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"Analyzing the Command and Control Maturity Levels of Collaborating Organizations"

Organizational Issues

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Analyzing the Command and Control Maturity levels of Collaborating Organizations

Abstract

In this paper we present a methodology to evaluate collaboration relationship maturity level on emergent cross-organizational networks. The methodology is based on the command and control maturity level model presented by Alberts & Hayes (2007). A human information exchange meta-model (Kuusisto 2004) is applied to this maturity model. We show that maturity level of potential or actual collaboration situation can be evaluated by making key word and key expression analysis both of released information content of certain organizations, and of the contents of the discussions between various organizations during their collaboration situation. We show that the knowing the topics of released information and discussions will be relevant information to guide collaboration support system design. The advantage of this kind of methodology is twofold. It does not require great amount of detailed data, and it responds immediately to the changes of interaction relationships. The analysis of the maturity level of the collaboration situation or potential can be made on-line thus giving opportunity to make fast development of collaborating processes and services.

Keywords: Collaboration support system, Command and control maturity, Information exchange, Inter-organizational cooperation, Complexity

1. Introduction

1.1 Collaboration support system

The working environment of organizations has changed due the extensive exploitation of information technology. Organizations are more or less interrelated to each others at least to ways. They are interdependent with each others with certain cross-organizational and non-organization specific processes, and they have situation related common interests concerning certain objectives. Information technology glues organizations together in two ways, as well. It enables collaboration and exploitation of non-organizational specific services, and it enables somewhat free information publishing and gathering. The organization independent information domain makes inter-organizational relationships complex and emergent by nature. This emergence cannot be controlled, but the content of mutually available information can be structurized to some degree by using processual and technological tools. Information technology can be seen as a tool to enable more sophisticated way to organizations to optimize their effort to gain sustainable goals on adequate collaboration maturity level.

In this paper we present a methodology to evaluate collaboration relationship maturity level on emergent cross-organizational networks. The methodology is based on the command and control maturity level model presented by Alberts & Hayes (2007). A human information exchange meta-model (Kuusisto 2004) is applied to this maturity model. We show that maturity level of potential or actual collaboration situation can be

evaluated by making key word and key expression evaluation both of released information content of certain organizations, and of the contents of the discussions between various organizations during their collaboration situation. We show that the knowing the topics of released information and discussions will be relevant information to guide collaboration support system design. The advantage of this kind of methodology is twofold. It does not require great amount of detailed data, and it responds immediately to the changes of interaction relationships. The analysis of the maturity level of the collaboration situation or potential can be made on-line.

The result of this study is practical method to analyze the patterns of emerging information exchange situations. Analysis results can be used to develop information exchange processes and procedures for collaboration situations of various organizations. They can be used to develop technological tools and services to enable necessary information exchange on required command and control (or collaboration) maturity level, as well. So, the methodology presented in this paper can be used to make feasible solutions of collaboration support systems for multi-organizational working environment.

We use a generic inter-organizational collaboration support system (CSS) concept as a reference. Generic nature of the reference system is acceptable, because we are not dealing with the CSS itself, but only with the methodology to study the information exchange phenomena during collaboration situations. This CSS is assumed to be an information releasing and exchange forum, as well as collaboration toolset for very various organizations that are working on the same operational area. We use this kind of solution instead of organization internal collaboration support systems (e.g. Zhao, et. al 2004), because this gives a new viewpoint to collaboration field by expanding the collaboration situation to an environment, where divergently view-pointed and oriented organizations will seek and establish collaborative relationships instead of organizing cooperative situations with relatively equally based organizations or parts of one particular organization.

The users will form relevant communities of interests (COI) to perform required cooperation activities. CSS supports this COI based collaboration enabling the existence of shared information via CSS processes on CSS services, which combination is managed by CSS support. This CSS information sharing architecture is depicted in figure 1.

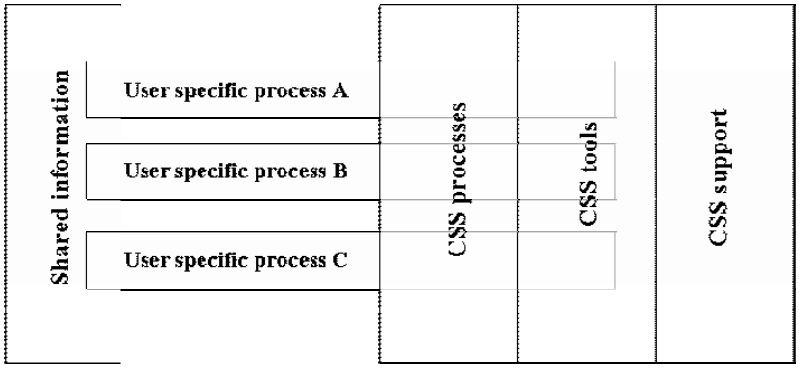

Figure 1: CSS information sharing architecture.

1.2 Experimenting command and control maturity levels on CSS platform

According to GUIDEx (2006) experimentation contains five main components that are treatment, effect, experimentation unit, trial and analysis. The flow of experimentation of a CSS when analyzing C2 maturity levels is depicted in figure 2. Services and processes of a CSS act as treatment. Effect is information sharing that the experimentation unit that is case specific community of interest (COI) will complete during trial. Trial is arranged and managed in suitable way and analysis is completed with the help of feasible methodology. In this case, the analysis outcome is C2 maturity level approximation that will guide the development of CSS services and processes.

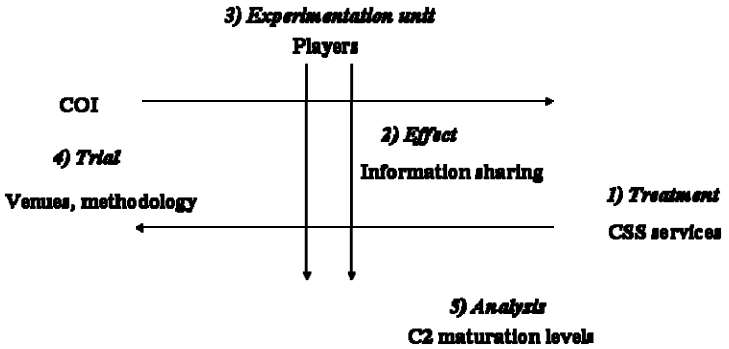

Figure 2: CSS experimentation structure, when analysing CSS capability to effect on C2 maturity levels of collaborating units.

1.3. Methodological idea

The ideas of Alberts & Hayes (2005 and 2006) and Alberts et.al (2005) about interaction maturity development and network centric operations (NCO) conceptual framework are followed. Analysis strategy of complex phenomena that exist inevitably in complex endeavors is formulated in the form of system. This system is depicted in figure 3. The main idea is to reach the end-state via two different ways. The way from complex reality to simple solutions will be reached both via understanding and analyzing the emergently revealing phenomena of complex working environment and categorizing and analyzing those data that can be collected from complicated model of the environment.

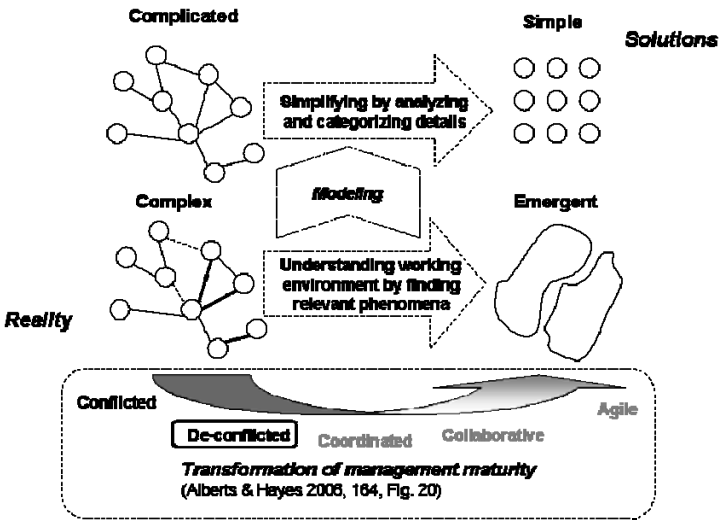

Figure 3: The analysis system from reality to solutions.

The idea analyzing CSS systems in complex working environments is to produce information that will help to construct simple solutions for complex situation. It should be remembered that complex is different from complicated. Complicated is something difficult and complex is something partly unknown systemic entity. Reality is complex, but it shows itself sometimes complicated, especially if real world has to be modeled by using incomplete or fragmentary information. This means that real world modeling is rather challenging in situations where lots of very various entities are interacting time-dependant. Simple is one component of complex. We can simplify complicated models by categorizing their content.

Emergent is something new that arises unexpectedly, but as a natural consequence. Complex systems have tendency to produce emergent phenomena. This means that reality inevitably produces some kind of logically understandable phenomena that can be figured out by finding out certain basic principles of complex reality. (See Ball 2004, Holland 1996, Kauffman 1995, Moffat 2003)

If we make both categorization of complicated models, and finding relevant features or phenomena of complex situations, we can find out those items that are relevant, when developing usable solutions.

2. Theory and models

2.1 Command and control maturity model

According to Alberts & Hayes (2007) management (or interaction) maturity transformation is described with five-phased model, where level of interaction maturity describes the level of operational maturity. Interaction maturity levels are (from less interactive to most interactive): Conflicted, de-conflicted, coordinated, collaborative and agile. Operational maturity levels are respectively: Disjointed, de-conflicted, coordinated, integrated, and transformed operations. (Alberts & Hayes 2007, 164) The command and

control (C2) maturity model has been under development in NATO working group from the beginning of the year 2006. The process has its motivation in discovered need to develop command and control practises in socio-technically networked cooperation environments. The maturity model is based on the experiences and expertise of people involved in C2 development and evaluation work. Some 350 different C2 related variables form the basis for the model. The expression of the model is expert analysis based proposal for C2 evaluating and developing purposes in networked environment. (Langsaeter, 2008) We take this model as "given" thus hypothesizing that certain level of collaboration maturity can be discovered by exploring the information exchange profiles of collaborating parties. Certain kind of information is required at each maturity level. The basis for information exchange profiles is described in chapter 2.2, and the idea of the analyzing procedure in chapter 2.3.

The phenomena of those levels are described (Alberts & Hayes 2007, 165-179). According to that and compared to CSS working environment, it can be postulated that the idea of CSS is to make as good as possible effort to move the vary various CSS users with very various agendas from conflicted interaction level to de-conflicted level and reaching towards coordinated and even higher levels. The hypothesis is that the ability of CSS to raise users from conflicted level to more sophisticated levels can be measured by using the criteria that is described in (Alberts & Hayes 2007, 165-179). These criteria in described later in chapter 2.3.

2.2 Information exchange meta-model

Information sharing situations are complex by nature.Actors´ interests to information can be categorized in several ways, e.g. on time axis, based on information content, based on the role of a particular actor or based on the phase of activity. Information sharing interests differ from situation to another and from actor to another, as well. All these interest viewpoints exist during the situation, where actors are involved.

The information model that is used to analyze the dynamism of organizations behavior in different situations is described in table 1 below. The basis of the model is in modern European philosophy of human information handling, interpretation and communication (Bauman 1990, Bergson 1911, Gadamer 1986 and 1987, Habermas 1984 and 1989, Heidegger 1962, Popper 1972) and it is described and applied e.g. (Kuusisto and Kuusisto et.al from 2004 to 2007).

Rows in the model describe the temporality and abstraction degree of information. Information at the upper the row is relatively most abstract, future oriented and its effects are long-lasting. The lowest level contains information that updates fast, is concrete and is observable as immediate events. The model can be divided on three main levels, as well. At the bottom level of the model a situation follow-up and interpretation of the meaning of the situation is completed. In the middle, planning takes place and finally at the top level the will to put activity in practice exists.

The column at left contains cultural information described by Schein (1980 & 1992). The next left column contains actors´ internal information. Te next right contains information

of expressed conclusions made by the actor. The right column describes information that comes from outside of an actor or is remarkably affected by the world outside the actor itself. Rough contents of the information categories are described, as well. The idea of this model is to act as a meta-model of human information handling. With a help of this method the complicated information exchange activity can be simplified and emerging phenomena of inter-working network can be found. The main idea to use this kind of model is to show how very divergent is the information space, when organizations or other actors move from one kind of situation to another.

Table 1: Information exchange meta-model.

Values	*Internal facts*	*Conclusions*	*External facts*
Basic assumptions Hidden assumptions that will guide the behavior of an actor.	**Mission, vision** An end-state of the actor.	**Decision** A solution based on thinking and assessment.	**Task** Given activities or work to be performed. For example, activities originated by upper-level management or by the development of a situation.
Socially true values Those assumptions that are mutually accepted in a certain group to be a basis of thinking and executing activities.	**Means** Activities or methods to reach an aim or fulfill a purpose.	**Alternatives to act** Description of possibilities or proposals to act.	**Foreseen end states** Future situations most certainly reached when activities are finished.
Physically true values Those assumptions that can be accepted to be valid in certain physical environment.	**Resources** Available material and human resources such as people, financial resources, material and office space and time.	**Possibilities to act** Describes a thing, event or development that can be taught or is expected. Possibilities to act are derived from strategies and resources.	**Anticipated futures** Describes possible paths to the goal that the actor can choose and that provide something new to the actor. For example, strategy alternatives.
Social artifacts Structure of a social system, principles of interaction and description of nodes and their mutual positions, and observable behavior.	**Action patterns** Describes how an actor can behave. Are stored on databases or is tacit knowledge, e.g., process descriptions, manuals, instructions and action plans.	**Restrictions** Things that have to be concerned before planning the use of resources and means. For example, restrictions placed on activities and conditions of information acquisition.	**Environment** Describes an area or a space that affects an actor. For example, activities of media, market trends, national trends, global trends and higher-level decisions.
Physical artifacts	**Features**	**Event model**	**Events**

Results of activity, like technical results of a group, written and spoken language, symbols, art.	Describes properties of objects such as the properties of an organization or equipment. Are stored in databases or is tacit knowledge, e.g., infrastructure descriptions, properties of equipments and competencies of people.	A description that enables the outlining of the pattern of a situation. For example, reports, documents, analyzed conclusions such as quality reports, statistics, pictures and maps.	Describes time-limited events caused by actors. For example, meetings, accidents, hostile activity.

Information exchange profiles will vary from one kind of situation to another. One of the most critical findings is that people tend to release different type of information that they will to have other to release. Most willingly is released own decisions and interpretations about ongoing situation (i.e. event model). On the other hand, information concerning both external and internal facts is preferably required. (Kuusisto 2008) That dilemma leads to communication gap and reveals itself as collaboration "immaturity", while exchange of the right type of information is lacking.

2.3 Information exchange meta-model applied to C2 maturity model

The departure point of creating analysis method for CSS development purposes is to analyze the C2 maturity model (Alberts & Hayes, 2007) content from the viewpoint of those features that has been determined to be relevant on each maturity level and in those situations, when maturity level changes will take place. This report were analyzed by using information exchange meta-model described above as a reference to find out, what type of information is exchanged on various maturity levels. Finally, an observation and analysis framework to find out maturity levels is introduced.

The idea is to find out, where on the information exchange meta-model (table 1) the collaborative actors are situated, i.e. on what type themes they are discussing or releasing information. Those themes will be pointed out and the maturity level, where the actors are, can be sorted out. The key-words that were found from Alberts & Hayes (2007) paper were turned into the concepts that are used in the information exchange meta-model. That results information exchange profiles of each maturity level on viewpoint of *information exchange* itself.

Next key-words were found from the various maturity level descriptions:

1. *Conflicted*: Individual contributors, no information distribution, and no interaction.

2. *De-conflicted*: Avoidance of adverse cross-impacts, problem space, solution space, function of geography, capability and time, decision distribution, constraints, peer-to-peer interaction to resolve cross-impacts, creation of boundaries along time, space, function and echelon lines, identification of potential conflicts, resolution of conflicts and boundaries.

3. *Coordinated*: Increase effectiveness, intent, relationships between plans and actions, enhance effects, non-organic resources, quality of information, shared intent, linking actions and various plans, formal and informal interactions, distribution of decision rights, shared intent and linked plan, linking of plans and actions to generate synergy, reinforcing each others efforts, option space, task organizing, shared intent.

4. *Collaborative*: Significant synergy, shared plan, establishing roles, coupling actions, sharing of resources, shared awareness, single shared plan, shared intent, conflict, supporting plans, interdependent, multi-level interaction, information and cognitive domain, shared understanding, single plan, delegating rights, sharing of resources, shared plan, symbiotic relationship, expanded option space, parallel planning, trust, shared understanding, pooling the risk, task organization, objectives, space, time, function, holistic, shared intent, shared understanding, trust, integrated and synchronized plan, collaborative environment.

5. *Agile*: Seeing future together, self-synchronizing, seeing possibilities and restrictions together, dynamic, richly and extensively shared information, distributed decision rights, shared understanding, collective intent, optimizing resources, dynamic, uncertainty, complexity, development of shared understanding, awareness and intent, robust, secure, ubiquitous and interoperable information infrastructure.

Those expression described above were situated in two different categories describing the information exchange orientation. The first category contains the information that shall be *released* to be available for potential use of any collaborative actor on the nominated maturity level. The second one contains information categories that determine the content of *discussions* that collaborative parties need to complete on nominated maturity level. The criterion to categorize released information was rather easy. Knowing the activity that follows certain information act here as a categorization criteria. The difference between released and discussed information was judged on the basis of how the categorizing key word was expressed. If expression indicated to mutual activity, it was judged as discussion. Other ways it was judged as information release requirement. The categories found were situated on the information exchange meta-model. Illustrations turned out to look somewhat interesting. (Figures 4 to 8)

Supposed to be effective, those items that shall be taken account shall be *discussed* with collaborative parties at least to some degree. So, if collaborative parties are observed to have been discussed those information categories that shall be taken account and *released* information of those categories that shall be exchanged, their C2 maturity level can be evaluated. To visualize this, those various levels are situated on the model depicted in table 1.

Basic assumptions	Mission, vision	Decision	Task
Socially true values	Foreseen end states	Alternatives	Means
Physically true values	Anticipated futures	Possibilities	Resources
Social artefacts	Action patterns	Restrictions	Environment
Physical artefacts	Features	Event model	Events

Figure 4: Conflicted way of acting does require neither information releasing nor discussion thus leading to situation, where every individual actor acts from its own departure points and alone.

Basic assumptions	Mission, vision	Decision	Task
Socially true values	Foreseen end states	Alternatives	Means
Physically true values	Anticipated futures	Possibilities	Resources
Social artefacts	Action patterns	Restrictions	Environment
Physical artefacts	Features	Event model	Events

Figure 5: De-conflicted way of acting requires limited information releasing mainly about decisions made and the ongoing situation, as well as discussions about mutual restrictions to avoid the collision if interests. (Information sharing area is inside a shimmered, and discussion area inside a dotted-line box.)

Basic assumptions	Mission, vision	Decision	Task
Socially true values	Foreseen end states	Alternatives	Means
Physically true values	Anticipated futures	Possibilities	Resources
Social artefacts	Action patterns	Restrictions	Environment
Physical artefacts	Features	Event model	Events

Figure 6: Coordinated way to act requires discussion of mutual goals to harmonize planning, as well as somewhat broad information releasing about situation, resources and futures views.

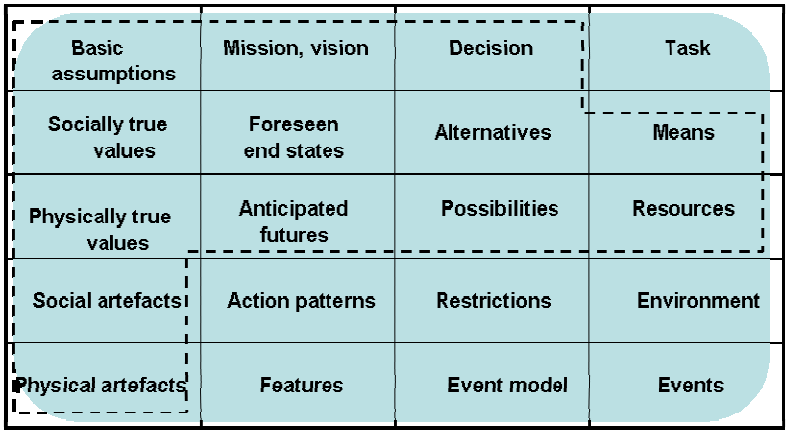

Figure 7: Collaboration requires comprehensive information releasing of the overall available information and knowledge domain, and deep discussions of cultural, normative, aim and planning viewpoints to gain mutual goals.

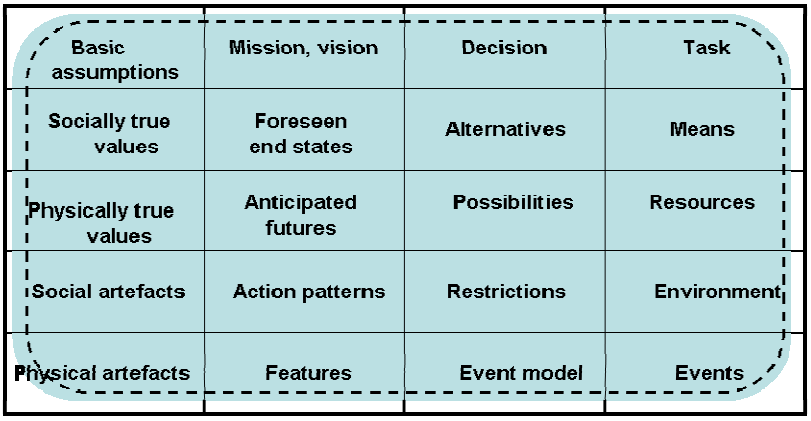

Figure 8: Agile way to act requires holistic information and knowledge sharing at situation understanding level. Agile way to act harmonizes all networked actors together as a meta-organization.

There are naturally several ways to evaluate the maturity level or level transformations of various actors. Here, a simple way has been chosen. C2 maturity level analysis is completed by searching emergent phenomena of maturity level features by making key-word analysis of collaborative events and information releasing reality of various actors. This can be made in two ways. First, collaborative events are observed using the methodological frame described above, and second analyzing the content of CSS databases. The method has a very good advantage compared to the analysis of precisely measurable items. The method produces results very quickly and with no extra workload for those actors, whose activity is explored. Disadvantage is that results remain to some degree obscure. Rather experienced analyst capabilities are required, as well.

3. Information exchange profiles in collaboration situations

Next, some findings based on the analysis of an inter-agency cooperation exercise are presented. Exercise was arranged in Finland on August 2007. Participants were professionals form several ministry- and agency level organizations. The nature of the exercise was to practice tactical management (i.e. optimizing the available resources to deal with ongoing situation to respond the foreseeable near-term future). To be successful, an actor was supposed to collaborate both intra- and inter-organizationally. To support that collaboration, a collaboration support system was established.

Three different information exchange situations were observed. First, a total of four general briefings were followed. Second, one decision discussion were observed. Finally, the information content that was released by all participants into the collaboration support system database, were analyzed at the title-level. Released and discussed information was situated into the information exchange meta-model described in chapter 2.2.

In briefing situations, mainly all information was shared in a unidirectional way by the briefer. About 10% of the information items were discussed. Discussion dealt merely with means, resources, alternatives to act, possibilities to act and restrictions (see table 2 and 3). When compared to C2 maturity model predictions, this information exchange situation had some features of de-conflicted and coordinated activities that had a slight tendency to point towards collaborative direction.

Table 2: Relative shares (%) of released information during briefings.

Values	*Share*	*Internal facts*	*Share*	*Conclusions*	*Share*	*External facts*	*Share*
Basic assumptions	**0**	**Mission, vision**	**0**	**Decision**	**8**	**Task**	**0**
Socially true values	**2**	**Means**	**17**	**Alternatives to act**	**3**	**Foreseen end states**	**0**
Physically true values	**1**	**Resources**	**15**	**Possibilities to act**	**3**	**Anticipated futures**	**1**
Social artifacts	**0**	**Action patterns**	**4**	**Restrictions**	**13**	**Environment**	**3**
Physical artifacts	**0**	**Features**	**3**	**Event model**	**3**	**Events**	**9**

Table 3: Relative shares (%) of discussed information during briefings.

Values	*Share*	*Internal facts*	*Share*	*Conclusions*	*Share*	*External facts*	*Share*
Basic assumptions	**0**	**Mission, vision**	**0**	**Decision**	**0**	**Task**	**0**

Socially true values	**0**	**Means**	**17**	**Alternatives to act**	**17**	**Foreseen end states**	**0**
Physically true values	**0**	**Resources**	**17**	**Possibilities to act**	**17**	**Anticipated futures**	**0**
Social artifacts	**0**	**Action patterns**	**0**	**Restrictions**	**28**	**Environment**	**0**
Physical artifacts	**0**	**Features**	**0**	**Event model**	**0**	**Events**	**0**

The decision and planning discussion information exchange profiles concerning released and discussed information are described in tables 4 and 5. Now, because it was question of experts´ contribution to support decision making, about 50% of the released information was discussed. Almost every other item was discussed but the situation facts and final decisions. Information released and discussed situated mainly in the middle of the information exchange model. One deviation compared to discussions during briefings exists. More information about futures development was both released and especially discussed. Again, when compared to C2 maturity model, this shows that the expert forum represented collaborative way of acting. This particular expert forum organized very fast (in less that 30 minutes) into this phase from de-conflicted via coordinated way to act.

Two significant differences were found compared to C2 maturity model predictions concerning coordinated way to operate. First, information about values and basic assumptions were not released at all. Explanation for that may be that most of the personnel of the exercise knew each others organizations or even other participants personally. In that case, basic value and culture information exchange is not necessary or even not recognized to be relevant. Second, discussions dealt with to some degree with lower level issues, as well. This may have its explanation of the rather dense time-frame of the activity in the exercise. Moving from one phase to another took place so fast that the “old” challenges still existed, while new ones already revealed.

Table 4: Relative shares (%) of released information during decision discussion.

Values	*Share*	*Internal facts*	*Share*	*Conclusions*	*Share*	*External facts*	*Share*
Basic assumptions	**0**	**Mission, vision**	**0**	**Decision**	**24**	**Task**	**10**
Socially true values	**0**	**Means**	**28**	**Alternatives to act**	**3**	**Foreseen end states**	**3**
Physically true values	**0**	**Resources**	**14**	**Possibilities to act**	**7**	**Anticipated futures**	**3**
Social artifacts	**0**	**Action patterns**	**3**	**Restrictions**	**7**	**Environment**	**3**
Physical	**0**	**Features**	**0**	**Event model**	**3**	**Events**	**28**

artifacts							

Table 5: Relative shares (%) of discussed information during decision discussion.

Values	*Share*	*Internal facts*	*Share*	*Conclusions*	*Share*	*External facts*	*Share*
Basic assumptions	**0**	**Mission, vision**	**0**	**Decision**	**0**	**Task**	**0**
Socially true values	**0**	**Means**	**38**	**Alternatives to act**	**6**	**Foreseen end states**	**6**
Physically true values	**0**	**Resources**	**19**	**Possibilities to act**	**13**	**Anticipated futures**	**6**
Social artifacts	**0**	**Action patterns**	**0**	**Restrictions**	**6**	**Environment**	**6**
Physical artifacts	**0**	**Features**	**0**	**Event model**	**0**	**Events**	**0**

Table 6 shows the distribution of the information types of the generally published information. The classification criterion was the content of the title of released publication. As a whole, same kind of information types were released in general publication process than in unidirectional phases during briefings and decision discussions.

Table 6: Relative shares (%) of CSS database published information.

Values	*Share*	*Internal facts*	*Share*	*Conclusions*	*Share*	*External facts*	*Share*
Basic assumptions	**0**	**Mission, vision**	**0**	**Decision**	**4**	**Task**	**0**
Socially true values	**0**	**Means**	**24**	**Alternatives to act**	**1**	**Foreseen end states**	**1**
Physically true values	**0**	**Resources**	**15**	**Possibilities to act**	**5**	**Anticipated futures**	**6**
Social artifacts	**0**	**Action patterns**	**6**	**Restrictions**	**9**	**Environment**	**1**
Physical artifacts	**0**	**Features**	**4**	**Event model**	**6**	**Events**	**19**

Some brief conclusions can be made on behalf of those results presented above. In tactical management situation, information in the middle of the model comes important in addition to situation follow-up and decision information releasing. During briefings, where lots of representatives of various organizations were present, discussions raised up

mainly about available means and resources and especially about possibilities and alternatives to act, as well mutual restrictions for activities. In the case of small group decision-making discussion, the general information releasing profile was quite equal to the one with briefings. What comes into the discussed information categories, still the means and resources items were found to be important, but discussion about alternatives to act moved towards to anticipate the future and to evaluate the possible end-states of overall activity. This tells that collaboration became deeper. Discussing about mutual future orients parties to work together more longer periods than to only deal with the emerging issues. It could be stated that future oriented collaboration is more mature than present day oriented.

4. Conclusions and future work

It was observed that information exchange meta-model applied to the C2 maturity model and analyzed real-life collaboration situations information exchange profiles were not completely equal. However, it was very interesting to find out that uniqueness between these two situations was observable.

As a suggestion, next hypothesis can be postulated: “The information exchange profiles concerning de-conflicted, coordinated and collaborative activity situations can be formulated in a way that is expressed in figures 9 to 11.” Because the information refining process progresses from the bottom of the model towards the final decision, and from sides toward the conclusions category, it is logical to make assumption that the higher the required collaboration maturity level is the higher and broader both the released and discussed information will disperse over the information exchange meta-model. Empirical results support this hypothesis.

However, some open questions will still remain. One is the role of values information. To which degree it should be released and discussed? The situation, where empirical data was collected did not support to study value issues, because personnel and organizations were at least to some degree familiar with each others. It is assumable that this kind of somewhat long-term effective information like values shall be communicated during long periods of time to become understandable to all organizations and people involved. Another somewhat important question is the role of the information claimed to be discussed during various collaboration situations. The data collected did not inevitably prove that the categories presented in figures 9 to 11 will be valid. So, those pictures represent still a hypothesis. However the validity degree of that hypothesis can be considered to be so high that it can be used a departure point for further research work.

Basic assumptions	Mission, vision	Decision	Task
Socially true values	Means	Alternatives	Foreseen end states
Physically true values	Resources	Possibilities	Anticipated futures
Social artefacts	Action patterns	Restrictions	Environment
Physical artefacts	Features	Event model	Events

Fig 9: De-conflicted information exchange requirements.

Basic assumptions	Mission, vision	Decision	Task
Socially true values	Means	Alternatives	Foreseen end states
Physically true values	Resources	Possibilities	Anticipated futures
Social artefacts	Action patterns	Restrictions	Environment
Physical artefacts	Features	Event model	Events

Fig 10: Coordinated situation information exchange requirements

Basic assumptions	Mission, vision	Decision	Task
Socially true values	Means	Alternatives	Foreseen end states
Physically true values	Resources	Possibilities	Anticipated futures
Social artefacts	Action patterns	Restrictions	Environment
Physical artefacts	Features	Event model	Events

Figure 11: Collaborative situation information exchange requirements.

Properly functioning collaboration support systems will help organizations to orient to more collaborative, coordinated or agile working principles. With a good methodology the on-line evaluation of the maturity level of collaboration procedures of organizations can be performed. That will help to evaluate and develop both organization related processes, collaboration system processes and inter-organizational processes. Further on

this will help organizations to move towards the edge and gain good performance of effects.

Finally it can be expressed that the methodology described here can be used to evaluate further collaboration situations. Results can be used to develop relevant processes to enable collaboration situations of different requirements like searching cooperation network, establishing networks and facilitating collaboration situations. The further testing both of the validity of the methodology and its ability to produce relevant results concerning the both evaluating and developing inter-organizational collaboration situations will be tested in the context of Multinational Experiment 5 during the years 2008 and 2009.

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References:

Alberts, D.S. & Hayes, R.E. (2007), *Planning: Complex Endeavors*, CCRP, USA.

Alberts, D.S. & Hayes, R.E. (2003), *Power to the Edge: Command… Control… in the Information Age*, CCRP, USA.

Alberts, D.S, Garstka, J.J. & Stein, F.P. (1999), *Network Centric Warfare: Developing and Leveraging information Superiority*, CCRP, USA.

Ball, P (2004): *Critical Mass: how one thing leads to another*, Arrow Books.

Bauman, Z. (1990), *Thinking Sociologically*, Blackwell.

Bergson, H. (1911), *Creative Evolution*, Henry Holt and Company, University Press of America, TM Inc. Lanham, MD.

Castells, M. (1996): The Information Age: Economy, Society and Culture: Volume I, The Rise of The Network Society, T.J. International Limited, Padstow, Cornwall.

Gadamer, H-G. (1986), *Gesammelte Werke, part 1.*, J.C.B. Mohr, Tubingen.

Gadamer, H-G. (1987), *Gesammelte Werke, part 2.*, J.C.B. Mohr, Tubingen.

Habermas, J. (1984), *The Theory of Communicative Action, Volume 1: Reason and the Rationalization of Society*, translated by Thomas McCarthy, Beacon Press, Boston.

Habermas, J. (1989), *The Theory of Communicative Action, Volume 2: Lifeworld and System: A Critique of Functionalist Reason*, translated by Thomas McCarthy, Beacon Press, Boston.

Heidegger, M. (1943), *Sein und Zeit*. Max Niemayer Verlag GMBH, Tuebingen

Holland, J.H. (1996), *Hidden Order: How Adaptation Builds Complexity*, Perseus Books.

Kauffman, S (1995), *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*, Oxford University Press.

Kuusisto, R (2004), *Aspects on Availability. A Teleological Adventure of Information in the Lifeworld.* Helsinki Universtity of Technology and National Defence College. Edita Prima Oy. Helsinki, as well as e.g. http://lib.tkk.fi/Diss/2004/ isbn9512274639/ and on the web-site of Air University.

Kuusisto, R (2006), Flowing of Information in Decision Systems, in *proc. of 39th Hawaiian Conference on Information Systems Sciences, (HICSS-39)*, USA January 2006.

Kuusisto, T, Kuusisto, R, Lund, O-P, Mikkola, T (2006), "Information Flow Aspects of High Level Tacitcal Management, *ICIW 2006*, Washington, March 2006, USA.

Kuusisto, R, Huttunen, M (2006), "The Emerging Combination of the Principles of War in the Networked IW Environment, *ECIW 2006*, Helsinki, June 2006, Finland.

Kuusisto, T, Kuusisto, R (2006), System Modeling Approach to Network-enabled Defence, *2006 CCRTS*, San Diego, CA, USA.

Kuusisto, T, Kuusisto, R, Nissen, M (2007), "Implications of Information Flow Study on Organization Structure Development for Crisis Management", *ICIW 2007*, USA, March 2007.

Kuusisto, R. (2008), *SHIFT Theoretically-Practically Motivated Framework*, The Finnish National Defence University, Department of Tactics and Operations Art, publication series nr 2. (In editorial process)

Langsaeter, T. (2008), *About NATO C2 Maturity model development*, an interview on 31 January 2008 at Helsinki. Tor Langsaeter is a member of NATO RTO SAS-065 Working Group that develops the C2 Maturity Model.

Moffat, J. (2003), *Complexity Theory and Network Centric Warfare*, CCRP, USA

Schein, E.H. (1980). *Organizational Psychology (3rd ed.).* Englewood Cliffs, N.J., Prentice-Hall (first published 1965, 2nd ed. 1970).

Schein, E.H. (1992), *Organizational Culture and Leadership*, 2nd ed, Jossey-Bass, San Francisco, USA.

The Technical Cooperation Program (2006), *QUIDEx, Guide for Understanding and Implementing Defense Experimentation*, Ottawa, Canada

Zhao, J.L., Bi, H.H., Chen, H., Zeng, D.D., Lin, C. & Chau, M. (2006), "Process-driven collaboration support for intra-agency crime analysis", *Decision Support Systems* 41 (2006) 616-633.