PVTT

Enabling unthinkable

Information Sharing Framework for Agile Command and Control in Complex Inter-domain Collaboration Environment

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Motivation

- All vital functions of societies and various globally functioning organizations are dependent on cyber world.
- All operations on the common domain require various kinds of information sharing activities.
- More and more of those information sharing activities are taking place in the cyber world.
- (Information) Access management is complex challenge.
- When seeking cooperation with various actors there will be no overtaking authority to take a role over collaborative parties, because that would be inappropriate and counter productive.
- Comprehensive information sharing framework will enhance the overall understanding about producing and distributing relevant information in various situations.

Research Approach

- The research question is: “In what manner can various approaches of the information exchange and assurance be combined together to develop a comprehensive model to enhance the construction of information exchange solutions.”

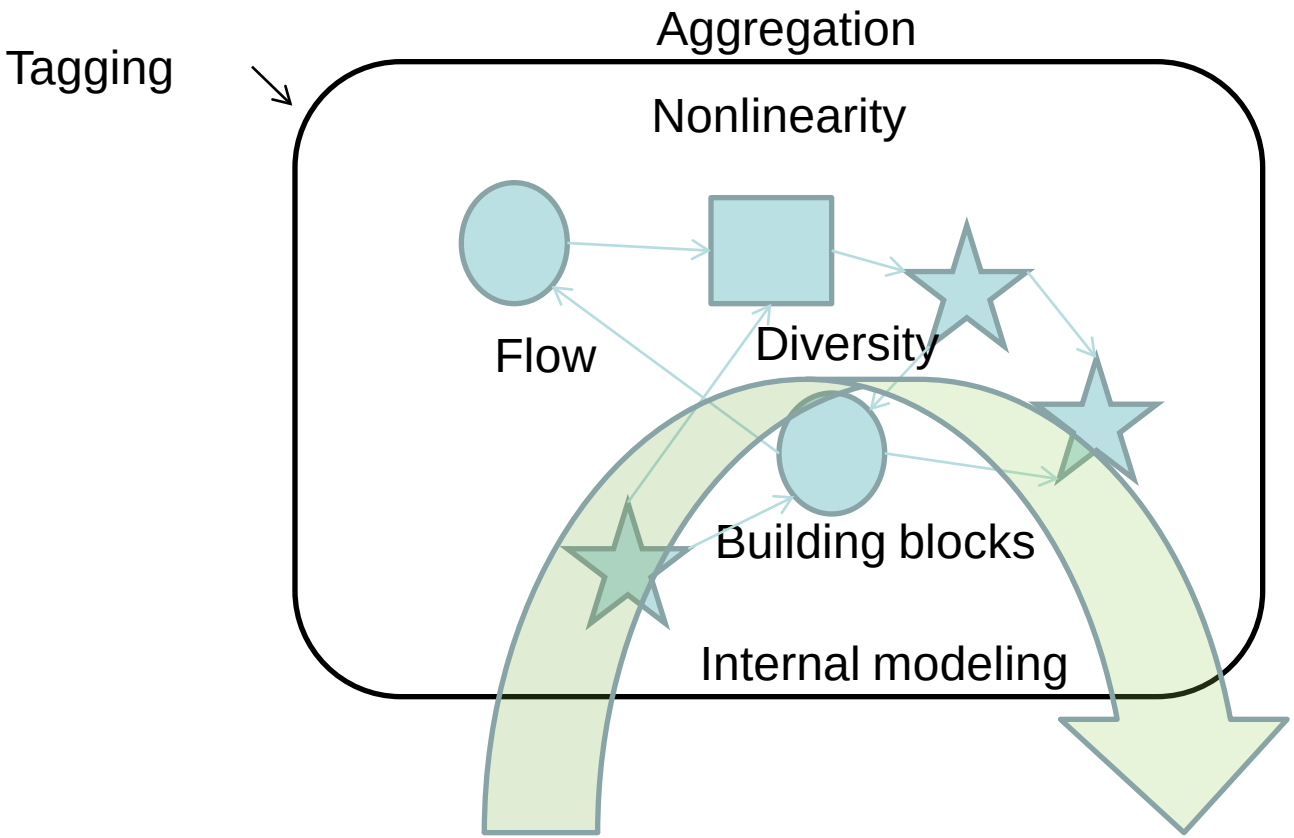
- Approach to information is framework and universally oriented pursuing to increase understanding about information exchange situations offering user focused approach to develop dynamic knowledge discovery solutions.
- The scientific approach is hermeneutical supported by validating empirical results.
- The research approach is cross-disciplinary.
- Research strategy is constructive pursuing to develop a generic model for practical purposes.

Theoretical Basis

- Theory for deepen the understanding about complex information exchange situations originates to complex adaptive systems (CAS) theory.
- Human information exchange framework is based on systems thinking, communication philosophy, sociology, cognition philosophy, organization theory, organizational culture, knowledge management and decision support systems.
- The findings are interpreted as information sharing policy suggestion using the theory of complex adaptive systems (CAS) as a reference.
- Empirical material is collected during national and international inter-organizational cooperation exercises between 2005 and 2008. Individual results of those studies have been published on academic conferences and research reports.

A CAS Entity

The theory of complex adaptive systems (CAS) by (Holland 1996) aims at to explain the chaotic nature of multi-actor interactive system on the viewpoint of one actor.



Hypotheses of Present Communication Activities

- Typically information is categorized by content and it is defined by subject of interest. Information exchange strategies are based on these content based aggregations.
- (Social) communication networks are defined by subject of interest.
- The outcome of nonlinear interacting system is frequently attempted to tame with complicated information categorization models and precise procedures.
- Information flow between various interactive entities is controlled by content and amount.
- Typically diversity is seen case by case without taking account the comprehensive wholeness
- The evolution of internal models is relatively slow thus making novel communication situations with unseen parties somewhat challenging.
- The building blocks of creating common models for releasing and receiving relevant information will be different amongst different communicative actors.

Information Sharing Strategies

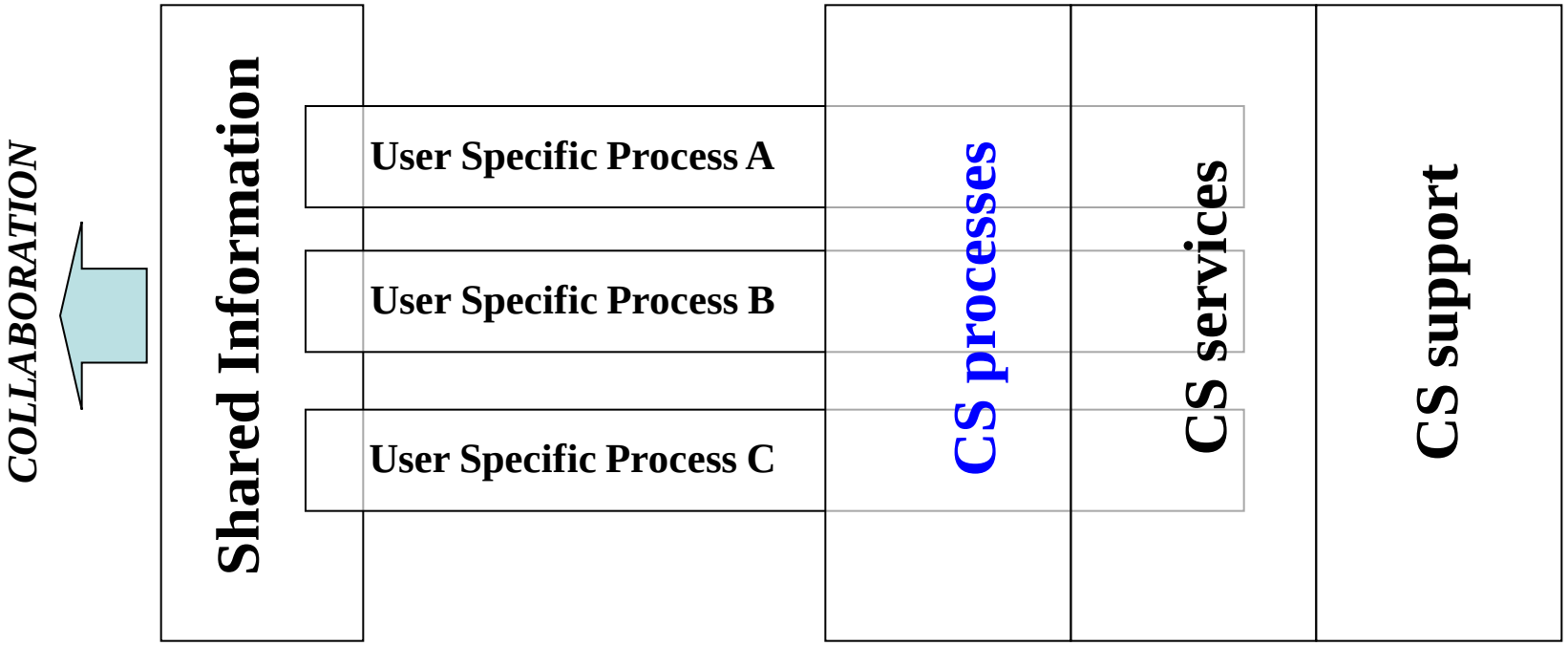
- Different information sharing strategies may be chosen to create understanding, acceptance and cooperation. Information releasing strategies can be expressed as follows:
  1. I share everything.
  2. I share nothing.
  3. I share to suitable degree by rationing out with nominated (subjective) criteria.
  4. *I share to suitable degree by releasing relevant type of information content related to criteria defined by working environment and situation.*

Strategy 4 – Fundamental Idea

- “I cannot exactly know the specified content information needs of my partners, but I can know the overall features of the working environment and the situation, where my partners are. If I know this, and I know what types of information (what kind of information exchange profile) is required to handle this kind of situation I can guide (and maybe control) my information publishing towards to release situation bound relevant kind of information and avoid to release unnecessary information.”

- Strategy 3 obeys rules that categorize or classify the information content itself while strategy 4 relies on the understanding of the universal fundamentals of communicative situations.

Collaboration Support Information Exchange Architecture



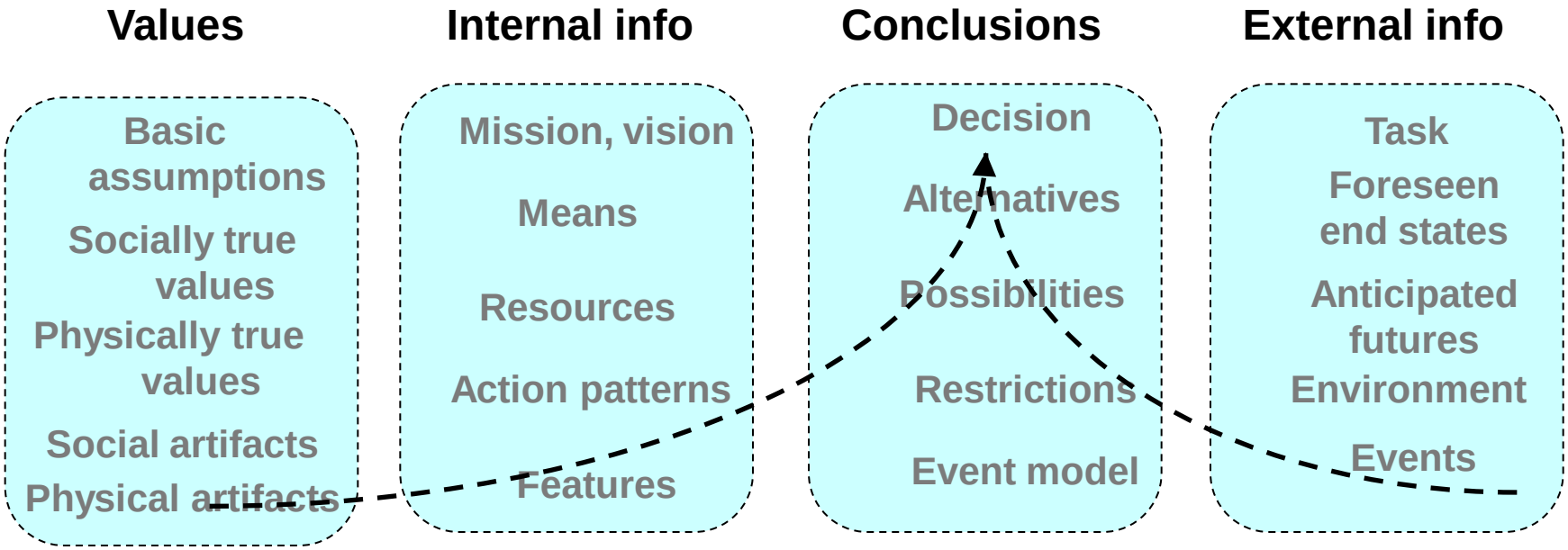
Conclusive Statements of CAS-based Approach on Complex Information Sharing Strategy

- Aggregation shall be done on the basis of collaboration context and situation instead of only communicated information content. Second order aggregation describes in that case the nature of cooperation instead of the meaning of each collaborative party.
- Tagging supports context and situation based aggregation.
- Nonlinearity is not tamed.
- Information flows are controlled by the demands of collaboration context and situation.
- Diversity is not controlled or forced.
- Individual tacit internal models are not tried to harmonize.
- Building blocks are situations instead of organizations or other actors.

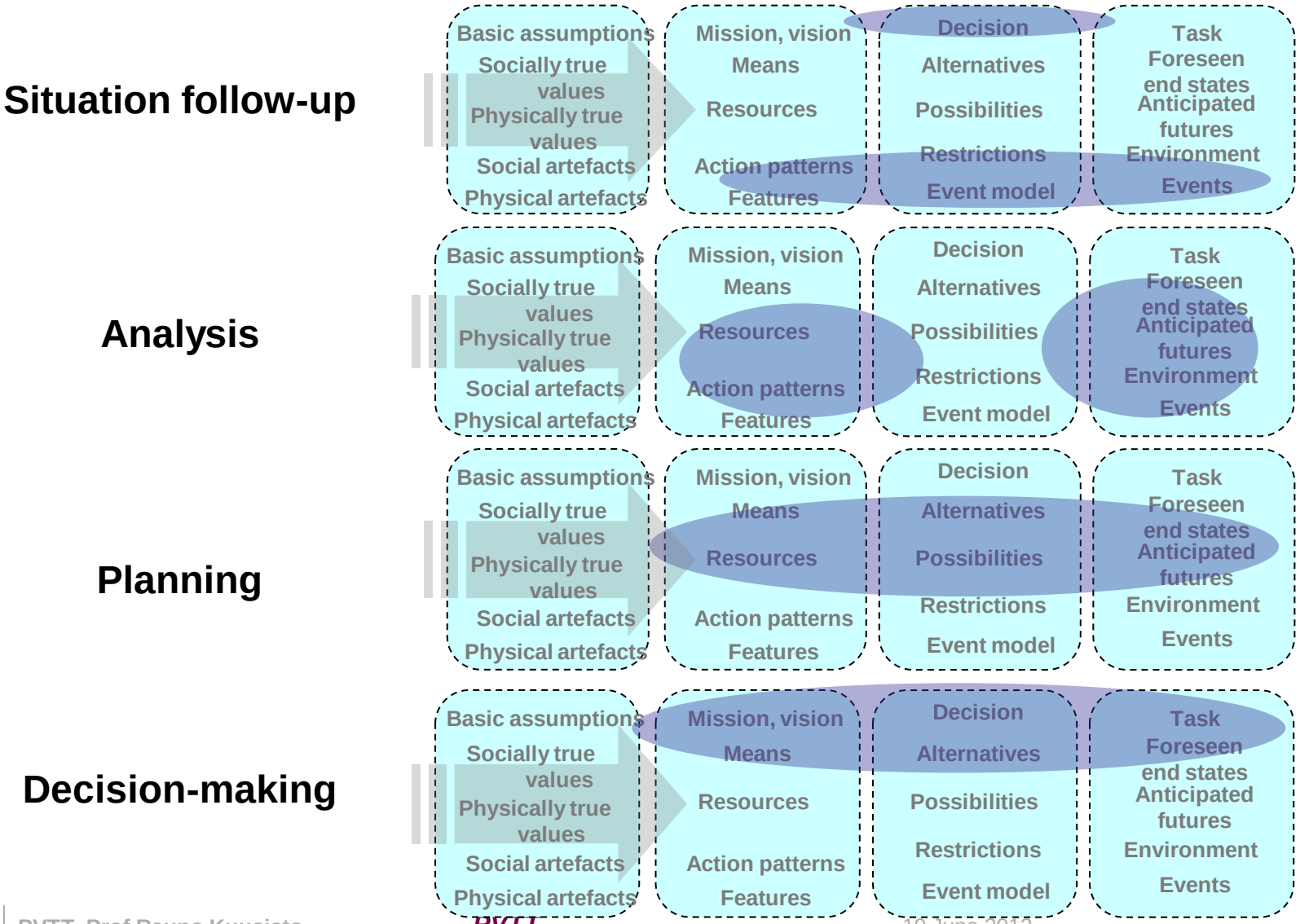
Information Approaches

- Organizations have different structures. However, organizations are formed and operated by human beings, who exchange information in a human way. That makes all organizations – despite their different structures – act among similar principles.
- Information content is one of the criteria taken account when constructing information exchange systems and practices. Obviously, the content of exchanged information shall be such that collaborating parties can feel it to be relevant for their own or commonly conducted activities.
- According to the operating level of an organization or its part (strategic, operational, tactical, operating), the nature of the information content obviously varies. This means that information content shall be taken account when designing various kinds of technological support systems for organizations.
- This does not mean that *information content is the only criteria* for this design and construction process. Also, this does not mean that the generic information interest profile of certain kinds of actors in organizations is different.
- Decision-makers are interested in same type of information despite on what level they are in the organization. That is the phenomena we are delving in during following chapters.

Human Information Exchange Model



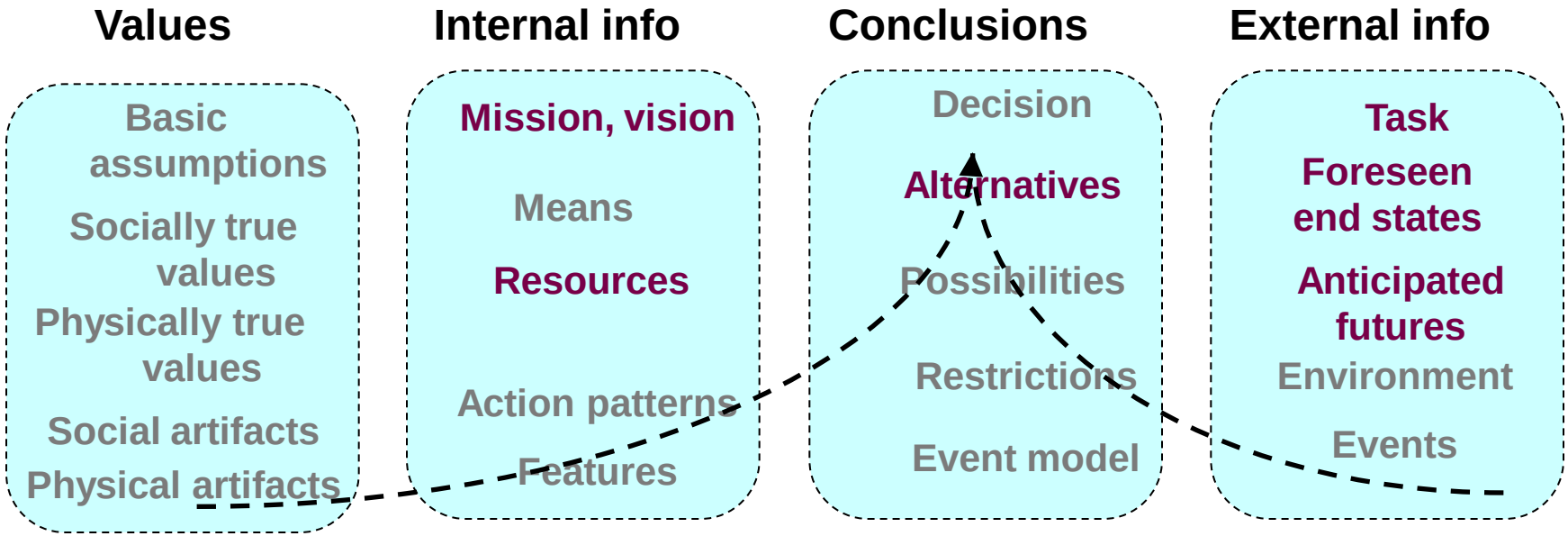
Role-based Info-sharing Profile Features



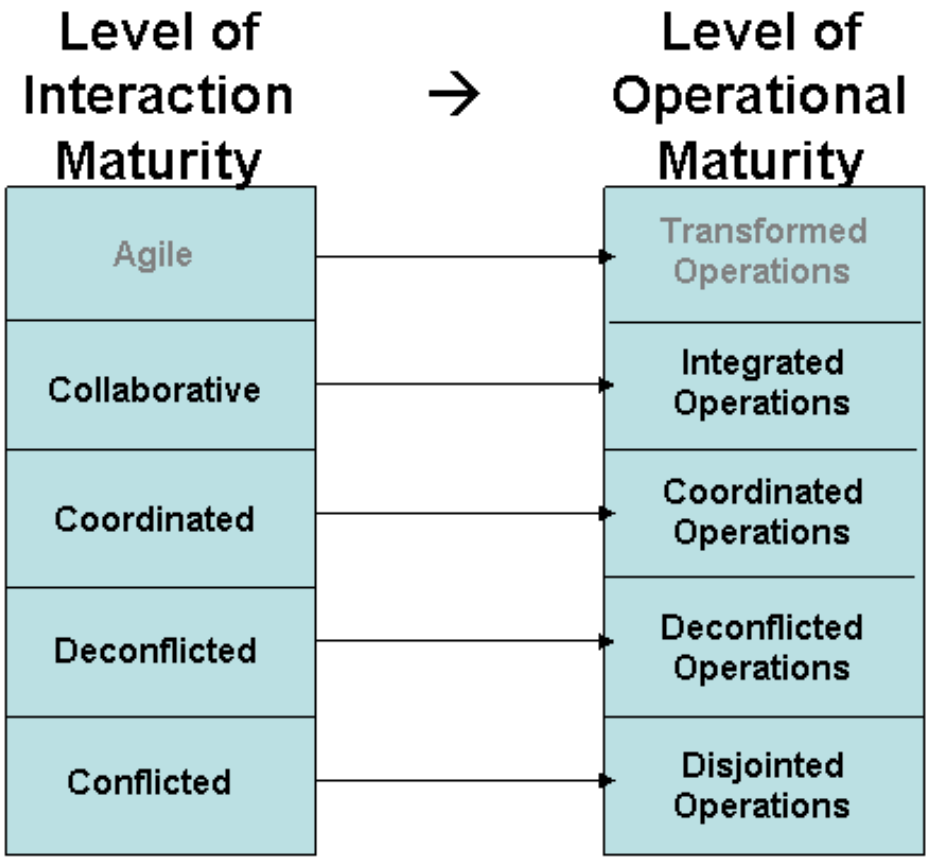
Information Sharing Profiles Correlated to the Phase of Activity

	Partnering	Planning preparation	Planning	Execution
Basic assumptions	**XX**			
Mission, vision	**XX**			
Decision		**XX**		**XX**
Task	X			X
Socially true values	X			
Means	**XX**	**XX**	**XX**	X
Alternatives to act			**XX**	
Foreseen end states			X	
Physically true values	X			
Resources	**XX**	**XX**	**XX**	**XX**
Possibilities to act		X	**XX**	
Anticipated futures		X	X	
Social artefacts				
Action patterns	**XX**	X		**XX**
Restrictions		**XX**	**XX**	
Environment			X	X
Physical artefacts	X			
Features	**XX**			**XX**
Event model		X		X
Events		**XX**		**XX**

Time Criticality of Information



Operational Maturity Levels



(Alberts & Hayes 2006, 85, Fig. 17)

Operational Maturity Development

De-conflicted

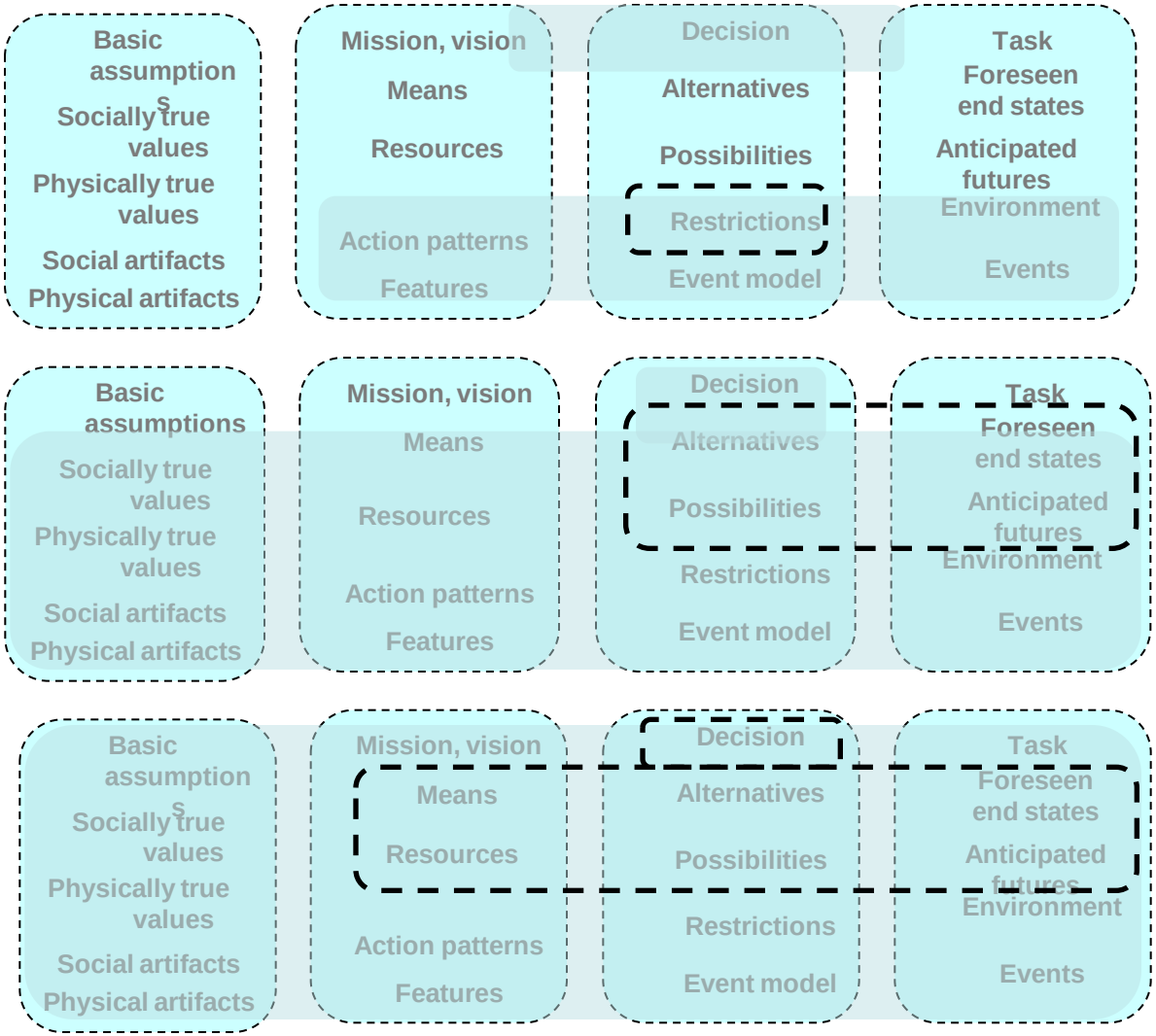
Situation is followed together

Coordinated

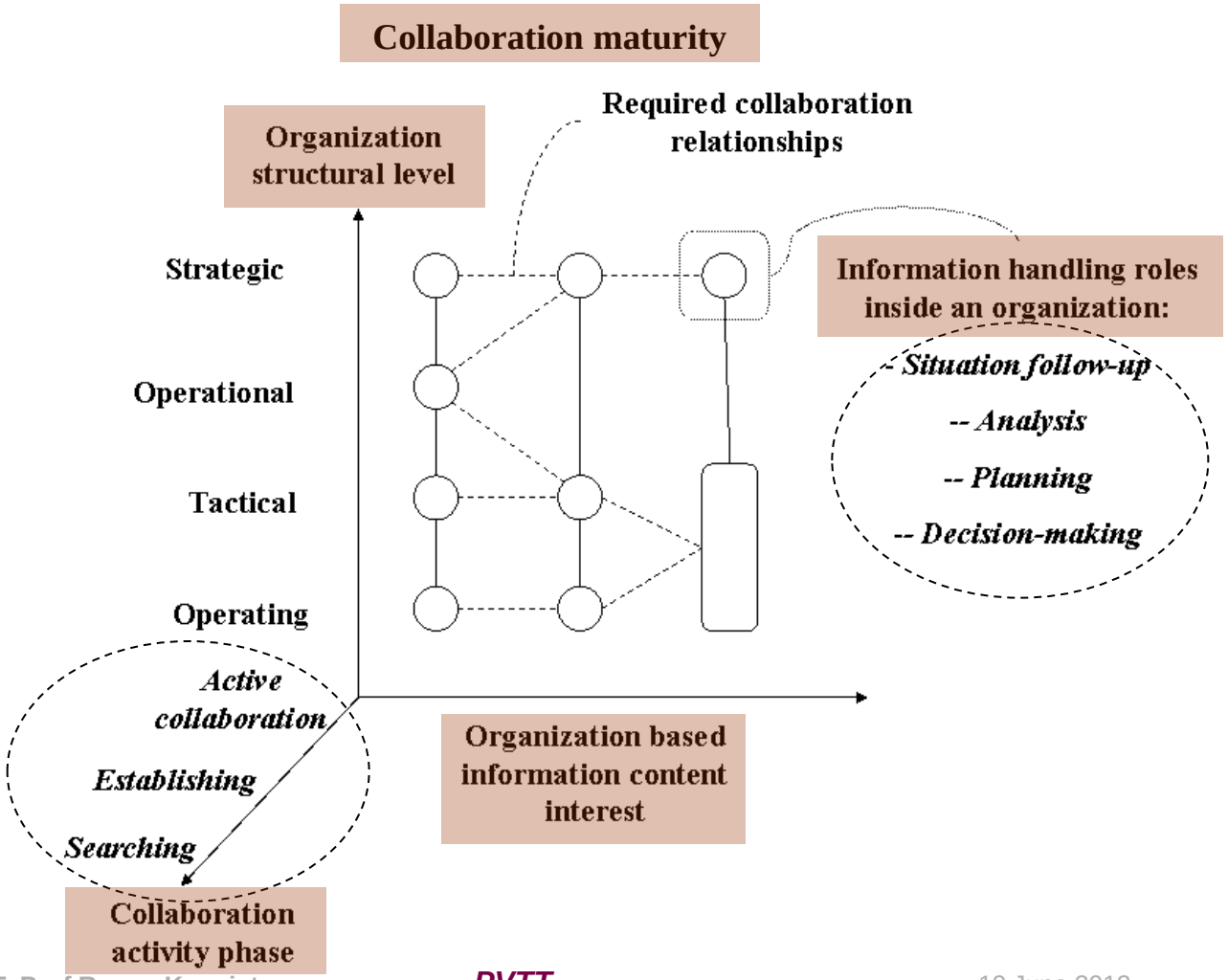
Also plans are made together

Collaborative

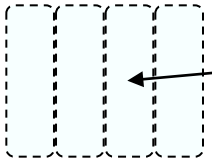
Information is analyzed and decisions are made together, too



Information Sharing Case-frame



Information Sharing Profile Frame

Activity phase *Role of an actor*	Searching collaboration	Discussing activities	Planning activities	Executing tasks
Decision maker	Information sharing profile f(S,D)	Information sharing profile f(D,D)	Information sharing profile f(P,D)	Information sharing profile f(E,D)
Planner	Information sharing profile f(S,P)	Information sharing profile f(D,P)	Etc…	Etc…
Analyst	Information sharing profile f(S,A)	Etc…		Etc…
Situation follower	Information sharing profile f(S,S)	Etc…	Etc…	Etc…

Every f(X,Y) is described by *Human Information Exchange Model*

Information sharing model correlated to phase of activity and the roles of actors

Decision maker

Planner

Analyzer

Situation follower

	Partnering	Planning prepared	Planning	Execution
Basic assumptions	XX			
Mission, vision	XX			
Decision		XX		XX
Task	X			X
Socially true values	X			
Means	XX	XX	XX	X
Alternatives to act			XX	
Foreseen end states			X	
Physically true values	X			
Resources	XX	XX	XX	XX
Possibilities to act		X	XX	
Anticipated futures		X	X	
Social artefacts				
Action patterns	XX	X		XX
Restrictions		XX	XX	
Environment			X	X
Physical artefacts	X			
Features	XX			XX
Event model		X		X
Events		XX		XX

Information sharing model at the level of de-conflicted operation

Decision maker

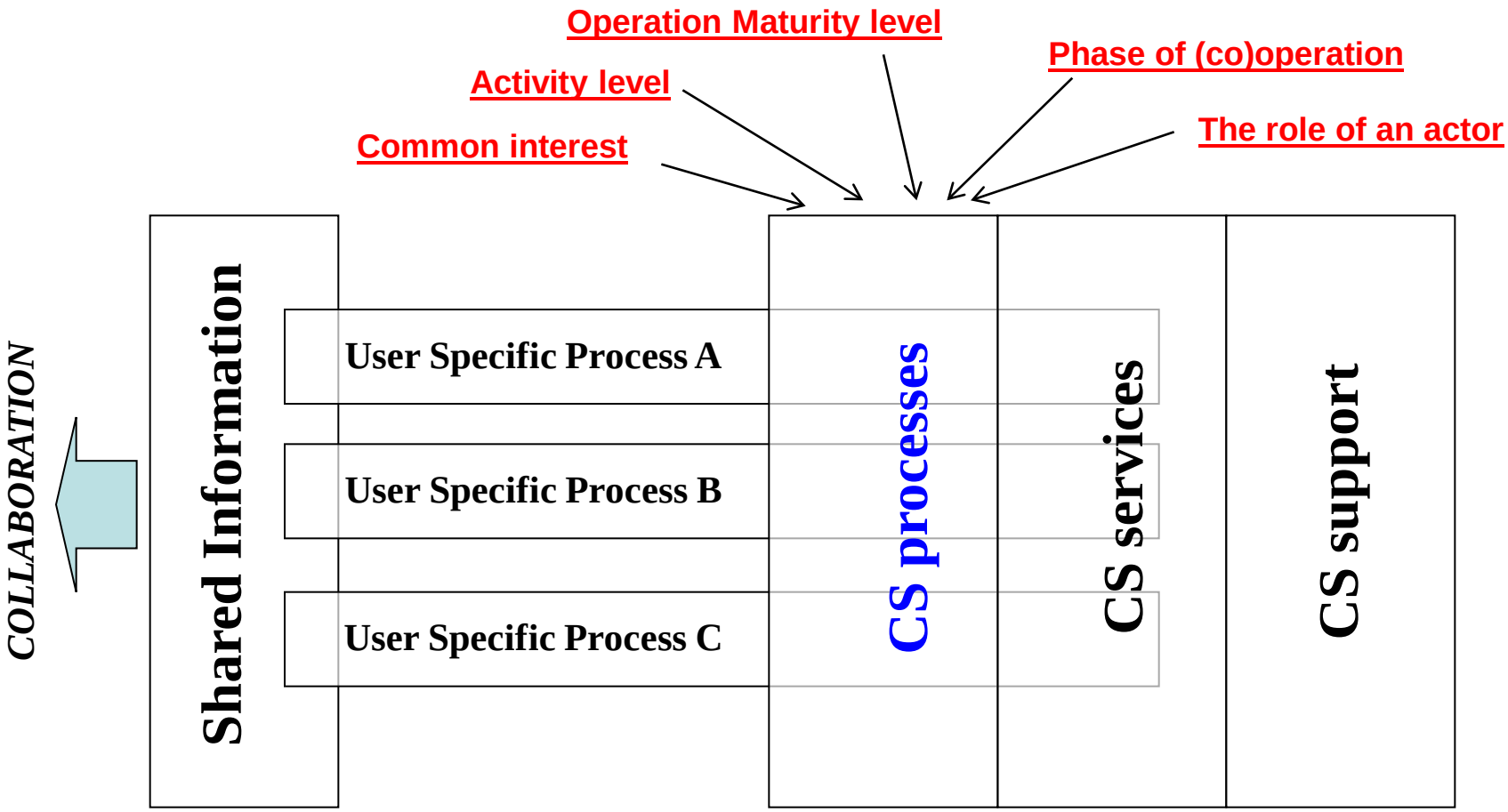
Planner

Analyzer

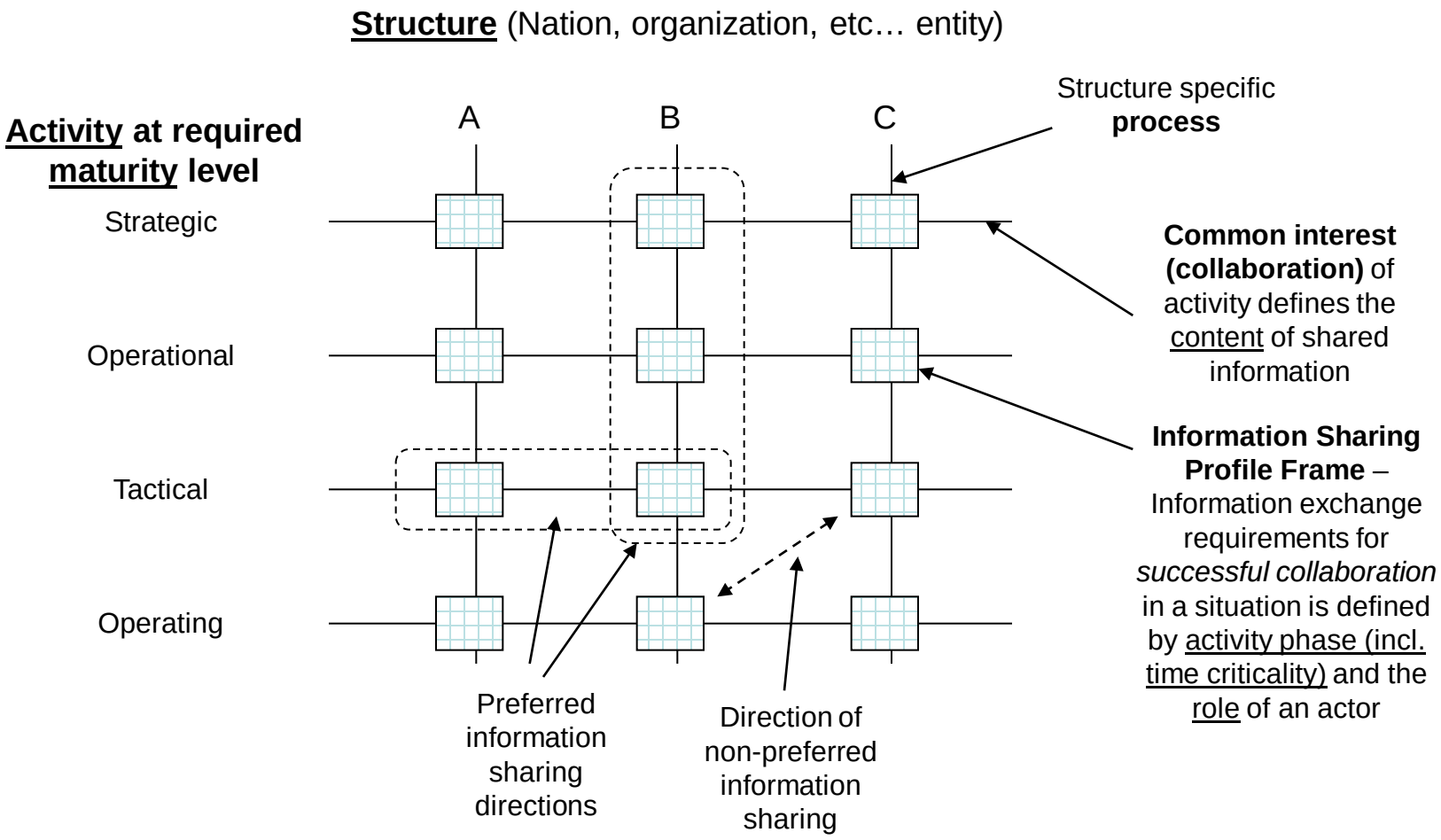
Situation follower

	Partnering	Planning prepared	Planning	Execution
Basic assumptions	**XX**			
Mission, vision	**XX**			
Decision		XX		XX
Task	X			X
Socially true values	X			
Means	**XX**	**XX**	**XX**	X
Alternatives to act			**XX**	
Foreseen end states			X	
Physically true values	X			
Resources	**XX**	**XX**	**XX**	**XX**
Possibilities to act		X	**XX**	
Anticipated futures		X	X	
Social artefacts				
Action patterns	XX	X		XX
Restrictions		XX	XX	
Environment			X	X
Physical artefacts	X			
Features	XX			XX
Event model		X		X
Events		XX		XX

Information Exchange Processes



Collaborative Information Sharing Framework



Discussion

- An information sharing framework for agile command and control in complex inter-domain collaboration environment was presented. It takes account not only the content of information but before all, the entire context, where information exchange situation takes place.
- This framework model helps to construct better functioning situation based information exchange and situation awareness systems in ever evolving and complex collaboration environment consisting of global commons glued together via cyber space.
- It shall be taken account that the data presented in this paper is not accurate as a data itself. The meaning of the data was to demonstrate the complex nature of the information exchange requirements in the multi-actor, networked working environment. Lots of generalization of the data was made to refine the nature of the fundamental phenomena of assuring the information required for comprehensive situation awareness and successful cooperation in complex inter-domain environment.
- Lots of research work needs still be done, before we can confirm all those hypotheses presented in this report.
- However, the basic features and relevant phenomena of releasing the right kind of information for cooperation were documented. Research shall be continued in a more detailed way to get various information exchange situations requirements confirmed in more precise way.

Thank You

…C's 'n' Q's…

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