

SUPPORTING UNSTRUCTURED WORK ACTIVITIES IN EMERGENT WORK PROCESSES

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Abstract: When existing information systems and organizational procedures lack to support work needs, people engage in informal networks of relations and make use of their tacit knowledge promoting this way the emergence of unstructured work activities. To improve the consistency and effectiveness of such practices we propose a model and a prototype to assist collaboration needs in such scenarios. Our contribution defends the need of the construction of a shared awareness to improve situation understanding and collaboration. Supported on the Reason's Swiss Cheese model for accidents we propose the use of a collaborative constructed artifact: Situation Matrixes (SM), to relate the different situation dimensions. The information needs in the existing contexts of action where the situation unfolds, will be supplied by different views over the (sub)set of matrixes.

1 INTRODUCTION

The existing work processes in organizations are supported in a continuum of structured and unstructured activities (Sheth, Georgakopoulos et al. 1996). Unstructured activities usually emerge from a lack of support of existing Information Systems (IS) and/or organizational procedures to deal with unplanned situations.

The most common approaches to IS development focus on identifying the structure of work processes to produce a system specification. However, many unknown *a priori* variables, both external (e.g., market dynamics, natural disasters) and internal (e.g., latent processes or work structures) are among the factors that may promote the emergence of unstructured work activities. Within these unstructured activities we include exception handling, business process reconfiguration and crisis management.

To get the work done when facing such unstructured scenarios, people usually engage in informal relationships and make use of their tacit knowledge in an opportunistic manner, which quite often

reveals as a source of innovation, creativity and flexibility.

We find in the research literature several projects addressing business process reconfiguration and exception handling e.g. (Kammer, Bolcer et al. 2000). The research reported in our work goes beyond the specific context of exception handling towards the much more complex scenario of emergent work processes supported in unstructured activities. We characterize such scenarios in the following way (Markus, Majchrzak et al. 2002): No best structure or sequence, Typically distributed, Dynamically evolving, Actor roles unpredictable and Unpredictable contexts.

When organizations deal with crisis management even contingency plans may be challenged by particular situations.

The concept of resilience, which may be characterized as a comprehensive endeavor towards increased organizational resistance and flexibility dealing within exceptional situations, has recently emerged (Hollnagel and Woods 2006). This concept encompasses that technology and in particular information systems should be analyzed and

designed to incorporate resilience concepts and contribute to organizational agility. Considering our concrete research objectives, we aim to increase organizational resilience by focusing on the technology support: developing a model and tool supporting collaborative unstructured activities in emergent situations.

In the next section we review this problem in more detail. Section 3 will present some related work. In Section 4 we describe in detail the proposed collaboration model. In section 5 we make some practical considerations about the collaborative tool and its implementation. Finally, we discuss the work done so far and present directions for future research and development.

2 PROBLEM STATEMENT

Many effective collaborative structures used in such emergent situations are not present in the organizations charts. People very heavily rely on their own networks of relationships to find information and make decisions. Regarding technology support, nowadays we still cannot provide flexible/agile software tools that may be reconfigured or redesigned at run-time to accommodate unexpected and unpredicted requirements emerging in dynamic real life situations. Many unpredicted situations are solved with a mix of activities inside and outside formal organizational rules, procedures, tools and systems.

We defend that a shared understanding of the situation is fundamental to bring some coherence and efficiency concerns to unstructured activities.

We note however there are a number of cognitive factors affecting SA, such as perception, attention, workload or training that are difficult to tackle with technology (Endsley 1988).

An additional difficulty to SA technology support is to devise information sharing, coordination and collaboration mechanisms avoiding work overhead, seamlessly integrating with current work practices and minimizing the gap between the perceived and the real situations.

3 RELATED WORK

From an analysis of the proceedings of the International Community on Information Systems for Crisis Response and Management conferences (ISCRAM) between 2004 and 2006, some recurrent

concerns may be identified: Shared awareness of crisis situations, information and knowledge management, information representation, usability and interface design concerns. Studies like (Milis and Walle 2007) and (Kanno and Futura 2006) also emphasises communication, information management and SA as major endeavours.

We had considered to our proposal the contributions from several research areas, highlighting: contexts representation (Bouquet, Ghidini et al. 2002; Brezillon 2008), social networks (cross, Borgatti et al. 2000; Liben-Nowell and Kleinberg 2003), situation awareness e.g. (Gutwin and Greenberg 2002), exception handling (Kammer, Bolcer et al. 2000), technology adoption (Bansler and Havn 2003; Bygstad 2005), and visual representation (Erickson 2001; Thomas and Cook 2004).

Some remarks about the above studies contribution for our proposal, follows:

Regarding contexts works we are adopting the definition of contexts which states that: contexts are a relational property and is managed moment by moment (Dourish 2004).

In what concerns with social network analysis, existing works typically do not address real-time enactment, which is mandatory in our context.

As mentioned earlier in this paper, the problem addressed by our research goes beyond dealing with business process exceptions, towards support to emergent work processes heavily relying on unstructured activities.

In respect to awareness research, the vast majority of works had focused in specific context/domain proposals (a product perspective), while we emphasize a process perspective, considering the information acquisition behaviour and the resources available for processing that information into decisions and actions.

As may be read in cognition studies, information visualization improve information sense making and may constitute a driver for technology adoption. For both mentioned goals we also emphasize the need of information visualization in our proposed model.

Considering that in crises contexts both rule-based (contingency plans) and knowledge-based behaviors will coexist, we focus our research focus in the knowledge-based behavior. In this domain one abandon models guidance and adopt map guidance for situated action (Suchman 1987; Gasson 1999) when facing situations that the existing models and procedures doesn't cope with a particular emerged context.

4 ADOPTED APPROACH

We propose the use of a shared artifact to organize actions and relations, for both internalize and externalize information and knowledge (Nonaka and Takeuchi 1995) in order to develop SA. The proposed model supports the collaborative construction of SA by sharing individual assessments, facilitating collective sensemaking activities and providing situated framing (Gasson 1999).

Our proposal was inspired by the Swiss Cheese model for accidents (Reason 1997) which posits that for an accident to occur, an alignment of holes (weaknesses, latent problems,...) in different organizational dimensions must occur. We defend that in order to construct SA, essential to mitigate a crisis, the involved actors should be able to manage different situational dimensions (e.g. involved actors, actions, resources, goals, etc.). Regarding the representation issues of SA, we adopt a perspective proposed (Miles and Huberman 1994), using several types of matrixes to represent qualitative information. We therefore defend the use of Situation Matrixes (SM) to correlate the situation dimensions (e.g., goals/actions, actions/actors, ... see Figure 1). The dimensions of the circles that mark the correlation are directly related with how strongly (qualitative assessment) is perceived that correlation. Of course for a useful sense making of the gathered information (semantics), we are assuming that people operating under such circumstances are professionals in their work and trained with the proposed methodology. As situations evolve, more information may be brought into the SA (e.g., more actors involved, more actions proposed, ...) and organized in existing and/or new dimensions.

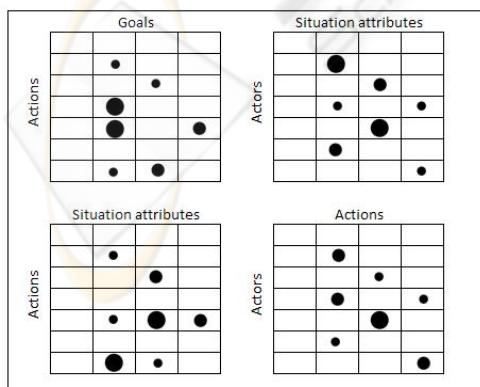


Figure 1: Situation Matrixes.

5 IMPLEMENTATION

We focus our actual concerns in the SA (re)presentation and usability issues. One key aspect to consider is related to the user interface: users should easily obtain an overview of the situation in which they are involved, and should efficiently manage the relevant awareness information. The developed prototype may be accessed from a desktop computer as well as from a Personal Digital Assistant (PDA). The PDA will allow supporting a more operational level, which entails how awareness information is maintained in the field of action. For a more tactical level SM can be managed in a desktop computer. The developed prototype is presented in Figure 2.

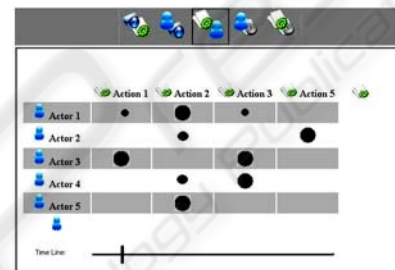


Figure 2: Developed prototype.

Keeping information up to date in such unstructured activities without adding overhead work presents some difficulties. For instance, status reports are hard to track due to their dependence of explicit user declarations. To address this problem, we adopted a pulling strategy. As SA information becomes old, users are prompted to report their validity, combined with a visualization schema to express the degradation of the quality of the information presented in the system.

6 DISCUSSION AND FUTURE WORK

The contribution presented in this work mainly defends that a collaborative SA model is essential to develop a shared understanding of an unplanned scenario. Similar collaborative approaches exist and are already used in some domains. For instance, flight operations and firefighters adopted a Crew Resource Management (CRM) training, which concerns not so much the technical knowledge and skills but rather the interpersonal skills used for

gaining and maintaining situational awareness, solving problems and taking decisions.

The next step in our work will focus on the collaborative management of SM.

Once we refine our prototype an evaluation should be made. In order to validate the proposed model we must evaluate its impact against organizational elements: the nature of work; individuals; organizational communication; relationships; organizational structure and processes (Vyhmeister, Mondelo et al. 2006).

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