TEAM SYNTEGRITY AS ACOMPLEMENTARY METHOD FOR REQUIREMENTS ANALYSIS

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ABSTRACT

When developing complex system and systems that will work in a complex situation, or a complex environment, there is an enhanced problem to capture the information needed. It is critical that the system provides the users with as relevant information as possible. The traditional ways to capture information and to involve the users may sometimes be insufficient. All aspects of the intended system may be hard to capture and there might also be a problem to bring different opinions of what is important into line with each other.
Team Syntegrity is a new process methodology developed by the management cybernetics Stafford Beer to stimulate collaboration and incite cross fertilization and creativity. The driving force behind the development of syntegration was to provide a structure for holding purposeful conversations which would be non-hierarchical and democratic but would be contained and not dissipate their energy or insights.
As a way to catch what should be included in a complex system and to join possible split pictures that are present, Team Syntegrity could be a helpful complementary tool. In this paper the possibilities with using Team Syntegrity in preparation for the development of a complex system is presented. As an example a system for training for crisis situations is used.

Keywords: Team Syntegrity, Systems Design, Systems requirements, Crisis Management, Complex systems

1. INTRODUCTION

There is a significant body of evidence that many information systems implementation projects end in failure [1]. The failure rate for major systems appears to linger around 70% [2]. Failures result in heavy expenses for redesign, redevelopment or even total rejection of the systems. A whole range of failures haunt organizations as they continue to invest valuable resources but do not achieve their original functional objectives [1]. While some blame the alarming rate of failure to the increasing complexity of systems, others think that organizations only can improve if they learn from the past [3].

One way to reduce the risk of failure, due to not fulfilling the functional objectives, is to include the intended system users in the design process. Participatory design (PD) methods for information systems development were introduced in the 1970s in collaboration between employees, employers, and researchers as a means to empower system users by letting them take active role in the design of an important part of their work environment. It has been claimed that the PD approach can make a difference where traditional systems development methods fail, in particular with regards to the social factors that are of importance for a successful implementation [4]. PD has been criticized for presuming a limited, rather homogeneous user group [5]. Most recent attempts to apply PD have been restricted to the design of small-scale isolated systems for a limited set of users in a specific organizational unit [6].

To design information systems for large organizations and projects, and inter-organizational collaboration and networking demands something more, if not to be exposed to an immidiate risk of failure. An example of such a complex system is a system for crisis management. Crisis management demands rapid and timely coordination, not only between members within a team but also between members of different teams. Each team has different roles and responsibilities. In particular, during a crisis, the coordination between team members need to be tightly coupled and aligned with organizational goals

for effective crisis response [7]. The complexity and the inter-organizational issues of such a system are described in Asproth [8][9][10].

As a way to catch what should be included in a complex system and to join possible split pictures that are present, Team Syntegrity could be a helpful complementary tool. In this paper the possibilities with using Team Syntegrity in preparation for the development of a complex system is presented. As an example a system for training for crisis situations is used.

2. TEAM SYNTEGRITY

Team Syntegrity is a new process methodology developed by the management cybernetics Stafford Beer to stimulate collaboration and incite cross fertilization and creativity. The full description is available in Stafford Beer's book *Beyond Dispute: the Invention of Team Syntegrihy* [11]. It has roots in cybernetics, and several other branches as logic, mathematics, information theory and sociology. Some of the roots can be found in McCulloch [12], Ashby [13], Shannon & Weaver [14], Sommerhoff [15], and not least Fuller [16] and his ideas about geodesics and the interplay of tension and compression. Fortunately, it is not necessary to master all these sources to participate in a syntegration, or to plan and deliver one. Beer observed that conversations concerning attention to the organizations future adaption and developt, as they took place in organizations, often were sporadic and fragmented. Good ideas might die because the innovators who proposed them did not have enough political muscle to prevail; important opportunities for synergy among parallel initiatives might be lost because of missing or ineffective transduction between significant players and a lack of cohesion or organizational closure might lead to a lack of direction and poor mobilization of resources. [17]

The driving force behind the development of syntegration was to provide a structure for holding purposeful conversations which would be non-hierarchical and democratic but would be contained and not dissipate their energy or insights. Beer chose icosahedron with its thirty edges, twelve vertices and twenty sides as an ideal shape on which to map the meetings and manage their variety.

A scientific principle is necessary for enabling productive and effective work in large groups of people. Simply allowing everyone to enter the debate typically results in chaos. Syntegration opens up a route somewhere between unilateral dictatorship and chaos democracy, based on a reliable mathematical principle.

In a syntegration a participant will be engaged directly in two teams as a member and two teams as a critic which will occupy him or her during four of the six scheduled time periods. In their two 'off periods' participants may observe (but not speak) in another team meeting or may use them as private time. [17]

The difference between syntegration and other group work is that the participants are evenly and uniquely distributed and will collectively have the means, the knowledge, the experience, the perspectives, and the expertise, to deal with the topic.

3. INTERREGIONAL COLLABORATION FOR CRISIS MANAGEMENT (NetAgora)

The netAgora project will develop a computer and net based integrated environment for mutual preparation and training for disasters and complex emergency situations. The netAgora environment will be all comprehensive with a disaster simulator, a scenario editor, and an assessment kit included in its core. It will support cooperation, coordination, training, preparation, and learning on individual, group, and organisational levels. The netAgora will further include support for an exchange of experiences, tools, and models of response to emergence situations within and between nations with a special emphasis on handling the cultural differences that may impede the emergence response. [18]

The suggested net based Agora aims to prepare for disasters with simulation of emergency situations for mutual preparation, training, and organisational learning. The Agora will ensure future security by:

- Rising awareness and preparedness of potential disaster responders by help of the

components and resources in the netAgora environment.
– Improving cooperation and coordination between responders.
– Improving competence and performance of organisations involved in security issues.
– Bridging cultural differences between responders from different organizations and different backgrounds.

A deep and thorough understanding of the problem domain, i.e. the disaster situation and its context, is of primary importance. That domain knowledge, however, has to be creatively combined and integrated by first-rate ICT skills from the solution arsenal. Consequently, the key issue of this project will the integration of problem domain knowledge with solution arsenal skills in order to meet the requirements of disaster preparation, training, and learning.

Further, to prepare for relevant and predictable disaster situations will also increase the capability for meaningful improvisation in unexpected situations. There is also important with long time management of disaster situations (recovery), not just immediate rescue during the acute phase. Current disaster research has also demonstrated that the final outcome of a disaster situation is highly dependant on the preparations made before the disaster occurred.

At last, in order to be useful for all disaster responders, even the ordinary citizens and spontaneous groups of such, the training tool has to be utterly robust, simple, intuitive, and easily accessible.

Disaster relief can be seen as a dynamic multi actor process with actors both joining and leaving the relief work during the help and rescue phase after the disaster has occurred. Actors may be governmental agencies, non profit voluntary organisations or spontaneous helpers comprised of individual citizens or temporal groups of citizens. Hence, they will vary widely in agility, competence, resources, and endurance. There will also be no sharp limit between helpers and victims but in almost every situation individual helpers / responders will be the first on place. However, despite differences in competence and resources every responder both have some unique knowledge and information to supply to the others and some specific information needs that other responders can help in providing.

Hence, the obvious conclusion will be that there will be as much need for coordination and communication support as for control and command support systems. The winning strategy, according to current research, will also be to move the focus from reactive disaster relief and rescue toward anticipatory mitigation, preparedness, training, and education.

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NetAgora will develop mathematical models of complex emergencies situations of the cross-border infrastructure in order to provide the tool for understanding of system structure and dynamics. Developed mathematical model will focus on important control problems in the resources flow network such as emergency area→information generation→ application ofrescue resources→ rerouting→emergency area and corresponding cross-border communication protocols and delays which are critical for proper system control. Models will be constructed by using the object-oriented paradigm combined with agent paradigm. The developed models are intended to reflect intelligent anticipatory systems for human operator anticipation of future consequences
The workpackages that is to be carried through in netAgora are:

- User integration and tools selection
- Design of netAgora environment with crisis simulator

- Development of test scenarios and test data collection
- Construction of crisis simulator and other tools of netAgora environment
- Testing, improvement and verification
- Assessment of netAgora environment and test results

4. TEAM SYNTEGRITY IN NetAgora

In different steps, when developing and testing the netAgora, Team Syntegrity could be a useful tool. Identified steps where and how Team Syntegrity could be used are the following:

- *User integration*

The objectives of the user integration are to outline the elements of successful user cooperation and collaboration.

Use of Team syntegrity: Here Team Syntegrity can play an important role both when designing the system for cooperation and collaboration and as a part of the test situation.

- *Design of netAgora environment with crisis simulator*

The objective of the design of Crisis simulator is to set the basic principles for the creation of a training tool that uses information technology and improves the abilities of decision – makers, organisations, crisis managers and teams dealing with crisis events. As a training tool, Crisis simulator has to be flexible, capable to be used and adapt on any crisis type, facilitating problem solving. External simplicity, internal complexity, theoretical underpinning, element of surprise, social structure and verisimilitude should be considered before designing. Crisis simulator must be, realistic in appearance and in its internal process, capable of generating realistic outcomes. Simulations have to produce similar reactions and feelings in participants as experienced in real life crisis events, such as tension, uncertainty, time pressure, sense of inadequate information and frustration. End user (trainee) will be able to choose various possible locations for operational centers, shelters, food and first aid centers, meeting directly the results of his choice to disaster response.

Use of Team syntegrity: In traditional systems development processes there are methods for catching the information that is needed for the system and to here out the end-users wishes. Syntegration could be used as an alternative or as a complementary method for this purpose.

- *Development of test scenarios and test data collection*

Objectives of this work package are:

-To create a realistic and dynamic scenario of an international disaster involving a large set of actors representing public, private and non-governmental organisations. The scenario will be based on previous disasters and possible future emergencies.

-To design the scenario so that involved actors are trained in mitigating the disaster through intra- and inter-organizational cooperation including communication failure, conflict and confusion. This will facilitate a learning situation based on network management rather than control and command.

-To retrieve data from previous national and international disasters in Europe, as well as to map the different structures of emergency management in target European countries, to constitute the base for building the scenario.

-To interact in the development of the complex emergency model implementing the scenario in the model.

Use of Team syntegrity: To be able to get realistic scenarios it is essential that all all aspects of the possible scenarios are caught. Team syntegrity seams to be a useful tool as all team members can contribute in a democratic way.

- *Assessment of netAgora environment and test results*

The objective of this WP is to use state of the art qualitative and quantitative research methodology (interviews, observations, web based surveys and document analysis) to analyse the process and effects of the SecSim project.

Use of Team syntegrity: As a complementary method a syntegration could be used.

5. TEAM SYNTEGRITY IN SYSTEMS REQUIREMENT AND SYSTEMS DESIGN

A syntegration engages a group of thirty participants for several days in an intense mix of facilitated thinking and conversation. In the case of deciding upon systems requirements

and design of a system the participants should be represent all possible end users of the system as well as system developers.

As a model for how the syntegration is to be carried through the ideal form icosahedron is used. In the syntegration each participant is assigned a role as one of the thirty edges or struts that connect, in groups of five, to twelve color-coded vertices of the icosahedron. Each of these roles combines two colors and no two struts will have the same two colors. Two other unique and complementary roles as a 'critic' of a next-but-one team are attached to each strut. After a complete round of meetings, or iteration, a great deal of information will have been shared. He or she will have been in a session with at least one member of eleven of the twelve other teams present as either a team member or critic. [17]

In the first step the participants write down statements on post-it notes. These staements are to be formed so that the other participants will take issue with it. The statements are to be in the area of a question or problem to be solved.

After the first iteration, the statements of each of the teams are typed up to make opportunities for adding additional comments. This gives a very high rate of communication and understanding of the frames of reference of other members of the group. The discussions make people more aware of other models or perspectives the other participants have.

Now the teams come together in a plenary session to present their results to the full group. Here everyone gets to see how their statements comes together to make a whole. As new questions now may appear it is possible to make new rounds of meetings to discuss them.

The questions/problems to be solved go from more comprehencive to a more detailed. Examples of questions are:
- Which functions shall be included in the system? What is limitad out?
- Which functions should be appearant only for some users?
- How should the system be designed? What is the common mode of expression?
- Which parts should be personalized?

The functions and design that are agreed upon will them be discussed in detail in new rounds. Functions and personalized interfaces can be discussed in the groups or by the individuals that will use them in the future. Here Participatory Design methods can be used.

After having discussed the systems functionality from an overall view down into details the risk of having missed important information is reduced to a minimum.

6. CONCLUSION

An emergency situation can be seen as a dynamic multi actor process, with rapid and timely coordination, not only between members within a team but also between members of different teams, where each team has different roles and responsibilities. The special conditions that are present during such a situation demand special attention. Team Syntegrity seems to be a helpful tool when designing a computer based system for training of crisis management. The difference between syntegration and other group work is that the participants are evenly and uniquely distributed and will collectively have the means, the knowledge, the experience, the perspectives, and the expertise, to deal with the topic. In the NetAgaora case this means that all aspects will be likely to be discovered and included.

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