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Validation and Data Collection

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1. Introduction

Since August 2001, a project called AMSIDO has worked with the construction of a simulation of information distribution in organizations (for more information, see the report "AMSIDO-1"). The overall purpose with the AMSIDO project is *to create a practical and theoretical base for a decision support system focusing on the efficiency of information distribution in organizations. The system is to be able to propose, evaluate, describe and visualize different possible information systems on different organization levels in a valid and usable manner.* This report is the results from the first opportunity of validation and data collection for the project during a real exercise.

There are many methods for data collection available, some of them quantitative, and some qualitative. The choice of which to use depends on the purpose of the study. Therefore this report begins with a discussion about validation and data collection in general. After that this general discussion, the method for the study is described.

The case scenario in this study is an exercise in strategic command conducted as a part of the Program for Advanced Command. Those exercises take place only in springtime and the AMSIDO-1 project therefore had no opportunity for making such a data collection. It is possible to read more about the exercise and project in the AMSIDO-2 Main report.

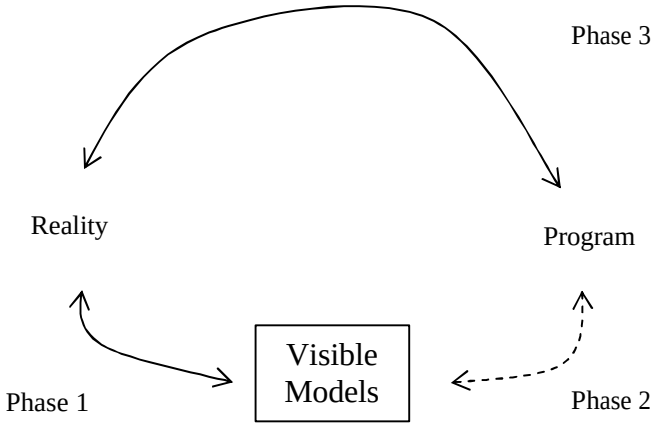

Figure no. 1: Model for validation of simulations.

The purpose of this report is to evaluate the models (mainly the overall model hierarchy) which underlay the AMSIDO-1 simulation (see AMSIDO-2, CASID/AMSIDO-1 Models). It is also an opportunity to study the distribution of information during an exercise and to collect data.

During the spring 2002, we worked with phase 1 (see figure no. 1) and compared the models from AMSIDO-1 with reality. However, since we knew that we knew too little about that we therefore had to make a data collection. Phase 2 and 3, in figure no.1 will have to wait.

2. Validity/data collection, a theoretical discussion

In this chapter we describe different methods for data collection and validation. The section is focused on quantitative methods since we have chosen to work with that kind of methods. In the section "method" below, we discuss the methods we have chosen to work with in this project.

"What, however, does 'validation' mean? A whole book could be written on the philosophical and practical issues involved in validation." (Kleijnen 1999 p. 647)

Kvale (1989) is the editor of a book about aspects of qualitative research. He says that qualitative studies have been rejected as subjective, unreliable and invalid. However, with the following definition of validity, he claims that it is possible to talk about validity even in qualitative research:

"The commonest definition of validity is epitomized by the question: are we measuring what we think we are measuring? In a broader concept validity pertains to the extent that a method investigates what it is intended to investigate" Kvale (1989 p 74).

With an altered concept of validity "validation" becomes "investigation", "continually checking", "questioning", and "theoretically interpreting the findings". Validation then becomes built into the research process, with continual checks. (Kvale 1989)

In social science the problems with reliability are more difficult than in other scientific areas. To deal with those problems Flood and Carson (1993) introduce the following idea: *"Face validity is where a group of experts or referees assesses whether the measuring instrument measures the attribute of interest. If there consensus among these judges (which is subjective and not necessarily repeatable), then the measuring instrument can be said to have face validity"* (Flood and Carson 1993 p.46). This is also called content validity. Miller (1978) reviews to Hermann about five types of validity. One of those is face validity. The other are internal validity, when variations in outcomes are checked. He also mentions variable-parameter validity, event validity and hypothesis validity which all deals with comparisons between the simulation and the reference system. Flood and Carson (1993) also present a number of criteria that can be used for the validation of complex models. As internal criteria they mention a consistency validity criterion, which means that the model should contain or entail no logical contradictions. The algorithmic validity criterion is also an internal criterion and there are several tests for checking that the algorithm for solving or simulating the model, is correct and leads to an accurate solution. As external criteria Flood and Carson (1993) mentions empirical validity criteria which checks if the models correspond to the available data. As the last criteria they mention theoretical validity which involves comparing the models with accepted theories and models. This is important when examining, as an example, assumptions, structure and elementary sub models.

Miles and Huberman (1984) present thirteen approaches for testing and confirming qualitative research. These approaches are grouped in four categories; Data quality, Looking at "unpatterns", test of explanations and feedback from informants.

Law and McComas (2001) concentrate on validation of simulations. They talk about three different types of validation. The first is the conceptual-model validation which performs a structured walk-through of the conceptual model together with an audience consisting of project manager, analysts and subject-matter experts. They also talk about results validation which is synonymous with variable-parameter validity as mentioned above. As several other authors they also bring up the face validity technique. Law and McComas (2001) and Law and Kelton (2000) recommend a method for sensitivity analyses to determine important model factors. Law and Kelton (2000 chapter 12) discuss this in detail; they only talk about statistical experimental design. The method could show the effects of each factor which can be formally estimated and, if the number of factors is not too large, interactions between factors can also be detected. Law and MacComas (2001) are convinced those classical statistical tests are not directly applicable. Law and Kelton (2000 pp 283-290) discuss how confidence intervals and time-series approaches can be used for comparing model and system output data. Shannon (1975) belongs to those who suggest using common statistical tests for sensitivity analyses. Law and MacComas (2001) emphasize in their paper that it is important to consider verification and validation of models and simulation applications in every method step. They suggest a seven-staged method to ensure a structured work.

Balci, Ormsby, Carr and Saadi (2000) recommend a methodology for certification of modelling and simulation applications. This methodology includes everything from requirements to quality and documentation.

As mentioned above, several authors recommend quantitative methods or validation methods. Möhring (2002) has made a review of Validation of simulation models. In one paper in the book the author claims that qualitative validation is at least as important as understanding the outcomes of complex models when combined with theoretical and qualitative knowledge.

Chew and Sullivan (2000 p. 813) summarizes a key concept when working with validation and verification by saying: *"It is important to note that there is no single set of verification, validation and accreditation tasks events or methods that would apply every time to every situation"*.

2.1. Quantitative interviews

"A great advantage with the interview method is its flexibility" says Tasker, Y (2000 p. 119). It is, as an example, possible to follow up questions. The quantitative interviews could be anything from formal interviews with a standardized questionnaire to informal interviews ruled by the respondents' answers and reactions. With a standardized interview it is easier to quantify and to structure the material. Regardless of how the interviews are conducted, it is important to make pilot interviews to evaluate the question. (ibid)

With a standardized questionnaire with open questions it is relevant to use "Content analysis". Content analyses counts key concepts in, as an example, answers, articles and other sources. After the content analysis it is necessary to do a critical source analysis. (Duffy 2000) Kvale (1997) makes a distinction between five types of analysis methods for qualitative analysis. One of these seems to be the same as content analysis. The author's translation of this is

"sentence categorization". He says that it is important that the categorization should be made by at least two persons.

Kvale (1997) suggests a seven-step method for qualitative interviews. He recommends the researcher to validate each step. During the first phase (problem) validity is independent of the theoretical conditions and the research questions. During the third phase (interview) he talks about the quality in the interview situation which includes always making sure the researcher understands the respondent's answers. In the sixth phase (validation) Kvale (1997) means that it is important to decide which validation forms are appropriate for a specific study.

2.2. Observations

An observation study is a difficult way to go. It demands careful planning, pilot studies and experience to optimize the outcome. When the observers know the technique they get a lot of information about the behaviours of individuals and groups (Bell 2002). Observations were traditionally used for classroom observations where events that followed each other were studied (Svanberg 1984). There are mainly four categories for observation, not-participating observer and participating observer, recall and unseen observer. In a recall observation the observer recalls his own experiences in a group. In the "unseen observer" the observer can, as an example, use a one-way mirror Hare (1966). In participating observations the observers take an active part in the life of the group while making the observations. In his case scenario, it would have implied participation from several of the students. (Henriksson, Månsson 1996). Hare (1966) means that after you decide which category to use you must choose whether to make a complete transcript, category system or ratings. The complete transcript provides the use of machines (for example movies or sound recording). Ratings consist of making summaries of certain aspects of group behaviour.

"In a category system the number of words used to describe behaviour is reduced." (Hare 1966, page 398). From the 1950s several category schemes have been developed. Some of them are simple and some of them rather complicated. The Open University has developed a system with six categories. This system can, as an example, be used during a meeting. The six categories are: Suggestions, support, dissonance, give information, seek information, follow up and work up (Bell 2000). Svanberg (1984), Rönnberg (1970), Hare (1966) also discuss different category systems. One great advantage of this kind of observation is that the analysis can be made easier (with observations where everything is noted it is difficult to see patterns). Miles and Huberman (1994) also think that using pattern codes in analysis is one way to analyse qualitative data. They state that it helps to do the coding visually. When one "map" the codes it is easier to see the interaction between components.

Rönnberg (1970) and Bell (2000) both recommend time sampling when working with observations. This means that an observation should be made in intervals of 3 seconds. Svanberg (1984) mentions an alternative, situation sampling, and then you follow one event from the start until the end. Svanberg (1984) also discusses problems with observations. One problem is the observer: the observer ha an effect on the process. If the examining group are established the affect are smaller.

3. Method

We have worked with both validation (of the models that were a part of the results from AMSIDO-1) and collection of data. The exercise OBS 02 started the 27th of May and ended on the 6th of June. The authors started the interviews, observations and validation on the 29th of May. Since the OBS 02 exercise is the only of its kind this year and we had no opportunity to make interviews or validation after the exercise (the exercise went on until 8 pm every day) we did our research when it fit into the exercise schedule. Because of the same reason it was not possible to make a schedule for the interviews, observations and validations. The interviews, observations and validation were an ongoing parallel processes. We did, however, make a preliminary schedule to get some kind of daily structure for the study, see Appendix A.

3.1. Interviews

We have done qualitative interviews with one person from each function on the operative level. In the political, military strategic level we have made one interview per level. The tactical level has not been interviewed at all. At the tactical level there were no students since professionals played those roles. Those players were also involved in the team that runs the exercise and therefore put under a lot of stress. AMSIDO-2 had the same focus as AMSIDO-1, the operative level.

The interviews followed a guide (se Appendix A) which was a sort of structured interview. In the beginning of the interviews we introduced ourselves and our purpose. We also defined some concepts. During the interview we used a tape recorder and after the interview (the same day) we made notes. In connection to those notes we made the encoding. In this report we use the word "keyword" instead of "code". We made a database (see design in figure below) to store and structure the keywords. In this database it is be possible to trace the keyword back to the source. The keywords were divided into groups. We expected that some of the groups could become components in a future design of the simulator.

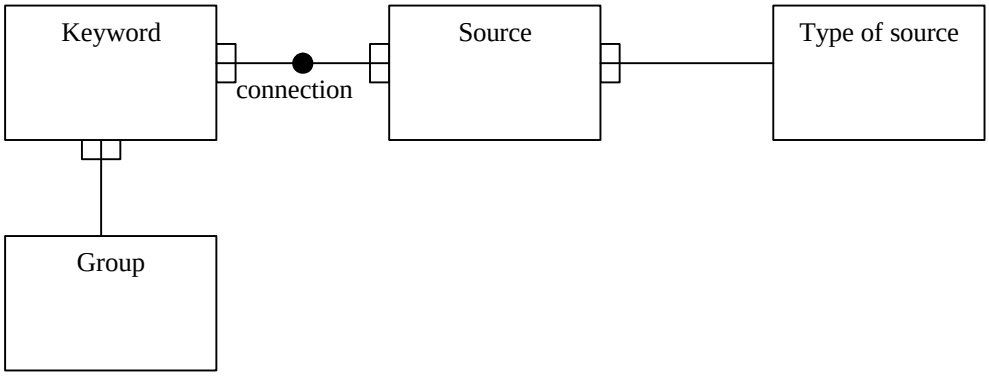

Figure no. 2 ER-diagram for the database

The interviews helped us to make an organisation chart (part of the validation) and an information flow chart.

3.2. Observations

We did observations and for that purpose we made four different observation protocols (see Appendix A). We worked with categories since we thought this made it easier to see patterns. Since the results will hopefully be operationalized in a simulation it is important to find patterns. We chose to use Open University's four categories (proposal, support, disagreement and decision) and we supplemented those with categories that concern the subject of study (see Appendix A).

The four observation protocols differ depending on focus. There is one for meetings, one for the study of information nodes, one for studying one person and one which is general. The observations will follow the principle that Svanberg (1984) suggest; situation sampling.

The plan was to do observations with four different protocols, but we only used three of them. One of the protocols, observation protocol for information nodes was not possible to use. The basic idea was to follow one node during 60 minutes. The problem was that the nodes were not used that way. If we would have studied one node for 60 minutes the probable result would have been that no interaction would have been observed during that time. The only node that would have been interesting to study was email and it is not possible to study email using a not-participating protocol.

The analysis of the observation protocols focused on patterns. We made flow charts to visualize the patterns. The symbols that we used were based on Axelsson's (1998) routine modelling technique. The recommended symbols do not suffice, so we made new symbols. The symbols will be presented in the data chapter. As mentioned, our goal was to find patterns, but when this was not possible we made "scenarios". A scenario was a description of, as an example, an hour of work.

The observation protocols were tested before we used them in the exercise. The first time that we used the protocol we made an interobserver reliability check to make sure that we used them the same way.

3.3. Validation of models

For this part of our work we worked with face validity or validation through experts. The difficult part was to decide who those experts were. The model was abstract, so even if the students were experts in their roles, they were not suitable as experts in the validation. We had to trust our assigner to point out experts.

The seminar was planned to first discuss different scenarios (for example: How they work with a plan) with the Rich Picture technique (Checkland and Scholes 1990). Then we presented a summary of the AMSIDO-1 overall model hierarchy and the seven behaviour groups that were produced in AMSIDO-1.

Our plan for validation was a seminar with 4-5 participants. That seminar was not possible to conduct, because of the difficulties to chose people and convince them to participate. One of

the problems was to find people who knew the activities in the exercise and at the same time were interested to discuss our models. Another problem was for these to have time for a seminar. Therefore this validation became a discussion with one member from SwNDC.

3.4. Validation of our collection of data

The validation of the data collection was followed this plan:

1. Planning phase

During the planning phase we made the interview guide, the protocols and the seminar agenda. Those documents were validated in the following manner:

We made two test interviews. Apart from answering the questions the respondents were asked to express their opinions about the questions. We made one test protocol of a meeting. After those tests we made changes in the guide, protocol and category scheme.

We conducted one seminar with two colleagues where we presented our material and discussed whether the method was investigating what it was intended to investigate. After the seminar we made changes in the guide, protocol and category scheme.

2. Realization phase

As mentioned above, the first protocols we produced independently were compared to each other in order to confirm that we use them in a similar way.

The coding of interviews was made by Egonsdotter, G and Öberg, L-M to confirm that we had chosen keywords at the same level. The coding of the interviews was made the same day as the interview.

Our ambition was to always follow up questions if something was unclear.

The exercise was going on for a week so there was time for following up with control questions afterwards during the exercise.

Interviews with the responsible teachers were made to validate the result.

3. Data analysis phase

The patterns were made by Egonsdotter, G and Öberg, L-M during discussions.
We evaluated the researchers' effects through discussions. It was generally known that the observer influenced the data collection. (Miles and Huberman 1984)

3.5. OBS 02

As mentioned above, the case scenario was the exercise OBS 02. In this exercise there were two teams playing against each other: Northland and Southland.

Participants in the exercise were the students at the Program for Advanced Command. In addition to them a lot of teachers, military professions, students in political science, journalists and other professionals of different kinds were participating (see figure 2). As a support for the students, there was a scenario control which partly controls the exercise. The exercise was, however, an open exercise and the scenario control only made moves when necessary. All in all there were about 90 participators during the exercise. The purpose of the exercise was to practice decision-making when several hierarchy levels were involved.

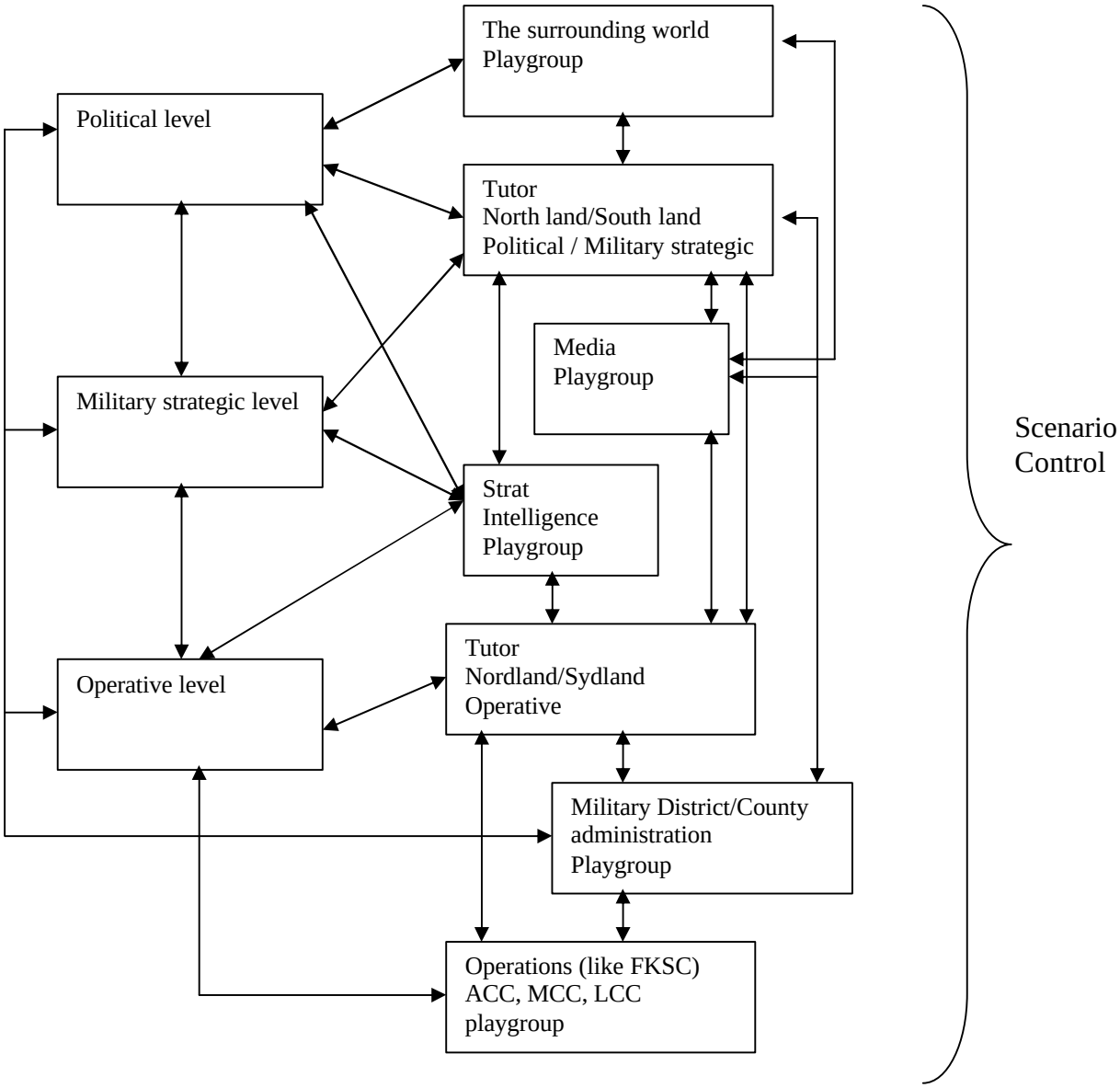

Figure no. 3: Organization scheme for the scenario control

3.6. Delimitation

There are some delimitation in this validation and data collection according to the exercise:

- Our focus was the operative level.
- No-one from the play control was observed or interviewed. The same applies to the tactical level.
- To give deep data instead of wide we studied only one of the teams. Our was the Southland team. This choice was based on the fact that they had the aquarium.

4. Data

In this section we will present the results of the collection of data and validation. The section is organised in three parts: interviews, observations and validation.

4.1. Interviews

We made 11 interviews during the OBS 02, see the table below. The first interviews were made the third day and the last ones during the last day of the exercise. The result of the interviews, the keywords, the information flow diagram and the staff routines are presented in the three following sections.

Function/Person	Hierarchy level	Number
C OPIL	Operative	1
Chief of stab	Operative	1
C J3	Operative	1
C J2	Operative	1
J9	Operative	1
IO (part of J4)	Operative	1
J4	Operative	2
J5	Operative	1
JOC	Operative	1
State secretary	Political	1
Stra int	Strategy	1

Table no. 1: Interviews during the OBS 02

4.1.1. Keywords

The keywords have been categorized into nine groups: agent, activity, condition, exercise information, node, organisation, other and problem. Below there are tables with the keywords sorted into the respective groups. The tables also contain number per keyword, number per group and keyword per group.

Group: Agent

Keyword	Number	Keyword/group
responsibility	1	
competence	1	
knowledge	1	
person knowledge	1	
person with a walk-on part	1	
	5	**5**

Table no. 2: Keywords “Agent”

Group: Activity

Keyword	Number	Keyword/group
activity level	1	
judgement	1	
preparation	1	
decision-making	1	
delegate	1	
filter	4	
anchored	2	
convey, meditate	1	
generating information	1	
compress	1	
coordination	1	
to manage	1	
orientate	1	
plan	2	
convened	1	
coordinate	2	
collaborate	2	
sort	1	
basis	1	
follow up	1	
valuation	1	
	38	**21**

Table no. 3: Keywords “activity”

Group: Condition

Keyword	Number	Keyword/group
resource	1	
time limit	1	
course of event	1	
	3	**3**

Table no. 4: Keywords “condition”

Group: Exercise

Keyword	Number	Keyword/group
media information function	1	
role-play	1	
problems with TYR (war simulator)	1	
students	1	
	4	**4**

Table no. 5: Keywords “exercise”

Group: Information

Keyword	Number	Keyword/group
adapted information	1	
decision ground	1	
picture	1	
border on information	1	
action alternative	1	
information	1	
flow control	1	
situation awareness	4	
goal	1	
quantity	1	
press messages	1	
realism in information	1	
sensor response	1	
written information	1	
language	1	
purpose	1	
safe information	1	
	20	**17**

Table no. 6: Keywords “information”

Group: Mediating of information

Keyword	Number	Keyword/group
briefing	1	
dialogue	1	
email	10	
unformal contacts	2	
informal meetings	2	
intranet	1	
communication	2	
mail structure	1	
media	2	
milplan	1	
meetings	8	
personal contact	2	
coordination meeting	1	
save documentation	1	
staff briefing	1	
telephone	4	
file tree	1	
personal delivered	1	
	42	**18**

Table no. 7: Keywords “Mediating of information”

Group: Organisation

Keyword	Number	Keyword/group
address (direct)	1	
address (unknown)	1	
battle rhythm	1	
decision-hierarchy	1	
settled processes	1	
functions	2	
hierarchy	2	
information cycle	3	
information paths	1	
management channels	1	
routines	3	
spreading	3	
staff organisation	1	
strategic level	1	
structure	1	
send order (what)	1	
send order (who)	2	

type of spreading	2	
repeated	1	
	29	**19**

Table no. 8: Keywords “organisation”

Group: Other

Keyword	**Number**	**Keyword/group**
decision support	1	
holism	1	
environment	1	
	3	**3**

Table no. 9: Keywords “other”

Group: Problem

Keyword	**Number**	**Keyword/group**
deficient basis	1	
interface	1	
make a stop	1	
available	1	
	4	**4**

Table no. 10: Keywords “problem”

4.1.1.1. Keyword grouping

In the figure below, a suggested structure of the keywords can be found. In the figure the keywords are related to each other.

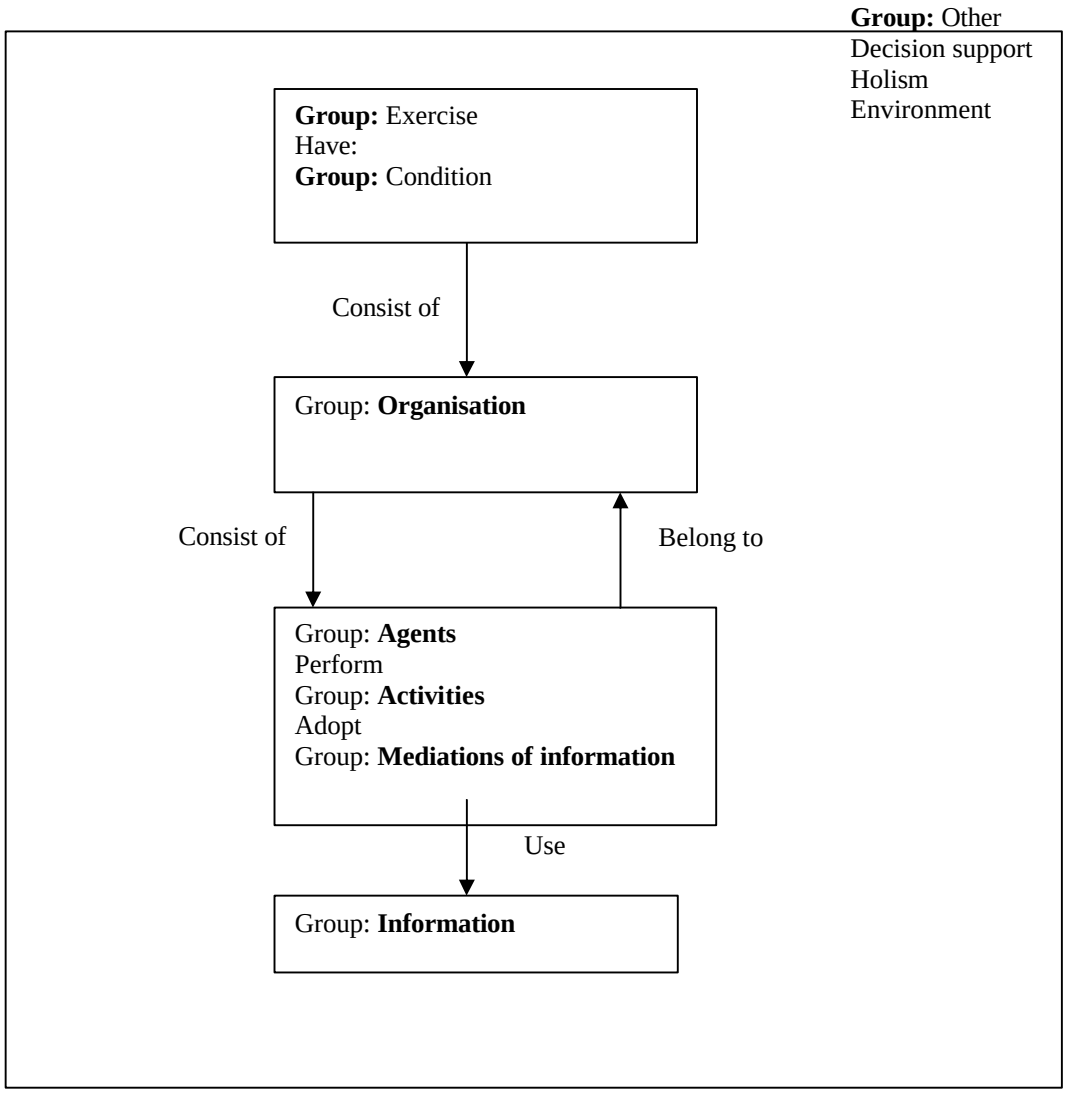

Figure no. 4: Keyword grouping

4.1.2. Information flow in the organization

The below organization chart, displaying information flows, is the result of question number five and six in the interview guide. It is important to note that it only shows the most common flows, not all flows that exist.

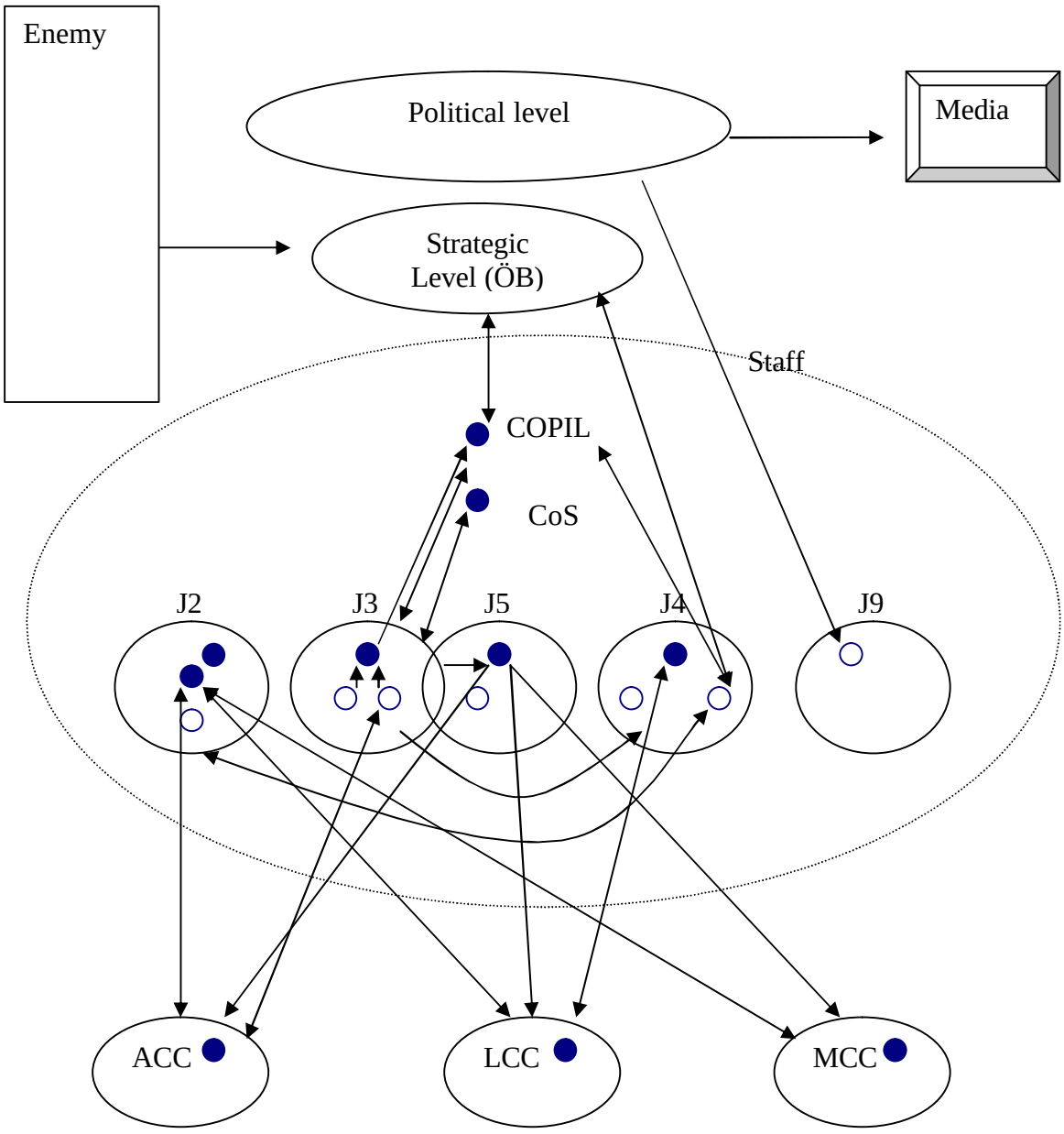

Figure no. 5: Information flow in the organisation.

● Commander of a joint function

○ Member of a joint function

4.1.3. Staff routines

Staff routines give the conditions for the work in the staff. It also gives different condition for meetings and decision.

4.1.3.1. Information cycle

As the keywords shows, routines are very important in this kind of exercises. The picture below shows how the information cycle should work in the staff.

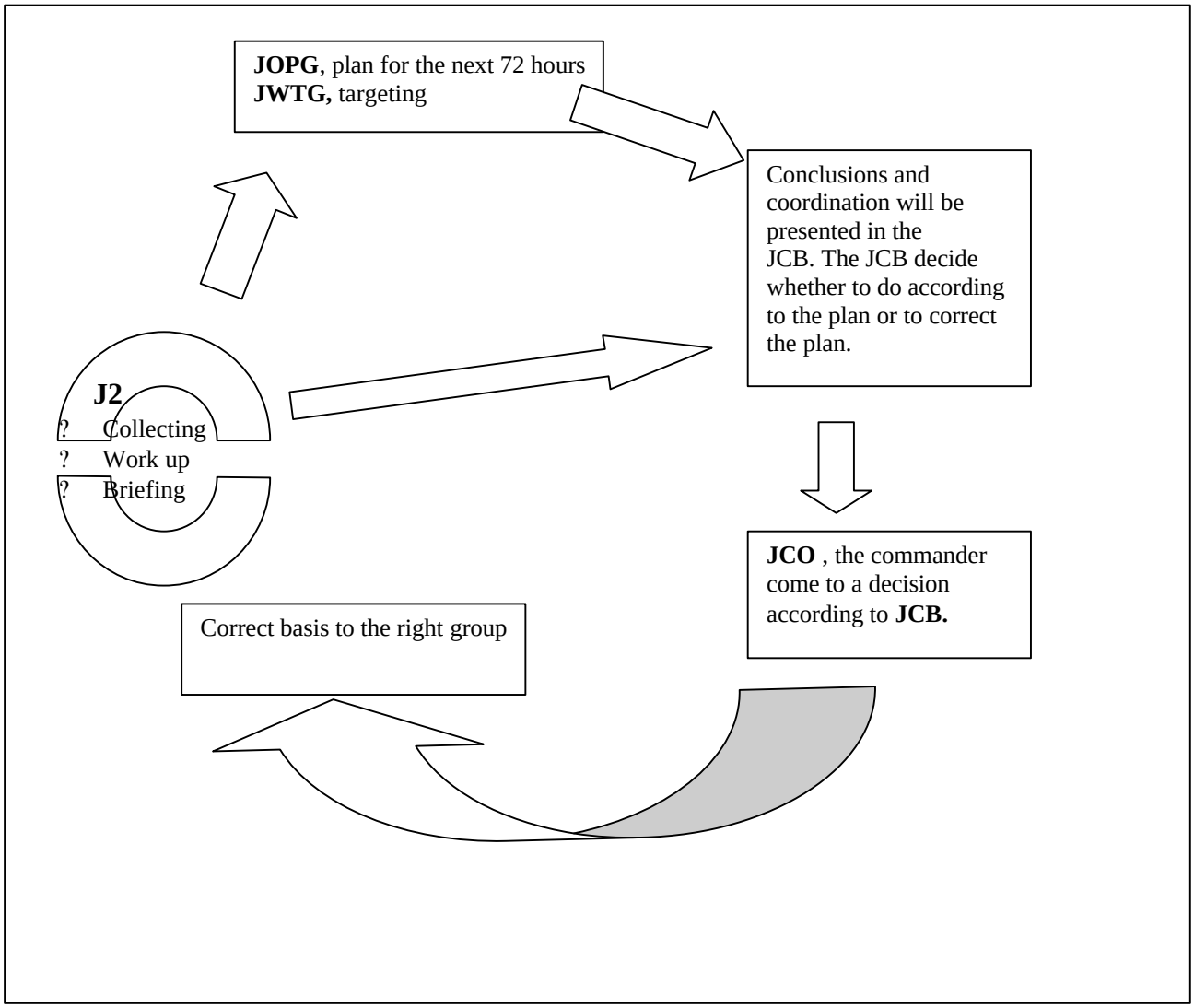

Figure no. 6: Information cycle for unit J2.

J2, Joint functions for Intelligence.
JOPG, Joint Operation Planning Group.
JWTG, Joint Work Target Group
JCO, Joint Coordination Order
JCB, Joint Coordination Board

4.1.3.2. Battle rhythm

During the exercise, a battle rhythm is settled. In the figure below, the battle rhythm for OBS 02 is presented. This battle rhythm shows the different kinds of meetings taking place during the day: morning brief, JWTG, SC council, JCB and summing up in the evening. The rhythm also shows the information activity during the day. It starts with a gathering in the morning, processing during the day and decision at the afternoon.

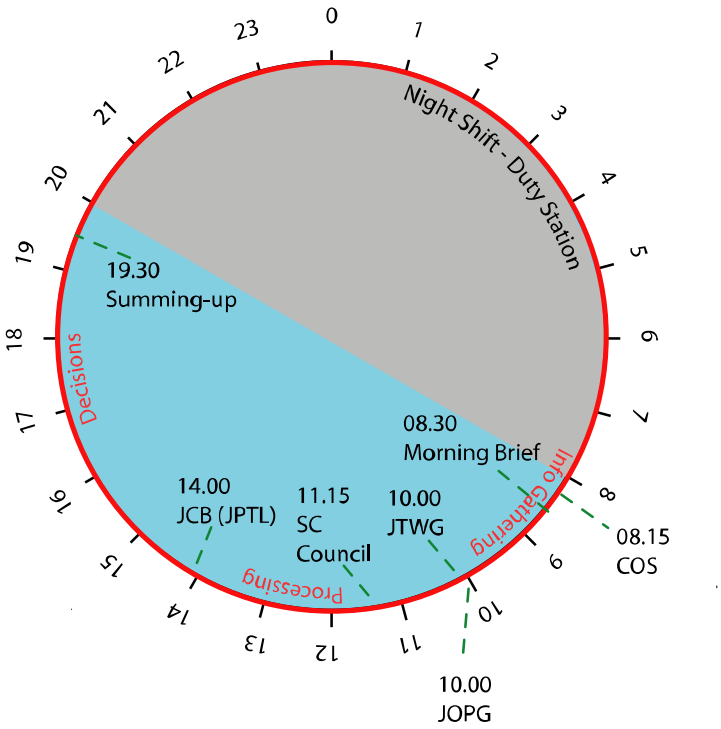

Figure no. 7 Battle rhythm

4.2. Observations

During the exercise we made 33 observations of work activities. In Appendix B the results visualized in the flow charts can be found.

4.2.1. Flow charts

As mentioned above we used some of Axelsson's (1998) symbols for routine modelling. For this study we made a couple of new symbols (see Appendix B). All diagrams are flow charts with the time running on x-axle. All diagrams have a table with the following information.

	Description
Number	Identification number
Name	Name of the diagram
Time	Estimated time for execute the diagram
Type	Pattern or Scenario
Condition	Conditions for the pattern or scenario

Figure no. 8: Description for flow chart.

The diagrams for activity and informal meetings are rather small. We have chosen to make small patterns that return several times during a period of time. In the reference system it is usual that those are combined into long sequences. An example on this can be found in appendix B. That scenario comes from one of our observations during the exercise.

Formal Meetings
There were a number of formal meetings during the exercise. Some important meeting at operative level will be described.

JCB (Joint coordination board).
The first diagram in the Appendix B shows a scenario with the participators at a JCB. Notice that the participators can be partly others at another JCB. The flowchart shows a pattern of a JCB. As you can see in the battle rhythm there is a JCB every day. The purpose of JCB is to set the plan for the next 48 hours. All the needed commanders are present to make it possible to make the decision immediately. As you can see in the flow chart, the final product is the JCO (joint coordination order) which is an important document for the staffs work. Figure no. 9 is an example of a flow chart.

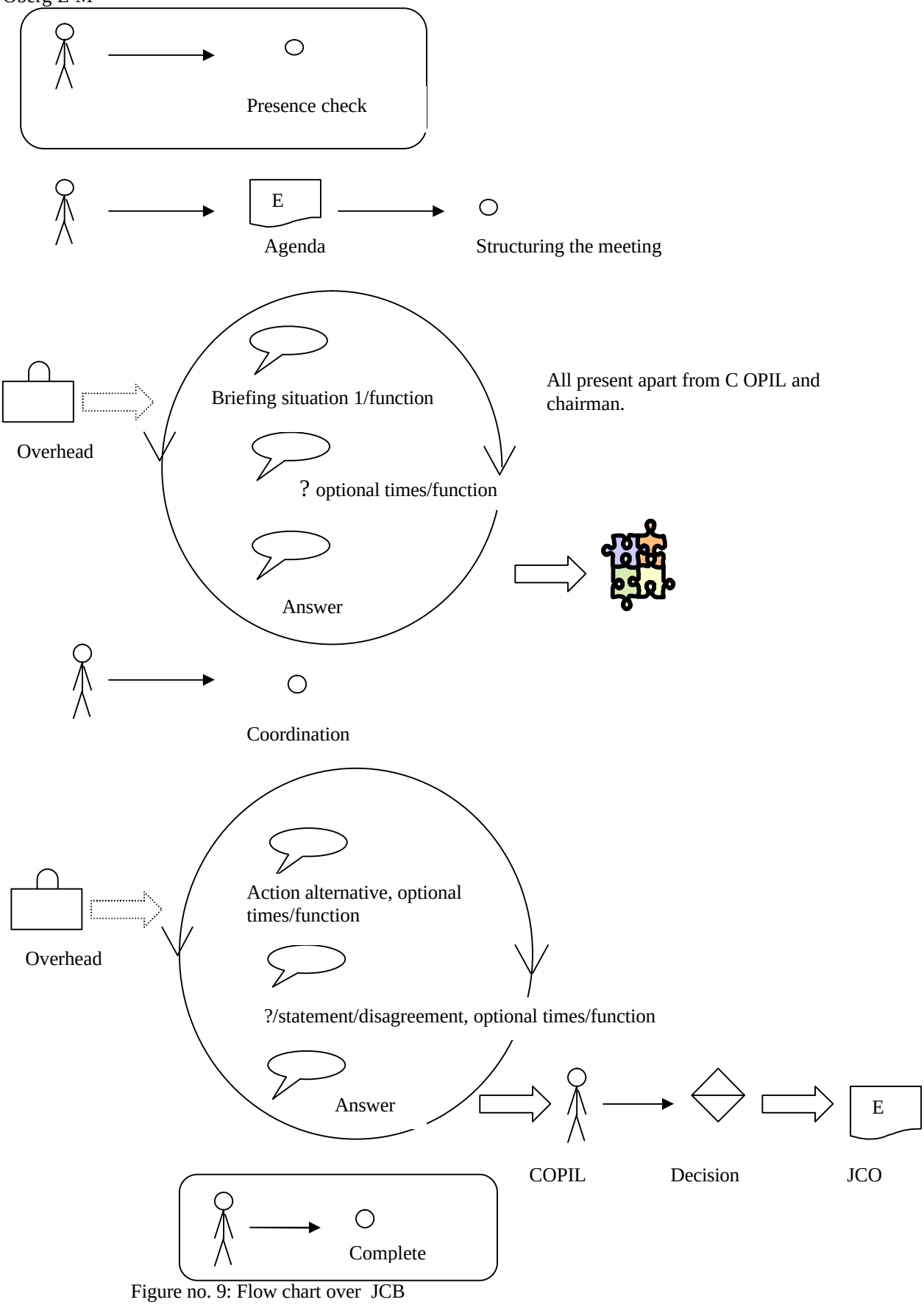

Figure no. 9: Flow chart over JCB

It is possible to found all flow chart in appendix B

Staff briefing
As you can see in the part staff routines, there were staff briefings every evening and every morning during the exercise. This is a meeting where no decisions are made, and with the only purpose that the staff shall have identical situation awareness after the brief.

Activity
Different work activities are also described during flow charts. This chart gives a view over different kind of activity. These activities can be put together in different scenario sequences. The 10 th diagram is an example of such a scenario. This special diagram shows a discussion over a mail that may perhaps contain incorrect information.

4.3. Validation of models

The result form the discussion with one member from SwNDC.

4.3.1. Strategy for spreading information

According to the member of the discussion, it is possible to see two opposite strategies for spreading information. The purpose of the information distribution in both cases is to give situation awareness.

One way is working up all information in an accessible database. In this database it will only be refine information but it also is available to all members in the organization.

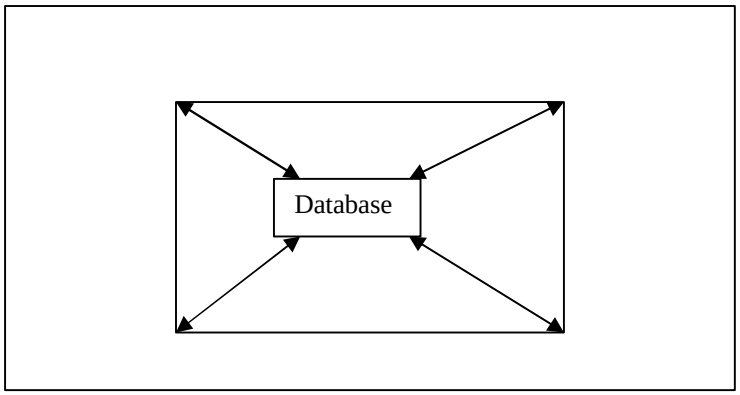

Figure no. 10: Central database a strategy for information distribution.

The other extreme case is a network consisting of both societies and technical solutions. In this strategy all information is raw data and it replays all information.

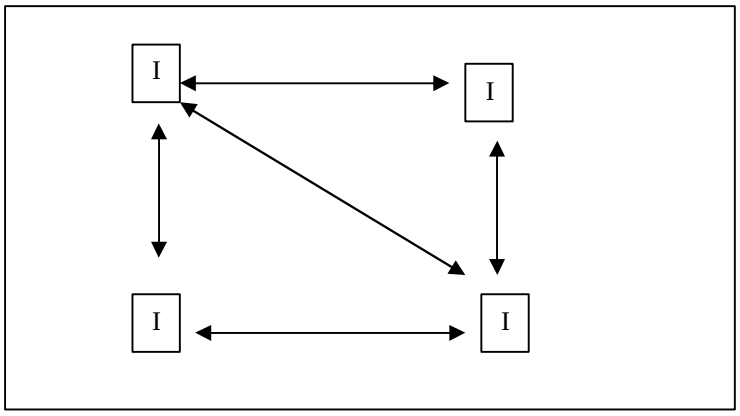

Figure no. 11: Network as strategy for information distribution.

In the usual case, these two strategies are mixed up in one way or another. The choices in the mixed strategies often depend on the staff and its members.

4.3.2. Components

The most important components in an organization for creating situation awareness are according to the member of the discussion:

? Search engine, in the mean of human characteristics. A person's ability to ask the right question and ask the question correctly.

? Technical solutions and the person’s opportunities to use the technical aid in the organization.

? Knowledge about the system, the knowledge of the conditions for every military unit. For this knowledge the commander have a great responsibility and it depends on his ability to create confidence.

? Dynamical decision making in a dynamical decision environment. To make this possible and trustworthy, the routines in a staff have an important role.

4.3.3. Evolution of the models in the AMSIDO

The conclusion of the interviewed person is that it is very important to put the individual’s requirements in focus in the models. He thinks that the model ”Overall Model Hierarchy” can be divided into two parts. One containing the social network according to him the most important, and one containing the technical network. Finally he would like to point out the importance to have a holistic view of the topic that is studied.

5. Conclusions

The model in figure 12 is the base for the simulation so far, and the model for evaluation.

If this figure is compared with the keywords in chapter 4.1.1 it is possible to see nine important groups of keywords. The groups "agents", "activities", "mediation of information" and "information" could describe different aspects of automata, information, information points and the interaction between these.

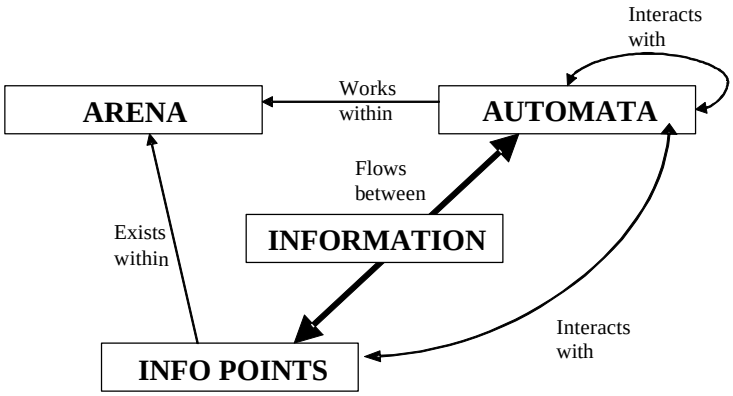

Figure no. 12: The overall model in AMSIDO 1.

The arena is to be seen more as a condition or a limit for the interaction even if it is mentioned as a keyword in the group “Other”. The group “organization” is contains different kind of interaction and rules for interaction.

The results from the investigation indicate that the entities are the most important parts for information distribution in an organization.

According to the discussion about validation (in 4.3), the human is the most important entity in the information distributing system. The human uses two networks, a technical and a social.

One conclusion of this result is that the model is not completely wrong, but the focus in the model should be on the human and the interaction between the different entities. One suggestion of a modified conceptual model is available in figure 12.

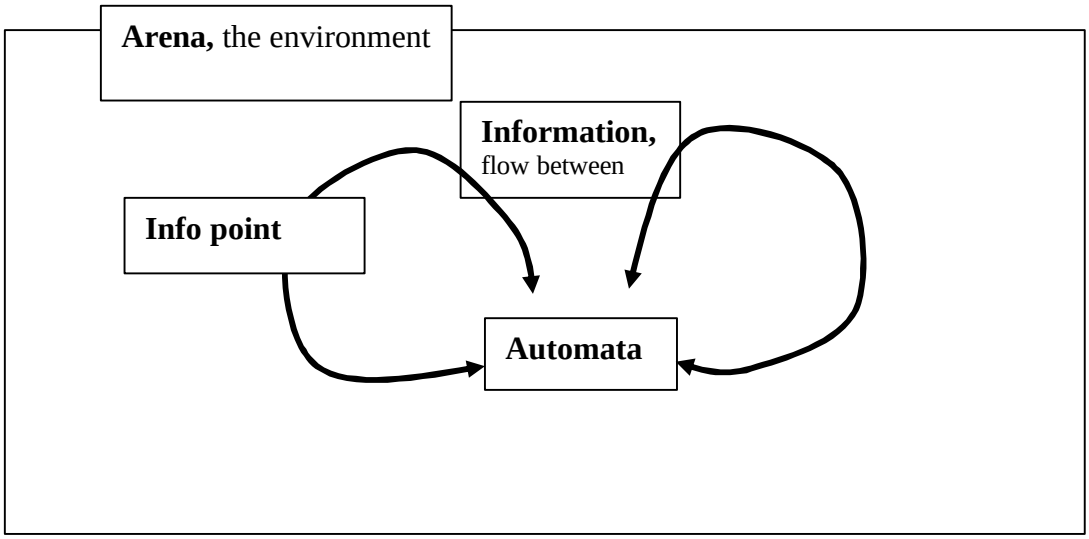

Figure no. 13. Modified model for the overall hierarchy.

The result from the validation does not change the entities, but changes the focus in the model.

5.1. The case scenario

One important conclusion from the validation was that focus should be put on humans/agents. If the purpose in the project is to measure information distribution in an organization and if we are supposed to study the whole system (including the humans), then human information processing must be one of the key issues in the project. According to our validation at SwNDC, the human uses two different kinds of networks to seek and distribute information: the social and the technical networks (see section 4.4.3 above).

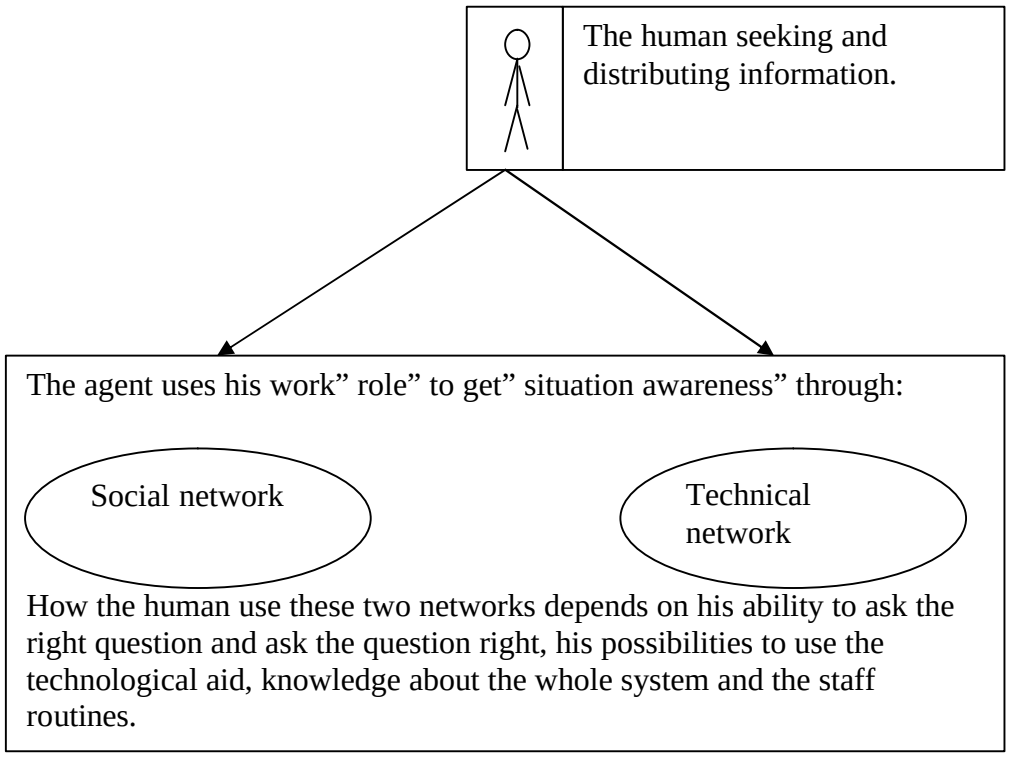

Figure no. 14: Social and technical network for distributing information.

The keyword groups could complement to the target in different ways. The focus in the model will be the grey scaled parts in figure no 13, containing Agent, Activities, Mediation of information and Information.

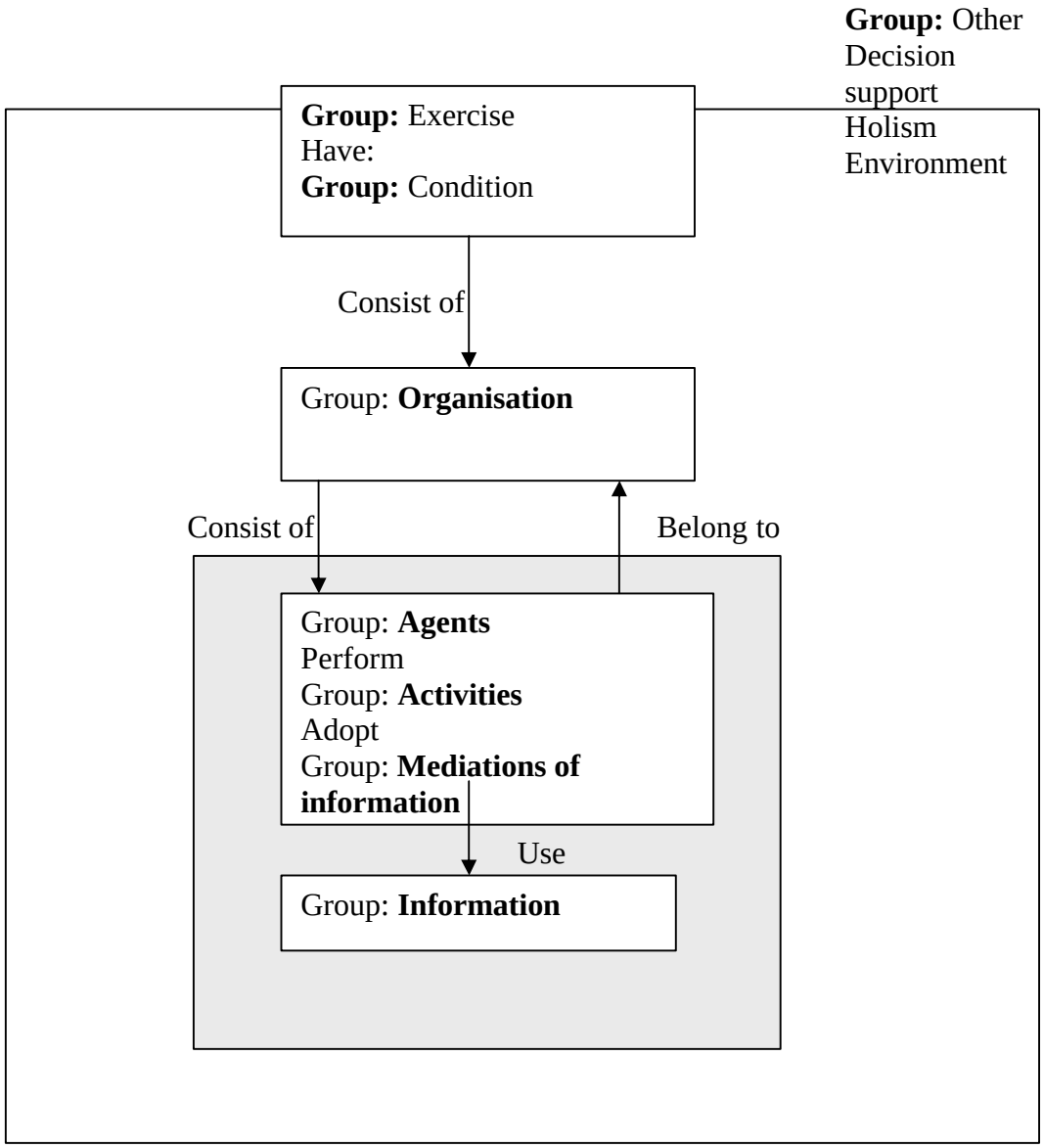

Figure no. 15: Focus in the model of keyword.

Agent
The keywords for the agent are words like "responsibility" and "competence". "Knowledge" is also mentioned. Because of this it is important to give the agents an ability of knowledge in the simulation.

Activity and mediation of information is the two large groups in the figure no. 15.

Activity
The activity group can be divided into four sub groups but the word “activity level” does not fit anywhere in this figure.

Category	**Keyword**
Group behavior	Coordination Coordinate Collaborate
Decision	Delegate To manage Convened Decision-making
Activity rhythm	Plan Preparation Judgement Orientate Valuation Follow up Convey, meditate
Handle information	Filter Sort Basis Generating information Compress Anchored Convey, meditate

Table no. 11: Different kinds of activity during the exercise.

Mediation of information
One possible and quite natural way to divide the concepts in this group is to split the group into "social network" and "technological network". In the social network are the different kinds of meetings; formal as well as informal meetings.

Category	Keyword
Social network	Briefing Dialogue Unformal contacts Informal meetings Communication Meetings Personal contact Coordination meeting Staff briefing Personal delivered
Technological network	Email Intranet Communication Mail structure Media Milplan Save documentation Telephone File tree

Table no. 12: Two different kinds of network and content.

In the technological network, many words related to computers can be found.

The two most important ways to mediate information during this particular exercise were emails and meetings between two or more people. These could be seen as two different tools for distribution and seeking information. Meetings use the social network, and email the technological.

Information
The human uses information for different purposes. During the keywords it is possible to some of principles. One important task is to create “situation awareness” which is use as a base for decisions. It is also obvious that information could be handled in different ways. Information is evaluated by the one who gets the information.

Category	Keyword
Picture	Situation awareness Picture
Base	Decision ground Action alternative
Goal	Purpose Goal
Information	Information Border on information Flow control Quantity
Type	Language Written information Press messages
Valuate	Realism in information Safe information Adapted information Sensor response

Table no. 13: Information is used for different things and in different ways during an exercise.

The keywords in the data collection could be analyzed in more detail, and they could also support modeling of the different entities in the model (see ASMIDO-1 Models).

5.1.1. Social network

The figure no.5 of "Information flow in the organization" could be used as a base for social networks in the organization. Unfortunately it only shows the most important information flows, not all of them. Thus, before it could be used as a social network, it needs to be complemented. A diagram over email communication during the exercise could be a useful complement, as an example.

5.1.2. Social concepts

In the category group behavior (see tab. no. 11) word like coordinate, collaborate and coordination describe group activities. Even if it isn't an obvious verification about it, it seems to bee important concept during a military exercise. Therefore this is important to study and implement in the model for information distribution.

5.1.3. Work activity

The battle rhythm and information cycle is the base for the work activities and for the different goals and sub goals during the day. The category "activity rhythm" indicates what kind of activities the participants perform during an exercise. This is important material for the creation of agents in the model.

The keywords in the activity group (see tab no. 11) describe what the participants actually do during work activity. As an example, it is possible to study what humans do with the information they acquire during the exercise, as an example sort and filter it.

5.1.4. Behavior for acting

A lot of different kind of meeting was observed during the exercise. In the appendix B, it is possible to read about different pattern and scenarios; these could be realized in a simulation. As a complement there are six descriptions about meeting done by "The Synthetic Family" (2001). These descriptions are done by observation during another similar exercise OPSÖ 01. The report is available at the SwNDC.

5.2. Summary

The three figures in figure no.16 are together the main result from the validation. They are connected with each other in two ways. One connection is that the different figures describe different aspects of the case. Another connection is that they together made the result more trustworthy, since the different figures come from different part of the validation.

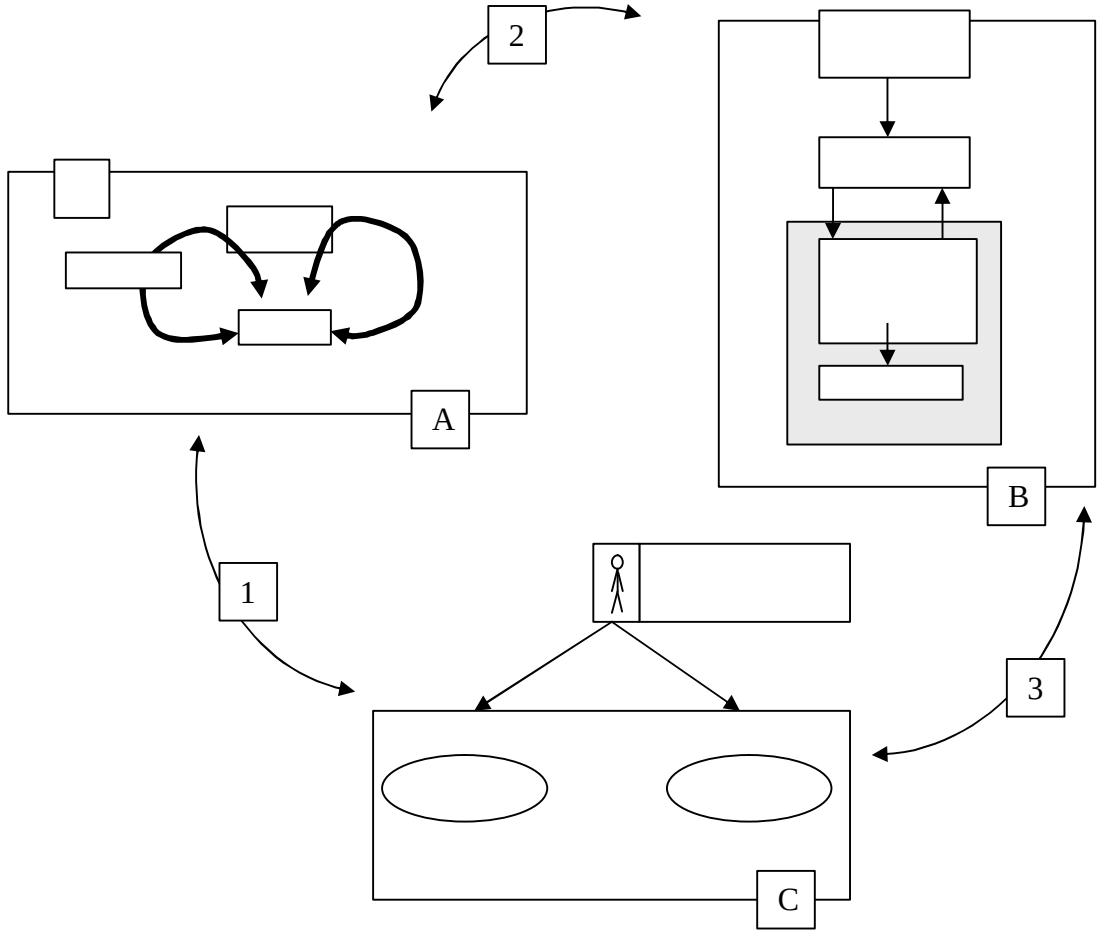

Figure no. 16: The main result from the validation

Figure A represents “The modified model for the overall hierarchy” (figure no. 13). Figure B illustrate “Focus in the model of keyword” (Figure no.15) and figure C “Social and technical network for distributing information” (Figure no.14). The connections between the three figures are indicated with numbers.

1. Figure C shows the two different nets people use for seeking and distributing information. This result puts the human in focus for information distribution like the figure A.

2. Figure C gives a deeper description of how humans use the two nets and of the connection with figure B.

3. Figure B is another approach for the study and it gives a description of what humans think they do during an exercise. It shows a lot of different activities for the agents and information distribution. Figure B also shows different levels for distribution in the organization. Still, figure B discuss two different nets for the distribution.

The most important results are:
? The four entities (Arena, Information, Information point and Automata) are so far the most important parts for our model, and the Automata is the entity to put in focus.
? The relationship between Automata and the different activities. One important part is the activities for distribution of information.
? There are different levels for information distribution in the organization.
? Humans use different channels for distribution, some channels are technical and other are humans.

5.3. Sources of errors

In a qualitative study like this, there are many possible sources of error. Some of these will be presented below.
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5.3.1. Exercise

Some of the sources of errors could be found in the condition of the exercise, which makes it difficult to compare it too another exercise or too reality.

This year, the OBS 02 exercise was very small and had smaller resources than during previous years. As an example, only second year students participated in the exercise. One of our conclusions is therefore that the information flow has been better than usually, since it was possible for everyone to keep track on the information produced in the exercise. The participants could easily move between different rooms and have small informal meetings.

Another observation was that of the variance in motivation amongst the participants. Some of them had a very low motivation, something they admitted more or less openly. According to the participants, the motivation was sometimes lacking because of the fact that they had already, in practice, graduated before the exercise.

In this exercise no formal staff routines were included, something which should be perceived as a special situation. The exercise administration's view of the exercise was that it was a very small exercise and that things would be solved anyway. In our view, it is difficult to say how this has influenced the results in our study. As we see it, the routines are very important and it is necessary they are explicit.

5.3.2. Method

During the investigation, it gradually became clear that we should have made a more distinct presentation of the project and our purpose with the study. Some of the problems we had during the study could be related to people not knowing exactly how to handle our observation.

In one observation, as an example, the observed participants started talking with us. Another problem in this specific situation was that the exercise was concentrated in two weeks from a quarter to eight in the morning to eight in the evening. We came very close to the participants, something which might have been both good and bad. Good because they felt comfortable during the interviews, and bad because we sometimes fell into a too friendly relation rather than keeping to being strictly observer and subject. .

The observations in the "aquarium" were very difficult to carry out, since the situation was very complex with several different parallel processes. Our conclusion after the observation was that it would be necessary to use another method in order to study this kind of processes. In such a method one question should be how it would be possible for one person to handle information from more than one process concurrently?

One deficiency in the interviews is that is not possible to see if a behavior depends on roles or personalities. Another lack with the interview method was that it was not practically possible to make interviews both in the beginning and at the end of the exercise. We think that we could have got other answers from same people if they had been asked at another time.

The validation of the "Overall Model Hierarchy" is too small to draw any conclusions from, since only one person was involved in that validation.

5.4. Further studies

For the next phase in the project it is important to use the results in this report. When the model for the simulation is developed, there is a lot of material available for use here. As an example, the keywords could be the base for a refocusing in the models.

The flow chart (in Appendix B) describes different patterns of action for the humans. Both formal and informal meetings are described. This action could be a possible action behavior in the agents.

To get a more general picture of the information distribution it is important to do other surveys during other conditions, other kinds of exercises or in other organizations.

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