Sensemaking and Organizational Boundaries - Aspects in Introducing Virtual Reality for Inter-organizational Collaboration

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ABSTRACT

Most studies of ICT introductions have their focus on one organization where the new ICT should support well-known activities in the organization. When ICT-introductions are aimed at starting, improving or changing inter-organizational collaboration the situation is different. New tasks need to be formed and organizations meet on unknown grounds, and not many studies have been done of this type of situation. Theories, that are found to be useful in situations when ICT is introduced in one organization, are not sufficient to account for all effects in an inter-organizational collaboration case. This paper explores how organizational theory can contribute to better understand the introduction of Virtual Reality for inter-organizational collaboration. Applying sensemaking and organizational boundaries to three studies of Architecture-Engineering-Construction projects shows benefits for identifying and analyzing upcoming difficulties in a structured way.

INTRODUCTION

Collaborative work is common in Architecture-Engineering-Construction [AEC] projects. New information and communication technology [ICT] is commonly presented as a mean to quality and efficiency of work. During recent decades 3D models, Virtual Reality [VR] and Building Information Model [BIM] have been introduced to support AEC projects. The use in maintenance (operations) is growing.

It is a well-known fact that introductions of new ICT commonly meet unplanned difficulties. Klein and Jiang (2001) report that the failure rate for system development projects is alarmingly high, and conclude that the development of a common understanding of expectations as well as more input from stakeholders are needed before a system development project is started.

Projects concerning city planning affect many stakeholders and their collaboration, and each stakeholder carries their organizations´ perspective and goals. Zhu Y and Augenbroe G (2006) state that AEC projects have a strong need of collaboration and information sharing because of the projects´ nature of being non-repetitive, temporary and fragmented with multiple stakeholders and project partners.

An organization's perspective, language and way of communicating have developed in accordance with its activities and boundaries, and have become specific for that organization. Poor communication between different stakeholders in AEC-projects has been identified as one of the major categories of problems by Bullinger et al. (2010). Two (of several) problems in this category are that end users do not

participate in the design process, and that different “languages” are used by various stakeholders which leads to misunderstandings in the planning process.

These statements motivate the need to better understand introductions of collaboration supporting ICT in inter-organizational settings. This paper attempts to generalize conclusions from three cases where VR was used in three different projects to share visions, ideas and information.

INTER-ORGANIZATIONAL COLLABORATION

Löfström (2010) presents inter-organizational collaboration as a situation where existing boundaries of an organization are challenged. Each organization brings its boundaries into the collaborative project, and the boundaries are tested against each other and some need to be changed. Löfström states that collaborative projects aiming at establishing collaboration between organizations need not result in positive changes within the participating organizations.

Organizational boundaries can be physical, but also mental constructs or procedure performing activities. Hernes (2004) set up a framework by categorizing boundaries in two dimensions. The first dimension is the function for the organization. Some boundaries organize and stabilize the way the organization acts, some define the organization from others, and finally, some are thresholds by regulating who and how someone can become a member of the organization. The second dimension is the nature of the boundaries, “mental”, “social” or “physical”.

Hord (1981, 1985) differentiates between cooperation and collaboration in that cooperation does not demand shared goals. Cooperation is based on routines that the partner organizations follow. Collaboration demands that partners agree on, and prioritize goals, divide work, and manage resources.

Berlin and Carlström (2008, 2011) define three levels of collaboration. The three levels are: Sequential, Parallel and Synchronous. Sequential collaboration means that each part is doing their own work tasks and leave room for others when they have finished their task. Whereas in parallel collaboration the work tasks are conducted simultaneously by several actors but each part perform their own, and the actors need to adapt and communicate more about the organization of how to perform work. Synchronous collaboration differs in that the participating organizations are expected to identify and share work tasks in a given situation.

Berlin et. al. (2012) discuss collaboration in teamwork, and state that the prevailing view in many theoretical approaches is that there is some kind of ideal state where the collaboration becomes efficient, and the coordination between the actors has no resource demand even though the coordination requires that the actors must see each other's goals, needs, and be able to share work tasks. The authors criticize this view and conclude that that collaboration is multifaceted and what should be considered "good" or "bad" teamwork depends on the context of the situation and the team's assignment.

What all of these authors say is that some collaboration demands that the participants' cognition is uniform enough to understand and act in accordance with their fellow collaborators. The participating organizational representatives interpret the situation and in order to be able to "take over" or share work tasks the organization must support its members in making sense of the situation in a similar way as their fellow collaborators. The process of "sensemaking" has to be similar

between the different organizations' members to enable them to see each other's view of the situation, and share work tasks that fulfill the other organizations' goals.

ICT INTRODUCTIONS IN INTER-ORGANIZATIONAL SETTINGS

Attewell (1992) uses the concept "knowledge barriers" to describe why some businesses did not computerize their business activities as fast as other organizations. He argued that lack of knowledge about how the technology works, and how to implement it in the organization are "knowledge barriers" that need to be surpassed to use the technology. Tanriverdi and Iacono (1998, 1999) identify four knowledge barrier categories that affected the introduction of telemedicine negatively. The first category is technology in accordance to Attewell (1992). The second is financial barriers which means that the adopter does not see how the adoption can be accounted for. The third category is organizational barriers, also discussed by Attewell, meaning that adopters cannot see how to implement the innovation, depending on factors in the organization. The fourth category is behavioral factors. When the adopter cannot see how to use the innovation in his/her usual way of working, and how it fits with the normal routines, the innovation will not be adopted.

An ICT system was introduced in a case reported by Suneson and Heldal (2010), to support communication between public safety and rescuing (PSR) organizations in Sweden. The involved organizations agreed on the benefits of solving accidents but still perceived the use of the ICT-system as taking resources from vital activities for each of the PSR organizations. Furthermore, each PSR organization incurred new fees for participating, for which they were not compensated. This forced them to prioritize in a new way and take resources from other activities. They all agreed that the ICT-system saved resources for society but they did not see benefits for the participating organizations, which is a financial barrier.

Moreover, in the same study (Suneson and Heldal 2010) identified an inter-organizational type of knowledge barrier. Several organizations' requirements have to be considered when deciding on how to set up, configure and use the ICT system.. This created a 'catch 22' situation when the partner organizations did not have sufficient knowledge about each other, and each partner waited for the others to act.

Seligman (2000, 2006) states that adoption can be considered as being a sense-making process referring to Weick (1995). Seligman connects the concept of sensemaking to theories of adoption. Sensemaking explains the evolution of the adopter's mental framework that underlies the theories.

Weick (1995) uses the concept of sensemaking to describe how organizational members understand their organizations, and form their expectations of them. Sensemaking has seven properties that are important to consider:

1) Sensemaking is grounded in identity construction. Individuals strive to form a self-image and a part of this self-image is, beyond how others seem to respond to their actions, how they see themselves being part of a certain context as associated with an organization in some way.

2) Sensemaking is retrospective in the way that the main source of evaluating who you are, and how you fit into a context, is found by analyzing what has already happened. Making sense of things that might happen in the future is troublesome.

3) Sensemaking is focused on extracted cues. Cues are signals that are familiar and tie together elements to a larger sense of what is going on. Context is important because it affects if a cue is observed and how it is interpreted.

4) Sensemaking is enactive. Decisions and actions taken affect the constraints of the environment. When someone does something, takes a decision or even interprets what is going on, this will affect the environment. It is not possible to separate the environment from the individual because they are interrelated.

5) Sensemaking is social and seen as a social process even if a person is alone. Weick and Sutcliffe (2005) state that sensemaking is an issue about language and communication that make meanings materialize. Sensemaking builds on symbolic interaction and on aligning and sharing with others.

6) Sensemaking is constantly ongoing. It is a process of constant defining and redefining of what is going on. We are living in a constant flow in which we extract cues. Weick (1995) makes an analogy with the hermeneutic circle where it is impossible to state an absolute starting point. We are constantly confronted with situations and need to make sense of them. We use known cues to make sense of situations, and the flow we are in, and use them to extract new cues.

7) Sensemaking is driven by plausibility rather than accuracy. We commonly live with incomplete information or do not even know what the complete information should be. We still use whatever information we have to produce an interpretation of how elements are put together. We search for plausible, reasonable and coherent interpretations rather than accurate ones.

INTERPRETATION

By using the theories of organizational boundaries and sensemaking we find means to interpret and describe parts of what is special about introducing VR as an ICT system for supporting inter-organizational collaboration. Knowledge barriers make collaboration hard or impossible. The way to overcome these knowledge barriers is to use aspects of sensemaking.

The studied situations. Three cases (or situations) constitute the empirical base for this paper. The first situation considered only one company while the two other cases were inter-organizational. Only a short description of the cases will be given here.

Situation 1: In the first case (Westerdahl et. al. 2006) a company wanted to prepare their employees before moving to larger premises. Before moving, the company was divided into divisions and partly as subsidiary companies. Many of the departments acted as subsidiary companies with their own goals, culture and premises. Furthermore, before the building was built, and the interior decided, 750 persons visited 3 different suggestions of future layouts of the building in VR shows. Different studies were performed in connection with these shows and in one of these the viewers were asked to judge the environment, using a VR questionnaire and the semantic environmental scale (Küller 1975). At a later stage the respondents were asked to judge the real environment by using the same instruments.

Situation 2: The second case (Suneson et. al. 2008) concerned the development of the design in rebuilding the main city library in Göteborg, Sweden. A series of interviews were conducted with respondents from the group of evaluators, the architects and the municipal authorities. However, in this case the use of VR was not planned from start

but added in the process. The VR-model was used by the group of evaluators in a VR show. The group of evaluators consisted of laymen representing politicians and stakeholders concerned by the rebuilding.

Situation3: The third case (Suneson 2014) concerned the re-planning of a central area in Göteborg, Sweden. The area approximately the size of 6 to 8 blocks, and is considered to be of great importance due to its location on a river bank. This rebuilding is of large public interest, and was preceded by open theme discussions arranged by the local City Planning Authority. The process should result in a detailed development plan for the area. VR was a demand from the commissioning body and was supposed to improve communication between actors in the process. The project consisted of members from several different organizations that represented different stakeholders and different roles in the process. The board of evaluators were professionals in or in association with the construction area.

ORGANIZATIONAL BOUNDARIES IN THE THREE SITUATIONS

However, in situation one there were boundaries between the different parts of the company. Different subsidiary companies and departments were located in different premises which meant physical boundaries. They had different cultures and different goals that guided them in decisions and actions taken. This meant that although all had the same parent company they still acted as different organizations with physical, mental and social boundaries that distinguished the different parts from each other. The corporate management tried to lower these boundaries by using VR. The study showed that VR has some effects that traditional models do not have to the same extent, as recognizing social meeting places.

The group of evaluators in the second situation did not have any preconceptions about using VR, and regarded it as a tool among others to evaluate suggestions from the architects. The group of evaluators did not demand the use of VR but accepted it when given the opportunity. All methods used in the evaluation were mainly suggested by representatives from the municipal authorities. The mental boundaries of the group of evaluators regarding how to evaluate such projects were not strong, but rather still developing within the group. Simultaneously, the architects did have a feeling of losing control over their ideas and how they were presented. It was not possible for the architects to influence how their suggestions were presented in VR when they did not know what to comment on, and whether or not they were responsible for the presentations or use of VR. The VR-models were prepared and adjusted by 3D-artists. The architects were used to situations where they develop and presented suggestions. They had strong mental constructs for how this should commonly be done, and how presentations are made, and the use of VR was not a part of these constructs. They had mental boundaries that had to be challenged to incorporate VR. At the same time social and physical boundaries did emerge in that the suggestions were prepared by the 3D-artists, who were unknown to the architects. This did not facilitate a collaborative use of VR but left the architects mainly outside collaboration while the board of evaluators used VR and found it informative.

When developing the detailed development plan in situation three, the groups of architects were asked to produce the VR-models themselves, and then to hand them in to the board of evaluators. This allowed the architects to have more control over the models. They also had the possibility of using VR as a tool for presenting

their suggestions. Interestingly none of the groups used this to any greater extent. Even the groups that worked extensively with 3D, and partly with VR in their internal work, did not use VR as a tool for presentation. Questions about what it meant to sketch in VR and what VR-models aimed at presenting detailed development plans should look like were raised by the groups. One interpretation of this is that there are inter-organizational knowledge barriers present (Suneson and Heldal 2010). It seems that due to the lack of understanding how other actors will react or understand VR they chose to use traditional presentation tools when communicating their suggestions. Even actors that commonly use VR were still uncertain of how the other actors would see the use of VR.

The board of evaluators did not know how to use VR in their work. They all considered themselves being able to use the traditional work tools and more traditional 3D-models to evaluate the suggestions. Even if they could see benefits with VR they did not have a plan for how they should implement VR use in their work. The interpretation is that the group of evaluators regarded VR as being outside their mental boundaries. A sign that this is valid for other participating actors is that when the suggestions were to be presented with VR as a part of the presentation, and the groups had little time, the choice then became not to use VR, by all groups of architects, and the board of evaluators did not ask for VR to be used. The municipal authorities that initiated the use of VR identified potential benefits but the other parties in the process did not know how to implement use of VR in this specific situation. It was also decided, by the municipal authorities, that the groups of architects should hand in two models at the second set of presentations. One for presenting the proposal to the public, and one for the work process in the evaluating group. The first should be simpler to ensure that no one would think that the proposal was finished and decided. This decision was a result of the media and a lot of debate contributions from the public.

IMPROVING COLLABORATION BY SENSEMAKING

Noticing inter-organizational knowledge barriers or organizational boundaries that affects the introduction of new ICT for inter-organizational use is a good start in understanding a situation. It does not, however, give guidance concerning what to do about the situation. To change organizational boundaries and passing inter-organizational knowledge barriers, Weick´s (1995) concept of sensemaking is needed.

It seems harder for organizations with strong organizational boundaries to adapt to new ICT when it challenges current boundaries. Moreover, in situation three, members in evaluating boards who were used to a certain process did not recognize benefits with VR as easily as members of the laymen evaluating board that did not have strong boundaries. Actors that are new to a situation find it easier to try new ICT and work tasks, and perhaps because these actors have to put in a lot of work to learn new work tasks anyway, then new ICT presents possibilities as they are not in their comfort zone and their boundaries are low. This suggests that in inter-organizational ICT introductions, effort needs to be put into redefining organizational boundaries.

An interpretation, in line with Löfström´s (2010) view of what collaboration means in terms of boundaries, is that the organizational actors need to redefine their organizational boundaries to include the new ICT system for inter-organizational use.

The joint use of ICT has to take the perspective of other organizations into account in addition to the perspective of the actor's own organization.

Sensemaking is social and this tells us that actions that aim to facilitate crossing organizational boundaries need to be organized together with the other organizations members. The retrospective feature of sensemaking tells us that working with situations from the past, and discussing them in the light of the new ICT can help in understanding how it will impact future situations, its focus on cues implies that passing important cues to other organizations members makes it essential in building a joint view to understanding what cues are important, thereby making it possible to adapt work tasks to fit a collaborative situation.

There were no social preparations before using VR, such as meetings to discuss the new ICT in situations two and three. It is very possible that the outcome could have been different if the preparations had involved such discussions where the different organizations goals and cues were discussed with the help of presenting and discussing earlier situations. Such process helps crossing boundaries but also in developing new perspectives on their own identity and its enacting.

CONCLUSION

Commonly inter-organizational ICT introductions´ foci are on distribution and putting up regulations for how to use the ICT but much less on facilitating crossing boundaries and on collective sensemaking, and based on three case studies we conclude that when new ICT-systems, supporting inter-organizational collaboration are to be introduced, more focus needs to be put on identifying knowledge barriers between organizations, and on the cognitive sensemaking side. The more change from the existing boundaries, the more effort on changing sensemaking and boundaries is needed. Using the characteristics of sensemaking can give guidance as to what steps to take, and the activities that can facilitate adoption. As this is building organization and understanding, it will not be as easy as following a simple checklist.

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