INFOSTROM: LEARNING INFORMATION INFRASTRUCTURES FOR CRISIS MANAGEMENT IN MEDIUM TO LARGE ELECTRICAL POWER BREAKDOWNS

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Motivation

One of the most important infrastructures in modern industrialized societies is the electricity network. Due to its fundamental role for many aspects of our everyday life, power infrastructures manifest a strong dependence between power suppliers and customers. Customers take the infrastructure for granted; it appears mostly invisible to them as long as it works, but in the case of breakdowns in power supply customers become aware of the dependence on electricity. They join professional actors in the recovery and coping work with regard to the electricity breakdown: Maintenance workers of the power provider, police, firefighters, red cross, etc. These institutions are professionalized for dealing with such situations, but the people affected by a power outage also need to be considered as actors.

Research Focus

The aim of the project 'InfoStrom' is to develop a 'Security Arena', a communication and information platform that aims to continuously improve the cooperation for coping and recovery work in medium to large power outages between power supplier, firefighters, police, county administration and citizens. It focuses on designing effective interorganizational communication, information and coordination processes and on the development of new innovative technologies in the areas of situation illustration, reliability, information quality visualization, flexibility and public participation. All technologies, concepts and methods will be developed and evaluated in by the University of Siegen, RWE, SAP Research, Fraunhofer FIT, PSI Transcom in cooperation with the counties of Siegen-Wittgenstein and Rhein-Erft.

The use of information and communication technologies should empower the actors to improve planning, observation and management of and in crisis situations. Based on a rich technological foundation of mobile technologies, service-oriented architectures and semantic technologies, we focus on the development of socio-technical concepts, demonstrators and media concepts, which allow including existing technologies of crisis management and infrastructure maintenance into processes to improve interorganisational communication and collaboration in scenarios of medium to large electrical power breakdowns (see picture 1). One important aspect will be to improve the integration of citizens as active participants in managing crisis situations.
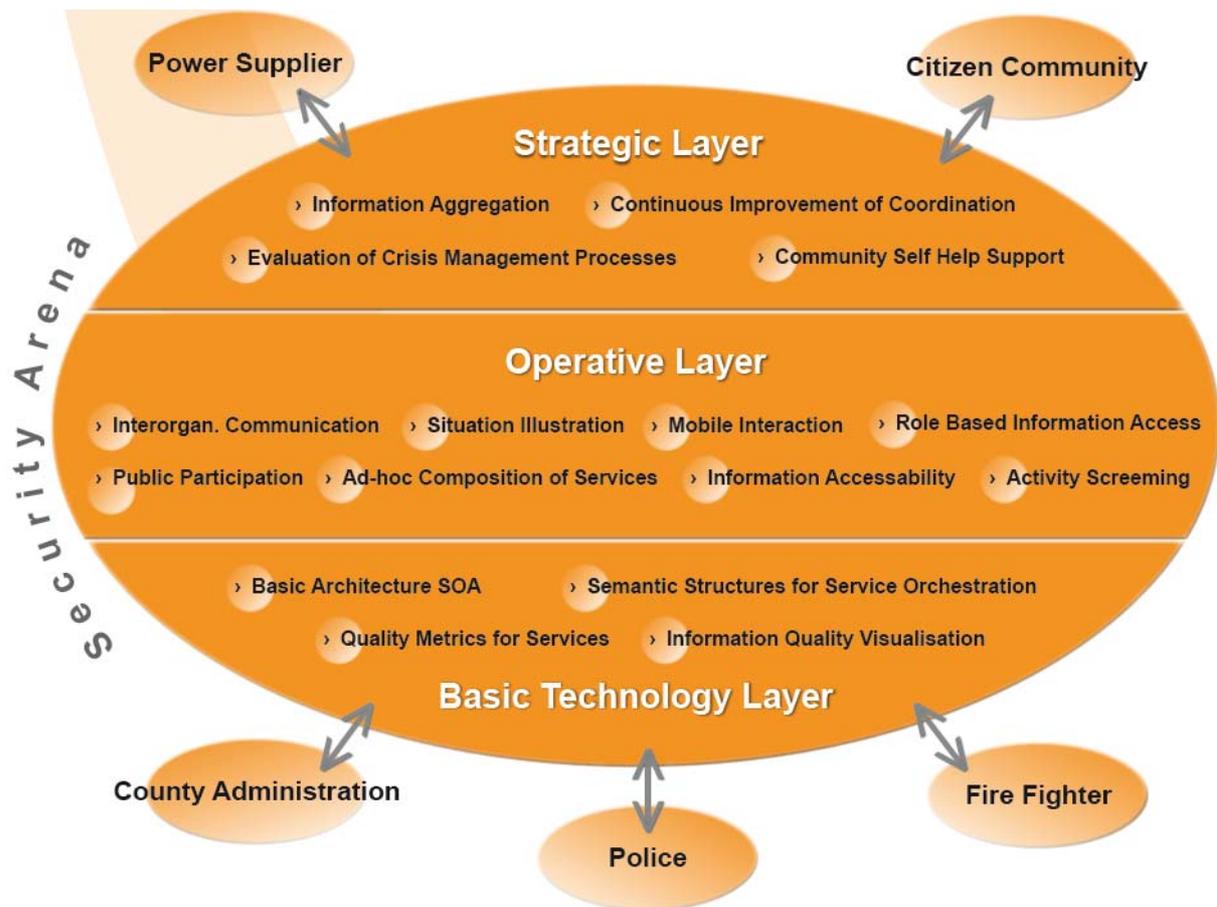
Fig. 1. Security Arena

Good communication plays an important role in crisis management and consists of a proactive policy (Milis and van de Walle, 2007): If the crisis reaches an advanced stage, the threats are bigger and the latitude to act is smaller. We also take into consideration that duration and extent of a crisis may vary in the perception of the different stakeholders involved, that different communication and collaboration cultures complicate the shared work, and consequently misunderstandings and collaboration problems at an interorganisational level are likely to occur.

Methods and Technologies

Aside from theory-led considerations, we aim to understand the attitude and crisis management practice of citizens and of the professional stakeholders by conducting empirical studies and following an iterative development approach for the 'Security Arena'. We collect information about the regulatory frameworks as well as the informal processes of communication and data management, and the artifacts used. In general, development of software for supporting collaborative work or learning requires a good (empirical) understanding of the context (Pankoke-Babatz et al., 2001, Randall et al., 2007, Müller and Pipek 2009). We will frequently use document analysis, observations, interviews and focus group discussions within our iterative process of designing the 'Security Arena' in order to ensure the validity of our research.

Like Turroff et al. (2004), who design a dynamic emergency response management information system, we also want to collect requirements and solutions in this field, but focus more on the inter-organizational communication. Palen and Liu (2007) focus on citizen communications in crisis. We also take the affected citizen into consideration, both as information consumer and provider, supported by information and communication technologies. The project "SoKNOS"

about service oriented architectures to support networks in public security combines a SOA-based information processing approach with a user-centric perspective on information visualization and handling (Doeweling et al., 2008). We want to proceed and extend this approach by our project.

Research and application field

In the project 'InfoStrom' we involved two partner regions (counties Rhein-Erft and Siegen-Wittgenstein), which have different topographies and network structures and therefore different dependences in the electricity supply recovery: *Siegen-Wittgenstein* is a densely wooded, hilly county in the middle of Germany. The main industries are tourism and a number of SME in Mechanical and Electrical Engineering. The center of the region is the city of Siegen. The county lays on the border of three federal states – and therefore different structures in emergency management may interfere. *Rhein-Erft* consists of 10 growing communes around the city of Cologne, some of them also have large chemical plants. There are many companies with specialized emergency plans. There are also some of Germany's most important transportation infrastructures, like highways, airports, railroads, and the river Rhine, which carry specific risks.

The collaboration with (and comparison of) two counties allows us to avoid generalizing from the specifics of one case. In every region we focus on several affected persons and organizations:

- Infrastructure suppliers (e.g. power supplier)
- Public strategic administration (e.g. crisis squad, county administration)
- Public operative administration (e.g. police, fire fighter)
- Affected citizens

By our close cooperation between researchers and users/practitioners and a continuous program of evaluation phases we interpret technology development as a process of further developing an existing infrastructure, not developing one particular technological solution (Pipek and Wulf 2009). The definition and negotiation of inter-organizational information chains has the same priority than the definition and formulation of technical aims.

Summary

With our approach we aim to establish an infrastructure to continuously improve information exchange and collaboration of the stakeholders that react to a power blackout. This includes maintenance workers, police, firefighters, the administrative bodies of cities, counties, states and the federal level, and – most important – the people affected by the power outage. Our 'Security Arena' will provide technological as well as organizational/media-related concepts and solutions. Methodologically, many technologies developed in the field of security research face the problem of finding themselves difficult to integrate in existing practices. Our approach, which we described here, targets this problem by a strong user involvement component (together with the counties of Siegen-Wittgenstein and Rhein-Erft), an interdisciplinary research team with competencies in technology development and empirical analysis (University of Siegen, Fraunhofer Institute for Applied Information Technology FIT), and with strong industrial partners (SAP Research, PSI Transcom and RWE) to bring project results into practice.

Acknowledgements

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