SECURE DYNAMIC CLOUD FOR INFORMATION, COMMUNICATION AND RESOURCE INTEROPERABILITY BASED ON PAN-EUROPEAN DISASTER INVENTORY

Deliverable 3.3 Second publication of inventory results

Christina Schäfer[1], Jens Pottebaum[1], Christoph Amelunxen[1],Johannes Büsching[1], Robin Marterer[1], Torben Sauerland[1], Robin Fischer[1], Daniel Eisenhut[1], Maike Kuhnert[2], Andrea Nicolai[4], Ioannis Daniilidis[6],

[1] University of Paderborn, [2] Technical University Dortmund, [4]T6 ECO, [6]Center for Security Studies (KEMEA)

November 2015

Work Package 3

Project Coordinator

Prof. Dr.-Ing. Rainer Koch (University of Paderborn)

7th Framework Programme

for Research and Technological Development

COOPERATION

SEC-2012.5.1-1 Analysis and identification of security systems and data set used by first responders and police authorities

Distribution level		Public		
Due date		30/11/2015		
Sent to coordinator		11/03/2015		
No. of document		D3.3		
Name		*Second Publication of inventory results*		
Type		*Report*		
Status & Version		*1.4*		
No. of pages		*74*		
Work package		*3*		
Responsible		*UPB*		
Further contributors		*TUDO* *KEMEA* *T6 ECO* *ULANC* *CS*		
Keywords		*inventory results, data sets, command systems, process analysis, information systems, business models, workshop,*		
History	Version	Date	Author	Comment
	V0.1	20/08/2015	UPB	Draft structure
	V0.2	01/09/2015	UPB	
	V0.3	17/09/2015	UPB	
	V0.4	23/09/2015	UPB	
	V0.5	06/10/2015	UPB	Integrating internal input
	V0.6	09/10/2015	UPB,TUDO	Integrating Input
	V0.7	14/10/2015	UPB	
	V0.8	29/10/2015	UPB	
	V0.9	29/10/2015	UPB, TUDO	Integrating Input
	V1.0	04/11/2015	KEMEA, UPB	Integrating contribution to migration case

	V1.1	16/11/2015	UPB	Integration of Review -Feedback
	V1.2	17.12.2015	UPB / ULANC	Integrating Monitoring Feedback
	V1.3	18.12.2015	UPB	
	V1.4	21.07.2016	UPB	Integrating reviewer feedback

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n°607832.

Authors

University of Paderborn
C.I.K.

Christina Schäfer
Email: c.schaefer@cik.upb.de

Jens Pottebaum
Email: pottebaum@cik.upb.de

Christoph Amelunxen
Email: amelunxen@cik.upb.de

Johannes Büsching
Email: buesching@cik.upb.de

Robin Fischer
Email: fischer.robin@gmx.de

Robin Marterer
Email: Marterer@cik.upb.de

Torben Sauerland
Email: sauerlandtorben@gmail.com

Daniel Eisenhut
Email: daniel90@campus.upb.de

TU Dortmund
CNI

Maike Kuhnert
Email: maike.kuhnert@tu-dortmund.de

T6 Ecosystems

Andrea Nicolai
Email: a.nicolai@t-6.it

Center for Security Studies (KEMEA)
P.Kanellopoulou 4
1101 77 Athens
Greece

Ioannis Daniilidis
Email: i.daniilidis@kemea-research.gr

Reviewers

TU Dortmund
CNI

Daniel Behnke
Email: daniel.behnke@tu-dortmund.de

CloudSigma

Alexander Georgiev
Email: alexander.georgiev@cloudsigma.com

Monitoring

ULANC

Monika Büscher
Email: m.buscher@lancaster.ac.uk

Executive summary

This deliverable describes the second round of collection of inventory content in WP3 and is thus a continuation of the previously published D3.2. In order to give a summary of research undertaken in this work package, all chapters include a description of activities for gathering and analysing the respective inventory categories. These are data sets, command systems including information management processes, information systems, and business models. The main contributions are based on literature research and identification of already existing background in the consortium. These activities were complemented by several interactions with stakeholder groups, like the Co-Design/Advisory Board workshop in Athens. Moreover a concept for publishing inventory content is described in the last chapter.

One major issue of research in this work package are **data sets.** Ultimately the SecInCoRe inventory will produce a generic infrastructure for the pan-European networking of disaster related information. To develop this, a two-pronged approach is taken. On the one hand, we identify available data-sets across different types of disasters (see D2.1 and D3.1) and already existing data networks (i.e. Linked Open Data). On the other, we develop an in-depth overview of datasets used in relation to specific case studies. For this round, data sets have a strong focus on the refugee / migration case study and elaborate gathering of available data sets in the respective scenario. First showing a template taking publicly available data into account and beyond this basis, pointing out individual lessons learnt of first responders in this case. National experiences and related relevant data sets are considered for a Greek and a German perspective.

Another category of the inventory is **command systems including information management processes**. The approach is based on the analysis of the ISO 22320:2011 “Societal security - Emergency management - Requirements for incident response”, ICS and on the FwDV100. The deliverable comprises first results in this area, a comparison of the mentioned command systems. Next steps are the ongoing recording and modelling of current processes. The identification of differences and commonalities can inform the development of coordination mechanisms and/or a unified command system.

Next is the **research and inspection of information and communication systems**. In a first step activities to analyse most common information systems were started. Based on the database scheme for information systems defined in the previous deliverable, a semi-automated evaluation method was used to expand this database scheme. In addition a template was defined to categorise information and communication systems and also target the development of taxonomy (T4.1). The success of information systems is essential to understand stakeholder needs and therefore success factors and barriers were analysed by determining key performance areas and key performance indicators.

The reference implementation Open Semantic Framework (OSF) explores **access to inventory content.** For this purpose a top-level inventory concept was defined to provide information to first responder and police authorities and connect data sources, which is governed by secure access policies.

Table of contents

1 Introduction

SecInCoRe develops a pan-European inventory of past critical events and disasters, their consequences (especially in terms of time dimension and costs) focused on collaborative emergency operations and real-time decision making (see [4]). Moreover the focus is on creating a critical mass of content and the infrastructure for a self-sustaining dynamic inventory that grows with the evolving landscape of first responder and police authorities practice.

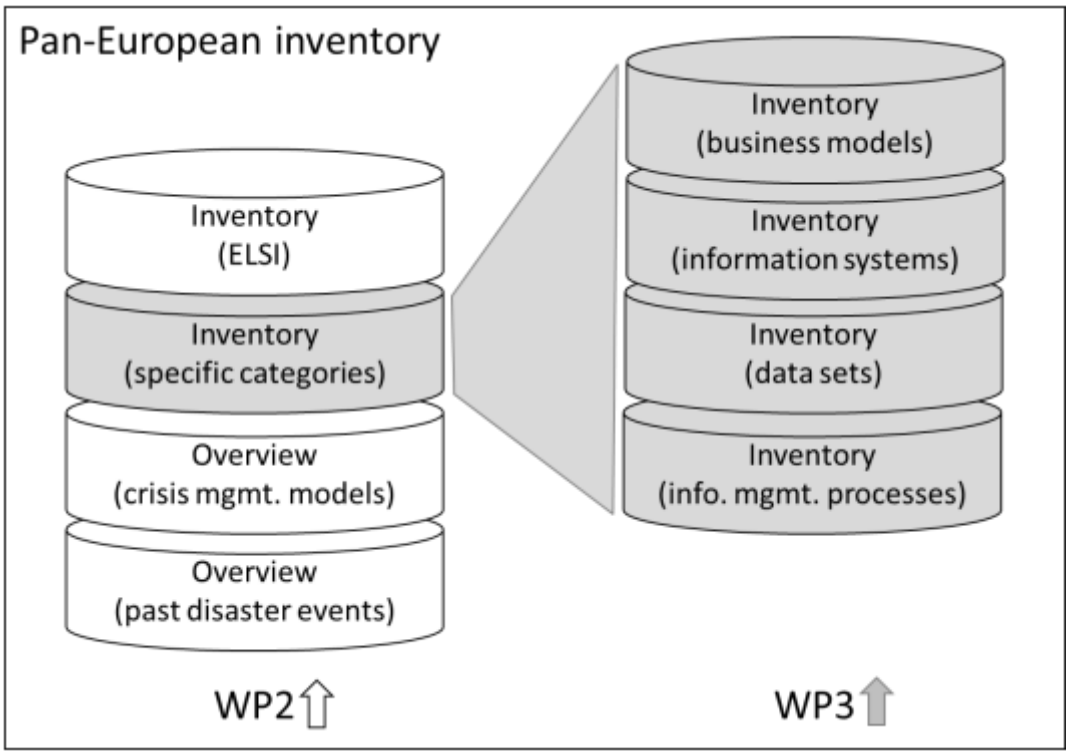

Figure 1 Inventory content

The inventory of disaster events will be complemented by an inventory of related information. According to the high level SecInCoRe objectives (see [3]) and the research methodology (WP3, see [5]) the inventory includes the following categories (see Figure 1 based on [5, p.13]):

- **Data sets:** identification of data sets which are available for first responders and police authorities as well as barriers to utilise these data sets (including both access as well as exchange issues in human to human, human to machine and machine to machine communication).
- **Information management processes:** identification and mapping of common work flows, decision trees, overall crisis management models and lessons learnt within each European country, to point out the possible gaps in data sets, missing interoperability within and between organisations and procedural differences.

- **Information systems:** identification of available and used information and communication systems, relevant functionalities as well as analysis of success factors and barriers for the application of information systems.
- **Business models:** analysis of business models to facilitate the cooperation between stakeholders (including Public Private Partnerships) and application of ICT solutions into practice. In addition to a fit between problems and solutions, a fit between these business models and regional, national, European and even international regulations and public procurement procedures is essential.

1.1 Purpose of this document

This document presents the current state of the inventory with regard to the aforementioned categories. While actual results are collected and maintained in a database to sustain inventory results (see integration of inventory content into the SecInCoRe demonstrator in [9] and [18] and [19] and chapter 6 “Access to inventory content”), this document summarises results in terms of

- activities and implications on the research roadmap for WP3
- structures and schemes to document inventory content
- exemplary content for all inventory categories

While the purpose of the entire inventory is to a) gather knowledge and b) simplify access to that knowledge, the main purpose of this deliverable is to document how the SecInCoRe team gather and structure inventory content and moreover to make it accessible by using a semantic search framework.

1.2 Validity of this document

The deliverable describes all activities carried out to create the inventory with regard to all four categories. As stated before, the deliverable does not include the complete inventory content. In the further progress of the project, the input described here will be complemented by means of further studies and research activities. Thus this collection allows just a first overview of data and information of the inventory.

1.3 Relation to other documents

This document has relationships with other documents created within the SecInCoRe project. The following documents are referred to in terms of foreground literature:

[1] Grant Agreement

[2] Consortium Agreement

[3] Description of Work (DOW)

[4] D2.1 Overview of disaster events

[5] D3.1 Inventory Framework

[6] D3.2 First Inventory Results

The outputs described in this document build the basis for all activities in WP3 and are therefore related to the following documents directly:

[7] D3.4 Final publication of inventory results

As other WPs are connected with respective results, the following documents are also connected to D3.3:

[8] D2.5 [in the form of T3.1 input to T2.2]

[9] D4.1 [in the form of T3.1/T3.2/T3.3 input to T4.2]

[10] D4.2 [in the form of T3.2/T3.3 input to T4.3]

[11] D4.3 [in the form of T3.1/T3.2/T3.3/T3.5 input to T4.1]

[12] D4.4 [in the form of T3.1/T3.2/T3.3/T3.5 input to T4.1]

[13] D6.1 [in the form of T3.4 input to T6.3]

[14] D6.3 [in the form of T3.4 input to T6.3]

As results of activities in other WPs are included in WP3, this deliverable is based on tasks which led to the following deliverables:

[15] D1.4 [as AB activities are regarded in all Tasks of WP3]

[16] D2.1 [in the form of T2.1/T2.3 input to T3.1/T3.2/T3.4]

[17] D2.2 [in the form of T2.1/T2.3 input to T3.1/T3.2/T3.4]

[18] D5.1 [in correlation to demonstrator setup in WP5]

[19] D5.2 [in correlation to demonstrator setup in WP5]

[20] D2.4 [in the form of T2.1/T2.3 input to T3.1/T3.2/T3.4]

All activities in WP3 are based on strong interdisciplinary collaboration with WP2 and stakeholder interaction which includes ethical, legal, and societal issues (ELSI). Thus, the research is in-line with the overall SecInCoRe approach towards those aspects and builds on

[21] D1.2 Research Ethics

1.4 Contribution of this document

This deliverable should facilitate reflection on the research methodology (as defined in [5]) and first inventory results. Thus it comprises a description of how inventory categories are understood and which background knowledge consortium members can bring to each category. This enables further and more detailed discussions of possible content. It helps to define validation and evaluation plans to assess the progress made in collecting items in the several Tasks of WP3 and the potential benefits for all types of stakeholders (cp. [3]).

1.5 Target audience

The deliverable is a working document to facilitate collaboration within the SecInCoRe team. It was declared to be public

- to allow sharing with 'third parties' from related fields of research or practice (e.g., first responder, information system provider and researcher)
- to gather feedback by such experts.

As the categories of the inventory are very different, some parts of this document address specific reader groups directly while they may be hard to understand for other groups. If the reader wants to go into more depth, the description of SecInCoRe objectives in [3] and the FP7 Security programme (especially topic 'SEC-2012.5.1-1 Analysis and identification of security systems and data sets used by first responders and police authorities') will help, and there are a range of academic and media publications available at the project website http://www.secincore.eu that elaborate on specific aspects.

1.6 Glossary

Abbreviation	Expression	Explanation
BAMF	federal office for migration and refugees of Germany	BAMFs working areas are manifold, including research and many other activities in the field of asylum, migration, integration and support to the return
BM.I	Federal Ministry of Internal in Austria	The BM.I is in charge of security issues in Austria comprising citizenship, elections and national referendums.
BMJV	Federal Ministry of Justice and Consumer Protection of Germany	The directorate is responsible for the courts constitutions i.e. for Federal law regulations on the structure and organisation of the courts and public prosecution offices. The Directorate General's sphere of responsibility also includes the procedural rules for ordinary jurisdiction (i.e. the civil and criminal courts, including criminal investigation proceedings) as well as for administrative and financial jurisdiction.
CAP	Common Alerting Protocol	Data exchange model

Abbreviation	Expression	Explanation
CEIS	cloud-based emergency information system	Emergency information system which can be accessed via internet.
DRK	Red Cross Germany	The German Red Cross is part of this universal community, which started 150 years ago to deliver comprehensive aid to people affected by conflict, disaster, sanitary emergencies, or social hardship, guided solely by their needs.
EFFIS	European Forest Fire Information System	EFFIS consists of a scientific and technical infrastructure at the Joint Research Centre (JRC) doing research on forest fires and operating a web based platform and database.
ELSI	Ethical, legal and social issues	Ethical and social challenges and opportunities that arise in emergency situations, especially with a view to the use of ICT. Legal issues arising, particularly around data protection, liability, and responder safety
EASO	European Asylum Support Office	https://easo.europa.eu/
FR	First responders	A **first responder** is an employee of an emergency service who is likely to be among the first people to arrive at and assist at the scene of an emergency, such as an accident, natural disaster, or terrorist attack. First responders typically include police officers, firefighters, paramedics, and emergency medical technicians.
FRONTEX		European agency - http://frontex.europa.eu/
GIS	Geographic information system	A **geographic information system** (**GIS**) is a system designed to capture, store,

Abbreviation	Expression	Explanation
		manipulate, analyse, manage, and present all types of spatial or geographical data.
GUI	Graphical User Interface	GUI is a type of interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, as opposed to text-based interfaces, typed command labels or text navigation.
ICT	Information and communication technology	ICT is often used as an extended synonym for information technology (IT), It is more specific term (i.e. more broad in scope) that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.
IS	Information systems	A computer **Information System** (**IS**) is a system composed of people and computers that processes or interprets information.
JRC	Joint Research Centre	The European Commission's in-house science service
KB	Knowledge base	A **knowledge base** (**KB**) is a technology used to store complex structured and unstructured information used by a computer system. In the SecInCoRe context the knowledge Base is the technical representation of the inventory
KPA	Key Performance Area	KPAs evaluate, measure the success of an organization

Abbreviation	Expression	Explanation
KPI	Key Performance Indicator	KPIs evaluate, measure the success of an organization
LOD	Linked (Open) Data	Web of Data, which can be understood as one realization of the Semantic Web
PIMS	profit impact marketing strategies	The **Profit Impact of Market Strategy** (PIMS) database "yields solid evidence in support of both common sense and counter-intuitive principles for gaining and sustaining competitive advantage": Tom Peters and Nancy Austin.
RDF	Resource Description Framework	A recommendation for semantic web data models
SFTP	Secure File Transfer Protocol	network protocol that provides file access, file transfer, and file management over any reliable data stream
SMART	Specific, Measurable, Achievable, Relevant and Time-bound	Guidance for the development of metrics for technology performance.
TextStat	Textstatprogram	simple programme for the analysis of texts
UN	United Nations	http://www.un.org/en/index.html
	Category entry	Entries in the inventory spanning the aspects data sets, information management processes, information systems, business models and cross-cutting ethical, legal and social issues
	Data types	Types based on descriptions of the data on a semantic level (e.g., spatial data in terms of vehicular movements)
	Stakeholder	Everyone who is involved in overcoming a disaster event

1.7 List of figures

1.8 Structure of the deliverable

The document begins with a general part in chapter 1. The following structure of this deliverable is in accordance with the inventory artefacts regarding this work package:

Chapter 2	Second version of data sets
Chapter 3	Command systems and information management processes
Chapter 4	Information systems
Chapter 5	Business models for to the application of information systems
Chapter 6	Access to inventory content

All these chapters are divided into two major parts: The first part describes all activities undertaken, delineates compliance with and deviations from the research programme defined in [5] and illustrates the coherences between and motivations for them. The second part comprises respective results of these activities.

2 Second version of data sets

In the following section the ongoing research regarding the acquisition and analysis of data sets will be presented. SecInCoRe provide a framework for secure information sharing practices. The inventory conducted in the SecInCoRe project define a basis for collaboration between first responder and police authorities, but moreover show types of data, categorisations and structure to enable the respective responder to create their own common information space (CIS).

2.1 Activities for the acquisition of representative data sets for past or ongoing disaster events

According to the research framework of [5], several activities have been conducted to gather information about data sets (see Figure 2).

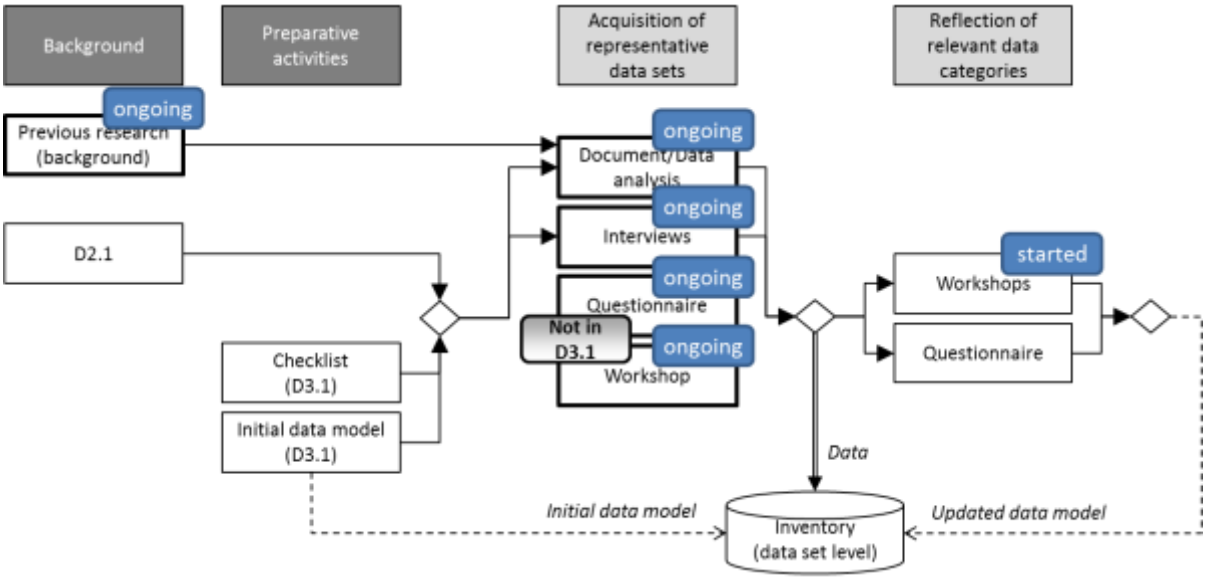

Figure 2 Initial activities for the inventory of data sets

- The first activity is the ongoing collection and analysis of results from **previous research** and **document / data analysis**: Overall SecInCoRe aims a broad approach for gathering data (i.e. linked open data, existing data bases, …). One dedicated case study based on the CIS documentation in [10] is the refugee / migration case. The focus is undertaken for this section, showing the information sharing activities in this situation. Therefore especially publicly available information was considered to cover all kind of aspects and provide a comprehensive overview of the situation. In a second step restricted data based on internal information sheets was analysed.
- **Interviews** with first responders involved in the refugee / migrant crisis: The interviews with these parties show available and also needed data sets. Further Lessons Learnt from the ongoing practice in the crisis are collected as Lessons Learnt.

- Another activity regarding the acquisition of data sets are **Workshops**: A second SecInCoRe Co-Design and Advisory Board workshop was conducted 10-11 September 2015 in Athens. Fourteen first responders from different countries participated and contributed their individual knowledge to the consortium.

What actually gets used during a disaster is very situation-dependent. Need and use of data, change according to the focus on a special phase of the crisis management cycle. Based on [5] and [6] the emphasis is on data usage and exchange between involved organizations. Hence analyses were defined on a more detailed level to search for data sets which are:

- available and used
- available and shared
- available and not used
- not available but needed
- not available in some organization but available in others

The actual deliverable of second publication of inventory content focuses on:

1. **Available data** sets with the willingness for sharing these data within and between organisations to directly react on domain analysis and ethical impact assessment (EIA) insights (from WP2, literature review and advisors´ input).
2. Reports on **experiences and lessons learnt** of first responders, also giving insights about needed but not available data sets in this context.
3. The **refugees / migrant crisis** in Europe, taking the chance of including a stakeholders' perspective during events. SecInCoRe members are already participating in the management of the crisis (especially consortium members in Greece, Italy and Germany are involved) and we have compiled a thorough case study for the inventory of past disasters in D2.1.

2.2 Data model regarding publicly available data sets in the refugee / migrant crisis

In the following chapter publicly accessible information are divided into different information channels or sources and their importance for the respective information receiver is exposed. Since not every receiver has access to all information and information channels (e.g. personal registration data of refugees) only publicly available information is included. However some kind of restricted data will be taken into account later in chapter 2.3 and possible access control mechanisms are / will be discussed in D4.2 and D4.3. Most public available data is reachable by using web-based access (use of mobile devices, laptop, computer…) and can be integrated in the

CIS like described in chapter 6. When looking at information paths on issues such as the refugee / migration case, three different characteristics for gathering information have to be distinguished. These are the searching groups, the information channel and the information level. In the scenario “refugee / migration case” the searching groups mostly are civil society (citizens involved in the refugee / migration case and the refugees themselves) and the public sector (based on the previous deliverable [19] elaborating the “Early setup of evaluation model for internal use case” stakeholders are grouped in the categories civil society, public sector and private sector. First responder and police authorities are part of the public sector). Main focus of SecInCoRe is first responder and police authorities, but as mentioned before other stakeholders are also taken into account. Each of these three groups (overall civil society, public sector and refugees) may use every information channel, but not every information channel is suitable for each person. For example internal matter like reports on experiences of the fire department are hardly suitable for the civil society or refugees / migrants, as they are addressed to people with duties in the crisis. But still a variety of reports are published on the internet (feuerwehr.de) for various reasons (better transparency, lessons learnt for other authorities, etc.). Also, most information is available only in the language of the respective country. Although the information is accessible to all groups, not everyone can understand the information. Common information paths are shown in the following graphic:

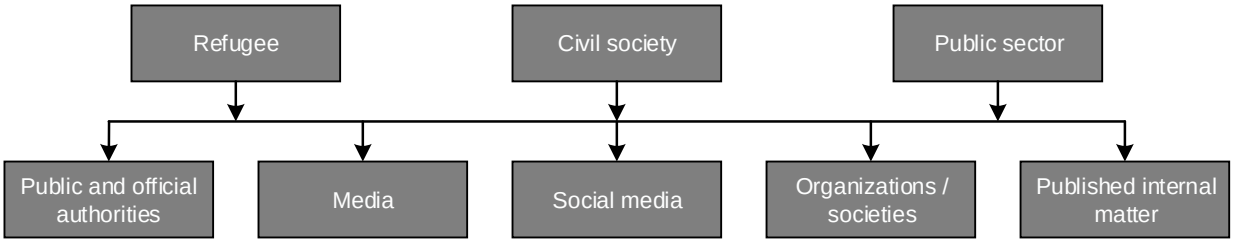

Figure 3 Information channels in the refugee / migrant crisis

The five channels of information (“public and official authorities”, “media”, “social media”, “organizations/societies” and “published internal matter”) can be divided further with respect to the information level (international, national and regional). Depending on the level this affects the available information. While statistics, which contain general information about the crisis and the refugees, are available at the international and national level, more specific questions are answered at the regional level. Exceptions in this case are represented by laws and agreements which cover organisational elements (e.g. allocation formula of Königstein for the distribution of refugees in Germany). These are also regionally important especially for people with organisational tasks in the crisis. Depending on the granularity of data, the chronological classification of the available facts varies. So the timeliness of information increases steadily from international to regional level. For example the latest available statistics on asylum applications at the European-level are published

until June 2015 via eurostat. At national levels, these statistics, however, are already available for August 2015.

The following table is used as a template to demonstrate the different information channels. Of course every group can have access to all information and is able to decide about respective relevance, but general assignment of the information to the high categorisation of civil society, public sector and refugees is done in the following section.

Table 1 Template regarding public available data sets in the refugee / migrant crisis

Information channel		
Type of information:		
Level of information:		
Sources of information:		
Relevant content for:	Refugee:	
	Civil society:	
	Public sector:	
Examples for sources:		

2.2.1 Publicly available data sets in the refugee / migrant crisis

In the following all information channels are presented in tabular form and information available through these channels is described.

Table 2 Information channel: Public and official authorities

Public and official authorities		
Type of information:		• Statistics (numbers of refugees, country of origin, gender, age, religion, etc.) • Laws and agreements (e.g. allocation formula of Königstein, Dublin-regulation)
Level of information:		• International, national: statistics • Regional: laws and agreements
Sources of information:		eurostat, BAMF (federal office for migration and refugees of Germany)
Relevant content for:	Refugee:	Information on the legal situation (What are my rights? Where do I put my application for asylum? What are my chances for asylum?)
	Civil society:	General information about refugees (numbers of refugees, country of origin, gender, age, religion, etc.)
	Public sector:	Regulations concerning refugees (e.g. Distribution of

	refugees in refugee camps)
Examples for sources:	• http://ec.europa.eu/eurostat/statistics-explained/index.php/Asylum_quarterly_report - Asylum quarterly report - eurostat • http://www.bamf.de/SharedDocs/Anlagen/DE/Downloads/Infothek/Statistik/Asyl/201508-statistik-anlage-asyl-geschaeftsbericht.pdf?__blob=publicationFile – Asylum business statistics – BAMF • https://www.bamf.de/SharedDocs/Anlagen/DE/Downloads/Infothek/Statistik/Asyl/statistik-anlage-teil-4-aktuelle-zahlen-zu-asyl.pdf?__blob=publicationFile – Current figures on asylum – BAMF • http://www.gesetze-im-internet.de/asylvfg_1992/__45.html – Asylum procedure act - BMJV[1]

The websites of public and official authorities can be used in particular for the information gathering of laws and agreements and also for general statistics. This makes them especially for the public society an important information source in the current refugee crisis. They are distinguished by a direct and unvarnished information transfer and highly topical in terms of the overall situation.

Table 3 Information channel: Media

Media	
Type of information:	• General information about refugees in the area covered by the newspaper (numbers of refugees, country of origin, etc.) • Public and official statistics (national newspapers) • Information on the processes in the region (assistants, refugee reception processes, next distribution, board) • Information for voluntary work • Information about donation • Explanations on critical issues (threat of jobs, eviction for refugee accommodation, etc.)
Level of information:	• National: statistics, general information • Regional: information on processes, voluntary work and donation and general information
Sources of information:	National newspapers (faz.net, welt.de, spiegel.de, focus.de, bild.de, etc.) and regional newspapers (general-anzeiger-bonn.de, ksta.de, nw-news.de, etc.) television, news, media websites

[1] Federal Ministry of Justice and Consumer Protection of Germany

Relevant content for:	Refugee:	Information about the local situation (board, charging-stations for smartphones, wifi, public telephones, etc.)
	Civil society:	General information about the local situation. Information about how aid can be provided (hotlines and e-mail-contacts of charity organizations).
	Public sector:	Media are used in control rooms to have an overview about an ongoing situation
Examples for sources:		• http://www.general-anzeiger-bonn.de/fluechtlinge/manche-kinder-kommen-barfuss-an-article1728754.html - some children are coming barefoot – General Anzeiger Bonn (regional newspaper) • http://www.ksta.de/koeln/wie-sie-fluechtlingen-in-koeln-helfen-koennen-sote,15187530,31719678,item,1.html – How you can help refugees in cologne – Kölner Stadt-Anzeiger (regional newspaper) • http://www.ksta.de/koeln/-fluechtlinge-sote-in-nrw-alles-wichtige,15187530,31847224.html – Relevant information about the hub at airport Cologne/Bonn – Kölner Stadt-Anzeiger (regional newspaper) • http://www.welt.de/politik/deutschland/article146034679/13-Fakten-ueber-Fluechtlinge-in-Deutschland.html - 13 facts about refugees in Germany – Die Welt (national newspaper) • http://www.zeit.de/gesellschaft/zeitgeschehen/2015-09/fluechtlinge-unterkunft-sexuelle-uebergriffe - Prevent further trauma of refugees – Zeit online (national newspaper)

Media serve primarily as a source of information for civil society, but can also be very helpful for refugees / migrants when it is possible to cross language barriers. They take particularly at the regional level the role of a filter by enabling targeted dissemination of information to the population. Information from all other channels is picked up by newspapers, preselected and forwarded to the reader in understandable language.

Table 4 Information channel: Social media

Social media	
Type of information:	• Information about planned actions of volunteers • Discussions on critical issues • Contact information of officials and experts
Level of information:	• International, national: discussions on critical issues • National, regional: information about planned actions and contact information

Sources of information:		Social networks (e.g. facebook), location based services (e.g. google places), micromedia (e.g. twitter), blog platforms (e.g. blog.de), video (e.g. youtube), Interest and curated networks (e.g. xing or linkedIn)[2]
Relevant content for:	Refugee:	Contact information of officials and experts, contact with volunteers, exchange of information with other refugees
	Civil society:	Information about planned actions (e.g. #trainofhope on twitter), discussions on critical issues, exchange of information with refugees
	Public sector:	Contact information of officials and experts (by using xing or linkedin), Information about planned actions of volunteers
Examples for sources:		• Twitter: #trainofhope, #refugeeswelcome, etc. • Facebook groups: Flüchtlinge Willkommen (refugees welcome), Studis für Flüchtlinge (students for refugees), etc. • http://tomgard3.blog.de/2015/09/24/syrischen-fluchtbewegung-20743578/ - About the Syrian refugee movement – blog.de • https://www.youtube.com/user/RefugeeAction - refugee action - youtube.com

Social media is in the current refugee / migrant crisis probably the information channel with the greatest amount of information. In this area, however, two groups must be distinguished from one another. Information on social networks, video networks or micromedia should be treated with caution. Due to the high sensitivity of individual subjects, there are often clashes between pro-refugee groups and anti-refugee groups among which the information content is suffering greatly.

By contrast, curated networks offer real support specifically for the public sector. Here a mass of contact information of experts and officials can be found which are absolutely necessary in managing the crisis. One statement from the Advisory Board meeting in Athens was: “Colleagues from Dusseldorf drove to visit us. Looked at what we’d been doing cause we said it’s better if you came rather than just talking on the phone. Look at our distribution centre see how we run it, how we get the non-organised volunteers working, do registrations, bus transfers etc… There’s no data base where we put the information in but people would call us.” The importance of getting in contact with respective knowledge bearer is clearly evident.

Table 5 Information channel: Organizations / societies

Organizations / societies

[2] Categorization based on the social media prisma of ethority (http://ethority.de/social-media-prisma/)

Type of information:		• General information about refugees • Information about donation • Information about voluntary work
Level of information:		• International, national and regional
Sources of information:		Public charity organizations (e.g. DRK, Caritas), private societies (e.g. refugees welcome)
Relevant content for:	Refugee:	General information about the crisis, contact with volunteers
	Civil society:	General information about refugees, contact with refugees, information about donation and voluntary work
	Public sector:	-
Examples for sources:		• http://www.drk.de/aktuelles/fokusthemen/fluechtlingshilfe.html - In a sign of humanity: The German Red Cross helps refugees - both at home and abroad – German Red Cross • http://www.caritas-paderborn.de/41852.asp?id=44926 – In order for the succeed of assistance to refugees – caritas • http://www.proasyl.de/de/ - General information about the refugee crisis – pro asyl • http://www.refugees-welcome.net/ - Mediation of refugees to homes in private ownership – refugees welcome

Charity organisations and societies allow mainly the civil society to participate through volunteering or donating. Their websites provide the best platform to start voluntary help. At the same time refugees can use these platforms to get in touch with volunteers.

Table 6 Information channel: Published internal matter

Published internal matter		
Type of information:		• Reports of experience
Level of information:		• International, national: leaked internal documents • Regional: reports of experience
Sources of information:		public society websites (e.g. feuerwehr.de)
Relevant content for:	Refugee:	-
	Civil society:	Information about refugees (particularly in the area of political decisions)
	Public sector:	Reports of experience for the optimization of own operations

Examples for sources:	• https://wikileaks.org/eu-military-refugees/EUMC/page-1.html - EU plan for military intervention against "refugee boats" in Libya and the Mediterranean – wikileaks • http://pressejournalismus.com/wp-content/uploads/kalins-pdf/singles/bm-i-sonderberichterstattung-und-analyse-der-derzeitigen-migrationslage.pdf - Special coverage and analysis of the current migration situation – internal document of the BM.I[3] • http://www.feuerwehr-celle.de/eins%C3%A4tze/einsatzbericht/2357 - Assistance at the refugee camp – Voluntary fire department Celle

The information from internal matter, depending on the view (public society or civil society) must be evaluated differently. For all stakeholders engaged in or supporting the work of first responders and Police authorities, internal documents and in particular reports of experience provide important information for its own operations with respect to the refugee / migrant crisis. In contrast, for civil society published internal matter rarely represent the first used information channel, but it can be used very good to verify pre-selected and customised information through media and to form its own independent opinion.

2.3 National experiences and lessons learnt in the refugee / migrant crisis

The inventory should provide better access to experiences and lessons learnt. To study how these are currently shared we have carried out studies in WP2 and WP3 and held discussions in workshops. One key insight from interdisciplinary study of the domain ([15], [16], [17], [5]) is that there are special needs for experiences, lessons learnt and a need to raise the trust regarding the respective information and therefore to be able to get in contact with the individual knowledge bearer: “In the real world, especially when it comes down to real incident you either know someone or someone that knows someone and try to get relevant information”, This is one statement made in an Advisory Board workshop. To gain some understanding of what experiences and lessons learnt are documented and how, we have carried out two case studies into individual experiences and lessons learnt on a national level to handle the refugee / migrant crisis. They are described in the following section. Knowing that “this problem cannot be solved by any one country working alone” [www5] two different perspectives of the crisis are taken into account.

In some countries the refugees / migrants cross the European border first time. Overcrowded ships arrive or people cross the border using the land journey accept

[3] Federal Ministry of Internal in Austria

deprivation. “But many refugees / migrants try to get to particular places within the EU. Germany and Sweden have taken in the majority of the refugees and asylum applicants.” [4] Demonstrating the national deviations the conducted analysis of lessons learnt is twofold.

These case studies provide a source of a more structured extraction of experiences and lessons learnt undertaken by members of the SecInCoRe project. In real world use of SecInCoRe, such experiences and lessons learnt would have to be documented by responders (ideally in the format suggested) and connected into the inventory network. The following case studies considering the refuge / migration case from a Greece and a German perspective enable members of the SecInCoRe project to structure and identify data sets and elaborate a template to gather lessons learnt.

2.3.1 Greece

The irregular migration crisis on the southern border of EU has reached unprecedented levels. Greece has been the recipient of the greatest wave of migrant / refugees in EU, reaching the hundreds of thousands, estimating that during September and October 2015 the arrivals have touched the extreme numbers between 7,000 and 9,500 people on a daily basis. This case study deals with the migration phenomenon in Greece. Different data sets have been derived from the ongoing and evolving migration crisis in southeaster Europe, and more specifically in the migration flows from Turkey. Most of the data sets are not obvious or easily identifiable. The length of Hellenic -Turkish sea borderline is more than 500 nautical miles and in many locations the distance between the Turkish coast and the Greek islands (e.g. Lesvos and Kos) is very short, thus traffickers are smuggling people into Europe using these routes. The National boarders (but also external borders of EU) are protected by the Hellenic Coast Guard at sea level while the Hellenic Police is guarding the land boarders. Furthermore, the Hellenic Coast Guards is not only responsible for the prevention of illegal entry but also for the Search and Rescue operations at sea.

The last three months due to the warfare in Syria the number of illegal immigrants entering Europe through these routes has risen significantly and unexpectedly, while it is reported by the UN that over three million Syrians have fled their country. Thousands of deaths (over 3500) have been reported by the Hellenic Coast Guard, in the attempt of migrants / refugees mainly from Syria, to cross to the Hellas and therefore EU.

Based on the type of the boat used by traffickers, the Hellenic Coast Guard will send the respective forces (e.g. type of vessel). Even when the traffickers are not using speedboats and the Hellenic Authorities detects them promptly, most prevention operations will become Search and Rescue operations. This is due to the course of actions of traffickers to avoid imprisonment. Most of the times traffickers will either

1) not supply the vessels with sufficient fuels and therefore refugees / migrants will not be able to return to the Turkish coasts or
2) they will destroy the vessel or
3) they will throw the migrants / refugees into the sea.

In daily bases the Hellenic Authorities and FRONTEX are conducting Search & Rescue operations but unfortunately there are many victims among the immigrants, in many cases people requiring assistance such as pregnant women and even children. Hence, there is a definition of migrant type and the required assistance.

Many EU and National agencies/bodies are assisting the aforementioned agencies to effectively manage the migrants / refugees.

FRONTEX, Europol and the European Asylum Support Office (EASO) will assist the Hellenic first responder agencies in the process of identification, registration, fingerprinting and screening of the migrants / refugees. The work of the agencies will be complementary to one another. Those claiming asylum will immediately go through the asylum procedure where EASO's supporting teams will assist during processing these cases as quickly as possible.

For those not in need/ or not qualifying for international protection, FRONTEX will assist Member States by coordinating the deportation, the voluntary or involuntary return/repatriation of irregular migrants.

Europol and Eurojust will assist the host Member State with the investigations in order to dismantle the smuggling and trafficking networks. Furthermore, the Office of the United Nations High Commissioner for Refugees (UNHCR) in Greece is involved.

Deployment of the responsible agency and communication to the respective supportive agencies/network (based on the number of migrants/refugees) depends on the respective National and European legislation.

The security operations by Hellenic Coast Guard and/or FRONTEX at the Hellenic-Turkish sea boarder are aiming at the best possible surveillance/monitoring in the eastern Aegean. Under the project "Poseidon" both organizations are patrolling the area from both air and sea in 24/7 base, to prevent the migrants trafficking in Greece and when possible to arrest the traffickers.

Furthermore, the Hellenic Coast Guard delivers the immigrants to the First Reception Service (F.R.S.), an agency of the Hellenic Ministry of Interior designed especially for events like the migration phenomenon, when they are detected in the sea while the Hellenic Police is responsible to deliver them to the F.R.S. when detected in land. The process after the F.R.S. receives the immigrants is as follows:

- First Aid to everyone who needs medical attention (F.R.S. in collaboration with doctors and nursing personnel from the local/regional Health Center or Hospital,

or in collaboration with NGOs supporting the actions of the respective Authorities)

- Hospitalization of the people requiring urgent/immediate need of medical treatment (Adults and Minors). The medical stuff (doctors and nurses) is recording the "first" personal details.
- Find temporary accommodation in the facilities of F.R.S. or in another suitable public facility/building, if F.R.S. facilities are unavailable or the number of immigrants is extremely high for the process of first reception to be carried out.
- Provide clothing for every individual and if and when required (in case that they need to stay for long) enough quantity of clothing (F.R.S., NGOs, local council authorities)
- Catering/Feeding ((F.R.S., NGOs, local council authorities) or in collaboration based on the situation/occasion.

Furthermore following aspects are relevant:

a) The First Reception Service was established under the Law 3907/2011. It is under the Deputy Minister of Interior, it has local jurisdiction over the district while it is distributed in all over the country. It employs civil personnel from Public Organizations. The main objective of F.R.S. is the effective administration of the illegal immigrants entering Hellas, while respecting their dignity and human rights.

   To achieve this, F.R.S. has establish First Reception Centres, and mobile units (mobilized in case of emergency) of First Reception on the islands of eastern Aegean. Nevertheless, they are not sufficient to meet the needs occurred by the massive inflow of immigrants.

b) The Centres and the mobile units are internally structured in distinct groups/teams by employees of the F.R.S. and/or supplemented by Police officers when the stuff of F.R.S. is insufficient.

   These groups/teams have been increasing due to demand, based on the (1) number of the incoming immigrants and (2) the capability to carry out the first reception procedures simultaneously or in rotation. These procedures are the following:

   The local Health centers/hospitals, local council authorities, UNHCR office in Greece, NGOs and FRONTEX's personnel are providing the necessary support/assistance to F.R.S. and/or Police authorities.

   Furthermore, certified translators working for FRONTEX and for the NGO "Diadrasi" (certified NGO) are also assisting the F.R.S. and the Hellenic Police.

c) F.R.S and/or the local Police authorities are, according to the Law, the only authorized public authorities who are responsible to coordinate the process of

identification, screening, fingerprint, debriefing, registration and the initial separation of migrants/refugees in two groups, (a) the people entitled for international protection and those who are not entitled and need further processing. Also they are responsible for the security measures required to temporarily hold the immigrants/ refugees (those that they need to further process).

d) All other involved authorities (local Health centers/hospitals, local council authorities, UNHCR, NGOs, FRONTEX and volunteer organizations) have supporting role in logistical and care issues (first aid, estiasis (e.g. feeding, accommodation), clothing, psychological support, inform them regarding their rights and responsibilities. In many occasions the native citizens are also assisting/supporting the authorities, especially when the number of arrived migrants/refugees is too high; great sacrifices from natives, even with risk of their lives during search and rescue with fishing boats have been reported.

e) The local Police authorities in collaboration with the Hellenic Coast Guard, local Health services and other supporting organizations are responsible to provide first reception services in locations that the F.R.S. does not have offices.

f) The local Police authorities are responsible for the security measures of the First Reception Centres as well as the administration/management of the migrants / refugees from security perspective. Local Police authorities will be reinforced with personnel based on the flow of incoming migrants / refugees.

2.3.2 Germany

The analysis based on the regional experiences of the arrival, the ongoing charge of the refuge / migrants and the respective reception centre in Dortmund.

First the usual process of registration, distribution and supply is shown in this section. In North Rhine-Westphalia two reception centres for refugees / migrants exist (number of reception centres will be extended). Most refugees / migrants crossing the border of Germany via train, first arriving in Munich and later on were distributed to the reception centres of the federal states of Germany. In Dortmund one of these reception centres is placed, where the ongoing stream of refugees arrive, were adequately supplied, get medical help if needed and then were distributed in the respective federal state (here other places in North Rhine-Westphalia) [www2]. The following figure illustrates the described procedure.

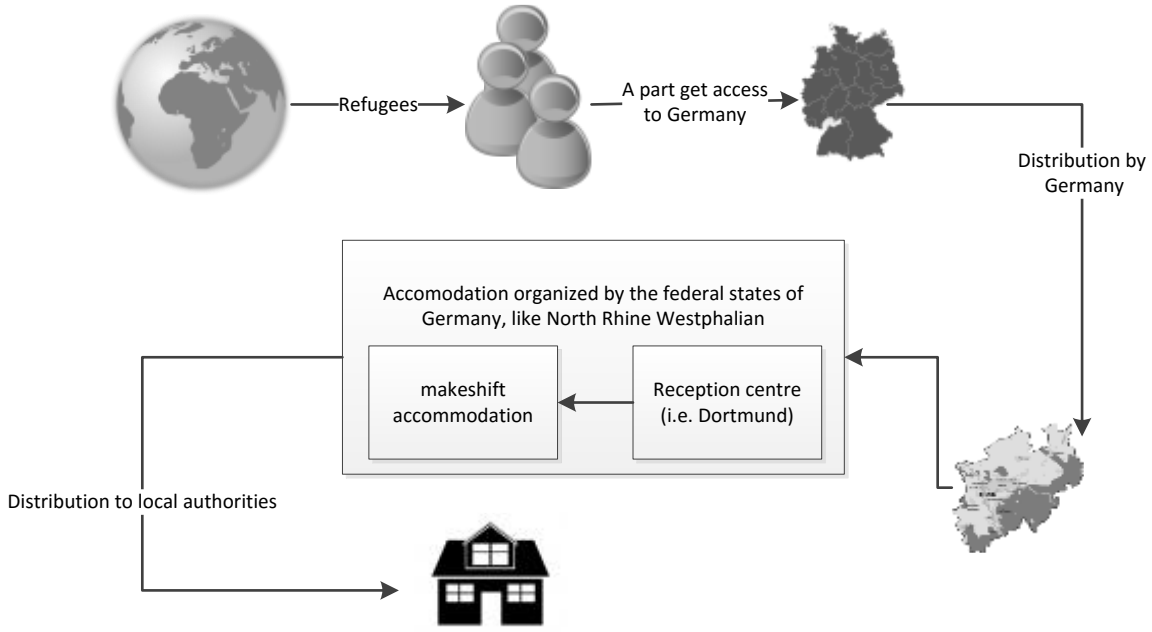

Figure 4 Distribution in Germany based on [www2]

The refugees / migrants arrive at Dortmund main station, a central hub of the city. There an attendance place is needed to coordinate the stream of refugees / migrants, provide first medical help and enable a structured and controlled way to the reception centre. [FwIS03]

Showing the process in more detail the following Figure 5 illustrates a timeline including timing, delay and unforeseen occurrences regarding the first days when refugee / migrants arrive in Dortmund. In contrast to the situation in Greece, in Dortmund a number of refugees / migrants and also the time of an expected arrival are known (but nevertheless delays was the normal case). Delays in the process chain caused by occurrences (fuzzy information, refugees are not best of health, cultural differences, unknown language, delay in boarding and departures of trains) are the normal case.

The timeline is based on internal briefing and debriefing information sheets of the fire department of Dortmund (i.e. [FwIS03], [FwIS04], [FwIS05]) and interviews with first responder of involved organisations.

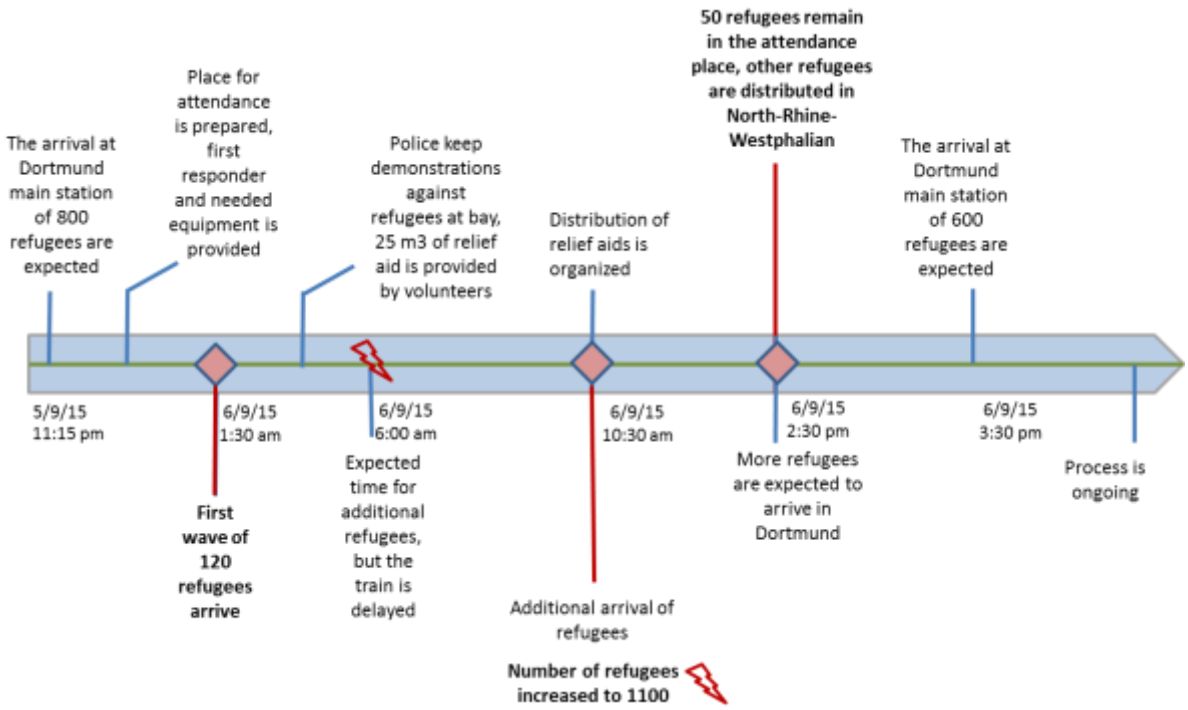

Figure 5 Timeline of the refugee's arrival in Dortmund (Source: authors based on [FwIS05])

The reception centre is equipped and prepared based on the information of the number of expected refugees / migrants and the time of arrival. The first wave of refugees / migrants reached the destination (main station in Dortmund) in time but with less refugees / migrants than expected. The first responders monitored the environment to be informed about possible demonstrations or violent parties. The police kept demonstrations against refugees / migrants at bay and overall the situation was calm and controllable [FwIS05]. The volunteer community was not monitored by the first responder and therefore the increasing amounts of relief aids provided by a huge number of volunteers was unexpected, but have to be manged and coordinated by the respective first responder (see Figure 5). On the 6th of September 25m^3 of commodity contributions were brought to the main station. Three days later 160m^3 of relief aids were provided and the possibilities of storage and sharing of these goods go to the limits of the first responder and take a huge effort regarding coordination and transportation of the contributions [FwIS08]. The aid of volunteers was the first "occurrence" in the described timeline, followed by the delay of the additional refugees / migrants.

In this situation the use of public available data was one main input for coordinating the operation. The information channel "social media" (introduced in section 2.2.1) was used to be informed about demonstrations and violent parties. But having i.e.

#TrainOfHope (see Figure 6) in mind; insights about activities of the volunteer community can be provided. In addition the information channel “personal contact” was important getting a holistic overview about the situation and constitutes the replacement of the information gap between not available but needed data. In order to get information about the delay of the train and the current position of the train (official request by other organisations and the Deutsche Bahn provide no valid result) first responders try to get direct contact to the train driver. This way of information sharing outlines an established procedure in this domain.

Figure 6 Impressions from Dortmund main station

Source: Twitter #TrainOfHope

In the described timeframe only the fire department offers the amount of two fire brigades located at the main station and one further fire brigade placed directly near the reception centre. [FwIS04] Overall 125 first responders and 100 volunteers worked and cooperate together in this night [FwIS06]. Due to missing human resources in the public order office further resources were required by the federal armed forces (covered by the German constitution, article 35: All federal and state governments provide legal and administrative assistance). The aim was twofold: first having helping hands for the guidance of the refugee / migrant and moreover providing transport vehicle (i.e. busses) taking the refugees / migrants to their final destination. In

difference to other involved first responder especially soldiers were reviled in accordance to their military background.

The delay of the refugees / migrants has adverse impact on the human resource planning for that operation and forces the first responder to extend the operation. Problems were recorded, Lessons Learnt derived and implemented in next operations. The mentioned experiences were documented in employee information sheets and published to involved first responder in the fire department of Dortmund. These information demonstrate one source for the inventory and the respective possible common information space. In example the acceptable driving period of bus driver was expired depending on the delay of the arrival of the refugees / migrants. To overcome this situation more human resources were required and all buses were equipped with two drivers. Federal differences can be noticed; in Bayern is an exception established that allows the extension of the driving period [www9].

In accordance to the fact that exact forecasting of the stream of refugees / migrants is not possible, changes in the organisational structure in North Rhine-Westphalia were necessary. To reduce the efforts and burden of the first responder an every-day changing attendance of Dortmund and Düsseldorf was agreed [FwIS07], [FwIS08]. Currently every day two trains with in total about 1000 refugees / migrants from South Germany or South-East-Europe are expected in North-Rhine-Westphalia [FwIS08].

The management structure of the fire department in Dortmund is established over the last weeks and useful to overcome the situation regarding the arriving streams of refugees / migrants. Changes may be conducted to save resources and further reduce the burden of the responder (i.e. closing time of the accommodation) [FwIS09]. Depending on the current stream of refugees / migrants further buildings and facilities in Dortmund were provided to get the situation under control and as comfortable as possible for the refugees / migrants [FwIS11].

Coordination of arriving refugees / migrants from defined trains and arriving refugees / migrants from other sources have to be combined and organized and outline one of the main challenges in Dortmund [FwIS13]. The overcrowded reception centres or overnight accommodation have to be refreshed every day to handle the next stream of refugees / migrants which arrived, has to be supplied and later on distributed all over North-Rhine-Westphalian.

2.3.3 Conclusion

Three dissimilar levels of experiences regarding the refugee / migrant crisis in Europe were examined in this deliverable: (1) public view of the crisis and relevant information channels (with dedicated structure of the information channels), (2) national experiences in a southern border country of EU and (3) the perspective from particular places within the EU where the majority of the refugees want to stay. Based on these three levels various available data sets but also needed and not available data sets

are recorded. Most data sets targeting *Resource Planning* (including human resource planning), *Logistics* and *Communication.*

The table below shows examples for how to categorise, structure and maintain such kinds of Lessons Learnt and related data sets but does not represent the whole research of data sets and information which was done to explore the refugee / migrant crisis. First responders do not have the capacity doing extra work for integrating Lessons Learnt in a dedicated system. Combing the different inventory categories regarding structure of the data sets Lessons Learnt, the integration in common processes and possibilities for technical support need to be researched.

Table 7 Structure of Lessons Learnt

Category	Issue	Lessons (Problem / Success)	Impact	What has been learned (Recommandation)?	Involved data sets		
					What information / data sets	Source	Status
Resource Planning, Logistics	Refugee / Migrant Crisis in Dortmund	Bus driver (taking the refugee migrants to their final desitnation) expire accaptable driving period due to the delay of the refugees / migrants	Refuggees can not be guided efficient to their final destinations	More bus driver are required and have the possibility for overnight accomandations near the reception center	• valid time of arrival	• responsible public organisation - "Deutsche Bundesbahn" • Train driver • other first responder organisation (starting point of the Train journey)	available and needed but not shared
Resource Planning, Mental Health	Refugee / Migrant Crisis in Dortmund	First responder get to their limit in order to have every day attandance to guide, supply and help refugee / migrants	Burden of frist reponder is too high, refugge / migrants have no optimal supplement	To reduce the efforts and burden of the first responder an every-day changing attendance of Dortmund and Düsseldorf was agreed	• valid time of arrival • valid number of expected refugees / migrants	• responsible public organisation - "Deutsche Bundesbahn" • Train driver • other first responder organisation (starting point of the Train journey)	available and needed but not shared
Logistics, Resource Planning, Communication	Refugee / Migrant Crisis in Greece	First Reception Services have problems with the preparation of the accomodation due to the large uncontrolled flow of refugees / migrants	High burden of first responders and not sufficient supply of refugees / migrants	The Centers and the mobile units are internally structured in distinct groups/teams by employees of the First Reception Services and/or supplemented by Police officers when the stuff ofFirst Reception Services is insufficient. This groups/teams, have been increasing due to demand, based on the (1) number of the incoming refugees / migrants and (2) the capability to carry out the first reception procedures simultaneously or in rotation.	• information about expected flow of refugees / migrants • information about accepted processes for a further distribution of the refugees / migrants • number of available first responder	• Turkish first responder orgnaisations	needed
Logistics, Resource Planning,	Refugee / Migrant Crisis in Greece	Most of the times traffickers will either (1) not supply the vessels with sufficient fuels and the migrants will not be able to return to the Turkish coasts or (2) they will destroy the vessel or (3) they will throw the migrants/refugees into the sea.	Thousands of deaths (over 3500) have been reported by the Hellenic Coast Guard, in the attempt of migrants / refugees mainly from Syria, to cross to the Hellas and therefore EU.	Based on the type and number of boat used by the traffickers the Hellenic coast guard will send the respective vessels	• number of boat • valid number of expected refugees / migrants • number of available first responder of the coast guard	• VTS/VTMIS • AIS	needed

3 Command systems and information management processes

In the following section results of the analysis of different command systems, especially the differences between command systems are discussed and an analysis is presented, bringing the various approaches used in the EU together.

3.1 Activities to analyse command systems and information management processes

According to the research framework of D3.1 Inventory Framework several activities have been conducted to analyse the command systems and information management process. The sequence of the packages is variable and is an ongoing mixed process. The process modelling part for example depends of the actual information input. In the following is the extended figure of the research approach:

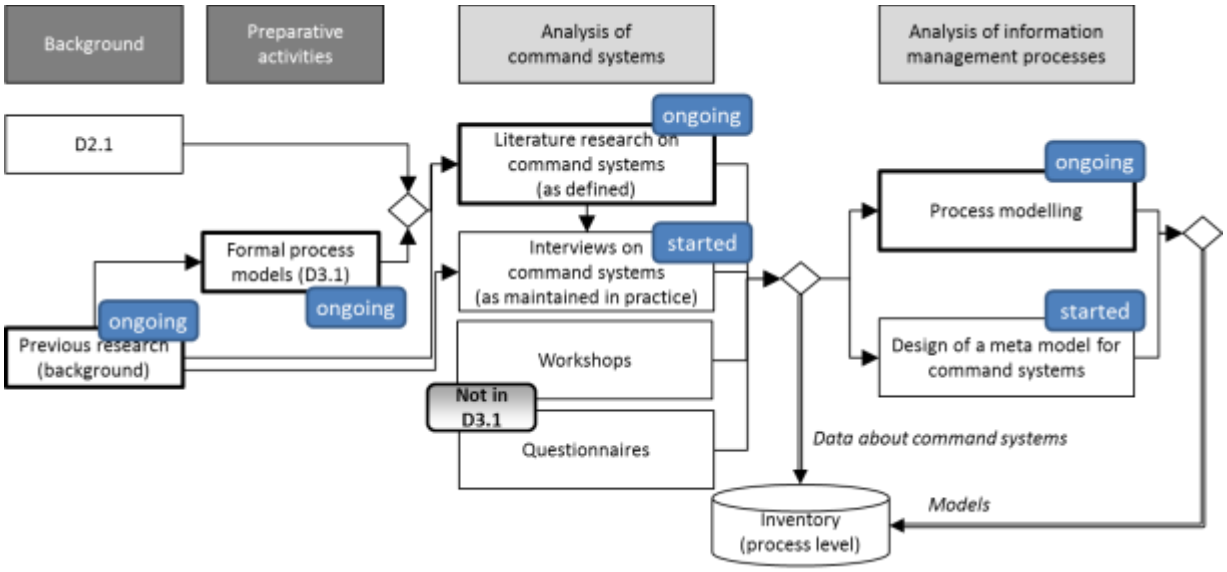

Figure 7 Research approach for the analysis of command systems and information management (as defined and as maintained in practice)
Source: Based on [5 , p. 30]

- Literature research on command systems: based on the ISO 22320, DV-100 and the ICS deviations between the command systems were analysed and illustrated.
- Process modelling: especially ISO 22320 was in focus to extract relevant tasks and relevant information

3.2 Results of process analysis and deviations from command systems

This chapter gives a first overview of processes included in command systems, which build the core of several command systems. It will become more detailed when having

a closer look on the collection of tasks that fulfil the general process descriptions in the following chapter.

The meta-structures of the command systems defined in the ISO 22320 and the DV-100 show no essential deviations. In both documents, the command system is split up into three parts [ISO11, p.4] [FwDV100, p.10]:

- Command Organization (Structure)
- **Command and control process**
- Equipment

The command and control process, as the main process for achieving the emergency organisation's objectives, shall be discussed in the following.

When analysing typical command systems, the command process, also defined as command and control process, represents the core of each command system. Comparing the DV-100 with the ISO 22320, no significant deviations can be determined. As it is illustrated in the following graphics, it is an ongoing process in both command systems. The naming of sub-processes differs in both command systems, while the meaning may be the same.

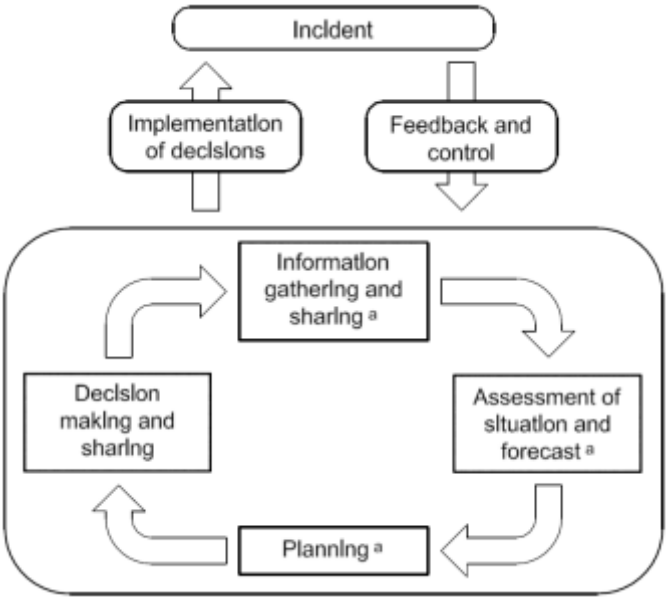

Figure 8 Command and Control Process ISO 22320 (Source: [ISO11, p.6])

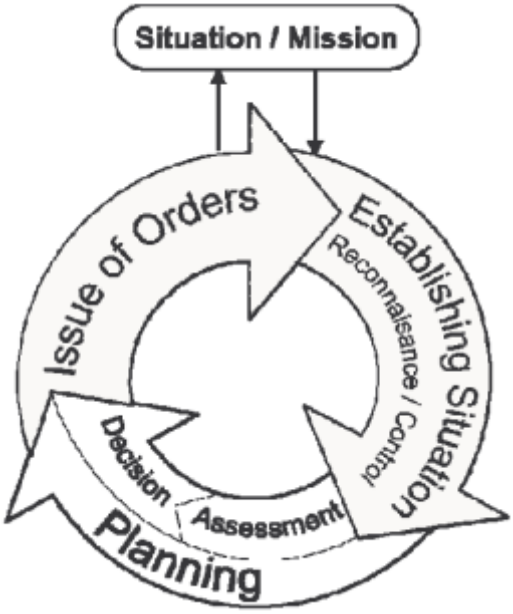

Figure 9 Command Process DV-100 (Source: [FwDV100, p.20])

In the following is shown, in which way both command processes bear relation to each other. For this purpose the whole process is divided into its unique sub-processes and set into relation.

ISO 22320		DV-100
Incident	⟷	Situation/Mission
Feedback and Control	⟷	Establishing Situation(Control)
Information gathering and sharing	⟷	Establishing Situation(Reconnaisance)
Assessment of the situation and forecast	⟷	Establishing Situation
Planning	⟷	Planning(Assessment)
Decision making and sharing	⟷	Planning(Decision)
Implementation of decisions	⟷	Issue of Orders

Figure 10 Relations between Command and Control Processes

The single sub-processes of the ISO 22320 are not described more detailed. There is just a list with functions that have to be included at least [ISO11, p.6]:

- Personnel, administration and finance
- Situational awareness and forecast
- Operation (planning, decision-making, recording and implementation)
- Logistics
- Media and press
- Communications and transmission
- Liaison
- Alerting and contact
- Safety

A specific relationship to the single sub-processes is not given. In contrast to this, the DV-100 gives a clear description of activities that have to be done in every phase of the command process [FwDV100, p.21 ff.].

Phase	**Activities**
Establishing the Situation	▪ Collection and preparation of information ○ Locality, time, weather, damage impact, level of emergencies, possibilities of emergency response ▪ Control of the decision implementation and comparison with the intentions ▪ Evaluate information and recognise limits ▪ Transmission of information
Planning	▪ Assessment in which way the emergency management can be accomplished to maximum efficiency with available means,

	taking all influences into account. ▪ Employ forces and equipment to optimum efficiency ▪ Decision of measures, forces and equipment to be implemented
Issue of Orders	▪ Put decisions into action (written or verbally) ▪ Content: concerned unit, objective, assigned means, location, method

Another process, which a command system focuses on is the information processing. The ISO 22320 describes it as a separate process, even though it is mentioned that it is a part of command and control process [ISO11, p.8]. In contrast to the ISO, the DV-100 includes the information processing within the command and control process and describes information "as the basis for an analysis" [FwDV100, p. 21].

Figure 11 Information processing in ISO 22320 (Source:[ISO11, p.8])

In contrast to the command and control process, the process of operational information is described in detail. Every activity shown in the illustration is split up in specific activities. In addition ISO 22320 describes several criteria, which define the quality of information. In context of quality of information, the ISO includes an example how to rate information concerning reliability and credibility of information. The following illustration tries to sum up all the relevant aspects of information processing in hierarchical structure.

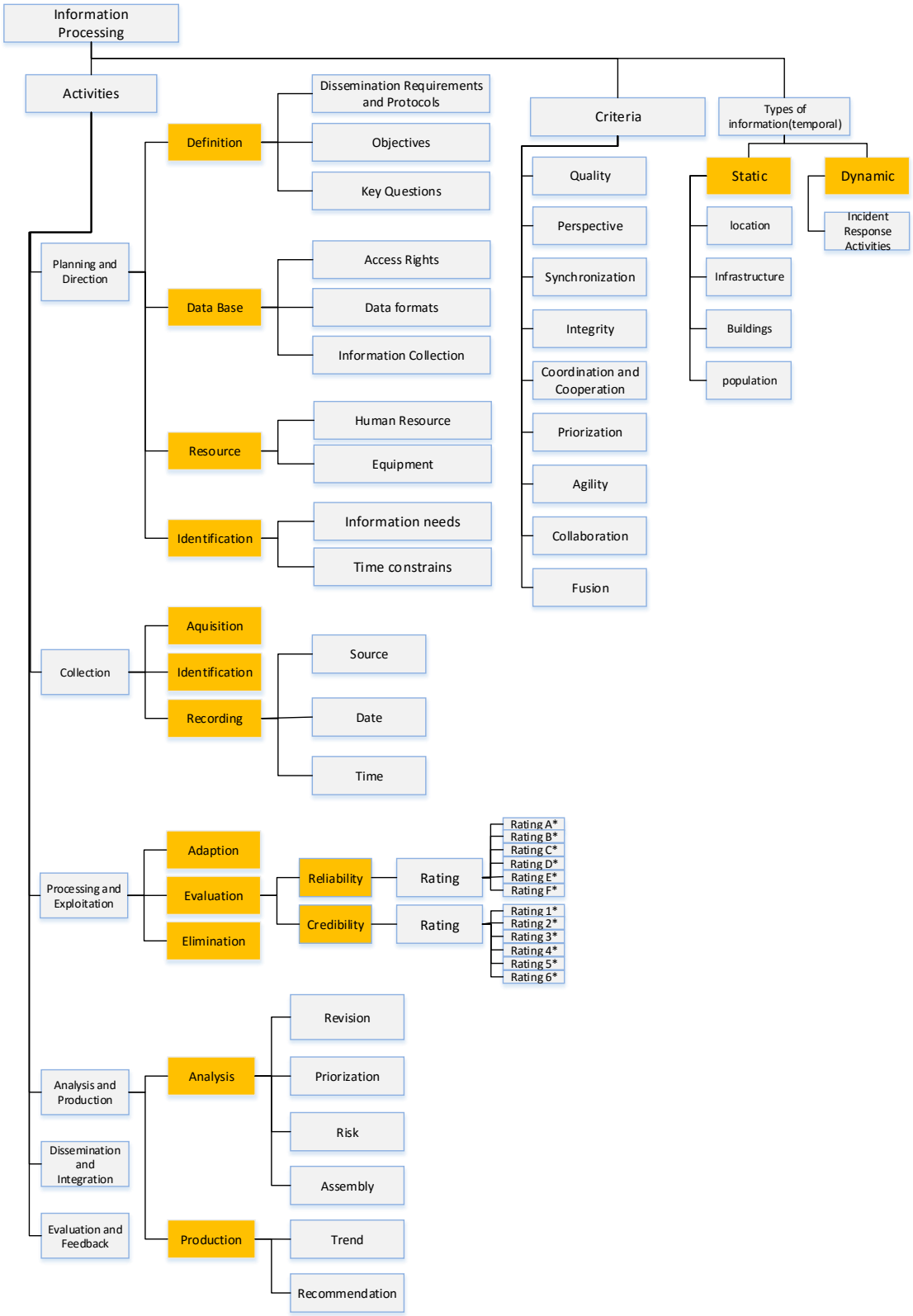

Figure 12 Structure of information processing ISO 22320 (Source: Extract from Taxonomy draft)

Even though DV-100 does not mention a separate information process, the great importance of information processing in the definition of a command system is clear. In contrast to ISO 22320, DV-100 integrates processes concerning information within the command process illustrated in Figure 13. The figure below illustrates the process of establishing a situation, in which information builds the basis of the analysis.

Figure 13 Process of establishing the situation (Source: [FwDV100, p.22])

3.3 Process modelling - Task analysis regarding differences between command systems

First step to point out differences between command systems is to build a collection of all tasks and activities mentioned guidelines for setting up a command system. To this point, a collection of tasks relating to the ISO 22320, the German DV-100 and ICS could be summarised. The respective ISO is an international approach; the German DV-100 provides insights about national guidelines and regulations and is influence from a military perspective (same like the UK command and control system, see http://www.jesip.org.uk/joint-decision-model). ICS work different, and is therefore used as another reference example. The number of considered command systems will increase over the project period.

The number of tasks was too high to point out similarities and differences. Further to compromise the complexity several categories of activities / tasks were worked out, which are able to represent the large number of tasks. Based on an existing

categorization of the DV-100, the following six groups were used [FwDV100, p.40]:

Table 8 Categorization of the DV-100

Personnel	human factors, management of human resources
Situation	monitoring and reporting the situation in progress
Mission	operative activities concerning a specific incident
Logistics	managing resources, equipment, facilities
Media and Press	management of public interfaces
Information and Communication	Collection, analyses, evaluation and sharing

This approach, based on DV-100, is not able to represent all tasks mentioned in the documents. Basically ISO 22320 includes many tasks that focus more on organisational topics. In addition, many tasks are mentioned that regulate the coordination and cooperation between several organisations. Examples for tasks that are not easy to assign into a category is given in the following:

- Implementation of a command and control system
- Determining roles, responsibilities and relationships
- Ensuring legal compliance and liability protection
- Definition of different levels of command
- Determine lines of command
- Assess the need for coordination with relevant actors and parties
- Implement active working relationships
- Include representatives of authorities, emergency services, involved institutions, agencies and experts
- Cooperation with other institutions, public services and organizations
- Test, evaluate and revise cooperation agreements at intervals

This led to the necessity to add two more groups to insure a holistic categorisation:

Table 9 Additional categories

Organisation	establishing a command system
Cooperation	establishing cooperation with other organisations

To this categorisation a separation into the source is done, to expose the different priorities of the regulations and possible deviations of priorities.

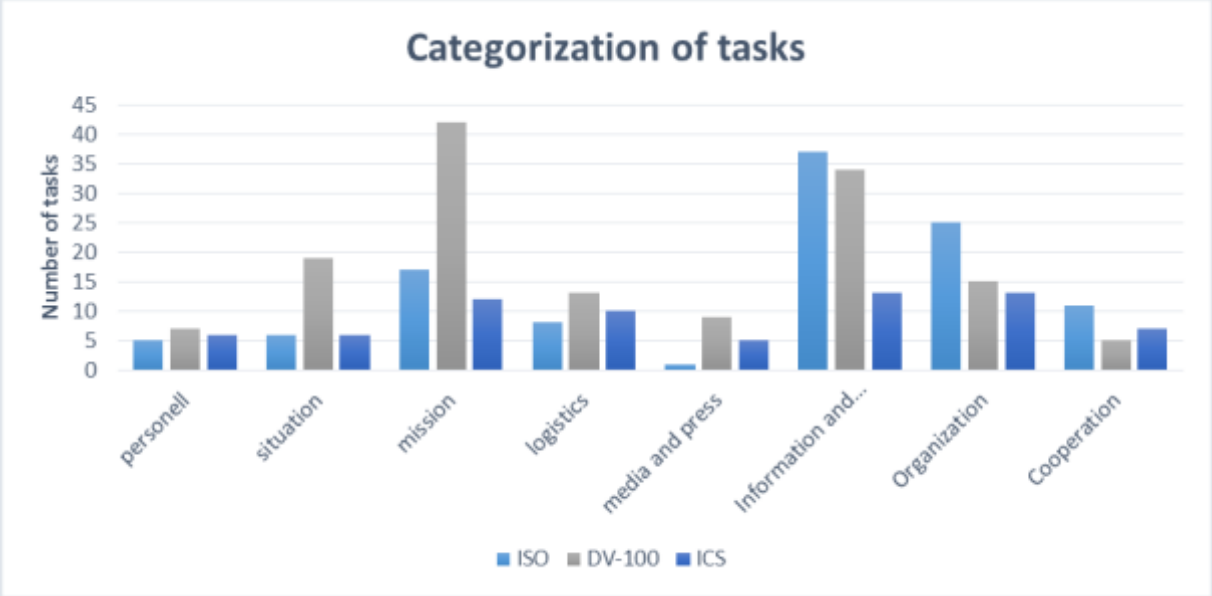

Figure 14 Categorisation of tasks based on the individual command systems

With this distribution it is possible, to get an overview of the main activities described in the literature. A striking focus of DV-100 in the categories “mission” and “situation” becomes visible. This underlines the impression, that DV-100 focusses more on operational topics, while the ISO sets organisational tasks in the foreground, which is illustrated by the diagram. Tasks referring to “information and communication” have a high priority in both of the documents. This can be pointed out as a main component in current command systems.

Comparing the definition of tasks out of ISO 22320 with DV-100, it becomes visible that the ISO describes the tasks in a more unspecific way compared to the DV-100. The task “monitoring, assessing and reporting on the situation and progress” for example mentioned in the ISO is very unspecific and open to interpretation. In the German Regulation this topic is discussed in seven separate tasks.

Table 10 Deviation between the level of detail

ISO 22320	DV-100
• monitoring, assessing and reporting on the situation and progress	• request and assess reports • mapping the actual incident situation • prepare and keep current overviews of description of the incident • prepare and keep current overviews of present number,

	types and sizes of damages • prepare and keep current overviews of present mission-sectors and mission-focuses • prepare and keep current overviews of present assigned, in stage and needed forces and equipment • prepare situation-reports and meetings for the discussion of the situation

The main differences relate to the task assignment in the various command systems. The results show that ISO 22320 acts on a very unspecific and general level are underlined by this point of view. Comparing the ISO, DV-100 and the ICS with each other, following circumstances become visible.

ISO	General description	
DV-100	S1 - Personnel	
	S2 - Situation	
	S3 - Mission	
	S4 - Logistics	
	S5 - Media and Press	
	S6 - Information and Communicating	
ICS	General Staff	Operations Section Chief
		Planning Section Chief
		Logistics Section Chief
		Finance/Administration Section Chief
	Command Staff	Public Information Officer
		Safety Officer
		Liaison Officer
		Assistants
		Additional Command Staff
	Incident Commander	
	Technical Specialists	
	Agency Representatives	

Figure 15 Task assignments in different command systems

It can be noted, that the precision of the task assignment is different in each command system. That goes hand in hand with the previous results, which identified that tasks are defined completely differently.

Analysing the tasks of emergency organisations, the chronological sequence should be taken into account. In this circumstance the four phases of emergency management were used [www6].

Figure 16 Four phases pf Emergency Management (Source: Adjusted illustration from [www6])

As illustrated, the phases are described as a continuous process. The boundaries of these phases are not precise, so that specific activities are covering more than one phase [www6].

The phases were used to structure the collected tasks. Therefore, a short definition of the phases is given to ensure a common understanding.

Mitigation: "Mitigation activities actually eliminate or reduce the probability of disaster occurrence, or reduce the effects of unavoidable disasters. Mitigation measures include building codes; vulnerability analyses updates; zoning and land use management; building use regulations and safety codes; preventive health care; and public education."[www7]

Preparedness: "The goal of emergency preparedness programs is to achieve a satisfactory level of readiness to respond to any emergency situation through programs that strengthen the technical and managerial capacity of governments, organisations, and communities. These measures can be described as logistical readiness to deal with disasters and can be enhanced by having response mechanisms and procedures, rehearsals, developing long-term and short-term strategies, public education and building early warning systems. Preparedness can also take the form of ensuring that strategic reserves of food, equipment, water, medicines and other essentials are maintained in cases of national or local catastrophes."[www7]

Response: "The aim of emergency response is to provide immediate assistance to maintain life, improve health and support the morale of the affected population. Such assistance may range from providing specific but

limited aid, such as assisting refugees with transport, temporary shelter, and food, to establishing semi-permanent settlement in camps and other locations. It also may involve initial repairs to damaged infrastructure. The focus in the response phase is on meeting the basic needs of the people until more permanent and sustainable solutions can be found. Humanitarian organisations are often strongly present in this phase of the disaster management cycle."[www7]

Recovery: "As the emergency is brought under control, the affected population is capable of undertaking a growing number of activities aimed at restoring their lives and the infrastructure that supports them. There is no distinct point at which immediate relief changes into recovery and then into long-term sustainable development."[www7]

The definition of each phase was used to assign the analysed tasks into the different phases, which led to the following distribution.

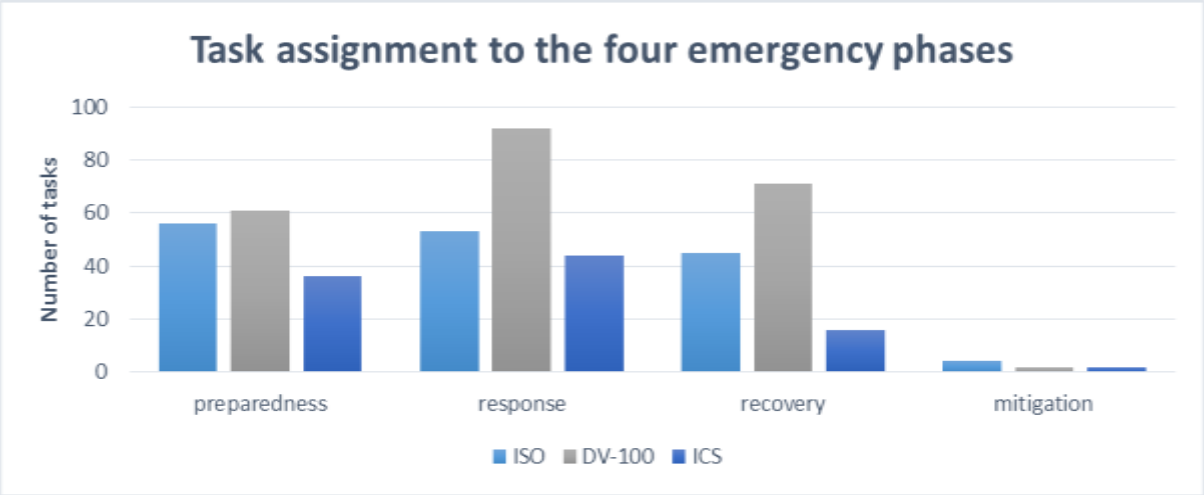

Figure 17 Task assignment to the four emergency phases

This distribution show that the tasks described in analysed command systems do not focus on activities which are relevant in the mitigation phase. Taking a view on the three other phases, no significant differences concerning the focus of a command system can be noticed. Entirely the distribution between the command systems differs. That can be attributed to the fact, that the command systems define activities in a different level of precision.

Keeping the SecInCoRe project objectives in mind, a closer look on tasks concerning the phase of preparedness becomes important for the project. For that purpose, a deeper categorisation of the upcoming tasks is needed and relation to the information sets / data sets which are necessary to accomplish the tasks. Furthermore, a detailed process modelling is planned in the project.

4 Research and inspection of information and communication systems

Useful information is the key factor to enable a purposeful response to or preparation for a disaster. Information systems (IS) are valuable support targeting the provision of adequate information and therefore a special artefact of the SecInCoRe inventory.

4.1 Activities to analyse available and frequently used information systems

The approach for research in this area was defined in [5]. In accordance to this respective activities have already been started (see Figure 18).

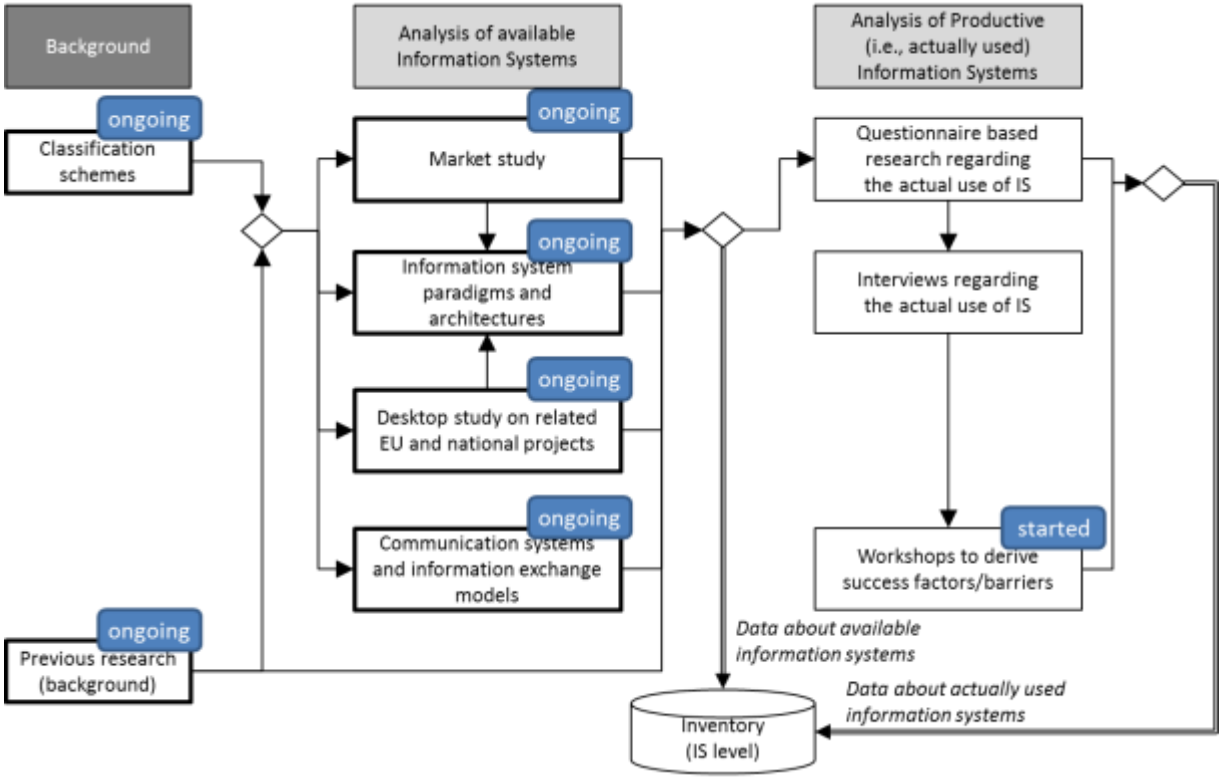

Figure 18 Current status of activities in task T3.3

These can be listed as follows:

- Conduction of **Market** and **Desktop studies** for performing an ongoing study on information systems: In order to extend the overview of information system on basis of SecInCoRe background, further available applications on the market were collected and analysed. To include the scientific efforts in this area, national and EU projects were researched on. On basis of these both approaches the industrial as well as the research landscape can be brought together enabling a comprehensive analysis.
- Analysis of **communication systems**: Besides the structure of information systems the interfaces to other systems is also important. For that purpose also communication systems are important as well. Thus the search and analysis of respective systems, their characteristics and architectures was in focus.

- Another research aspect was **success factors** for the uptake of information and communication systems. First insights and frameworks are presented based on literature research and inspection.

4.2 Literature research and inspection of the structure of available and frequently used information and communication systems

The inventory of information and communication systems aims to define relevant criteria and parameters for describing the range of function of a respective system. Overall about 100 systems were analysed and ca. 30 systems were categorised in detail. In the following section the resulting data schema is provided based on the analysis. This enable system provider to optimise their individual system descriptions and make the confusing landscape of information system in this domain more comparable.

4.2.1 Structure of information systems

In the previous deliverable [5] a first viewing of information systems is already described. Here, the following data scheme has been developed and applied in tabular form for different IS.

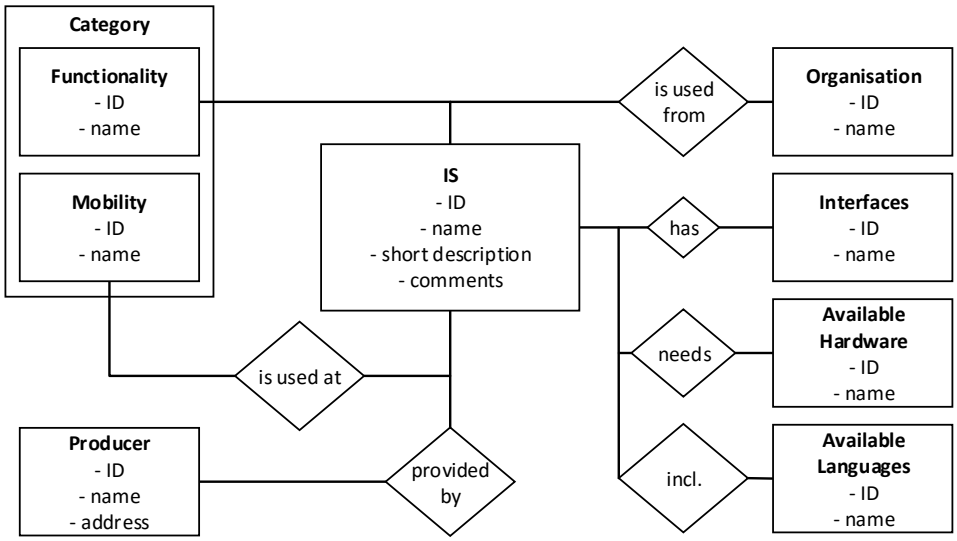

Figure 19 Database scheme for information systems (see [5])

In further studies this data scheme has been expanded and optimized by a newly established method. The creation of the data scheme in [5] was based on manual analysis of different information systems, in contrast, a semi-automated evaluation was used in a new step to achieve objective results. For this purpose, websites and

brochures were analysed word by word by using TextStat[4] and sorted according to the frequency of mention. In a second step, all non-relevant terms were removed and the remaining terms have been divided into categories. The exact procedure for this is shown in Figure 20

[4] Textstatprogram

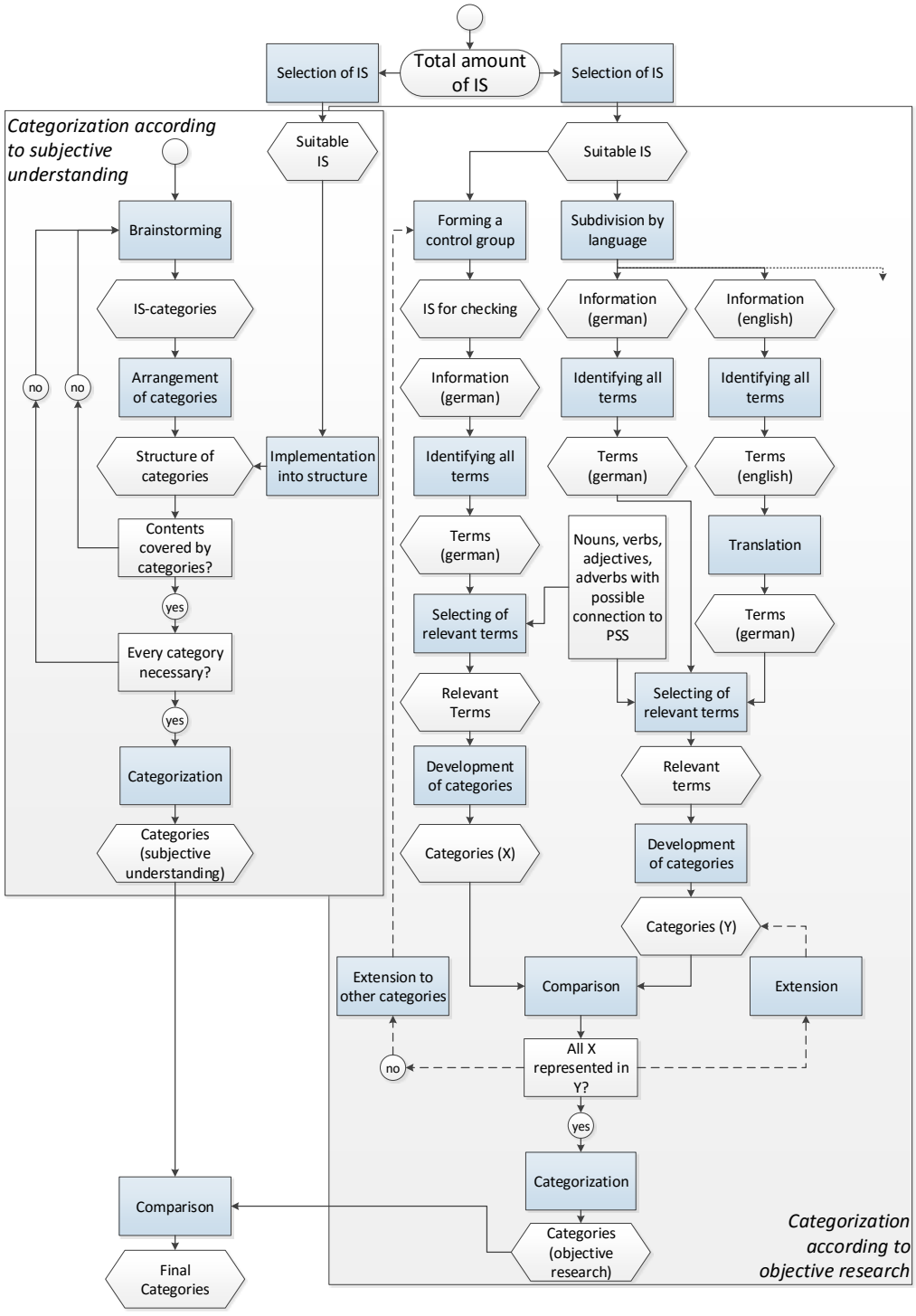

Figure 20 Procedure for semi-automated evaluation

The procedure, shown in Figure 20 for semi-automated analysis provided an extension of the data scheme to the modules "operating system", "support" and "IT-protection". In addition, the functionality "Training / Simulation", "administration", "remote access", "Building and Route Control" and "Press", were integrated in the module "Categories".

Next additional sub-functions have been introduced, similar to the functionality "GIS" from [6]. These changes result in a new scheme (see Figure 21) and a new table for the IS catalogue (see Table 11; recommendations of the functionalities after the semi-automated analysis are shown on the right side; Grey items are high level categories and white item detail the respective categories).

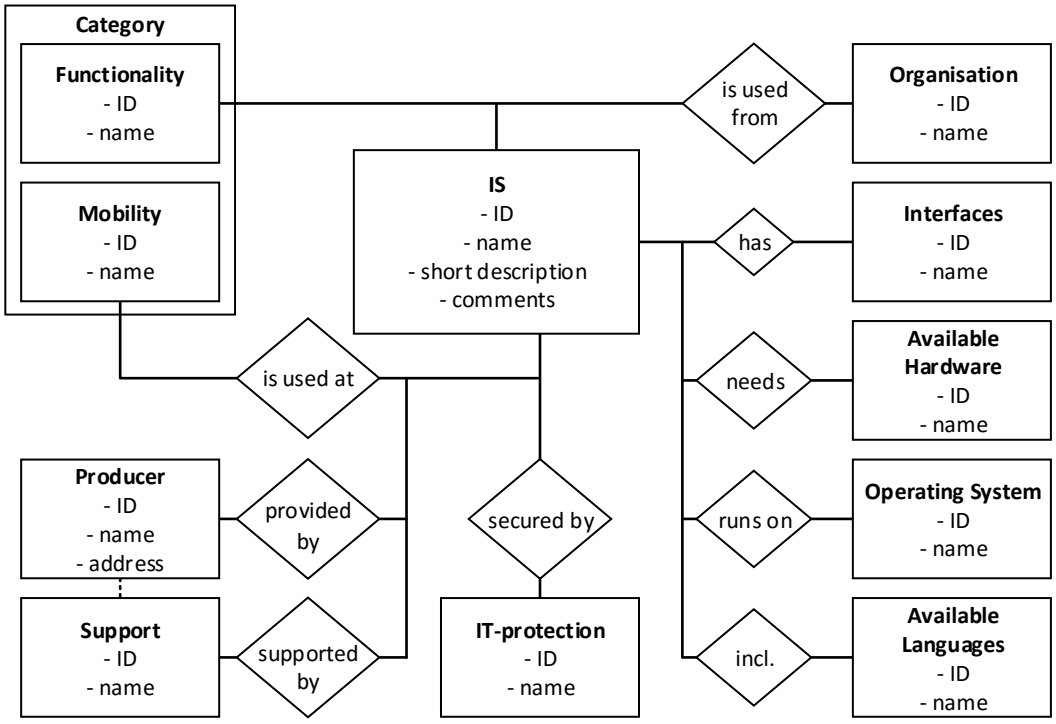

Figure 21 New database scheme for information systems

Table 11 IS catalogue

Functionality:
GIS
Navigation
Interactive Map
Tracking
Operation planning

Functionality:
GIS
Navigation
Interactive Map
Tracking
Operation planning

Operation monitoring
Communication / Alerting
Resource and vehicle
Operational unit disposition
Databases
Logging
Archiving
Others

Termination
Decision support
Operation monitoring
Decision support
Communication / Alerting
Disposition
Resource and vehicle
Operational unit
Training / Simulation
Remote access
Databases
Logging
Archiving
Others

4.2.2 Structure of communication systems

Beside the extension of the database scheme regarding information system a structure for communication systems as a special type of information system was conducted. Especially the elaboration of CS-structures was necessary to show the different parties of the communication with regard to the following aspects:

- Extending and understanding communication processes
- Figure out special requirements regarding system architectures
- Get Findings about data exchange requirements and standards

Title: FREESIC (FREE Secure Interoperable Communications)

Short description:

Highly secure and cost effective interoperability between communication infrastructures over the entire Europe

Category:

	Control room	Local Mission Center	Responder at Scene	APP	Others
Operation planning and –control					
Operation monitoring					
Communication between: Control room	**X**	**X**	**X**		
Local Mission Center	**X**	**X**	**X**		
Responder at scene	**X**	**X**	**X**		
Resource- and vehicle disposition					
Operational unit deposition					
Data-Sets					
Others					

Stakeholders:

- Fire department ■
- Emergency services ■
- Technical Emergency Relief ■
- Police ■
- Military ■
- Security Services ■
- Aid organization ■
- Others ■

Gateways:

Available Hardware:

Comment:

Interesting for the SecInCoRe Project because of the tended interoperability across Europe

Available Languages:
English

Producer:
European Commission

Figure 22 Filled Template of CS

The Figure 22 above demonstrates the template and usage of the defined structure to categorise CS.

4.2.3 Derivation of a generic communication architecture based on literature research

There are several communication architectures available, each focusing on a different aspect during crisis communication. Every architecture leads to the same objectives: information exchange in a secure and reliable way under varying environment conditions.

Based on the public available communication architectures (see Table 12) this chapter derives generic communication architecture guidelines based on the similarities found out during literature research.

Table 12 Communication Systems in Crisis Management and Response

Communication System	Description	Operator
OOS (OFDM[5] based overlay systems	Objective of OOS is the adaption of PHY and MAC layer enabling a dynamic fitting to dynamic spectrum allocations. This allows the efficient use of existing resources.	DLR Institute for Communication and Navigation
VaMEx (Vales Marineris Explorer)	infrastructure-less navigation technology for autonomous, heterogeneous robotic swarm exploration.	DLR Institute for Communication and Navigation
GERYON (Next generation technology independent interoperability of emergency services)	innovative emergency inter-networking system capable of connecting existing first responder communication systems and enabling the integration of next generation mobile networks.	European Commission
PANDORA	bridge the gap between table-top exercises and real world simulation exercises, providing a near-real training environment at affordable cost.	European Commission
SECRICOM	Seamless communication for crisis management.	European Commission
PLUTO	New technologies for radio networks for simplifying complexity and lower the power consumption of receivers.	DLR Institute for Communication and Navigation
TAKOKO	Overlay systems that can coexist with other systems in the the same fequency	DLR Institute for

[5] Orthogonal Frequency Division Multiplex

	bands.	Communication and Navigation
Opti-Alert	Enhancing the efficiency of alerting systems through personalized, culturally sensitive multi-channel communication.	European Commission
e-triage	Disaster Management Systems: module based solution for first responders and organisations.	Euro-DMS Ltd
ARTES	Communication systems with special focus on satellite communication.	eesa
INDIRA	Interoperability of data and procedures in large-scale multinational disaster response actions.	European Commission
FREESIC	Interoperability between communication infrastructures.	European Commission
EULER	EUropean Software Defined radio for wireless in joint security operations.	European Commission
A4A	Alert4All: extensive and interdisciplinary alerting framework.	European Commission
gsmconnex	GSM and Wifi Connectivity for Aircraft.	TRIAGNOSYS
triasat3g	Electronic registration of disaster victims.	TRIAGNOSYS
ABSOLUTE	Aerial Base Stations with Opportunistic Links for Unexpected & Temporary Events.	TRIAGNOSYS
NICOLE	Next generation InteraCtive brOadcast mobiLe nEtworks. It deals with the design of the ground and space segment of a satellite network for mobile terminals that should be built in the mid-term.	DLR Institute for Communication and Navigation

The most arising issues handled by the architectures are:

1) Combined use of several network access technologies, like 3G, SATCOM, LTE, WiFi, WiMAX, TETRA, TETRAPOL etc.
2) Support for mobile, web and desktop clients
3) Integration of several information and data sources
4) Handling of decentralized information
5) On-site emergency communication, long-range communication
6) Ad-hoc setup of communication for unexpected and temporary events
7) Differentiation between voice and data communication
8) Cross Border communication and interoperability between existing communication infrastructures

4.3 Success factors and barriers for the uptake of information systems

The cloud-based emergency information system (CEIS) of SecInCoRe is a kind of knowledge / information management system. There are several reasons deciding about success or failure of such projects. First, projects fail in the implementation stages because the system never reaches a critical mass of users (see [Fink09]). Secondly, the every-day use is not ensured to keep the system alive i.e. willingness of knowledge sharing and integration in used processes (see [HeVo99]; [HKK04]). More research regarding information sharing and collaboration practices is presented in [17] and [20].

Therefore in the context of the analysis of inventory artefacts (especially regarding IS), success factor for the use of IS were considered.

4.3.1 Research approaches to elaborate success factors

Within the implementation and use of IS in the domain of first responder and civil security various problems occur and are grouped in the following categories:

a) Penetration of the European market

b) Usage during an operation

c) Usage of the full range of function

In an economical perspective the analysis and measure of success and failure has a long history and the economic impact on the IS provider depends on the mentioned factors.

Sidney Schoeffler working at General Electric in the 1960s initiated the study regarding profit impact marketing strategies (PIMS). “It was developed with the intention of providing empirical evidence of which business strategies lead to success, within particular industries.” [www4] Most of the used criteria or dimensions lead to an economic perspective, which is limited for covering first responder organisations. Taken a granted, the economic impact on IS provider can be analyses using the defined approaches, but especially the points b) and c) are not included in this analysis. Usually first responder organisations are not designed like profit companies and are subject to national structures, regulations and financing concepts and these conditions targets the procurement process and moreover don´t take the usage of IS during operation into account. Peters and Waterman [PeWa82] have used a more comprehensive approach with “In Search of Excellence” and enables further insights in research of success factors.

The SecInCoRe consortium defined four Key Performance Areas (KPA) in [3]. These KPAs are part of the validation strategy of the SecInCoRe outcomes. In order to define criteria regarding the success factors of the use of IS, the KPAs were taken into account:

- **Operational Procedures** – in this context operational procedures are meant:

a) The development process of IS provider

b) The process of use and moreover the quality of use and the integration in existing FR – processes (like command and control process)

- **Efficiency** – measurement of factors of efficiency of IS and further the efficiency of FR operation due to the use of IS
- **Capacity** – range of function and capacity of IS and in this relation the capacity of FR organisations
- **Economic considerations** – in this KPA aspects like the IS provider´s sales rate as well as procurement regulations and opportunities of FR organisations are grouped.

Based on research outcomes of SecInCoRe the importance of addressing ELSI in system design process lead to one more KPA:

- **ELSI viability** – security, availability, reliability

Moreover literature research ([MBP04], [Dorn94]) expose further KPAs directly linked to the use case of IS-provider and the respective user. Table 10 shows the mentioned KPAs.

Table 13 KPAs regarding IS provider and IS-user

IS-Provider	IS-User
Support by executive board	Revise false expectations
Involvement of end users	Thinking as a whole, starting with parts
Experienced project managers	Promotion by leadership, acceptance of everyone
Distinct business goals	Quality not quantity of information
Straightforwardness	Including external information
Standardised software infrastructure	Consistency of data
Stability of main requirements	User-friendly display of information
Reasonable process model for the whole software lifecycle	Connection to other applications
Reliable calculations	Flexibility and dynamic
Motivated and competent team	

Within the respective KPAs various key performance indicators (KPI) have to be defined for analysing success factors in this context. KPIs have to be SMART (Specific, Measurable, Achievable, Relevant and Time-bound). In each area KPIs have to be defined considering Input indicators, Process Indicators, Output Indicators, Outcome Indicators and Efficiency Indicators.

But nevertheless in this special domain the relevant methods for measuring KPIs are twofold:

a) Quantitative methods (i.e. measuring times of use, response time, economic impact for IS provider)

b) Qualitative methods (using interviews or focus groups, i.e. measuring acceptance, satisfaction, usability or achieving specific objectives like success of operation)

In a first step qualitative methods were used to elaborate these kinds of indicators. Based on literature inspection, interviews and workshops with expert's factors of success were conducted, giving a first framework for further research activities. The first responder or first responder organisation perspective was taken into account, but elsewhere IS-providers were considered in the analysis.

4.3.2 First responder perspective

"First responder organisation" specific factors have to be taken into account to elaborate effects on the success of IS in the respective organisations.

During the Advisory Board Workshop in Athens factors that contribute to the success of new technologies were explicitly discussed. The advisors were encouraged to focus on a system used in a preparation case. Furthermore, they were asked for reasons for a contribution, what they would contribute, how they like to do it and what concerns appear in the described process. The statements of first responder organisations go along with already existing principles, rules or design pattern regarding usability. The following listed statements come up asking for qualities of a good system and are grouped in the main topics "Display of information", ´"Providing information", "Implementation" and "Regulation on information sharing".

Display of information:

- As simple as possible
- Key information first
- Big derivations and exceptions automatically displayed
- User needs to work with information not how to get them
- Easy accessible (no extra passwords)

Providing information:

- Up to date and available in due time
- External information needs to be processed

- Levels of access have to be flexible and dynamic
- Processing data of other applications within the organisation

Implementation:

- Fit in existing processes
- Mean no more efforts
- No extra steps to normal processes
- Starting with parts

Regulation on information sharing:

- Get along with required data protection regularities
- National law - which information is allowed to be shared
- Legal situations different

In a direct emergency situation is no time for analysing huge amount of information to find the small piece that helps and in a preparation situation (i.e. designing a training exercise) first responder represent "normal" user of IS. In comparison to already existing studies and design principles ([SP04], [Niel94]) first responder point out no difference in this meta-level.

Following relevant topics are figured out of literature research and inspection for IS-user and have to be combined with insights of interviews and workshops with end-user in the respective domain.

Revise false expectations:

- Reasons why IS was bought

Thinking as a whole, starting with parts:

- Process of implementing software into the company

Promotion by leadership, acceptance of everyone:

- How did the leadership promote the software? (e.g. emails, workshops, events)

Quality not quantity of information:

- Degree of access to information
- How quick were new information processed and available for end-users
- Access user-friendly

Including external information:

- Easy access to external data

Consistency of data:

- Are users able to reach data independent of the location where data is stored?

Usability regarding display of information:

- Time of training period (divide in beginners/daily users)
- Number of clicks to reach key information for everyday work
- Display of derivations and expectations
- Able to break down information into the deepest levels?

Connection to other applications:

- How many applications are connected to the IS?

Flexibility and dynamic:

- Level of individualisation possible

By analysing these factors an overall success factor regarding the use of IS can be conducted and builds the basis for a framework for measuring success. The elaborated factors, based on literature will be combined and compared with the development of ELSI-guidelines in the SecInCoRe-project.

4.3.3 IS provider perspective

By providing and using the top 7 success factors (mentioned in Table 13 KPAs regarding IS provider and IS-user), the success rate of software projects lays above 84% [SG01]. Only 6% success rate is seen in software-technology, which [MBP04] states as underrated and therefore modified and added success factors provided by the Standish Group.

The elaborated list of success factors for IS-provider:

Support by executive board:

- How often did goals change while developing the software?
- Average time to decide a resource problem/prioritisation?

Involvement of end users:

- How often did the IS-provider communicate with the principal?
- How clear were the statements of end-users towards the main requirements of the system?

Experienced project managers:

- Years working as a project manager
- How many projects did the manager lead
- Size of projects/size of team
- Success rate

Distinct business goals:

- Review processes
- Process of communicating business goals

Straightforwardness:

- Size of project/man power needed

Standardised software infrastructure:

- How often did developers work on the basis software infrastructure instead of their actual task? (time spent on infrastructure/actual task)

Stability of main requirements:

- Are main requirements set at the beginning of a software project

Reasonable process model for the whole software lifecycle:

- Development of processes regarding development/maintenance timetables

Reliable calculations:

- How much did calculations differ from the actual results? (divided in different sections, e.g. costs of development, costs of maintenance, time/man power needed)

Motivated and competent team:

- Knowledge of each team member

Based on interviews (not in a representative manner, but indicatory) with IS-providers in the domain of emergency and disaster response, conducted in the context of the BAPCO conference, procedures for implementing new systems and procurement approaches regarding first responder organisations were discussed. Highest priority is the communication between end-users and IS-providers. To the contrary most IS-providers did not speak to procurement managers. Likewise political aspects and economic reasons were not considered by IS-providers during the development process. The result, from an IS-provider's point-of-view, is a modular software with high quality and good usability, which can fit any needs. As they do not take economic reasons in consideration and customisation is one of the top cost drivers, FR-organisation often are not able to acquire the IS-system they would actually need. Also end-users have to provide an interface to ensure interoperability with existing systems. As political aspects are not taken in consideration as well, penetration of the European market is also a difficult task. The picture below shows the origins of customer of the company D4H Technologies Ltd. The Trade is limited to countries of the UK, Ireland and Norway.

Figure 23 Customers of D4H [www3]

4.4 Success factors and barriers for the uptake of communication systems

In terms of communication system selection, development and dimensioning, factors of success are very important and these factors are somehow different to critical success factors of information systems. In the following the most important and relevant factors for SecInCoRe communication architecture and relevant architectures in crisis communication are listed and linked with some high level requirements in the field of crisis management. This allows defining specific metrics that are later on important for the dimensioning of the communication system.

- Availability: percentage of actual uptime relative to planned uptime. A communication system should be available nearly 24/7. Even when there is a need to deploy an ad hoc solution, the deployment itself should be feasible 24/7.
- Planned unavailability: percentage of unavailability caused by planned changes relative to service hours. That means unavailability in terms of updates or extensions. Normally, there should be no down-time.
- Mean time to repair (MTTR): average time between failure and resolution. This time should be as low as possible. In an optimal case, the network is self-healing and can deal with unexpected events. In crisis communication special strategies exist, to cope with these situations.
- Mean time between failure (MTBF): average time between equipment failures. This time should be also as low as possible, in terms of crisis communication next to zero. If a failure occurs there have to same backup mechanisms, that enable ongoing communication.

- Scalability: The communication system should for work for different number of users offering the same level of Quality of Service (QoS) und Quality of Experience (QoE).
- Quality of Service (QoS): Totality of characteristics/performance of a telecommunication service/communication network that bear on its ability to satisfy stated and implied needs of the user of the service [DLRS14].
- Quality of Experience (QoE): QoE measures the users' experiences with a service and focus on a holistic evaluation of the service experience.
- User acceptability: positive acceptance of the communication system leads to usage and success [C-G et al.]. SecInCoRe handle these issues by involving the Advisory Board in the design of the concept in specific co-design workshops.

Some more specific technical parameters are:

- Coverage: Area of communication range
- Delay: Delay between sending and receiving of a message
- Bandwidth: Available bandwidth, this includes also control data
- Throughput: Available throughput, this covers only payload data, that means data the user can see directly.
- ELSI viability: Security, reliability, availability

More specific parameters can be found in the WP4 Deliverables.

5 Business models for the application of information systems

In the following section further results regarding the procurement of information systems in the domain of public safety and security will be presented.

5.1 Activities for analysing business models

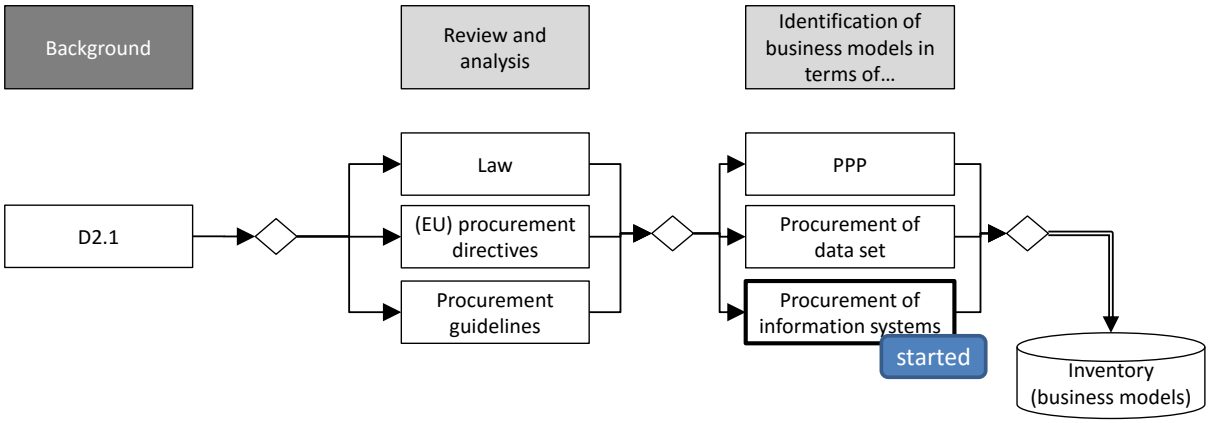

Figure 24 First activities for analysing business models

Especially the different national laws influencing the procurement of information systems. Therefore deviations in law and resulting consequences considering the procurement were analysed based on literature research and inspection.

5.2 National procurement processes

The analysis of procurement processes was conducted and provided in D6.1. The different models directly lead to deviating decisions and options for the market, shown in the following table.

Table 14 Factors of influence in the choice of procedure (Source: D6.1)

<table>
<tr><th colspan="4">Sufficient knowledge of the market to define requirements for end-solutions?</th></tr>
<tr><td colspan="2">Yes</td><td colspan="2">No</td></tr>
<tr><td colspan="2"></td><td colspan="2">Preliminary Market consultation</td></tr>
<tr><td colspan="4">Need R&D services prior to procurement?</td></tr>
<tr><td colspan="2">Yes</td><td colspan="2">No</td></tr>
<tr><td colspan="2">Do you wish to acquire innovative products or services on a commercial scale, as part of the same procedure?</td><td colspan="2">Can a specification of the end-products/services to be procured be developed?</td></tr>
<tr><td>Yes</td><td>No</td><td>Yes</td><td>No</td></tr>
<tr><td>Innovation</td><td>Pre-commercial</td><td>Competitive</td><td>Competitive</td></tr>
</table>

Partnership	procurement	procedure with negotiation	dialogue
Levels of competition or time/resources inadequate for above procedures? Consider joint procurement or, in exceptional cases only, derogation from the directives.			

5.3 Impact of different business models on first responder

Based on the interviews related to the BAPCO conference 2015, customisation is one of the main principles regarding business models (sales activities) for IS-provider. In order to provide maintenance contracts with special benefits some further customisation is included. To demonstrate deviations between maintenance contracts, the impact on first responder and combining it with the demonstration case regarding the refugee / migration case one system was chosen. Ruatti systems focused on the current refugee / migrant crisis and adapt Ruatti.Commander to optimise the system capacities regarding the coordination, recording and leading of refugees / migrants accommodations and reception centres. [http://ruattisystems.wix.com/ruatti-systems]. These adaptions are cost-free for organisations with maintenance contracts.

Thereafter the system can be used to coordinate:

- What material is in operation (i.e. camp beds, tents, …)
- What material is available, and in case of emergency can be used by other facilities
- What material is needed to accomplish the current tasks

In this way respective state associations and first responder organisation will see the capabilities and needs of the individual refugee accommodations and reception centres. The following picture shows the respective system.

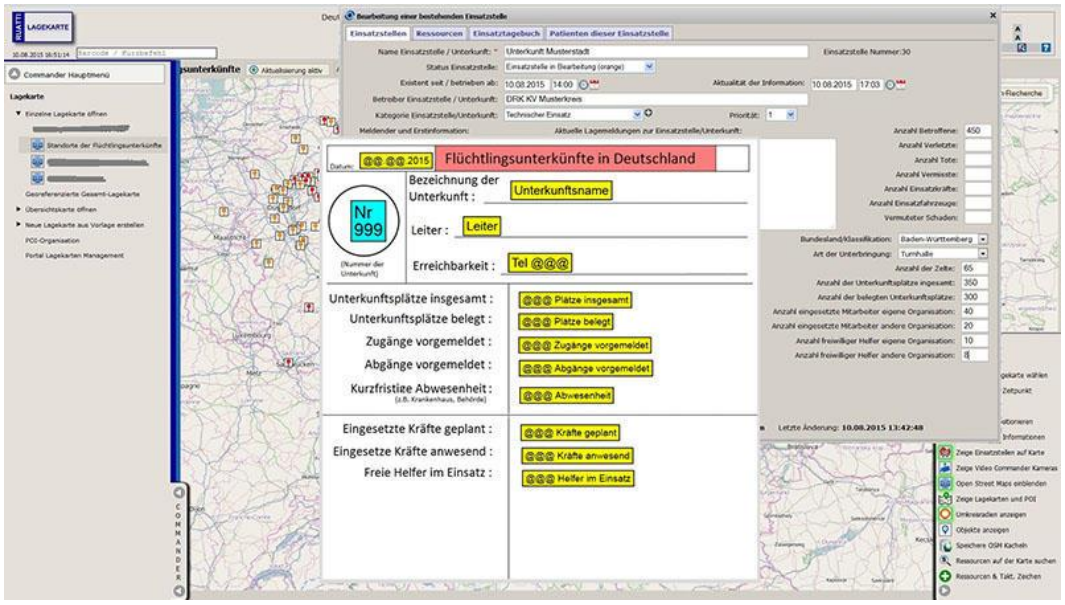

Figure 25 Ruatti.Commander [http://ruattisystems.wix.com/ruatti-systems]

6 Access to inventory content

The SecInCoRe inventory is an infrastructure for the networking of information and information sources. The Knowledge Base (KB) is the concrete technical component, which provides functionality to create, read, update and delete instances of information, documents or database entries. After a comprehensive analysis of information systems, business models, processes and data sets on a conceptual level, the results can be stored into the KB. The reference implementation of Open Semantic framework (OSF) builds upon the KB (data and metadata tier) and provides functionality to combine, search (logic tier) and visualise (presentation tier) data from the KB.

The problem that OSF in the SecInCoRe framework concept tries to solve is the following: All persons and organisations in the domain of public safety and security have a lot of data in the form of for example MS Office or PDF files, or data in databases and on websites which represent a big part of the domain knowledge. But the only one who can access the data and use it for their tasks are the owners of the files and databases or people who know that the information is stored there and ask the owners for access. By building a respective common information space (based on the described framework of D4.2) the different data sources will be combined and will impact on first responder and police authorities who are part of the CIS. But nevertheless users need an easy way to identify the data which is fitting to their recent question out of the amount of data available. Therefore the data should be analysed using semantic knowledge to enable a specialised semantic search. This knowledge could be used within a search system, which enables the user to search via a specific GUI for the exact information he needs. Figure 26 shows how this top-level concept is implemented in more detail.

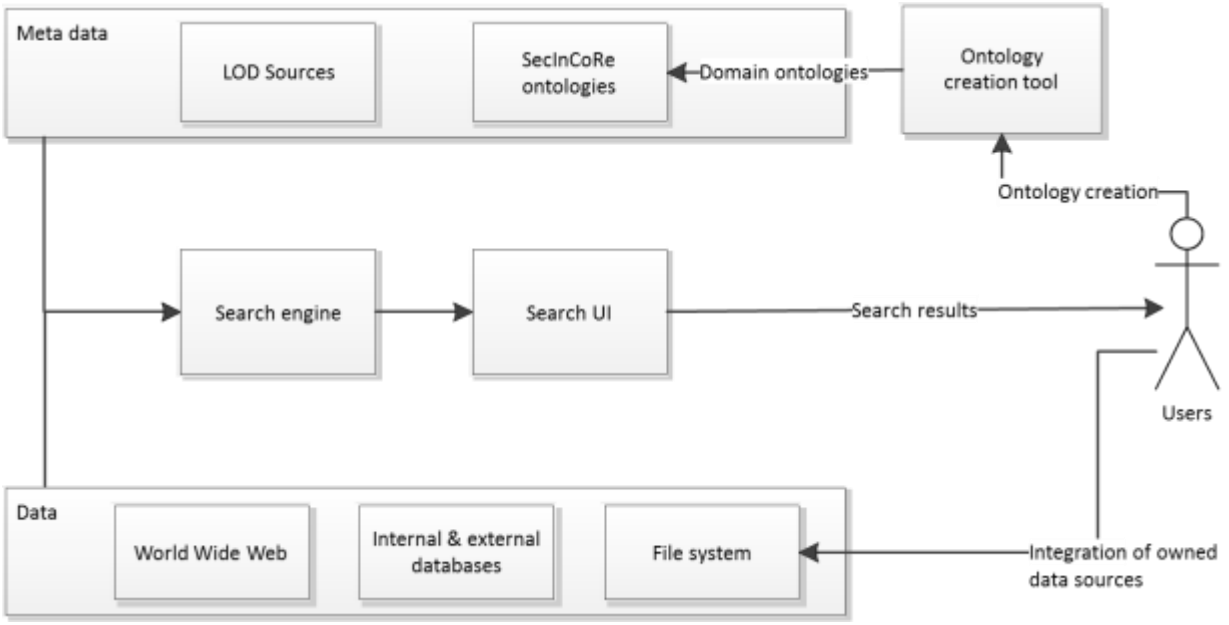

Figure 26 Top-level inventory concept

The inventory focuses on all information which matter to the end users of SecInCoRe. Therefore the corresponding data sources are very heterogeneous. On the one hand the inventory contains a first pilot version of available data and offers the functionality to integrate individual data source of involved first responder (security aspects regarding the work in a CIS will be described in D4.3). This aspect is meant for all information which is stored at several distributed computers owned by all kind of persons and organisations of the domain. On the other hand several external data sources should be connected to the system to enable the inclusion of as much relevant data as possible and preserve the system as flexible as possible. The mandatory data sources are therefore file systems, relational databases (e.g. MySQL, PostGre) and websites. After that several other data sources are possible and should be supported if needed. To search the connected data sources semantic metadata is used. These metadata should represent as much of the knowledge stored in the data as possible. Two different kinds of semantic metadata are used to enable the best representation. Firstly the domain taxonomies which are created in SecInCoRe (see T4.1 and [11], [12]) are used as the basis for ontologies which enable the domain knowledge for the search. As SecInCoRe could only create a first version of the domain ontologies the ontologies should be extended and updated by an interested domain community. For that reason an ontology creation tool is planned which should be filled with the created domain ontologies, complemented by the community and used as metadata for the semantic search. To extend these domain restricted metadata, a “world knowledge” is added using Linked Open Data (LOD) which

consists of online open source ontologies and other semantic concepts. An example is the opencyc[6] knowledge base.

6.1 Status quo

The first attempt was to create a fast build solution to show the possible functions of the inventory to the project partners and advisors. For that reason a search system was implemented using the Open Semantic Search[7] software. The recent system enables SecInCoRe to integrate many kinds of documents to the inventory via the Secure File Transfer Protocol (SFTP). After uploading, the documents are crawled automatically and added to a search GUI. The recent GUI is available here:

http://www.secincore.eu/search

The search GUI is shown in Figure 27 and enables keyword suggestion, faceted search and highlighting.

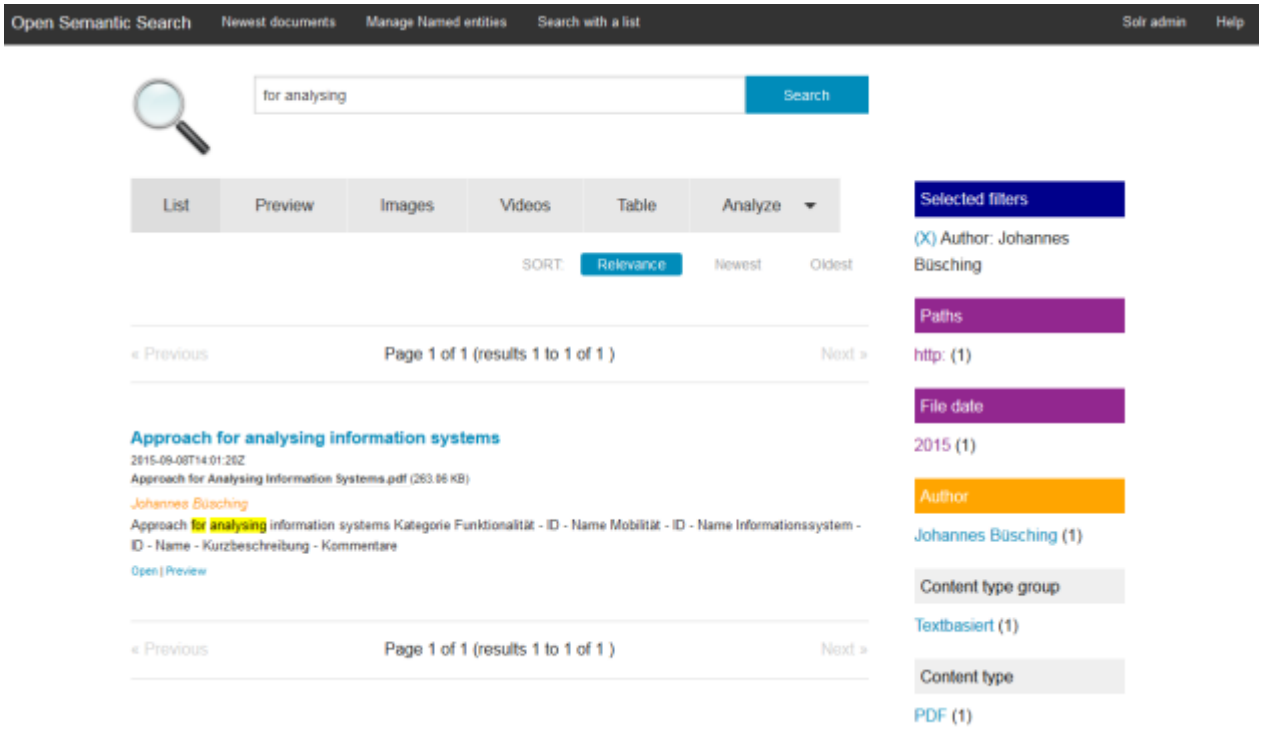

Figure 27 Search GUI

For the extension of the SecInCoRe taxonomies with a semantic wiki a detailed investigation took place. As a result the MediaWiki Software with the Semantic Media Wiki extension is used. It enables a simple creation of wiki content, methods to add

[6] http://www.cyc.com/platform/opencyc/
[7] www.opensemanticsearch.org

semantic properties to every content and a way to export the semantic data as RDF (Resource Description Framework) data what enables the use of the ontology in the planned search system.

7 Literature index

[C-G et al.] Crivianu-Gaita, Daniela, et al. "User acceptability—a critical success factor for picture archiving and communication system implementation." Journal of digital imaging 13.1 (2000): 13-16.

[DLRS14] Delgado, José Darío Luis, and Jesús Máximo Ramírez Santiago. "Key Performance Indicators for QOS Assessment in TETRA Networks." arXiv preprint arXiv:1401.1918 (2014).

[Fink09] Finke, I. (2009): Einführung von Wissensmanagement. In Mertins, K., & Seidel, H. (Hrsg.): Wissensmanagement im Mittelstand (S. 23-32). Berlin, Heidelberg: Springer.

[FwDV100] Dienstvorschrift (German Regulation) DV-100 Leadership and Command in Emergency Operations. Online: http://www.idf.nrw.de/projekte/pg_fwdv/pdf/fwdv_100_engl_org.pdf , 2007.

[FwIS03] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.3), 2015.

[FwIS04] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.4), 2015.

[FwIS05] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.5), 2015.

[FwIS06] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.6), 2015.

[FwIS07] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.7), 2015.

[FwIS08] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.8), 2015.

[FwIS09] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.9), 2015.

[FwIS11] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.11), 2015.

[FwIS13] Führungsstab Feuerwehr S 2 (Athanassios Thanos), Feuerwehr Dortmund Mitarbeiterinformation: Flüchtlingslage Nr.3(fire department Dortmund staff information sheet Nr.13), 2015.

[HeVo99] Hermsen, T., & Vopel, O. (1999). Wissensmanagement – Warum so viele Projekte scheitern. Wirtschaft & Weiterbildung, Nr. 2, 50-56.

[HKK04] Howaldt, J., Klatt, R., & Kopp, R. (2004): Neuorientierung des Wissensmanagements. Paradoxien und Dysfunktionalitäten im Umgang mit der Ressource Wissen. Wiesbaden: DUV.

[ISO11] ISO 22320:2011(E): Societal security — Emergency management — Requirements for incident response, 2011.

[ICS] Incident Command System. Online: https://training.fema.gov/emiweb/is/icsresource/assets/reviewmaterials.pdf, 2008.

[Niel94] J. Nielsen: Usability Engineering, Academic Press Inc., Cambridge, 1994.

[PeWa82] In Search of Excellence: Lessons from America's Best-run Companies, by Thomas J. Peters and Robert H. Waterman, Jr., HarperBusiness Essentials, Date 1982

[SP04] *Designing the User Interface. Strategies for Effective Human-Computer Interaction.* 4. Auflage. Addison-Wesley, 2004

[MBP04] K. Moll, M. Broy, M. Pizka, T. Seifert, K. Bregner, A. Rausch (2004): Erfolgreiches Management von Software-Projekten. Informatik Spektrum 18. Oktober 2004

[Dorn94] B. Dorn (1994): Das informierte Management – Fakten und Signale für schnelle Entscheidungen. Springer Verlag.

[SG01] Standish Group International, Inc. Collaborating on Project Success. Software Magazine, February/March 2001, Wiesner Publishing.

Internet sources

[www1] http://en.wikipedia.org/wiki/Linked_data#mediaviewer/File:LOD_Cloud_Diagram_as_of_September_2011.png

[www2] http://www.mik.nrw.de/themen-aufgaben/auslaenderfragen/asylbewerber/aktuelle-situation-unterbringung/verfahren.html

[www3] http://www.d4h.org/company/

[www4] https://en.wikipedia.org/wiki/Profit_impact_of_marketing_strategy

[www5] http://www.unhcr.org/55dc749d6.html

[www6] The four “phases” of Emergency Management. Online: http://www.vanderbilt.edu/vector/research/emmgtphases.pdf, 2010.

[www7] http://www.gdrc.org/uem/disasters/1-dm_cycle.html

[www8] https://uxmag.com/articles/the-complexity-of-simplicity

[www9] https://www.regierung.unterfranken.bayern.de/assets/gaa/9/infoblatt_ausnahmen_sozv.pdf