



IMT Mines Alès
École Mines-Télécom

CRISIS MANAGEMENT TRAINING: IMPLEMENTATION OF A SIMULATION EXERCISE BASED ON REPETITION OF LEARNING SEQUENCES

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Introduction

I.1) Laboratory for the Science of Risks (LSR)

A laboratory from **IMT Mines Alès**, France

➔ *To provide a **transverse and systemic vision** for the study, control and management of **risk situations** in the face of future changes*

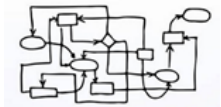
Four R&D themes :



Characterization and reduction of hazards



Vulnerability and resilience assessment



Engineering of complex systems in the face of risks



Crisis management



Crisis management training

I.2) Different types of crisis management training



Picture taken from europe1.fr



Picture taken from d'actu.fr

Level of
challenge

Theoretical
seminar

Workshop

Case study

Tabletop
exercise

Task training

Simulation
training
exercise

On-site
exercise

Full-scale
exercise



Level of skill

I.3) Training principles



Picture from europe1.fr



Creation of a crisis management training

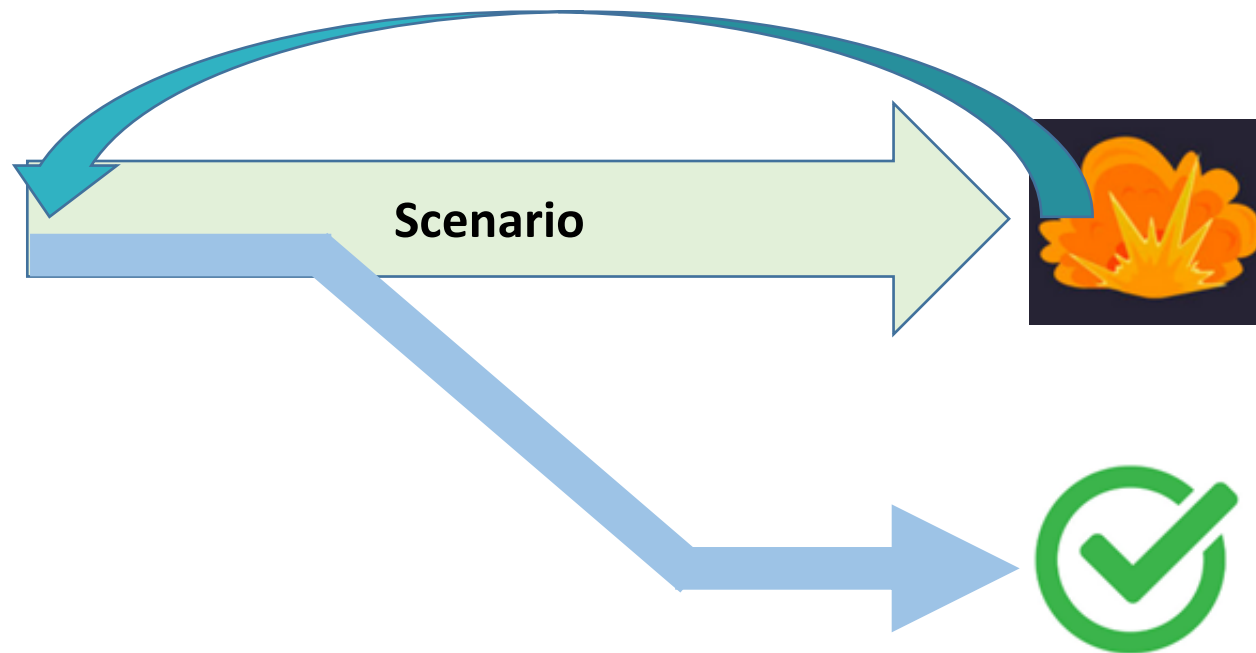
I.1) Pedagogical interests of the repetition

Theoretical approach

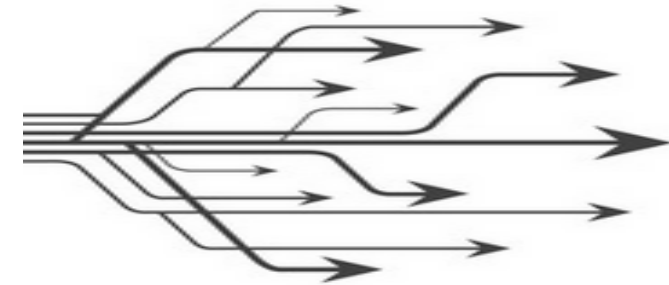
Learning from experience



Trial and error



evolving and adaptive
scenarios



the need for a
training tool

D. A. Kolb and A. Y. Kolb, "THE KOLB LEARNING STYLE INVENTORY 4.0,"

A. Hua, H. Williams, N. Nordin, and K. Haire, "Simulation Training in the Intensive Care Unit,"

R. Grassinger and M. Dresel, "Who learns from errors on a class test? Antecedents and profiles of adaptive reactions to errors in a failure situation"



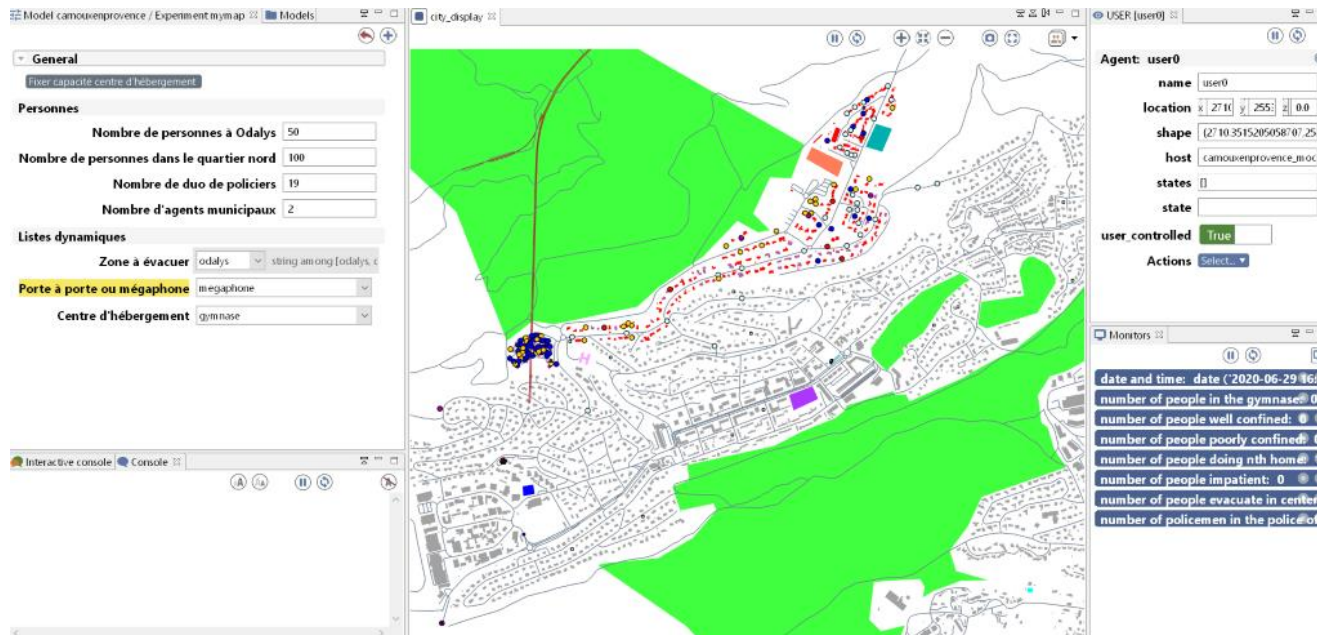
II.2) Creation of a simulation tool: MAS example

Needs of the trainers :

- realism of the training
- immersion of the participants
- replaying all or part of a scenario



Transform the crisis system model by using a Multi-Agents System (MAS)



→ Visualize the position and the current process of each integrated actor

→ Transcribe an instruction given by a learner

→ Save and load the simulation and the states of every agent

→ Requires a dedicated trainer during the exercise

II.3) The construction of the crisis model

The systemic approach allows to model complex systems on all their aspects: a multi views modelling approach

→ The studied system is called **crisis environment**

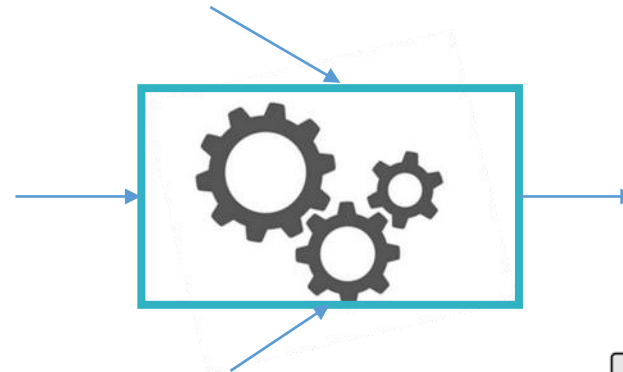
Structural view: System organization



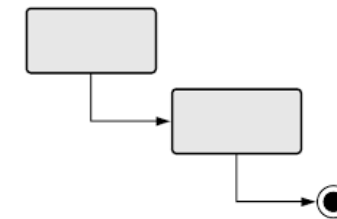
Contextual view: Exchanged services and influences



Functional view: Transformation process

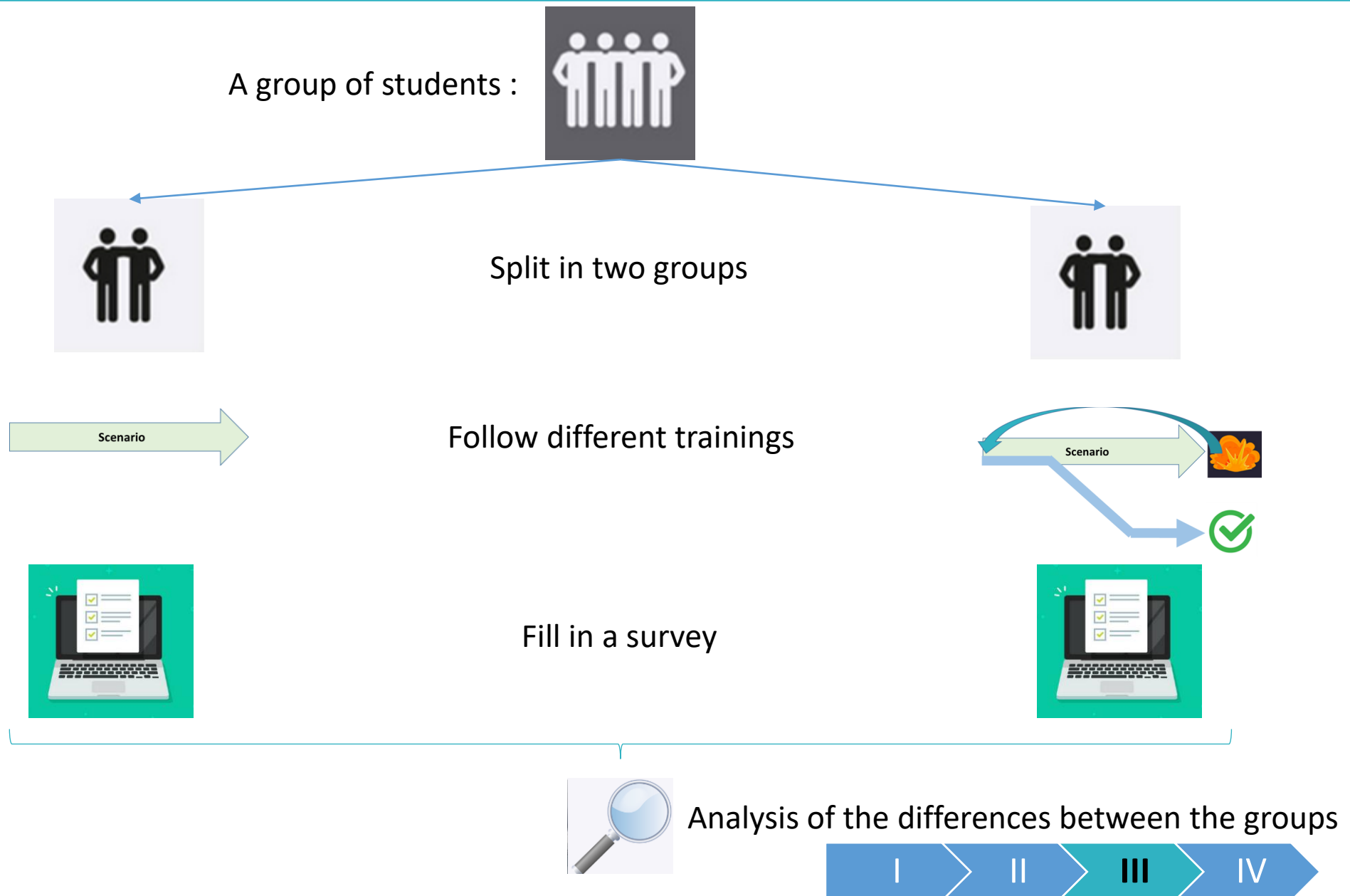


Behavioral view: Actor states change



Implementation of a crisis management training

I.1) Experimental protocol



III. 2) First results



First test in december, 22 students, 17 answers (77%)

Second test in february, 26 students, 16 answers (62%)



Replay has positive impacts on the use of specific skills.



Replay seems to have a positive impact on motivation, immersion and regaining control of the situation.



Replay does not seem to have a negative impact on the perceived realism of the exercise.



The progress of the two groups is similar : The data collected do not allow us to decide on the educational benefits of replay.



The exercises were carried out at a distance, making it difficult to observe the learners during the exercise.



The small number of tests and the low response rate put the results into perspective

IV) Conclusion and perspectives

Realization of crisis management training exercises

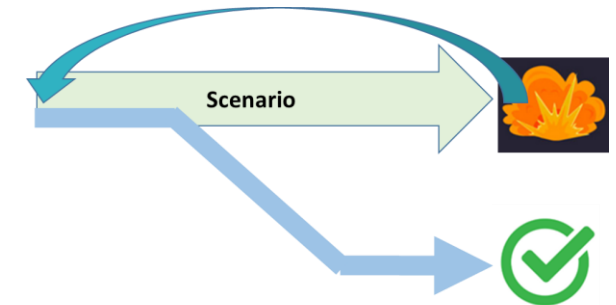
Comparison between a classic training and a replay training

→ Acquire more data on the learning progression

Evaluation of the replay process impacts

→ Carry out tests in the simulation room

→ Testing other ways of replay



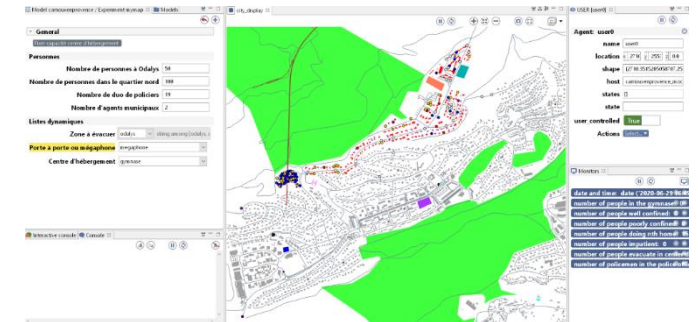
Development of a simulation tool

Creation of a realist systemic model of the crisis

→ Confronting the model and improving it

Creation of a simulation tool

→ Add more agents and features



Thank you for your attention !

Some R&D projects involving and associating people from different themes of LSR

- European projects
 - IMPETUS (Intelligent Management of Processes, Ethics and Technology for Urban Safety) (hazard)
 - MANIFESTS (MANaging risks and Impacts From Evaporating and gaseous Substances To population Safety) (Hazard and Crisis Management)
- French National Research Agency (ANR) RESIIST (Complex Systems and Resilience)
- Industrial Chair CIME (Critical Infrastructures Model based system Engineering)

Some examples of Theses

- Evaluation of resilience of critical infrastructures (Complex Systems and Vulnerability / Resilience)
- Safety demonstration of Nuclear Facilities (Complex Systems, Vulnerability and Crisis management)
- Depollution of industrial sites (Hazard and Complex Systems)
- Improved understanding of field retting mechanisms of hemp stalks (Hazard)
- Experimental study of the propagation of the flame front and the rate of combustion of an explosion of aluminium dust (Hazard)