

USING ACTIVITY LOGS TO ANALYSE CRISIS MANAGERS' BEHAVIOURS DURING SIMULATION EXERCISES IN INDUSTRIAL WORKPLACE

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BELGIAN ERGONOMICS SOCIETY

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1. Background (1/2)

Crisis management

- Crises cover a large spectrum of realities (Lagadec, 1991). Here, they are considered as unexpected and disruptive situations following a severe accident with significant short term losses.
- These situations require an urgent response provided by several stakeholders, including the internal crisis unit, which is often composed of the company's managers who have to use a specific skillset.
- During crisis management, while managers are not used to deal with complex and rare accidental events, they still have to react immediately in an efficient and inventive way (Lapierre, 2015).



1. Background (2/2)

Simulation training

- Managers need to be trained to display specific behaviours and skills related to crisis management, such as decision-making and exchanging information (Yee & al., 2005).
- From this perspective, simulation training can be of interest :
 - Trainees can practice within a risk-free environment (Jafferlot & al., 2013)
 - Simulations enable trainees to be exposed to rare and complex conditions (Jafferlot & al., 2013)
 - Simulation-based learning is experiential (“learning by doing”) and reflexive (e.g. debriefing) (Fanning & Gaba, 2007 ; Haute Autorité de Santé, 2012)



2. Context

The Expert'Crise project

- Between 2015 and 2018, the Expert'Crise project aimed to develop crisis management training programs for managers working in high risks industrial systems (e.g. Seveso companies).
- The simulation scenario results in a partial exercise where trainees play their own roles in the crisis management system, and trainers play predefined fictional roles.
- Each exercise has three steps: briefing, simulation session, and debriefing.
- The Expert'Crise project features :
 - A practical goal (training crisis managers)
 - A research goal (designing and analysing crisis simulations)

3. Objective

Crisis management activity analysis

- A detailed analysis is needed to understand precisely what happened during the simulation, specifically regarding the crisis unit.
- A methodology, based on observation, was developed to analyse the crisis managers' activity, in order to :
 - Meet a need for tools to analyse activity, especially when it is carried out in such a complex and uncertain context
 - Give feedback to managers regarding their crisis management
 - Suggest recommendations for improving emergency planning, both on material and organizational levels

4. Method ^(1/6)

Data collection

- 12 high risks Belgian companies (mainly in chemical industries)
- During the exercise, cameras and observers were located in strategic positions on the site. The observational data collection was done through camera recordings, and observation grids.

Time	Actions	Communication			
		Agents		Message content	
		Sender	Receiver	<i>Sender's words</i>	<i>Receiver's words</i>
		<input type="checkbox"/> Person 1 <input type="checkbox"/> Person 2 <input type="checkbox"/> ...	<input type="checkbox"/> Person 1 <input type="checkbox"/> Person 2 <input type="checkbox"/> ...		
		Vector			
		<input type="checkbox"/> In person <input type="checkbox"/> Mobile <input type="checkbox"/> Computer	<input type="checkbox"/> Radio <input type="checkbox"/> Landline <input type="checkbox"/> Other:		

4. Method (2/6)

Data processing

- All of the observers' grids were integrated into a single database, which was completed with information from the camera recordings in order to lead to an extensive activity log.
- At this stage, the data still had to be sorted according to :
 - A set of issues encountered by the crisis unit (e.g. accident identification and management, media contact)
 - The level of completion of these issues :

LEVEL 1: Issue raised	The issue is encountered for the first time by the crisis unit, or mentioned without being resolved or questioned.
LEVEL 2: Issue being resolved	The issue is mentioned at least for the second time and is the subject of information, actions, questions or discussions by the crisis unit.
LEVEL 3: Issue resolved	Crisis unit members implement actions to resolve the issue, or receive confirmation that the problem is over.

4. Method (3/6)

Time	Actions	Message content		Issue	Level of completion
		Sender	Receiver		
10h04		Guard: 1) <i>Accident in column 4, there's ammoniac smoke...</i> 3) <i>There's one person injured.</i>	First aid: 2) <i>I will put on my equipment and alert my colleagues. Any other information?</i> 4) <i>Trigger the alarm.</i>	Alert	1
10h05	Alarm goes off.			Alert	2
(...)					
10h17		Crisis unit chief: 1) <i>Did you call for first aid?</i> 3) <i>Is someone injured?</i> 5) <i>Do we know who?</i>	Guard: 2) <i>All I know is that there's ammoniac smoke and we need a fire truck operator.</i> 4) <i>Yes.</i> 6) <i>No, they didn't tell me... He isn't moving anymore...</i>	Crisis unit intervention	2
10h18		Evacuation manager: 1) <i>John and Peter aren't here, so I'll do the evacuation count.</i>	Guard: 2) <i>OK, let me give you the list.</i>	Evacuation count	1

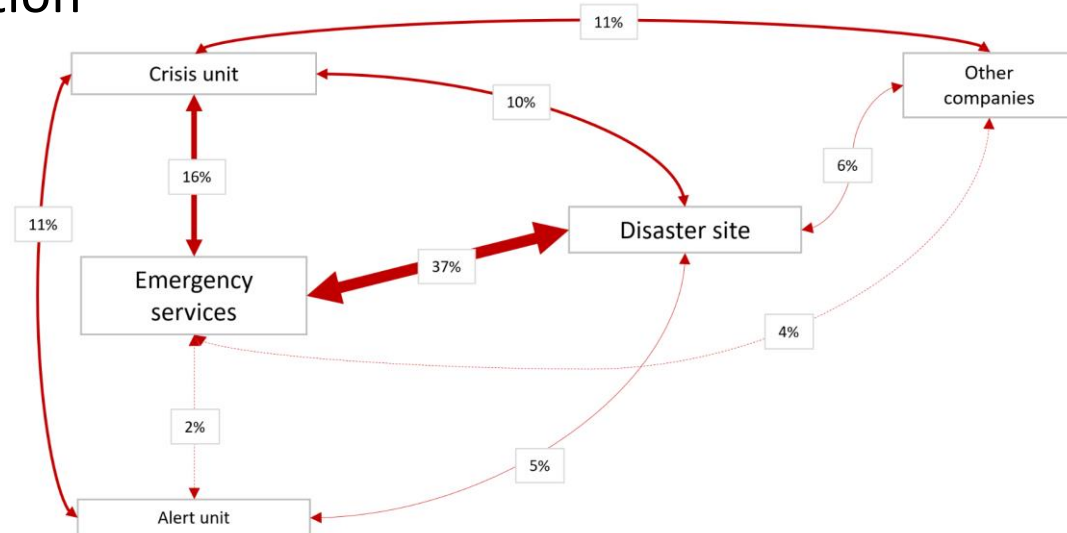
4. Method (4/6)

Time	Alert	Emergency services contact	Evacuation	Injured person care	Fire fighting	Pollution restricting	Message to media	Missing person care
09h30	1							
09h35	2	1	1					
09h40	2	2	2	1				
09h45	3			2	1			
09h50			3	2	2	1		
09h55		2		2	2	2		
10h00		2		2	2	2	1	
10h05		2			2			
10h10								1
10h15		2						

4. Method (5/6)

Data analysis (1/2)

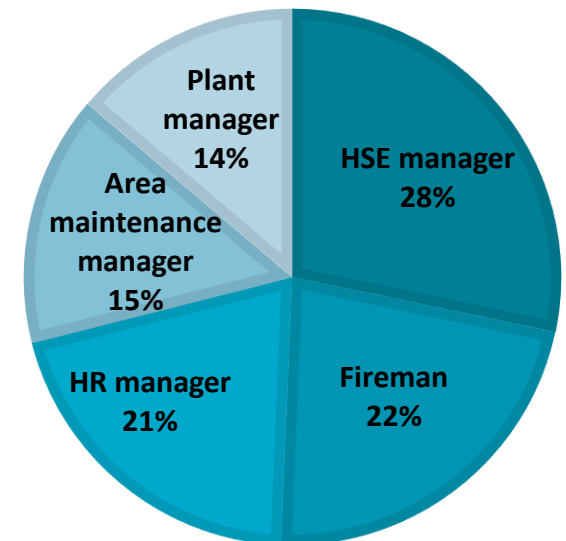
- From a global perspective, the analysis includes :
 - The identification of the crisis phases : warning chain, crisis management, and recovery process
 - The communication flows between the crisis locations
 - The means of communication and related difficulties



4. Method (6/6)

Data analysis (2/2)

- Regarding the crisis unit, the issue emergence and resolution can be analysed through:
 - The crisis leadership, according to the interventions performed by each crisis unit member
 - The accordance with crisis roles set by the emergency instructions
 - The differences between the trainees' actions and the emergency procedures
 - The difficulties encountered by the crisis unit during the simulation



5. Conclusion

One method among others

- The major challenge leading to this methodology was to achieve a cost effective trainees' activity analysis regarding crisis management.
- Finally, the presented methodology is clearly not exhaustive and the analysis may include other factors.
- For further information : Vandestrategie, S., Dubois, L.-A., & Van Daele, A. (2018). Crisis management and simulation training: analysis of crisis managers' behavior using activity logs. *Proceedings of the 20th Congress of the International Ergonomics Association, 2*, 501-508.

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INTRODUCTION

EXPERT'CRISE PROJECT

The Expert'Crise project aims to develop **crisis management training** for managers and decision-makers:

- theoretical training;
- **on-site accident simulation exercises.**

SIMULATION

What happened during the simulation, specifically **inside the crisis room**, between the crisis resolution agents?

OBJECTIVES

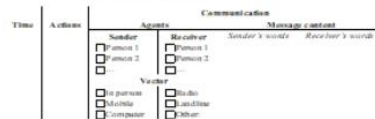
Develop a methodology based on **observation**:

- to give **feedback** to managers;
- to suggest recommendations for **improving emergency planning.**

METHOD

1. DATA PROCESSING

The observational data collection was done through camera recordings and **observation grids**.



After the exercise, all of the observers' grids were:

- **collated**, in order to avoid data redundancy if several observers took notes of the same event;
- integrated into a **single database**;
- **completed** with information from the camera recordings if grey areas remained.

In order to process the data, several indicators were identified :

- a set of **issues encountered by the crisis unit** (e.g. media and authorities contact);
- the **level of completion** of these issues.

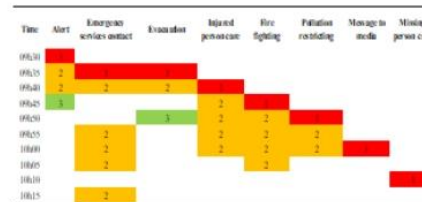
LEVEL 1: Issue raised	The issue is encountered for the first time by the crisis unit, or mentioned without being resolved or questioned.
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LEVEL 3: Issue resolved	Crisis unit members implement actions to resolve the issue, or receive confirmation that the problem is over.

Finally, this database includes **key information about trainees' actions and communications** linked to an issue and a level of completion.

2. DATA ANALYSIS

Each issue is now ready to be analyzed through strategic **crisis management topics** (communication, leadership inside the crisis unit, accordance with crisis roles set in the emergency instructions, issue resolution, difficulties and deviations encountered during each issue resolution, and achieving the learning targets).

A summary table can be achieved by means of a **timeline** taking the levels of completion (in the lines), and the issues concerned (in the columns) into consideration.



The issue emergence and resolution can be analyzed through:

- the **crisis leadership**, in relation to the interventions performed by each crisis unit member to identify the one who was leading the crisis management team;
- the **accordance with crisis roles** set by the emergency instructions;
- the **differences** between the trainees' actions and the emergency procedures;
- the **difficulties** encountered by the crisis unit during the simulation.

The analysis ends with a short crisis summary to check if the simulation exercise was a success concerning the **learning targets** prepared in advance of the simulation exercise.

CONCLUSION

The major challenge leading to this methodology is to achieve a **cost effective trainee activity analysis**. To do so, the Expert'Crise trainers chose to rely mainly on **observational data**.

In the end, the activity log is not as exhaustive as the initial database but it arranges raw data, classifies them into logical groups, and retains the **crisis key resolution elements** in a simple and usable way.

The purpose of this whole analysis process is to give **concrete recommendations** to help crisis units be better prepared to deal with the next crisis about crisis management:

- **resources**: protective equipment, means of communication, and crisis room equipment;
- **organization**: the definition of crisis roles, training of operators and managers, and information sharing.

Thank you.
Questions ?

