Trainings for Crisis Information Systems in Civil Protection: A German Perspective

Matthias Max
German Red Cross
maxm@drk.de

Sigmund Kluckner
AIT Austrian Institute of Technology
sigmund.kluckner@ait.ac.at

Susann Jentzsch
German Red Cross
jentzscs@drk.de

ABSTRACT

Much research and technical development has been conducted to make crisis management more efficient, especially regarding crisis information systems used to streamline operations of authorities during a crisis. Experts from the German Red Cross mention that there is a need for the development and improvement of specific training methods and structures for such new crisis information systems in command and control centers. They also say that computer simulations could be a practical possibility to train crisis management and response staff. To substantiate this information, interviews were conducted with key officials in the field of German civil protection: command and control center staff, command and control center software trainers and crisis information system managers. This paper presents a qualitative study in the field of training German response personnel in crisis management information systems. The results are presented in three sections: suitable training strategies and structures, challenges and best practices for the implementation of trainings and using simulation as a training method for crisis information systems. The results contain personal experiences, opinions and known best-practices of the interview partners.

Keywords

Training, Simulation, decision support systems, civil protection, crisis management

INTRODUCTION

The management of crises is a complex task and challenges all players involved in the response. Crises not necessarily need to be catastrophes with mass casualties to pose a challenge; even daily emergency operations demand a lot of energy and commitment from responders, command and control personnel and also emergency call center staff.

Today, crisis management organizations require more and more efficient means of communication and interaction between all involved entities (BITKOM, 2008) in order to increase productivity and efficiency. Many security research projects develop information and communication systems to support this need of increased efficiency within organizations in Germany (Bundesministerium für Bildung und Forschung, 2007), however often leaving behind the non-technical aspects. Also worldwide research has been conducted for a variety of systems, for example information management systems between organizations and management levels (Šubik et al., 2010), systems for the collaboration of organizations (Berlin and Carlström, 2008) and also decision support systems (Van de Walle and Turoff, 2008).

Much of this research however focuses on technological advances and tends to neglect end-user aspects, and consequently might jeopardize the acceptance and usability for the end-users and target audience. One part of usability involves providing users with appropriate, needs-driven training possibilities, since the main goal of

software training is to actually get people to use the software on the job (Olfman and Bostrom, 1988). "A major problem at the start of establishing a crisis management training program is conducting a needs assessment to identify what needs to be taught" (Goldstein, 1989).

In personal interviews with the authors of this paper, experts from the German Red Cross voiced similar concerns. It was mentioned repeatedly that there is a need for the development and improvement of training methods and structures specific for software support systems in command and control centers. This specifically means the sustainable transfer of knowledge and skill for use of new functionalities, which are mostly part of a larger software environment within the civil protection authorities. In their opinion, the creators of trainings should prioritize understanding the needs of the users and fully include these training requirements into future trainings. The experts also mention that computer simulations of crises and their response could be a practical possibility to train crisis management and response staff in a virtual environment. In this paper, simulation is referred to as computer software that represents and visualizes the real world (or parts of it) and its actions and reactions, based on data and models taken by observation or assumption. This is in line with recent research, for example by Dugdale et al. (2009) who state that simulations can be invaluable in emergency management training.

Following the principle "To create a cumulative body of knowledge, there must be well-understood frameworks for major independent variables, training methods and users" (Gupta and Bostrom, 2006), we are taking a first step in the direction of a needs assessment for trainings of crisis management systems for command and control center staff. Additionally, we are investigating opinions and possible uses of computer simulations as a viable method in crisis management trainings. Since the German civil protection is organized federally (meaning that member states have diverging crisis management systems in place), it is very difficult to gather a complete picture of nationwide information systems and the training that is given for these systems. For this reason, explorative interviews were conducted with those responsible for civil protection trainings and training systems.

RELATED WORK

Several European Union funded research and development projects were or currently are dealing with the training of crisis management staff. For example, the project "PANDORA" has made several advances in the creation of a framework for near reality training simulation environments for crisis management (Boldyreff et al., 2011). One of the developed training environments is "PATE" (PANDORA advanced training environment), which is geared towards the education and training of high level crisis management officers, i.e. the "gold level commanders". In initial studies involving the target group, their approach received positive feedback from participants (Bacon et al., 2012). Since gold commanders bring a wealth of experience from earlier crisis response activities, this training is geared towards the development of negotiation skills and understanding other cooperating agencies. In a very similar manner, the CRISIS project aims at creating an immersive simulation-based training system for crisis management, yet focusing on "decision making, problem diagnosis, planning and acting beyond procedural familiarity" (Rooney et al., 2010). These both provide good examples of how knowing the user can help make a more meaningful and effective training.

The European research project "CRISMA" (Crisis Management) aims at offering an integrated modeling and simulation platform especially for applications during short-term and long-term planning, training and debriefings after exercises and crisis situations (Sautter et al., 2012) . Regarding the training and debriefing applications CRISMA follows the approach of computer-based training systems that "allow crisis managers to gain insights they normally gain during real-life experiences." Thus allowing them to learn and reflect in the training on events, which they could eventually encounter during a crisis. The information from real-life exercises can be additionally used as an input for simulation systems allowing them to be continually improved. Additionally, an exercise could be supported by reporting, debriefing, evaluation tools and what-if/forecast functionalities (Max and Sautter, 2013).

In the nationally funded German research project "SAFER" (German: "Simulation in der Ausbildung für Einsatzkräfte in Rheinland-Pfalz", Simulation in the Training for First Responders in Rheinland-Pfalz[1]), trainings were developed with the objective of a computer-simulation of incidents with up to 500 injured people in various situations (Feuerwehr und Katastrophenschutzschule Rheinland-Pfalz, 2013). This includes the consideration of realistic timelines and resource availability as well as a review of tactical variants. The simulation also contains methods and didactics for leadership trainings. The training system enables the presentation of the entire rescue chain as well as various training stages, making it possible to train certain measures separately and also using them in all levels of a training. Thus allowing for a better flow of

[1] Translation by the authors

information, through repetition during times when mistakes can best be learned

The EU-funded project "CAST" (Comparative assessment of Security-Centered training curricula for first responders on disaster management in the EU) investigated the current best practice for general trainings of crisis management staff throughout Europe for different crisis types. In the course of the project, a standardized modular curriculum of training of first responders was developed, targeting young officers in middle-management of response organizations. Other features described as outcomes of the project are virtual reality biofeedback systems, driving simulators and simulations of a nuclear power plant control room (CAST Project Consortium, 2011). Unfortunately, no public documents are available to investigate their outcome further.

Recent work also shows that simulation, in its theoretically limitless adaptability, can be useful in training crisis management personnel and first responders. Application towards the training can range from 3D-virtual environments for fire fighters, where they can safely practice firefighting techniques (St Julien and Shaw, 2003), to simulation of the command and control realm based on cognitive systems engineering (Ntuen et al., 2006). It is also suggested that simulation based on a scenario-driven and game approach can play a useful role in real-time emergency management trainings. This is especially true since simulations are cheaper than table-top exercises which require lengthy manual preparations and time to be played out. Simulations are seen to be helpful in automating a lot of tasks and thus provide a faster and more convenient run of training (Walker et al., 2011).

In this paper, we show that while all of these projects and efforts have produced a valuable output, it has not yet fully reached the educational and training environment of civil protection in Germany.

METHODS

In order to gain an overview about aspects of the specific training needs of crisis information system users, targeted guided interviews based on methods described by Bortz and Döring (2006) were conducted with individuals from a variety of key officials in the field of German civil protection: command and control center staff, command and control center software trainers and those responsible for crisis management. Due to the explorative character of this research, thirteen individuals were interviewed. They were identified by the authors from close collaboration within the German Red Cross and their connections within the German civil protection environment.

The interviews were semi-structured, with blocks of questions on the following topics: suitable strategies for training of software systems in command and control centers; structures for trainings of these systems in civil protection; best practices for training measures; and opinions and experiences with the use of computer simulations in a training environment. The questions were targeted to spark discussions with the practitioners, based on guiding questions. The outline and content for the questions were laid by the main investigator's practical experience, who is working in civil protection and crisis management. The interviews were then summarized and a content analysis was conducted. The results of this analysis are presented in the following section, where direct quotations from interview partners are included and indicated by quotation marks.

RESULTS AND INTERPRETATION

The results of the interviews presented here are divided into three sections, which summarize the interviews into thematic blocks. The first section includes the question of suitable training strategies and structures of the trainings. This is followed by the challenges and best practices for the implementation of such trainings and finally included is the possibility of using computer simulations as a training method for crisis information systems. In each section a summary of the questions asked is provided followed by a summation of the answers and the key findings through analysis of key words in the responses. The questions are numbered for an easy reference from the text.

Suitable Training Strategies and Structures

During the interviews, many considerations for trainings were repeatedly mentioned. The main question addressing these concerns was: What are suitable training strategies and structures to explain and teach the value of the software system to command and control center staff?

Guiding Questions	**Answers**	**Key "Findings"**
(1) In your opinion, what needs to be covered by trainings for software systems?	• Training systems should be as self-explanatory as possible, but need to give the user the possibility to "dig deeper" on how to utilize the system to best fit their needs, for example in explanatory videos. • "Multiplicators" (people that carry the knowledge through an organization) are needed for new software systems to encourage use, answer questions and spread knowledge • Theoretical training methods such as lectures, presentations, reading material are not sufficient for training the user.	- Self-explanatory - Possibility to "dig deeper" - "Multiplicators"
(2) Can you mention explicit functionalities (that the system should have)?	• Training mode where the results of actions taken by users can be tracked, and reviewed by users. • People need the context to their daily work: Use past events to provide realistic scenarios for the users. • Repetition of the trainings is important to ensure that users are able to use the systems when they are needed. Have a two phase plan could provide the highest training effect: o "Base training" seminar where the very basics of the software are shown in presentations and animations would provide the user with an overview of the system. o "Training system" would help the trainee to learn how to use the system hands-on by playing through various scenarios. • Repeated trainings of the same sections and scenarios so that the user can learn from their mistakes. • Assessment about the trainee's performance during the training runs could provide, a more focused training during future training sessions. • Target specific needs of the trainee through focused training. • Trainings should be split into beginners and advanced, with different levels of details and difficulties based on the users' needs.	- Training mode - Using past events - Context to daily work - Two phase plan: basic functions & Training system - Specific user needs - Split into beginners and advanced
(3) In your opinion, which special aspects need to be considered in the field of civil protection?	• The closer the training is to reality, the more useful the learning regarding the system and its functionalities will be. • Training needs to be complex enough to ensure trainees can use the system, but not so complex that the trainees' frustration inhibits learning. • Imaginary situations and places are not suited for trainings because it does not prepare them for the use of the system in realistic situations. • Relating to places that the trainees have a connection to or might use in the future. They need to be able to imagine the situation, with situational keywords and resource allocations that are real or at least plausible for the training scenario. • The trainee needs to know about the system, why it behaves in one way or the other and what support it delivers to the user. This knowledge will allow optimal use of the system when a real crisis arises.	- Real resource allocations - Learning how to best serve their community - Optimal use of the system during a real crisis
(4) What impact do the different backgrounds and requirements on	• While centrally organized compact courses at one location allow for intense trainings, it causes many employers to ask "how many of my staff can I afford to send to a seminar, but not lose productivity of daily tasks in my team?"	- Online training - Provides access (anywhere at any time)

content and time of the different users in crisis management teams have on the trainings?	• An online training system could combat this problem, as it provides access anywhere at any time. It could then be used by trainees at their own pace, when it is most convenient for them and their employers.	

Table 1. Suitable Training Strategies and Structures

The answer that was given the most as shown in the "Guiding Question" in Table 1 was that training systems should be as self-explanatory as possible, but also need to give the user the possibility to "dig deeper" on how to utilize such a system to best fit their needs, for example in explanatory videos. The interview partners also mentioned that "multiplicators" – people that carry the knowledge through an organization – are needed for new software systems. Multiplicators can use their knowledge to give initial feedback in face to face discussion about specific questions.

Purely theoretical training methods such as lectures, presentations, reading material are not sufficient for training the user. A training system needs to provide a training mode, as mentioned in the guiding question 2, where the results of actions taken by users can be tracked and thus better understood by users. These systems can even be improved by using past events, which provides a realistic scenario for the users. This helps the users to understand not only the usefulness of the system but also helps them to determine how to best use it during a real crisis. Since the data has been recorded, it would be fairly easy to replay this same scenario and use it in another training situation. Through all these methods, the trainee could associate the tasks with the system and see the corresponding results. "People need the context to their daily work." Since these systems likely will not be used on a daily basis, repetition of the trainings is important to ensure that users are able to use the systems when they are needed.

Therefore, the closer the training is to reality, the better will the learning effect regarding the system and its functionalities be. It is important that the training is complex enough to ensure trainees can use the system, but not so complex that the trainees' frustration inhibits learning. Generally, imaginary situations and places are not suited for trainings because it does not prepare them for the use of the system in realistic situations. It is much better to relate to places that the trainees have a connection to or might use in the future. They need to be able to imagine the situation, with situational keywords and resource allocations (guiding question 3) that are real or at least plausible for the training scenario. For example, it is of no help to train people from Stuttgart, Germany with a scenario placed in Berlin. The terrain, the critical infrastructure, the resources and the special needs and behavior of the population are different. The trainees would not be learning how to best serve their community. Finally, it is important that the trainee knows about the system, why it behaves in one way or the other and what support it delivers to the user. This knowledge will allow optimal use of the system when a real crisis arises.

Interviewees mentioned nearly unanimously that having a two phase plan might provide the highest training effect. First, "a base training" seminar where the very basics of the software are shown in presentations and animations would provide the user with an overview of the system. From that point on, the user would be able to utilize the basic functions of the system. The second phase using a "training system" would help the trainee to learn how to use the system hands-on by playing through various scenarios. Such a training system should also allow for repeated trainings of the same sections and scenarios so that the user can learn from their mistakes. Additionally, if such a training system includes an assessment about the trainee's performance during the training runs, a more focused training could be provided during future training sessions. This allows the user to get the most out of the training because their specific needs are targeted and addressed. This saves time and improves the users' ability to use the system. To the same end, trainings should also be split into beginners and advanced, with different levels of details and difficulties based on the users' needs.

While centrally organized compact courses at one location allow for intense trainings, it causes many employers to ask "how many of my staff can I afford to send to a seminar, but not lose productivity of daily tasks in my team?" An online training system could combat this problem (see guiding question 4), as it provides access anywhere at any time. It could then be used by trainees at their own pace, when it is most convenient for them and their employers.

Challenges and Best Practices for the Implementation of Trainings

The question of best practices shows which training measures are valued in practice, and which fit best to command and control centers regarding crisis information systems.

Guiding Questions	**Answers**	**Key "Findings"**
(5) Can you think of positive or negative examples of trainings in software systems?	• The confrontation with completely new software and thus user interfaces and functions during a training. • The biggest problem was that most people can work with Microsoft Outlook, but here they were faced with completely different software. Ultimately, it only works well with regular practice. However, no one working in a command and control center has the time for that. • Less used functions need to be presented simple and clear or familiar to the user.	- Faced with completely different software - Functions simple and clear or familiar to the user
(6) Do you know training concepts or modules that are good examples for teaching software systems in a usable manner? If yes, which ones?	• Use real data from the real system in control centers in a mirrored training system. That means that there is always current data of the city. • Pick individual sections of the city and select districts and their current conditions for trainings. • The user in the dispatch call center might get a call (taken from a past event) and has to deal with the situation. Based on their reaction in the scenario and real data from the event, the users can review their decisions after the training. • The users want to see how the system reacts. Direct feedback from the system offers very realistic and clear evaluated results of the training.	- Real data from control centers - Regionally relevant data from real events - Direct feedback from the system

Table 2. Challenges and Best Practices for the Implementation of Trainings

One of the main problems mentioned in guiding question 5 by the interview partners was the confrontation with completely new software and thus user interfaces and functions during a training. In one example, the training did not go well: "The biggest problem was that most people can work with Microsoft Outlook, but here they were faced with completely different software. Ultimately, it only works well when they practice regularly. But no one working in a command and control center has the time for that". The interview partners pointed out that the less used functions need to be presented simple and clear or familiar to the user. When asked about best practices in guiding question 6, the most mentioned point was that it is best to use real data from control centers in a mirrored training system. This means that regionally relevant data from real events should be used for trainings. "We take all the information from the real system. That means that we always have current data of the city. We can pick individual sections of the city and select districts and their current conditions for trainings". In training mode, the user in the dispatch call center might get a call (taken from a past event) and has to deal with the situation. Based on their reaction in the scenario and real data from the event, the users can review their decisions after the training. "The users want to see how the system reacts". Direct feedback from the system offers very realistic and clear evaluated results of the training.

Guiding Question	**Answers**	**Key "Findings"**
(7) Do you think that there are problems with the user acceptance of new software systems in the "field"?	• The use of real data is one of the main factors improving the acceptance rate of new software in the organization, since the user has a recognizable added value of the new system. • The complexity of the system has to be reduced to the essential needs of the user. • The more extensive and "playful" (i.e. distracting) a system is, the less acceptance it will find in practice. • Regional specificity of the data, which can be the added value for the daily work. It would reinforce the acceptance because then the practitioners do not need to equip the system with additional data.	- Real data one of the main factors of acceptance - Regional specificity of the data crucial for acceptance

Table 3. User Acceptance of new software systems in civil protection

The interviews show in guiding question 7 that the use of real data is also one of the main factors improving the acceptance rate of new software in the organization, since the user has a recognizable added value of the new system. To achieve this, the complexity of the system has to be reduced to the essential needs of the user. “The more extensive and distracting a system is, the less acceptance it will find in practice.” It was also said that one of the crucial points to acceptance of new systems is the regional specificity of the data, which can be the added value for the daily work. “Regional-specific data would reinforce the acceptance because then the practitioners do not need to equip the system with additional data”.

Using Simulation as a Training Method for Crisis Information Systems

In this section of the interviews, participants were asked about their personal experiences and opinions about computer simulation software as a way to train staff. The main question was if, in their personal opinion, such simulation tools might be able to improve the effectiveness of trainings.

One of the main described training methods in guiding question 8 was to use “Virtual Reality”, which is also based on the approach of the mirrored systems. In such a virtual environment, a trainee can “move” through the affected area and explore it; this could even be embedded in some sort of game. “The system reacts exactly like the real command and control system (see guiding question 9)”. Before computers, this was sometimes done with management “board games” or map exercises. This allows for the same result: users have access to the area as they would in real life, which allows them to effectively plan a solution.

Guiding Questions	**Answers**	**Key “Findings”**
(8) Do you know of any computer simulations as a training module?	• Virtual Reality, based on the approach of the mirrored systems. In such a virtual environment, a trainee can “move” through the affected area and explore it; this could even be embedded in some sort of game.	- “Virtual Reality” - Approach of the mirrored systems
(9) What are the specific needs and requirements for such a simulation?	• The system needs to react exactly like the real command and control system. • Users have access to the area as they would in real life, which allows them to effectively plan a solution. • Interactions between the computer and the trainees can be recorded, allowing scenarios to be played back for review. • This play back can then be augmented with explanations, hints and other information that might help the trainee in improving their skills. • An evaluation of the simulated training can track error patterns and mistakes that are made and give this information to the user. • The simulated system could be a fully operational terminal, where only the back-end functionality is simulated (communication systems, printers, etc.). • Constant feedback should help the trainees see what their actions triggered within the system. • Error messages should be shown to explain that something was wrong. • Simulation should uses data that comes from real-life events • Local geographical, organizational and environmental constraints are useful in simulations. • Data sets that have been used before, that exist within the organization or data from statistical sources should also be reused and not newly invented for the purposes of the training. Data that has not been captured or might not be plausible for the specific training environment could then be added manually. • Scenarios for the simulation and training should be chosen selectively. Scenarios should be as concrete as possible, an	- System reacts like the real command and control system - Recording interactions - Evaluation of the simulated training - Best simulation; real-life events - Scenarios should be as concrete as possible

	event that can actually happen. • The location of the event should be something that can be changed, according to the surrounding environmental framework.	

Table 4. Using Simulation as a Training Method for Crisis Information Systems

One advantage of new technologies like computer simulations is that interactions between the computer and the trainees can be recorded (guiding question 9), allowing scenarios to be played back for review. This play back can then be augmented with explanations, hints and other information that might help the trainee in improving their skills. An evaluation of the simulated training can track error patterns and mistakes that are made and give this information to the user. Additionally, by changing up the scenarios, such errors could be straightened out for the user. Also, the simulated system could be a fully operational terminal, where only the back-end functionality is simulated (communication systems, printers, etc.). During the simulation, constant feedback should help the trainees see what their actions triggered within the system. Also, error messages should be shown to explain that something was wrong.

Input data for simulations (parameters) and scenarios that build the general setting for a training and simulation environment were also mentioned repeatedly in the interviews. As previously stated, the best simulation uses data that comes from real-life events. Furthermore, local geographical, organizational and environmental constraints are useful in simulations by increasing the perceived reality of the scenario for the user. The organization using the software knows about its' own rivers and lakes, population and critical infrastructures and hospitals and can input these data as needed or wanted. Additional data sets that have been used before, that exist within the organization or data from statistical sources should also be reused and not newly invented for the purposes of the training. For example, citizen numbers can be taken from the census to see how many people are affected, or weather changes can be taken from the forecasts and statistics. The effectiveness of the training will improve by providing a very realistic scenario. Data that has not been captured or might not be plausible for the specific training environment could then be added manually.

The interview partners answered in guiding question 9 that scenarios for the simulation and training should be chosen selectively. "Scenarios should be as concrete as possible, an event that can actually happen." However, the location of the event should be something that can be changed, according to the surrounding environmental framework. For example, if using a toxic cloud as a scenario, the weather plays an important role of how to act and respond. Such information must be present and play into the simulation.

DISCUSSION

As the interviews showed, the training of new civil protection support systems should be as suitable as possible to the users' environment and almost ubiquitous in their workplace. Quick reactions in emergency situations must be possible, even if special support software is not used in the day-to-day job. This means it user must be well-trained, but the system itself also needs to be extremely user friendly.

There is the need and the potential for a more thorough training curriculum and training mode in civil protection support systems. As the interview partners said, regional real-time data could be a potential base for more realistic and regional specific training modes and simulations, which could also increase the acceptance of newly developed software systems in the field. To push this forward, aid organizations and scientific institutions should work closely together to create a more specific analysis of such specific trainings, with higher availability and a use of real-time regional data. One of the biggest challenges will be to create a set of basic input parameters for every command and control center, generated from their own software systems.

In this context, it should be possible to import recent regional mission data (e.g. from the regional control center) into a training system, but also include secondary data from other sources. Such sources can be everything, ranging from current weather data to the traffic information from local streets, or news channels that might affect the situation. To make this work, it is important to identify the important data and input parameters based on the local environment and special requirements, which can be used to develop a region-specific training mode. The parameters mentioned in this paper are initial assessments, with much more to be considered in future research and in the development of such a software system and a comprehensive training system.

From a technical perspective, including and importing real time data from the variety of systems is definitely

possible, but does need further efforts in the field of data exchange for crisis management software systems. Also, technical and organizational issues have to be considered when managing and integrating the different sources and data formats for such realistic training scenarios. The biggest challenge will lie in making the trainings and data exchange as seamless and unnoticeable as possible to the users and administrators of the current and future software systems, as the daily work routines cannot be disrupted or even shut down.

As for the structure of the trainings, a two-step approach seems to be the most appealing to crisis managers and trainers. The first step should involve a training on how to use the system: the what, when and how. This could be accomplished with an easy to use e-learning platform, as trainees cannot just leave to a week-long seminar. Of course, the challenge here is the need for a thorough and thought-through platform and teaching mode, as the usage is not easy to predict. This also means more data needs to be collected on how people learn from such systems. Alone the time of use can range from a few minutes to hours, depending on the work load that an employee can have in the command and control environment. This distant learning environment should include a methodical and tactical introduction to the new system, and if applicable, a separation between beginners and advanced levels.

The second step of the training should consist of a training mode within the real system that can be embedded in the daily work environment. For example, so-called mirrored training systems are already successfully in use of several command and control centers as training systems. These systems have the benefit to import regionally relevant data from real events directly into the training system. Thus, is it possible for the command and control users to train their skills during a “replayed” real emergency situation and can review their decisions after the training. A training of this sort is best set in a computer simulation, where most of the environmental and situational factors are included. It will be up to the researchers in the field, the creators of the simulation software, but also the trainers to spend enough time and resources to gather and understand the specific training needs of crisis management staff. However, seeing the great benefit of almost-real simulation tools in the statements of the interviews, this should be well worth the effort.

CONCLUSION

In this paper, we introduced a first step towards a study in the field of trainings for crisis management information systems within German civil protection. We conducted interviews in order to compile personal experience, opinions and best-practices from key officials in the field of German civil protection: control center staff, trainers and crisis managers. The interviews were grouped into three main sections: suitable training strategies and structures, challenges and best practices for the implementation of trainings and using simulation as a training method for crisis information systems. The interviews were analyzed and presented in this paper. Based on the content of the interviews, several suggestions for improved trainings and further research were given in the discussion section.

ACKNOWLEDGEMENTS

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° [261732].

REFERENCES

1. Bacon, L., MacKinnon, L., Cesta, A., Cortellessa, G., 2012. Developing a smart environment for crisis management training. Journal of Ambient Intelligence and Humanized Computing 4, 581–590.
2. Berlin, J.M., Carlström, E.D., 2008. The 90-Second Collaboration: A Critical Study of Collaboration Exercises at Extensive Accident Sites. Journal of Contingencies and Crisis Management 16, 177–185.
3. BITKOM, 2008. Krisenmanagement und Bevölkerungsschutz – Eine neue Qualität. Bundesverband Informationswirtschaft, Telekommunikation und neue Medien e. V.
4. Boldyreff, C., Dastbaz, M., Liu, H., Arafa, Y., 2011. Engineering advanced training environment for crisis management: The Pandora project, in: Proceedings of Advances in Computing and Technology Conference. pp. 125–131.
5. Bortz, J., Döring, N., 2006. Forschungsmethoden und Evaluation: für Human- und Sozialwissenschaftler, 308–312, Springer-Medizin-Verl., Heidelberg.

6. Bundesministerium für Bildung und Forschung, 2007. IKT 2020 - Forschung und Innovation. Bundesministerium für Bildung und Forschung, Bonn.
7. CAST Project Consortium, 2011. Final Report: CAST - comparative assessment of security-centered training curricula for first responders on disaster management in the EU. Salzburg.
8. Dugdale, J., Bellamine-Ben Saoud, N., Pavard, P., Pallamin, N., 2009. Simulation and Emergency Management, in: Van de Walle, B., Turoff, M., Hiltz, S.R. (Eds.), Information Systems for Emergency Management. M.E. Sharpe, Armonk NY.
9. Feuerwehr und Katastrophenschutzschule Rheinland-Pfalz, 2013. SAFER [WWW Document]. URL http://internet.lfks-rlp.de/index.php?id=425 (accessed 11.4.13).
10. Goldstein, I.L., 1989. Training and development in organizations, 1st ed. ed, Frontiers of industrial and organizational psychology. Jossey-Bass Publishers, San Francisco.
11. Gupta, S., Bostrom, R.P., 2006. End-user training methods: what we know, need to know, in: Proceedings of the 2006 ACM SIGMIS CPR Conference on Computer Personnel Research: Forty Four Years of Computer Personnel Research: Achievements, Challenges & the Future. pp. 172–182.
12. Max, M., Sautter, J., 2013. Analysis of a German First Responder Exercise: Requirements for Exercise-Support and Simulation. Presented at the ISCRAM 2013, Baden-Baden, Germany.
13. Ntuen, C.A., Balogun, O., Boyle, E., Turner, A., 2006. Supporting command and control training functions in the emergency management domain using cognitive systems engineering. Ergonomics 49, 1415–1436.
14. Olfman, L., Bostrom, R.P., 1988. The influence of training on use of end-user software, in: ACM SIGOIS Bulletin. pp. 110–117.
15. Rooney, C., Passmore, P., Wong, W., 2010. Crisis: Research priorities for a state-of-the-art training simulation and relevance of game development techniques, in: Proceedings of the Workshop on Crisis Management Training: Design and Use of Online Worlds, NordiCHI.
16. Sautter, J., Engelbach, W., Frings, S., 2012. User-Centered Elaboration of an Integrated Crisis Management Modeling and Simulation Solution, in: Aschenbruck, N., Martini, P., Meier, M., Tölle, J. (Eds.), Future Security 2012, CCIS. Presented at the Future Security 2012, Springer Berlin / Heidelberg, Bonn, Germany, pp. 513–516.
17. St Julien, T.U., Shaw, C.D., 2003. Firefighter command training virtual environment, in: Proceedings of the 2003 Conference on Diversity in Computing. pp. 30–33.
18. Šubik, S., Rohde, S., Weber, T., Wietfeld, C., 2010. SPIDER: Enabling interoperable information sharing between public institutions for efficient disaster recovery and response, in: 2010 IEEE International Conference on Technologies for Homeland Security (HST). pp. 190 –196.
19. Van de Walle, B., Turoff, M., 2008. Decision support for emergency situations. Information Systems and E-Business Management 6, 295–316.
20. Walker, W., Giddings, J., Armstrong, S., 2011. Training and learning for crisis management using a virtual simulation/gaming environment. Cognition, Technology & Work 13, 163–173.