

## SHARING OF EXPERIENCES A Method To Improve Usefulness Of Emergency Exercises

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### Abstract

This study presents an exercise of major train accident organized in SE Finland in spring 2002. A specific method was used to collect and share experiences of the participants. This method, originally developed for the analysis of real accidents and crisis, demonstrates a strong potential to improve the overall benefits of this kind of exercises. The special feature of this exercise was the co-operation between many different authorities and voluntary actors. The authorities represented rescue services, police, health care, mental crisis care and social care. The voluntary actors included both first aid and mental crisis care groups. The success of an exercise depends on two main factors: motivation of people and similarity with real conditions. The challenge in collecting the lessons learned from an exercise is in its character of simulating the real situation. One has to target to separately analyze the experiences on the exercise conditions and on those useful for planning for real operations.

**Keywords:** Emergency exercise, organizational learning, rescue services

### 1. Introduction

Exercises are organized to train people to face emergency conditions and to collaborate among organizations during stressful and unusual contexts. The practical benefits of exercises in terms of training and lessons learnt are very variable, depending upon the way they are organized.

Much work is done to develop tools and methods for analyzing past accident situations (e.g. Rasmussen and Svedung 2000). Reporting of accidents and investigating major accident cases is a regulatory responsibility of enterprises and authorities, which is under considerable pressure for development (Stoop 2002). In the field of rescue services, in everyday life, accident situations and their management is not often analyzed in a detailed manner. Due to time pressure and tradition, the authorities routinely prepare only official reports containing major facts, causes and consequences (Wybo and Lonka 2002).

Exercises play an important role in emergency preparedness. They are vital in keeping up and developing the skills of the rescue personnel as well as the voluntary groups. In the best cases exercises involve many different actors and serve as real learning experiences for all participants. Too many times, though, an emergency exercise turns out to be only “exercising an exercise”. It is characterized by low motivation of the participants and collecting results, which could be foreseen already in planning phase of the operation.

Reconstruction of an accident situation and collecting lessons learned is a challenge both for authorities and representatives of possible private companies involved. Accident is a sensitive

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situation including often both technical malfunctions and operational flaws as root causes. In more serious cases question of guilt can't be neglected. Accident investigation is often closely focused on finding the root causes of the incident. Less effort is put to study the organizational factors influencing the effectiveness of emergency management.

Exercises can serve as invaluable source of information on functioning of emergency management in accident situations. In simulated cases lessons learned can be collected and difficulties in the incident management identified without tackling the question of guilt. Also in exercise cases participants seem, though, to be very sensitive to the successes and drawbacks recognized in their personal or in their organization's work. This can form an obstacle for collection of all relevant information available in a simulated case.

This study presents a case of an exercise of major train accident organized in spring 2002 in SE Finland, and the application of a method to collect and share experiences of the participants. This method, originally developed for the analysis of real accidents and crisis, is here for the first time applied to a case of a simulated accident. The method consists of individual interviews and transcription of series of episodes based on these. Finally common knowledge of the situation is validated in a meeting gathering all the participants. Methodology gives promising results of extracting information from an ordinary exercise case. It helps effectively to avoid withdrawal of information concerning drawbacks in functioning of persons and organizations.

## **2. Methodology: the method to collect, formalize and share individual experiences**

This report is based on a study made according to a French method "Rexao" ([www.rexao.org](http://www.rexao.org)). This is a special method designed to collect, analyze and merge the individual experiences of an accident. The "Rexao"-method has so far been applied to analyze real accident or incident situations in industrial installations and also for some cases in public transport (Wybo et al. 2002). This was the first time when the "Rexao"-method was applied to analyze experience and collect lessons learned from an exercise.

The "Rexao"-method is based on collecting the so called "particles of experience" of those who have been involved in an accident or incident situation. These particles of experience are collected by individual interviews of different actors who have been acting at different levels of hierarchy in the crisis situation. The special feature and strength of the Rexao -method is that people are interviewed separately. In this way, they can explain their own point of view without a stress set by a group. This enables collection of explicit and tacit knowledge of the incident management (Wybo 1998).

Each interview starts with interviewee telling in free words about what happened during the exercise in chronological order. After that researcher points out certain moments of the story and asks clarifying questions like "why did you do that?", "what else could you have done?", "how did you do that?" In this way the critical moments on each individuals actions and decisions can be collected from the story. These are called "particles of experience".

Based on these particles of experience an overall picture of the development of the situation is drawn by the researchers. This picture, a common story, is then presented in a collective "mirror meeting" in which it is reflected to the idea the participants have had of the incident management from their own point of view. Based on the experiences collected and the reflections made during the mirror meeting an "objective truth" of developments of the crisis situation is sketched. Based on this information important conclusions can be drawn as "lessons learned" from the exercise. The collective processing of the individual experiences enables the participants to commit themselves to the conclusions reached during the process. This is very useful from the point of view of individual and organizational learning and applying the lessons learned for future real situations and for planning of future exercises.



### 3. Study: the major accident exercise

#### 1. General background

The SUROVA exercise is a Finnish exercise type to train different authorities for co-operation during major accidents and disasters. In South Eastern Finland District this kind of exercise takes place approximately once a year. The responsibility to lead the management of the exercise rotates between different authorities and voluntary organizations.

The exercise in question took place in Kouvola on 25 May 2002. This exercise was coordinated by South Eastern District of Finnish Red Cross. Representatives from the following authorities took part in the exercise: Rescue Services units from Northern Kymi Valley Region including ambulances and voluntary units, Health Care Center of Kouvola-Valkeala (first aid and crisis care groups), Social Care of City of Kouvola, Police district of Kouvola, Military police unit from Utti garrison. From Red Cross voluntary groups participated the first aid group, mental crisis care group and members of various voluntary aid groups, who played the roles of victims. The amount of personnel at scene was 20 rescue workers, 2 policemen, 4 military police, 8 persons of ambulance personnel, one doctor, one nurse, one assistant and one crisis care worker from Health Care Center, one person from Social Care and 4 first aid group members from Red Cross.

The accident to be simulated by the exercise was a collision of passenger train with a car. The train was represented by one coach with 40 passengers. The car included 4 victims. All patients in the car were severely injured, in the train was 20 non to slightly injured, 10 badly injured and 10 severely injured patients. According to the exercise description the train coach was fell on its side but for the practical reasons the coach was in real left to an upright position. No movement or bending of the seats in the coach took place either.

The exercise started at 14:00 of Saturday and it was announced to be finished at the scene at 15:15. The exercise continued though till about 16:00 at the Kouvola-Valkeala Health Care Center facilities. The interviews to collect information were organized during one day two weeks after the exercise and mirror meeting was organized one week later.

#### 2. Succession of events

The structure of the exercise as succession of events, based on the interviews, is following:

1. Alert
2. First actions of the Emergency Call Center
3. First review of the accident at scene
4. Management of the first operations at scene
5. First operations by the rescue leader
6. Triage of the victims
7. Taking care of the passengers in the car
8. Evacuation of the train
9. Preparing the first aid place
10. Evacuation to the Health Care Center (HCC)
11. Activities in the HCC
12. Co-ordination of the mental crisis care
13. Co-ordination of the social care
14. Co-ordination of the voluntary work.

The particles of experience are divided into four phases: 1) context i.e. the main aspects of the current situation; 2) analysis describing, how an individual perceives the situation or its evolution and the hypothesis he/she considers; 3) action representing chosen decisions and actions and 4) effect, which gives the point of view of the individual on the effects of his/her actions on the situation. Particles of experience identified during the analysis and the merging of individual experiences divided into these four phases are presented in the table 1.



TABLE 1. Particles of experience and the reconstructed succession of key events

| Context   | Analysis   | Action  | Effect  |
|---|--|---|---|
| Alert: a train accident at the Kouvola railway yard takes place at 14:00.                           | Train driver analyses the situation.   | Driver informs the Train Command Center.  | TCC <sup>2</sup> calls Emergency Call Center and makes further alarms inside the company, further accidents prevented.  |
| First actions at the Emergency Call Center: The alert from TCC is received.                         | ECC <sup>3</sup> officer in duty: Major accident has taken place.  | Basic Alert to be alarmed.  | Alarm sent to Rescue Services units and other authorities (HCC <sup>4</sup> , Regional hospital).   |
| Medical Commander (L4) is the first to arrive at scene of accident.                                 | Medical commander analysis at the scene: 40 victims, 4 victims in the car.   | More medical units are needed, L4 self starts the triage in coach and team member starts working with victims in the car.   | L4 contacts the Rescue leader (P3), triage in the coach and first aid in the car are started.   |
| First rescue unit to arrive is Kouvola unit K11 and its leader P4.                                  | Rescue team leader (P4) gets instructions from L4 on how to start the rescue work.   | P4 starts to organize tasks: emptying the coach, leading the rescue work at the car.  | Rescue operations are started.  |
| Rescue leader (P3) arrives 5 minutes after first rescue units and takes the lead of the situation . | Rescue leader (P3) identifies the tasks: emptying the coach, victims out of the car, founding a first aid place, first aid to the patients, transport of the patients. | Defining the approach threshold for arriving units, dividing responsibilities between units, creating speech groups at Public Authority Network (TETRA/VIRVE).            | Different groups get orders on their tasks and can move to appropriate speech groups at VIRVE.  |
| 40 victims in the coach.  | L4 analysis: 4 groups of victims: green (slightly injured) 20, yellow (badly injured) 10, red (severely injured) 10, black (difficult position or dead) none.          | Patients to be moved as fast as possible respecting their injuries and be carried to the first aid place. Instructions given to the rescuers on how to move the patients. | Triage took 20 minutes and emptying the coach started simultaneously.   |
| Four victims in the car   | L4 team partner analysis: all victims in the car are severely injured. They must be got out as soon as possible.   | The first rescue units to arrive must start to open the car wreck.  | Patients are being taken care of by rescuers and the first ambulance teams which arrive to the scene.   |
| The coach is full of patients who have been classified.   | The patients must be carried out and moved to the first aid place.   | Rescue team leader KU11 is given the duty to lead the emptying the coach according to the instructions of L4.   | Rescuers report on duty to L4 who gives them orders on how to empty the coach. Ambulance units are reported to duty to L4 who instructs them on first aid and on how to guide rescuers further. |
| 24 patients need immediate first aid.   | First aid place must be founded close to the coach.  | Koria Rescue Unit is given the duty to found the first aid place  | The first aid place is founded at 14:20.  |

<sup>2</sup> Train Command Center

<sup>3</sup> Emergency Call Center

<sup>4</sup> Health Care Center



| Context   | Analysis   | Action   | Effect   |
|---|--|--|--|
|   |  | according to the instructions of L4.   |  |
| Evacuation to the Health Care Center. In order to test effectively the organization HCC has wished to get patients to their facilities a.s.a.p.                                     | The patients must be transported in bigger groups than in real life to fulfill the wishes of HCC.  | Patients are grouped at the first aid place in groups of five to be transported to HCC.  | A further analysis of the ambulance work was not meaningful because of deviation from real life circumstances. Grouping of patients caused crowding at the first aid place.  |
| Alarm got to the HCC at 14:06.  | Analysis by the nurse in duty who received the alarm: A large accident has taken place and probably over 10 patients will be transported to HCC. | The plan of emergency must be put in force. The nurse in duty informs the head physician of the situation. The physician orders nurse to start to call for more forces according to a phone list and to start moving existing patients from first aid to another part of the building.   | <ol style="list-style-type: none"> <li>1) The permanent staff of the first aid division of HCC was got in touch within half an hour.</li> <li>2) The first aid team with a doctor, a nurse and an assistant was sent to the field at 14:15.</li> <li>3) The psychologist responsible for the mental crisis care was reached and she started to call for crisis workers. According to the exercise plan one crisis worker was sent to the field already with the first aid team.</li> <li>4) The head nurse of the first aid division arrived at 14.25 and took over the responsibility for co-ordination of the actions.</li> <li>5) The leading emergency group was called together.</li> </ol> |
| Co-ordination of the mental crisis care. The HCC assistant alarming people got in touch with the psychologist responsible for the co-ordination of the mental crisis care at 14:23. | Analysis by the psychologist: A large accident has taken place and a mental crisis care group must be called together.                           | Calling through the list of 30 persons. Contacted by the mental crisis worker on scene (who had left with first aid team) psychologist orders a hospital therapist to leave for the accident scene immediately. The head nurse of first aid division contacts the Regional hospitals head psychiatrist to inform about the situation. He contacts the psychologist 14:50 and delegates further co- | <ol style="list-style-type: none"> <li>1) Report to the head nurse of HCC on mental crisis care activities at 14:50</li> <li>2) The hospital therapist sent to the scene could not find anybody to report for duty to (no P3, nor L4). So, he contacted only the crisis mental worker, whom he knew.</li> <li>3) No contacts were made by the HCC to the voluntary mental crisis workers even though the P3 was of</li> </ol>  |



| Context  | Analysis  | Action  | Effect  |
|--|---|---|---|
|  |   | ordination to her and HCC.  | the understanding that this would have been the procedure.  |
| Co-ordination of the social care. The ECC tried to call Social affairs director of City of Kouvola, to inform about the situation, but couldn't find his number. ECC asked the HCC to contact him. The HCC head nurse got in touch with him at 14:50. Social affairs director entered the first aid place in the field at about 15:00 hours. | At the scene of accident were 6 under aged children and 10 elderly persons, who needed shelter. One aurally handicapped person needed help in continuing her trip destination Brussels and a couple of Russian speaking people needed help with interpretation. | Contact to children's homes in the region and elderly homes in Kouvola to find out about free places. Tried to find translators.  | 3 children with other family members were sent to Villa Jensen in Kotka, 3 children were sent to children's home in Kouvola. The temporary shelter was created for the elderly people in the sports hall of Kaunisnurmi elderly home in Kouvola. No translators could be found in the given time. |
| Co-ordination of the voluntary work. Alarm from ECC at 14:08 to the emergency duty number of the officer in charge at the South Eastern Finland's Red Cross voluntary service.   | The voluntary officer in charge (E3) identified the needs. E3 asked ECC, what groups were needed. ECC contacted directly P3 on this. P3 told that only first aid groups as well as stretchers and blankets were needed (i.e. no mental health care).            | E3 called the first aid group leader with the instructions given from ECC. E3 called a partner for himself to follow him to the scene of the accident.<br>Actions at the scene:<br>1) E3 arrived and tried to call P3 by VIRVE on scene, but had no success. He reported himself for duty to P3 orally. No further wishes were expressed from P3 to E3.<br>2) Head of the voluntary First Aid group collected 7 persons by calling through a list of volunteers. Group arrived at the scene about 14:45. They reported for duty to E3 and then to L4 to get instructions. | 2 volunteers helped people next to the coach and 5 went to the first aid place. Only the first aid team of the Red Cross voluntary workers could be made use of since mental health care group did not get the alarm.   |

#### 4. Results: Observed impacts on people

The success of an exercise in its realization depends on two main factors: motivation of participants and similarity with real conditions. In collecting the feedback the challenge is to differ the experiences on the exercise and on the feedback that can be used to develop the real operations and their organization.

In general we noticed that people participating in the exercise were very well motivated to participate also in interviews and collection of feedback. They appreciated the idea that their experiences could be made use of in developing the future exercises and real operations. It is



noticeable that interviews were carried out in the beginning of June when the holiday season in Finland had already started.

The lessons learned based on the interviews and mirror meeting are grouped in the following categories: 1) Preparing of the exercise; 2) Management of the situation and division of responsibilities; 3) Communication; 4) Social care and mental health care; 5) Voluntary units, role of victims.

### 1. Preparing of the exercise

The exercise was prepared in a group with representatives from all participating authorities and other actors. The Red Cross representative chaired the group, which met 5 times during half a year before the exercise.

The basic idea of the exercise was to be a major accident simulation. Yet, practical reasons to restrict this idea rose during the preparation term. Firstly, the railroad company was not well committed to participate. Their own emergency management crews were not available for the exercise as it took place on Saturday. The company also restricted the use of the railroad coach in very crucial way. The coach had to stay in an upright position and no harm was allowed to be done to it. This had an important effect on the simulation and ability of participants to act as if the situation was real.

Another flaw was that the regional hospital couldn't participate in real because of shortage of staff during a weekend. This had an important effect on the role of ambulance teams and transportation during the exercise. Also the special wish of the Health Care Center to get patients soon and in larger groups into its facilities disabled the simulation of ambulance team work.

Many participants, when interviewed, commented this situation with 40 patients 20 of which were badly or even seriously injured as a "small situation". According to an official classification an incident with over 10 injured victims is to be considered as a major accident. L4 commented: *"If it would have been a bigger situation, I would certainly have chosen a different model of leading the medical section. Maybe also in this case (with 40 patients) I should have concentrated more to lead the medical actions than e.g. in doing the preliminary triage during first 20 minutes."*

The fact that the coach was evacuated very fast and easy compared to a real situation had a considerable effect on the realization of the exercise. Comment of L4: *"The fact that the coach was in an upright position had a clear effect on the speed by which it was evacuated."*

### 2. Management of the situation and division of responsibilities

The basic difficulties in the management of the situation were due to the confusion of participants on whether to live the situation as a major accident case or as a smaller one. This had an effect on the management of the situation by the rescue leader in dividing the duties and in organizing the communication as well as in decisions of other field workers concerning their own duties.

One important decision concerning the management was that no meetings were organized with the rescue leader and field leaders. No "blackboard" or other visualization of task division was neither used. The management of the incident was profoundly based on communication by radio terminals. This may also be due to the fact that one important target of the exercise was to test the new Public Authority Network (VIRVE) and to collect experience on its functioning. Yet, due to the solutions made in the overall management, the situation didn't serve this purpose in a best possible way.



The difficulties in simulating a major accident also rose from the restrictions set in the exercise plan. The railroad coach standing in an upright position didn't demand special effort for carrying the victims out. All the action was very fast and led to the short duration of the whole exercise (1 h 15 minutes).

In this exercise the co-operation between medical units and rescue units was very important, and also co-operation between medical professionals and the volunteers. A central part of the work took place at evacuation of the coach and moving the patients to the first aid site.

According to representatives of those organizations which have less experience in the field work – mental crisis care, social care – the co-operation with other units was difficult because important spots (P3 car, first aid site) and important persons (L4, P3) were not easily recognizable. They suggested these persons and spots should be marked more clearly in the field.

### 3. Communication

The testing of VIRVE public authority network and radio communication was set as an important target of this exercise. This fact had clear effect on the leading and management decisions made at the situation as explained above. The rescue leader put lots of effort to the defining and controlling the speech groups and this ended up in certain "virtuality" in his way of managing the situation.

The most important experiences on VIRVE communication were:

- following different speech groups simultaneously can end up in negligence and missing of important information and trials of contact during the situation
- L4 comments: *"I don't know, whether he tried to contact me. And I don't know, whether the fact that I didn't hear him calling me, had do to with a technical problem (e.g. no field). I think it is probable that I just didn't have the capacity myself to receive his message because I was so concentrated on dealing with the patients and making the preliminary triage."* (according to Nokia specialists' measurements on scene, there was no technical problem with the network in any spot)
- a clear technical problem was the use of direct mode channel (DMO) and that this inhibits the scanning of other – e.g. group leaders' – speech groups. It became clear that different groups of professionals had different habits in their ways of using the new radio terminals and the network. This was due to the equipment and their tacit knowledge on, how to act in the most effective way in their own organization. This resulted in the situation were the communication inside the team was carried out effectively but the communication in a wider group was easily neglected.
- In the field of healthcare, the importance of having enough VIRVE radio terminals for the personnel became clear by the experience. As the first aid nurse at HCC comments: *"It was very good that also the nurse in the field had the VIRVE phone and not only the doctor. In this way we could contact her when the doctor was too busy to answer. In real case it is very important that we have enough phones."*

### 4. Social care and mental health care

The including of the social care activities in the exercise was a big challenge, especially taken into account the short duration of the situation.

There was a considerable time-lap in alarming the social care services when the GSM-number of the social affairs director of city of Kouvola was not to be found in the Emergency Call Center (ECC). This information didn't exist at hand in the HCC either. The director, responsible for co-ordination if social care, could despite these difficulties participate to the exercise and make the appropriate decisions of e.g. situating the children and the elderly people in the given time.





In realization of the social care work the idea of the rescue leader to have an empty bus for the slightly and non-injured patients would have been a very good one. Unfortunately the information on the existence of this “virtual bus” did not reach other actors in the field.

Different participants had different ideas on the role of mental crisis care in such an incidence. Despite this slight confusion the alarming of mental crisis care was done by decision of HCC head physician at the same time as decision on raising the overall preparedness level at the HCC. It was a positive experience, how fast a considerable amount (7-10 persons) of the mental crisis care personnel could be reached.

The mental crisis care work necessary during the situation should not be mixed with the debriefing activity, which can effectively be done first a certain time interval after the crisis situation. Especially in a situation with lots of injured patients including children, families and elderly people the timely mental crisis care is of great importance. The realization of later debriefing work can be difficult if the authorities can not get the personal information of the people (i.e. also slightly and non injured persons) involved in the crisis situation. This information should be forwarded to the authorities at the hometowns of the patients.

##### 5. Voluntary units and playing the role of victims

For voluntary groups it was rather a disappointment that voluntary mental crisis group never got the alarm. This was due to a misunderstanding that the voluntary crisis group should have been alarmed from the HCC simultaneously with their own crisis group.

The alert for voluntary first aid group took place rapidly through their own alarm system after the alert from the ECC. The voluntary first aid worker felt, though, that they were not made very well use of. They thought this might be because the authorities probably are not fully aware of their training, experience and capabilities.

The effort of those voluntary persons playing the role of victims was of great importance for the good results of the exercise. The interviewed victims had really lived their roles even to the limit, where they felt emotions, e.g. disappointments, which the victims would have felt. The victims made a valuable work also in experiencing the action of the rescue personnel.

The following comments were given:

- Part of the rescue personnel were felt to neglect the needs of the victims. As one victim puts it: *“The rescuers (firemen) were just running back and forth and nobody paid any attention to me.”*
- Not enough attention was neither paid to the real needs of those playing the roles of victims, e.g. laying on a bare ground was in reality very hard (the cold, the humidity and insects) for people at the victims roles, not to mention what it would have been for real victims.
- It was widely agreed that for the children’s needs not enough attention was paid to. E.g. first when a mental crisis worker arrived, were the children moved further away from the accident site (i.e. from the coach).
- For the first time in this exercise a separate feedback session was arranged for the people playing the victims’ roles. This was felt to be a very useful praxis.

From the point of view of voluntary workers themselves, playing the victim’s role was felt to be very important and useful, thinking of their real appointment in the first aid work in real situations. Clearly the use of children in victim’s role in such an exercise should be re-considered. At least a special briefing and debriefing should be arranged for them.



## 5. Discussion

The success of an exercise in its realization depends on two main factors: motivation of participants and similarity with real conditions. The success in terms of lessons learnt, on the other hand, depends on the conditions in which the exercise is analyzed afterwards. This study has demonstrated that creating conditions favorable to the free expression of participants and to the sharing of perceptions and reactions forming their individual experiences is a key factor for the efficiency of exercises as tools to practice emergency conditions and to identify sources of improvements.

Taking into account that the exercise in question took only couple of hours, the amount of information, which could be extracted was astonishing. Most important conclusions to improve planning of future major accident exercises concerned the *commitment of participants* to the chosen accident scenario and possibility to *create physical conditions*, which in a best possible way simulate a real situation. One clear conclusion is that in early preparatory stages of such an exercise those organizations unwilling or unable to fully participate should be excluded. Also a consensus on what is a major accident should exist between participants before the exercise starts. Special effort should be put to ensure good simulation of realistic physical conditions.

Some conclusions concerning the organization of emergency management in real situation could be drawn. Most important of these concerned the *co-operation between different authorities* and *communication*.

The new TETRA/VIRVE Public Authority Network provides a new type of platform for multi-agency communication and it can thus radically enhance the smooth co-operation during real situations. In implementation of the new network more attention should, however, be paid to create common user cultures between different authorities and voluntary groups. Now too much weight seems to have been put to the technical aspects, while users have created their own individual ways of using the technology at hand. Exercises and their structured follow-up could be used systematically to collect experience for further developing such new communication systems and to enable them to better respond to the users' needs.

Despite the implementation of new technology, e.g. TETRA-network, the traditional methods of incident management should not be forgotten. In leading a situation time should be dedicated to meetings between rescue leader and the field leaders in order to ensure proper management of tasks. Also graphical tools like "blackboard" should continuously be used as part of incident management.

In emergency management of complicated situations attention should be paid to *ease the involvement of voluntary groups and less field experienced authorities*. Practical means like marking of key persons and key spots in the field can turn out to be vital for smooth operation in the field also in real crisis situations.

## Biography

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