Evaluating Design Principles for Temporality in Information Technology for Crisis Management

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ABSTRACT

This work evaluates a set of design principles for temporality in crisis management information systems by reflecting on the design principles based on two national crisis management information systems. Interviews were used as data collection method where: crisis managers discussed how the interface supports the design principles, crisis managers demonstrated common tasks in the system, and information from past crisis management activities was used as an indication of how the system is used in actual crisis management. The evaluation indicates that the design principles: 1) can be used to identify interface flaws, 2) can be a foundation for discussing temporality in design, and 3) can be used to explore temporality in general, including temporality found in: work tasks, the crisis context, and the interaction between crisis manager and information system. In addition, the evaluation suggests two new design principles as a complement to the original six principles.

Keywords: Computer-Supported Collaborative Work (CSCW), Crisis Management, Crisis Response, Information Systems, Temporality, Time

INTRODUCTION

The response to crises (floods, earthquakes, terrorist attacks, and other events that seriously may impact societal functions) often involves multiple organisations. According to Dantas, successful response work requires that organisations have access to information characterising the disaster’s intensity, location and related damages, as well as the availability of human and physical resources (Dantas & Seville, 2006). However, information like this is dynamic and is likely to change as the crisis and response work develops. This study focuses on how temporality can be addressed in the design of information technology support for crisis management, including issues concerning presentation of temporal information adapted to dynamic crisis response work.

An information system for crisis management may be intended to support the coordination of crisis response activities (Franke, 2011), situation awareness (Endsley, Bolté, & Jones, 2003), time-critical decision making (Iannella & Henricksen, 2007), or the visualisation of crisis

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related information (Andrienko & Andrienko, 2007). All these elements depend on time. A problem is how to consider these diverse aspects of time when creating an interface for a crisis management information system. Six specific design principles for how to consider time related aspects in the design of interfaces supporting crisis management have been suggested by Gryskiewicz and Chen (in press), and this study aims at assessing and improving the design principles.

Two sets of design principles which can be used in the development of crisis management systems are: the design principles for Situation Awareness (Endsley et al., 2003) and the general design principles for emergency response systems (Turoff, Chumer, Van de Walle, & Yao, 2004). Gryskiewicz and Chen (in press) suggest six new empirically based design principles focusing on how temporality can be addressed in the design of information technology for crisis management, intended to complement the principles defined by Turoff et al. and Endsley et al. Temporality is here used to denote any time-related information connected to events and activities during a crisis. The reason for the new design principles is that the two first sets only address temporality briefly. Endsley et al’s design principles focus on Situation Awareness (SA). The principles discuss how information systems should be designed in order to support the operator in understanding a situation, and through this aiding decision making. Turoff et al’s design principles are founded on experience and best-practice. They are, unlike Endsley et al’s, specifically directed at crisis management or emergency response systems. Temporality is mentioned in passing, for example, when discussing the importance of up-to-date information.

This work has evaluated the design principles formulated and suggested by Gryskiewicz and Chen (in press) to see if they can be used as a basis for interface improvement suggestions and to further refine the principles. The principles have been evaluated against two different crisis management information systems commonly used in Sweden. This was done through interviews with end-users of the systems; consisting of crisis managers in municipalities and rescue service personnel at different levels. The interviews also entailed the opportunity to study information from real crises stored in such systems. The reflections about the design principles presented in this paper are therefore based on the actual use of crisis management information systems. The contribution of this paper is a discussion of how the design principles for temporality can be refined, a discussion of how the design principles can be used in an interview setting, and the definition and suggestion of two new principles complementing the original six principles.

RELATED WORK

This section discusses research from different fields that in various ways can contribute to better usage of temporality concepts in design. The works in this section mostly focus on how to present information in an interface, but from slightly different angles. The works cover: presentation of temporal information, temporality in dynamic presentations of information, technical considerations of representing temporal information, and temporality as design material. The section also includes works related to the evaluation of information systems.

Temporality

Time and various concepts of time are meaningful and useful design material from a human-computer interaction perspective when designing the interfaces of information systems (Lundgren & Hultberg, 2009). Lundgren and Hultberg define six temporal themes - live time, real time, unbroken time, sequential time, fragmented time, and juxtaposed time - that can be used to describe how an interface behaves from a temporal perspective. Lundgren and Hultberg argue that designers should consider time in the design and use the opportunities this presents, and not let the temporal behaviour of an interface be a side effect of other explicit design
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