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I /A\ IIII CascEff

The challenge

Modern socio-technical systems are increasingly characterised by a high degree of interdependency. These interdependencies generally make systems more efficient under normal operations. In a crisis, however, they can also lead to severe cascading effects and become extremely difficult to handle. Therefore, the process of preparing for and responding to emergencies is also becoming increasingly complex. New strategies, structures and methodologies are needed to meet these evolving challenges, including cross border and multi-agency cooperation in conducting operations and providing or receiving support across borders.

The CascEff project

The aim of the FP7 project CascEff is to improve the understanding of cascading effects in crisis situations through the identification of initiating events, originating and dependent systems, and key decision points. Objectives supporting this aim are:

- Provide a better understanding of cascading effects in crisis situations;
- Identify the impacts of human activities in crises;
- Develop an incident evolution methodology (IEM) and an incident evolution tool (IET) for predicting crisis evolution that can lead to cascading effects; and
- Improve incident management for present and future threats

Within the CascEff project, cascading effects are defined as the impacts of an initiating event where:

- System dependencies lead to impacts propagating from one system to another system; and
- The combined impacts of the propagated event are of greater consequence than the root impacts; and
- Multiple stakeholders and/or responders are involved.

The figure below illustrates the initiating event, dependencies between systems, and cascading order during an incident with cascading effects.

The CascEff methodology

A large number of past events have been studied to categorize cascading effects and dependencies between systems and to describe effects of human activities, e.g. key decision points. The results have been used to describe cascading effects and as a basis for the development of the IEM. End-users have been involved in the IEM/IET development process to ensure the usability, functionality and feasibility of the IET. The IEM will be validated in simulated incidents using selected scenarios.

The main parts of the CascEff project are:

- Studies and categorization of incidents with cascading effects;
- Decision making and key decision points in relation to incident management;
- Human behaviour, communication and use of media during incidents;
- Existing tools and use of such tools today;
- User requirements, development, and validation of the CascEff IEM;
- Incident management: practices today, challenges and suggested improvements.

Some conclusions so far

The CascEff project will conclude in July 2017. The following conclusions are based on feedback from end-user groups, questionnaires, and recommendations and research from earlier stages of the project.

- The IET should be flexible, scalable, and useful for everyday purposes. The CascEff IEM/IET has great potential in emergency/crisis management and policy, especially in planning, preparation, and training.

- Decision making is a dynamic process that is not necessarily linear.
- The complexity of an emergency is largely dependent on the design of responding organizations and their procedures, support tools, training and other issues of management.
- Achieving situational awareness could be more of a challenge during cascading events because effects may carry over into less familiar domains.
- There is no clear correlation between the number of systems involved in an event and the total duration
- It is the total ability of the constellation of actors that determines how successful incident management can be.
- Crisis communication needs to be prepared to explain the rationale behind some measures, especially when measures may appear to be uncalled for.
- Language, common operating procedures and communication protocols are potential issues.
- Print and broadcast media remain the most trusted and authoritative sources of information during crisis situations.
- The role of the news media has shifted from only focusing on its own production of news ("gate-keeping") to also publicizing and sharing relevant news content ("gatewatching").
- Social media can assist in building resilience against future incidents by facilitating multi-directional information flows.
- End users state that the IET could be useful in the response phase if the relevant data was made available in advance.
- The IEM could be useful for dependency analysis with regard to risk and vulnerability.
- Planning and preparation in the preincident phase is very important; however, it is difficult to find all the relevant information needed. Sometimes the information is made available during a crisis, but is not available for planning and preparation.

Acknowledgement