A Methodology to Analyze Interoperability in Crisis and Disaster Management

IDIMT - Interdisciplinary Information and Management Talks
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Establish Pan-European Information Space to Enhance Security of Citizens

Funded from the European Community’s Seventh Framework Programme FP7/SEC 2013.5.1-1 under the grant agreement no. 607078 “EPISECC”.
Motivation

EPISECC will provide a concept of a common information space. To ensure that the required information will be provided

• Best practices and shortcomings of the management of past disasters need to be analysed

• Such analyses need to be performed in a way allowing comparable and quantifiable comparisons (taking data protection requirements into account)

• Questions of stakeholders on the management of past disasters will be answered

That is what the EPISECC inventory ensures
Concept: Analyzing the response to questions from stakeholders

Questions are related to:

a. Selected disasters
b. Processes/measures of responding to the specific disaster
Pan European Inventory of events/disasters, considering time dimension

- **Technical Approach**: Development process of EPISECC inventory
## Approach

1. Generation of SQL statement – combining adequate fields of information
2. Generation of tables – further processing in Excel – Example of a table

<table>
<thead>
<tr>
<th>Old</th>
<th>DISASTER_NAME</th>
<th>DisasterTypeID</th>
<th>DisasterType</th>
<th>Country</th>
<th>Process name</th>
<th>Measure name</th>
<th>Quantity</th>
<th>Resource Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>187</td>
<td>EQ L'Aquila</td>
<td>1111</td>
<td>Ground shaking</td>
<td>IT</td>
<td>Safety measures for cultural heritage buildings</td>
<td>Valuation and planning predisposition</td>
<td>0</td>
<td>Material costs</td>
</tr>
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<td>EQ L'Aquila</td>
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<td>IT</td>
<td>Safety measures for cultural heritage buildings</td>
<td>Securing cultural heritage</td>
<td>0</td>
<td>Material costs</td>
</tr>
<tr>
<td>124</td>
<td>Snowstorm Hungary, March 2013</td>
<td>1212</td>
<td>Extra-tropical cyclone (winter storm)</td>
<td>HU</td>
<td>Planning response operation for trapped people on Highway M1</td>
<td>ASFINAG - Snow plugs</td>
<td>30</td>
<td>Person hours</td>
</tr>
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<td>ASFINAG - Snow plugs</td>
<td>10</td>
<td>Person hours</td>
</tr>
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<td>ASFINAG - Snow plugs</td>
<td>10</td>
<td>Person hours</td>
</tr>
<tr>
<td>121</td>
<td>Flood June 2013</td>
<td>1300</td>
<td>Hydrological</td>
<td>AT</td>
<td>PROC1</td>
<td>Interaction with LWZ</td>
<td>50</td>
<td>Person hours</td>
</tr>
<tr>
<td>287</td>
<td>Great Flood in Germany 2013</td>
<td>1311</td>
<td>Generic (river) flood</td>
<td>DE</td>
<td>Liaison and Coordination</td>
<td>Collecting information to provide overview of disaster situation</td>
<td>1000</td>
<td>Person hours</td>
</tr>
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<td>Generic (river) flood</td>
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<td>1</td>
<td>Facility costs</td>
</tr>
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<td>135</td>
<td>2013 European floods</td>
<td>1311</td>
<td>Generic (river) flood</td>
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<td>323</td>
<td>Flood (January 2005) Estonia</td>
<td>1313</td>
<td>Storm surge/coastal flood</td>
<td>EE</td>
<td>Providing uninterrupted communication</td>
<td>Ensuring communication for response phase</td>
<td>0</td>
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</table>
Standards used by organizations
Standards used by organizations

17 organizations stated using a total of 27 different standards.

• The only standard that appears to be widely used (7 mentions) is the Common Alerting Protocol (CAP)
• Other standards used by multiple organizations include UNISDR Terminology on Disaster Risk Reduction and Insarag Guidelines
• Otherwise no clear trends – many standards used by only one organization
Type of responding organizations

Stakeholder Type

Responsibility Type

Number of Organisations

Governmental | NGOs | NGOs:Other | Other

Number of Organisations

Strategic | Strategic:Tactical | Strategic:Tactical:Operational | Tactical | Tactical:Operational
Tools used by organizations

Number of users
Tools used by organizations

18 organizations stated using a total of 27 different tools.

• Most widely-used:
  Common Emergency Communication and Information System (CECIS) with 7 mentions

• Followed by:
  VirtualOSOCC, JIXEL, OCHA Relief Web (5, 3 and 3 mentions respectively)

• 5 organizations claiming to use 4 or more tools
• 8 organizations claiming to use only one
Interoperability

\[KI_{Int} = [0.5 \cdot (1 - T_{suc}) + 0.5 \cdot (1 - T_c)] \cdot \frac{D_{Tr-is}}{D_{Tr-id}} \cdot \frac{D_{Us-is}}{D_{Us-id}}\]

**KI\textsubscript{Int}** Key Indicator for Interoperability (Value between 0 and 1, 0 = Worst Case, 1 = Best Case)

**\(T_{suc}\)** Normalised Time for setting up an information exchange channel, e.g. a frequency channel for communication (Value 0 ideal case = no time for setting up channel, value 1 worst case = worst case time to set up channel, depending on expectation of stakeholder)

**\(T_c\)** Normalised Time for exchanging or provision of information (Value 0 ideal case = no time needed for the process of information exchange (ideal, not possible, the shorter, the better), value 1 worst case = worst case time for exchanging information, depending on expectation of stakeholder)

**\(D_{Tr-is}\)** Data transmitted real status (is); (Value 100 best case = all required data transmitted, value 0 worst case = worst case, no required data transmitted)

**\(D_{Tr-id}\)** Data transmitted ideal (id); always 100 (100%), all expected data transmitted

**\(D_{Us-is}\)** Data understood real status (is); (Value 100 best case = all data transmitted understood, value 0 worst case = worst case, no required data understood)

**\(D_{Us-id}\)** Data understood ideal (id); always 100 (100%), all expected data understood
Interoperability

Interoperability Indicator

Number of incidents

Indicator value

0 = no interop., 1 = good interop.
Interoperability - Analysis

Mean values and standard deviations for the four parameters:

- Setup time = $0.05 \pm 0.11$ (range: 0-1; best case = 0)
- Exchange time = $0.15 \pm 0.21$ (range: 0-1; best case = 0)
- Data transmitted = $93 \pm 9$ (range: 0-100; best case = 100)
- Data understood = $86 \pm 13$ (range: 0-100; best case = 100)

Limiting factors appear to be exchange time and the amount of data understood
Discussion

Currently, the review process is still in progress. However, preliminary conclusions can be drawn

• Nine different types of input fields are provided – avoiding free text improves analysis considerably (nevertheless there is need for narrative explanation in some cases)

• However, there is urgent need to consider the context in order to avoid unsuitable comparisons (e.g. can the time of arrival of first responders be compared in case of an earthquake in Haiti and flooding scenarios in mid-Europe?)
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www.episecc.eu