Effect of Map Sharing and Confidence Information in Situation Map-Making

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the overview

- the background
- the method
- the results
- the conclusion and the discussion

1. the background

2009 earthquake in Yingxiu-Wenchuan

2010 earthquake in Haiti

photo by United Nations Development Programme

the needs

- to have a reliable overview of the disaster situation for disaster response mobility
- one needs to know:
  - » accessibility of the road network
  - » safe areas
  - » the condition of damaged infrastructure
  - » location of evacuation shelters & emergency facilities

the problems

- situation map difficult to construct
- often the scope of the incident is only understood after several days
- lack of resources due to overwhelmed local emergency services

the possible solutions

- distributed model of disaster management
- the affected population as potential users
  - » 90% of total population who are not killed or injured
  - » untrue myth of helpless victims
  - » they are capable, cohesive, calm and helpful (Quantantelli, Dynes, Drabek &McEntire, Wenger)
- collaborative participatory effort

2. the method

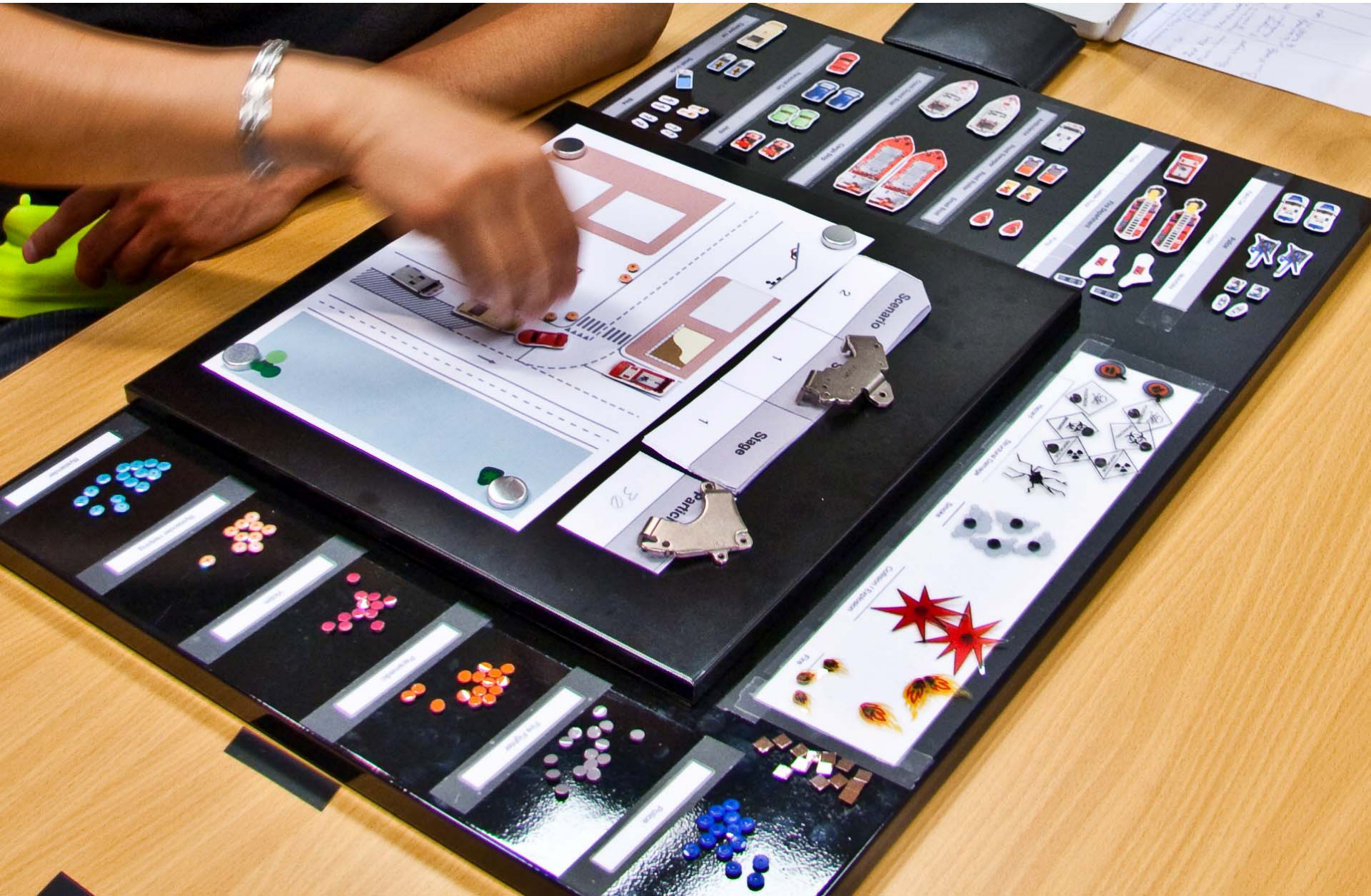
the hypotheses

- the quality of the situation map can be improved by:
  - » using a distributed situation map making process
  - » providing additional communication modalities
- the collaboration process can be improved by
  - » including confidence information to events on the map

the preparations: two scenarios

the preparations: miniature world

the preparation: the magnetic board

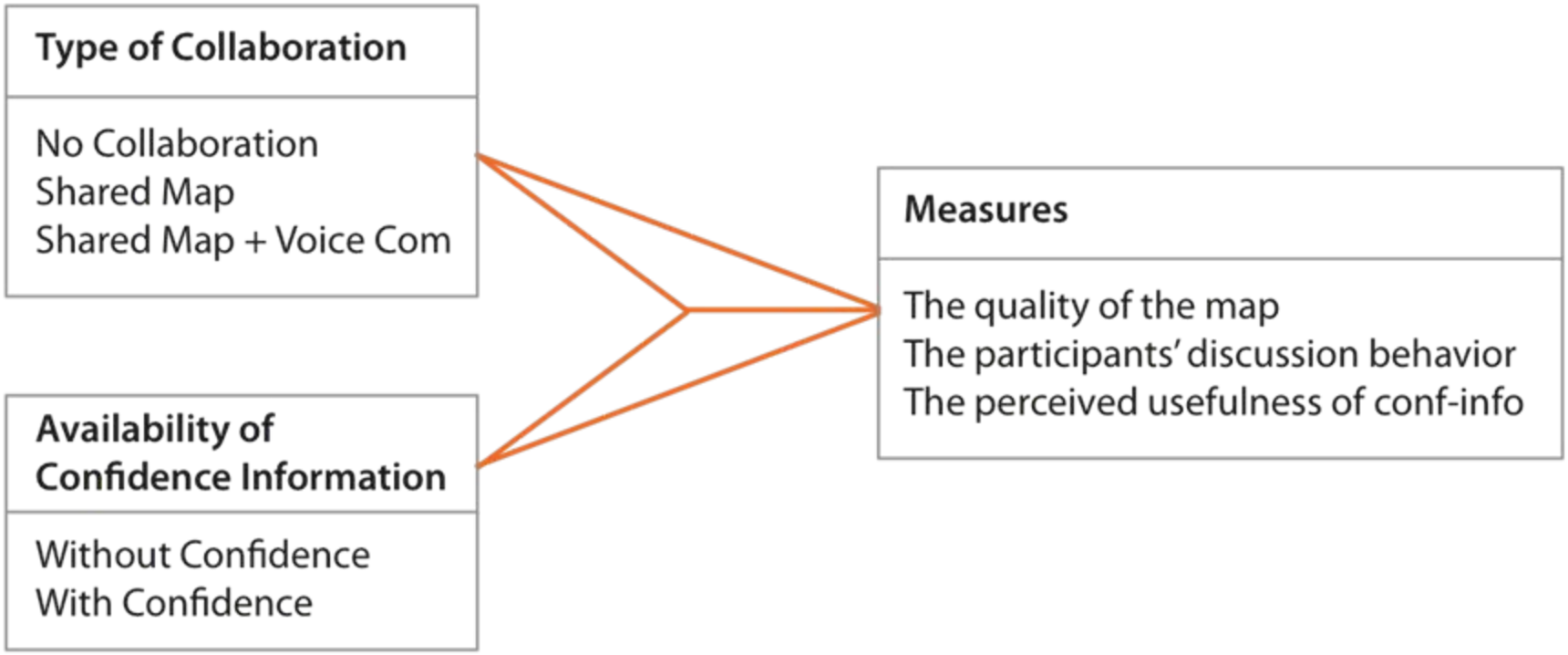


the participants

- 32 participants (16 pairs)
- 7 female, 25 male
- 22-42 years old (*M*=28, *SD*=4.26)
- undergraduate to post-graduate level of education
- recruited from EEMCS Faculty, Delft
- 2 out of 32 had special training as rescuers
- token gift

the design

- two-way repeated measures design
- within subject factors



the procedure and the task

the procedure and the task

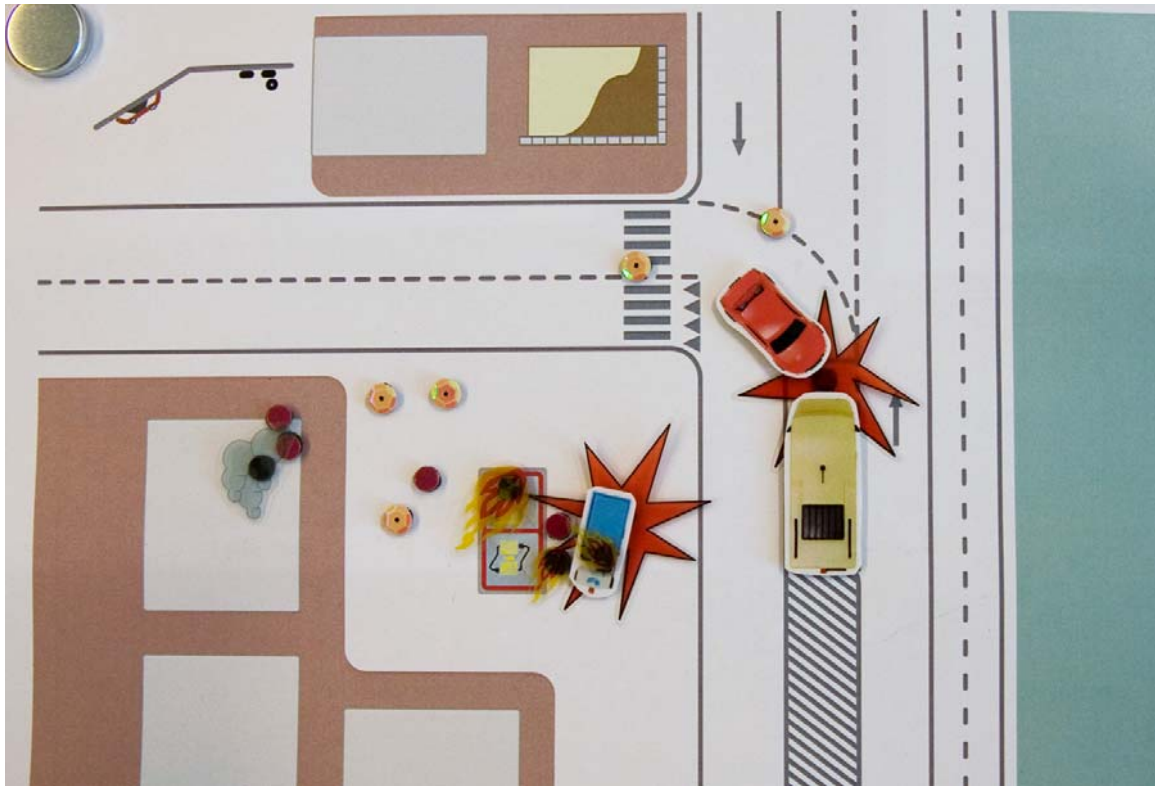
the procedure and the task

the measures

- the quality of the map
  - » comparing to an ideal key map
- the behavior of the participant in the discussion
  - » recorded the discussion, coding scheme, annotation
- the perceived usefulness of confidence information
  - » post-questionnaire

3. the results

data preparation: general map quality



(C) Accident/Collision between red car and the camper car						
1. Detected A/B	1	1	1	1	1	1
2. Location A/B	1	1	1	1	1	1
3. Confidence level	1	1	1	1	1	1
4. Collision/damage detected A/B	1	1	1	1	1	1
(L) Vehicles						
Car 1: red racing car						
1.1 Detected A/B	1	1	1	1	1	1
1.2 Location A/B	1	1	1	1	1	1
1.3 Confidence level	1	1	1	1	1	1
1.4 Correct type of car A/B	1	1	1	0.5	0.5	0.5
Car 2: camper van						
2.1 Detected A/B	1	1	1	1	1	1
2.2 Location A/B	1	1	1	1	1	1
2.3 Confidence level	1	1	1	1	1	1
2.4 Correct type of car A/B	1	1	1	0.5	0.5	1

the results: general map quality

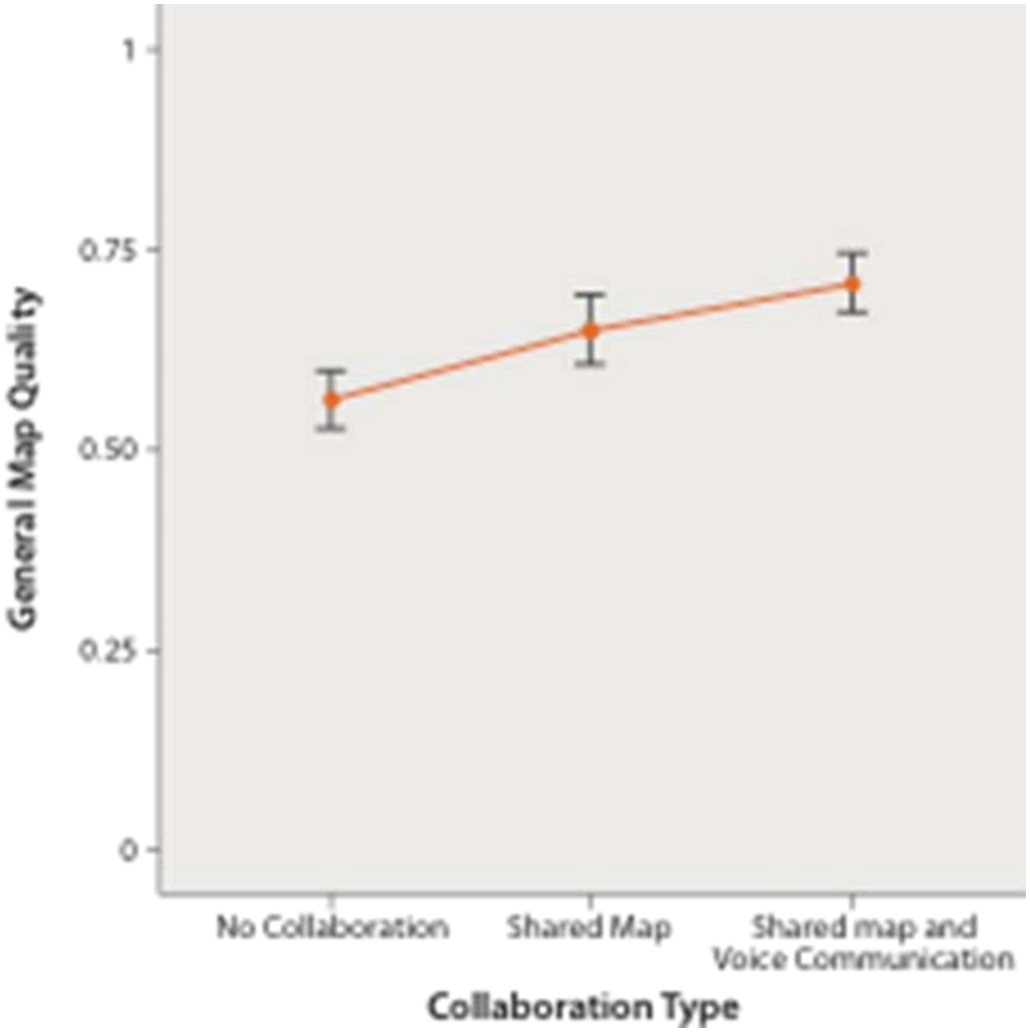


image and voice collaboration modalities improve map quality

data preparation: discussion behavior

File Annotations Profiles Help

Save

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Start

Communicate
Procedure
My story
Your story
Ref. map
Certain
Uncertain
Bargain
Disagree
Agree
Conclusion

Communi... | Procedure | My story | Your story | Ref. map | Certain | Uncertain | Bargain | Disagree | Agree | Conclude

ID	Time start	Time end	Description	Type
P15362	15362	15362	Phase 5b: uncertainty	object
P5328	0	9325	Phase 1 interval	object
P9325	9325	22874	Phase 4 interval	object
P22874	22874	54648	Phase 3 interval	object
P54648	54648	62131	Phase 4 interval	object
P62131	62131	77125	Phase 3 interval	object
P77125	77125	79648	Phase 4 interval	object
P113832	113832	113832	Phase 5a: agreement	object
P79648	79648	136819	Phase 3 interval	object
P136819	136819	139824	Phase 4 interval	object
P139824	139824	160345	Phase 3 interval	object
P167318	167318	167318	Phase 5: referencing map	object
P160345	160345	173327	Phase 4 interval	object
P199515	199515	173832	Phase 4 interval	object
P173832	173832	185822	Phase 3 interval	object
P189792	189792	185342	Phase 3 interval	object
P196822	196822	196822	Phase 5: referencing map	object
P185342	185342	200336	Phase 4 interval	object
P200336	200336	207848	Phase 3 interval	object
P207848	207848	215331	Phase 4 interval	object
P246340	246340	246340	Phase 8: disagreement	object
P215331	215331	274316	Phase 3 interval	object
P274316	274316	278823	Phase 4 interval	object
P278823	278823	289820	Phase 3 interval	object
P289820	289820	294327	Phase 4 interval	object
P294327	294327	300336	Phase 3 interval	object
P300336	300336	309000	Phase 9 interval	object

Delete Annotation | Edit Annotation

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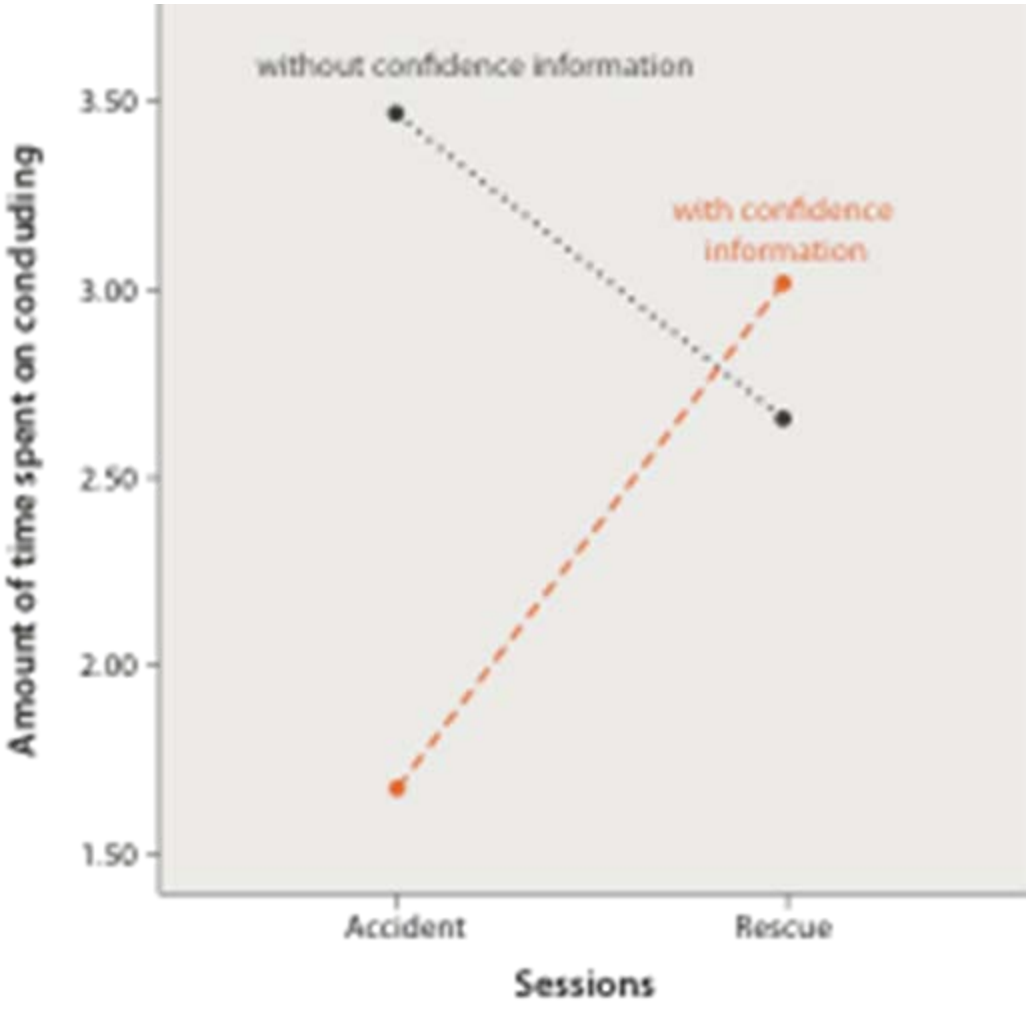
the results: voice discussion



confidence information :

less time in concluding in the accident session

the results: post questionnaire

- the perceived usefulness of the confidence information
  - » participants lean toward a positive attitude towards this feature

4. the conclusion and the discussion

the conclusion

- sharing map improve the quality of situation map
- sharing map + voice communication improve the quality even more
- confidence level availability can shorten conclusion phase in the discussion
- playmobil as quick prototyping tool worked well (but was time consuming to prepare)

the discussion: 3D can be useful