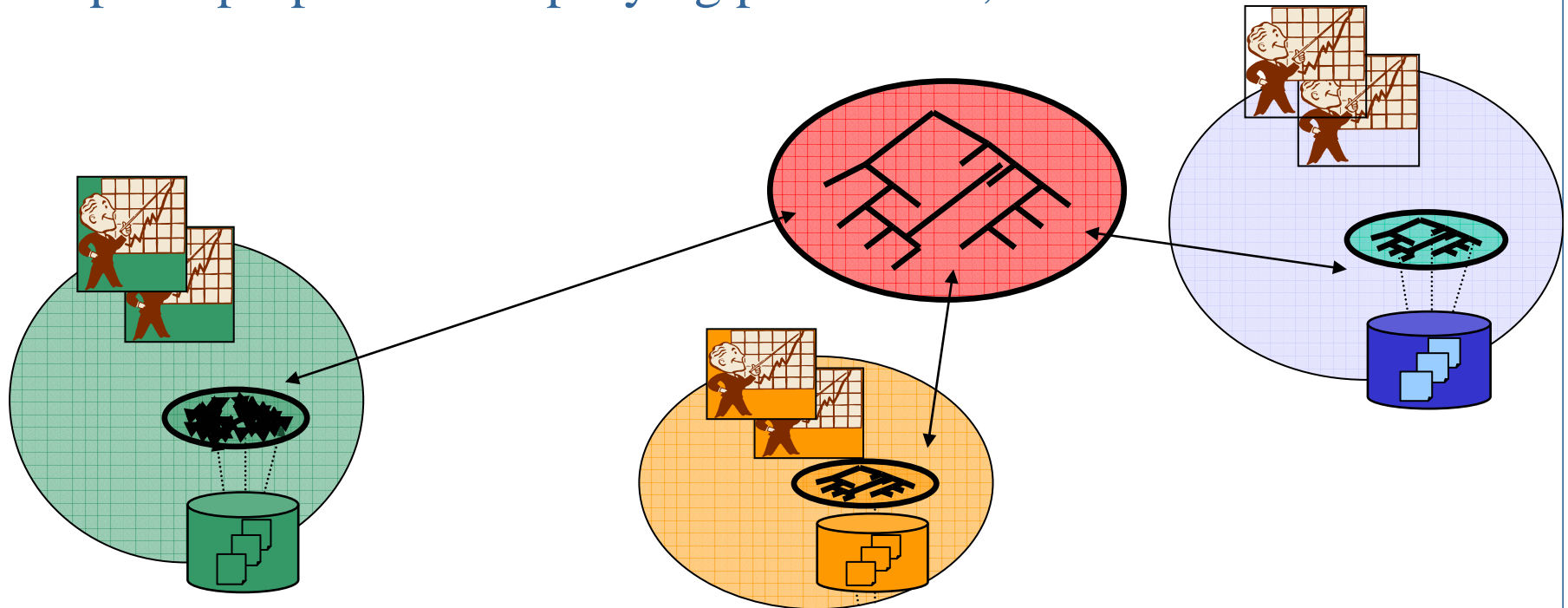
- (i) guaranteeing reference to unique definitions (standardization of concepts),
- (ii) leaving the individuals of the organization free to use their own terms, with specific meanings (coordination by plan),
- (iii) allowing the individuals to continuously negotiate meanings and create their own ontology from scratch (mutual adaptation)





## Coordination by standardization

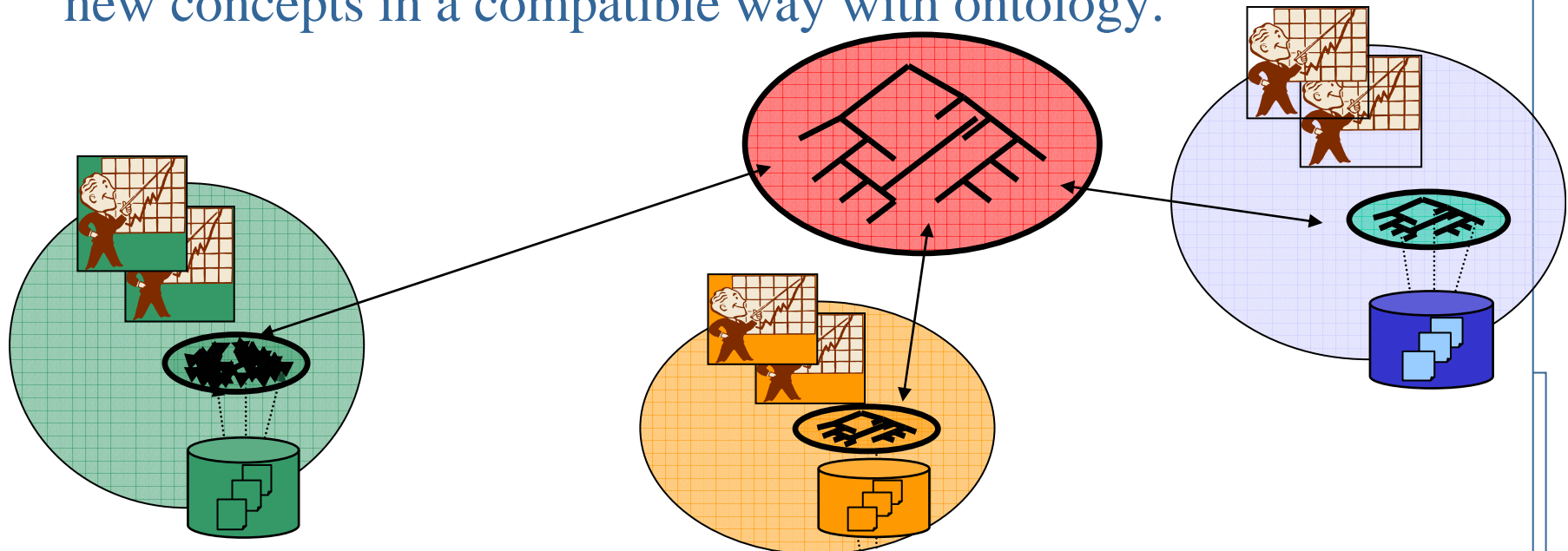
the agreement has a significant temporal duration it makes sense to provide standardization tools for complex organization, with the explicit purpose of simplifying procedures;





## Coordination by plan

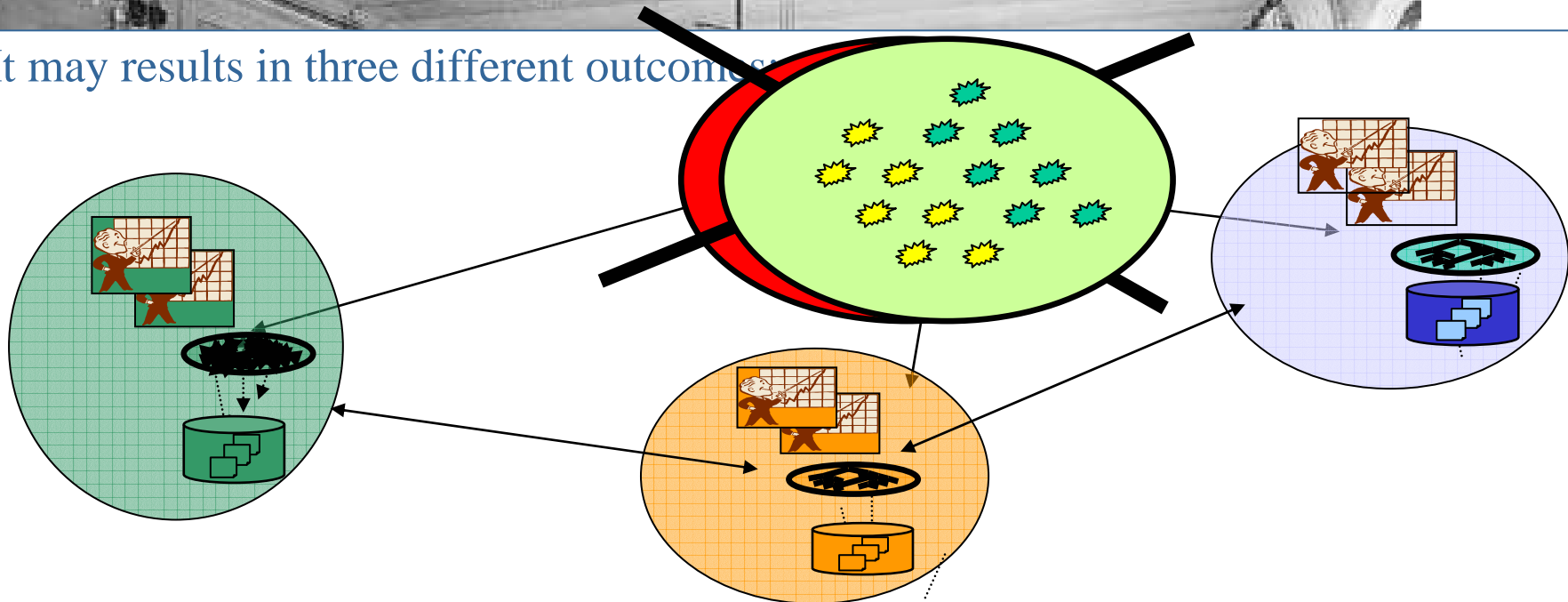
terms do not need to have a complete axiomatization, and therefore it is possible that different users have different beliefs compatible with the same ontological assumptions, and specify new concepts in a compatible way with ontology.





## Coordination by mutual adaptation

It may result in three different outcomes:



- (1) a new agreement about properties that have not yet been actually defined;
- (2) a temporary agreement on properties that permit knowledge sharing, based upon some standard, already accepted in the process of negotiating;
- (3) a radical disagreement in favor of another one



## FO in the coordination...

- by standardization: FO consists in the intentional definition, adoption and respect of a stable (in terms of time) agreement upon the meaning of the domain conceptualization;
- by plan: FO consists in a general ontology that could be specified for different situations depending on the real situation workers have to deal with;
- by mutual adaptation: FO is the typical outcome of negotiations that cannot have as an outcome stable agreements, because the purpose of the process is to agree on a temporary basis upon a meaning.



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**Thanks for your attention !!!**



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**Any question?**



## Some references

- Bonifacio M., Bouquet P., Cuel R., 2002 "The Role Of Classification(S) In Distributed Knowledge Management". In Proceedings Of "6th Int. Conf. KES'2002", IOS Press
- Brown J.S., Duguid P., 1991 "Organizational Learning And Communities-Of-Practice: Toward A Unified View Of Working, Learning And Innovation"; Organization Science, 2
- Cristani M., Cuel R., "A comprehensive guideline for building a domain ontology from scratch". Atti del convegno I-KNOW '04, Graz, Austria, 2004
- Cuel R., Bouquet P., Bonifacio M., 2005 "A Distributed Approach to Knowledge Management, the Concept of Knowledge Nodes, and their Implications" Schwartz D.G. Ed., Encyclopedia of Knowledge Management
- Cuel R., Cristani M., "Ontologies as Intra-Organizational Coordination Tools" in Proceedings of I-KNOW '04, Graz, Austria, 2005
- Orlikowski, W. J., Robey, D., 1991. "Information Technology and the Structuring of Organizations". Information Systems Research, 2(2).
- Thompson J.D., 1967. "Organizations In Action", Mac Graw Hill
- Woodward J., 1965. "Industrial Organization: Theory And Practice", Oxford University Press, Londra



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