

# Tackling the Requirements Jigsaw Puzzle

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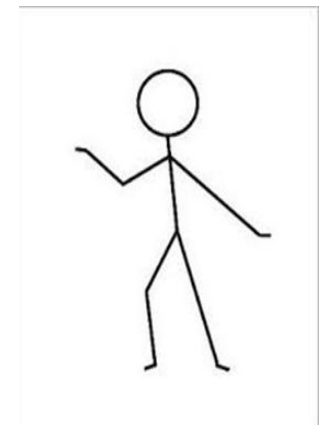
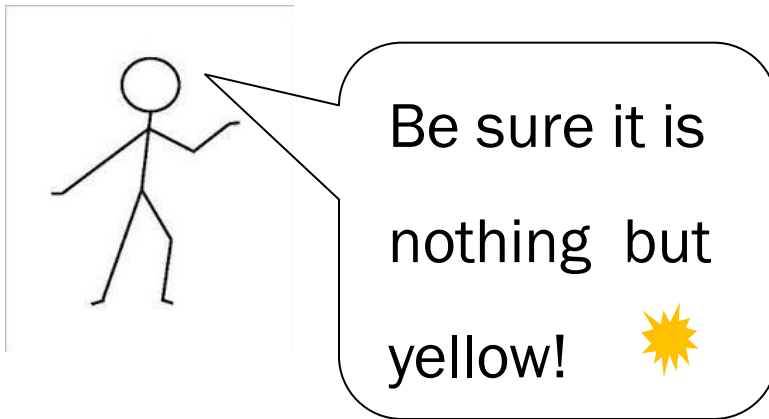
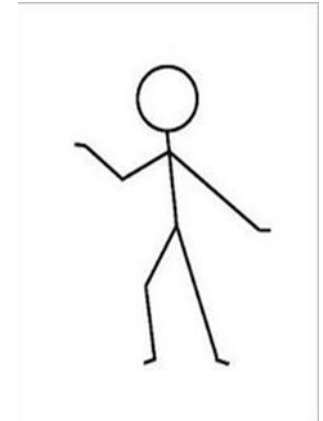
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# Presentation outline

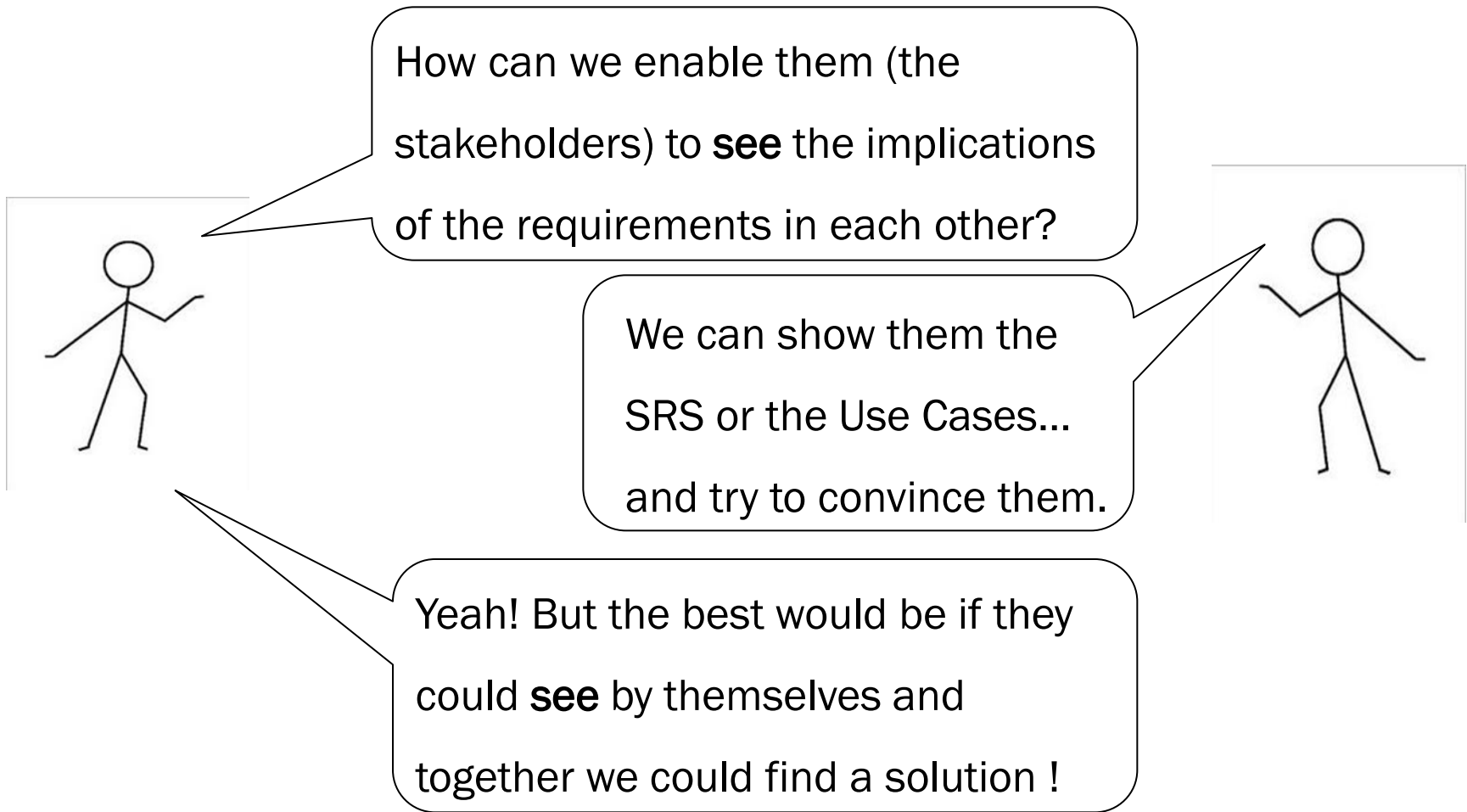
- Problem
- Background and motivation
- Proposal
- Evaluation
- Conclusion
- Future work

# Stakeholders

# Req. Engineers



# Req. engineers



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# Problem

- Present the requirements and conflicts in a way that fosters

- co-responsibility & co-ownership**

- the software system solution is not (only) a RE analyst problem

- **Need – explicit representation**

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# Background and motivation

- Good techniques to identify and handle
  - ambiguity (Berry et al)
  - inconsistency (e.g. NFRF, viewpoint-based, modelling languages)
- Not appropriate to communicate with stakeholders - heterogeneous background (non SE expert)
- Need new approach – **separation** of:
  - **processing** information about conflicts from
  - the issue of **communication** those conflicts

# Background and motivation

- Gotel: use of (good) **visual metaphors** for RE
  - geometric metaphors (UML, i\*)
    - need to be learned, not suited when there is no org.
  - other visual (City – Knight/Panas/Wettel, Landscape - Balzer)
    - used for artifacts already existing
  
- RE and **creativity** - Robertson02, Maiden04,05,07
  - analogical reasoning techniques
    - analogies difficult to understand

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# Background and motivation

- Stakeholders work together with the req. eng. to create ideas for new systems
- Need new visual metaphors
  - **easy to understand** visual analogies
  - analogies for **artifacts that are being built**

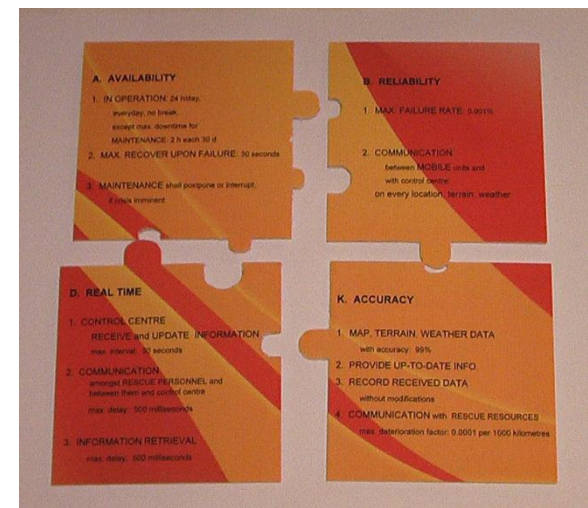


# Proposal

## ■ Two well understandable analogies

- Jigsaw puzzle – we are building a system
- [Boccuzzo07] – badly-shaped means badly-designed
  - Metrics: well-shaped house (...) – well-designed class

## ➤ Requirements Jigsaw Puzzle



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# Proposal

- Jigsaw puzzle piece represents a requirement
  - when the requirement text contains conflicts with other requirements
  - the respective puzzle pieces almost fit together but not perfectly
- It communicates explicitly that exists a problem!

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# Proposal - Crisis Management System SRS text

- **Availability**

1. The **system** shall be in operation 24 hours a day, everyday, without break, throughout the year except for a maximum downtime of 2 hours every 30 days for maintenance.
2. The system shall recover in a maximum of 30 seconds upon failure.

- **Real-time**

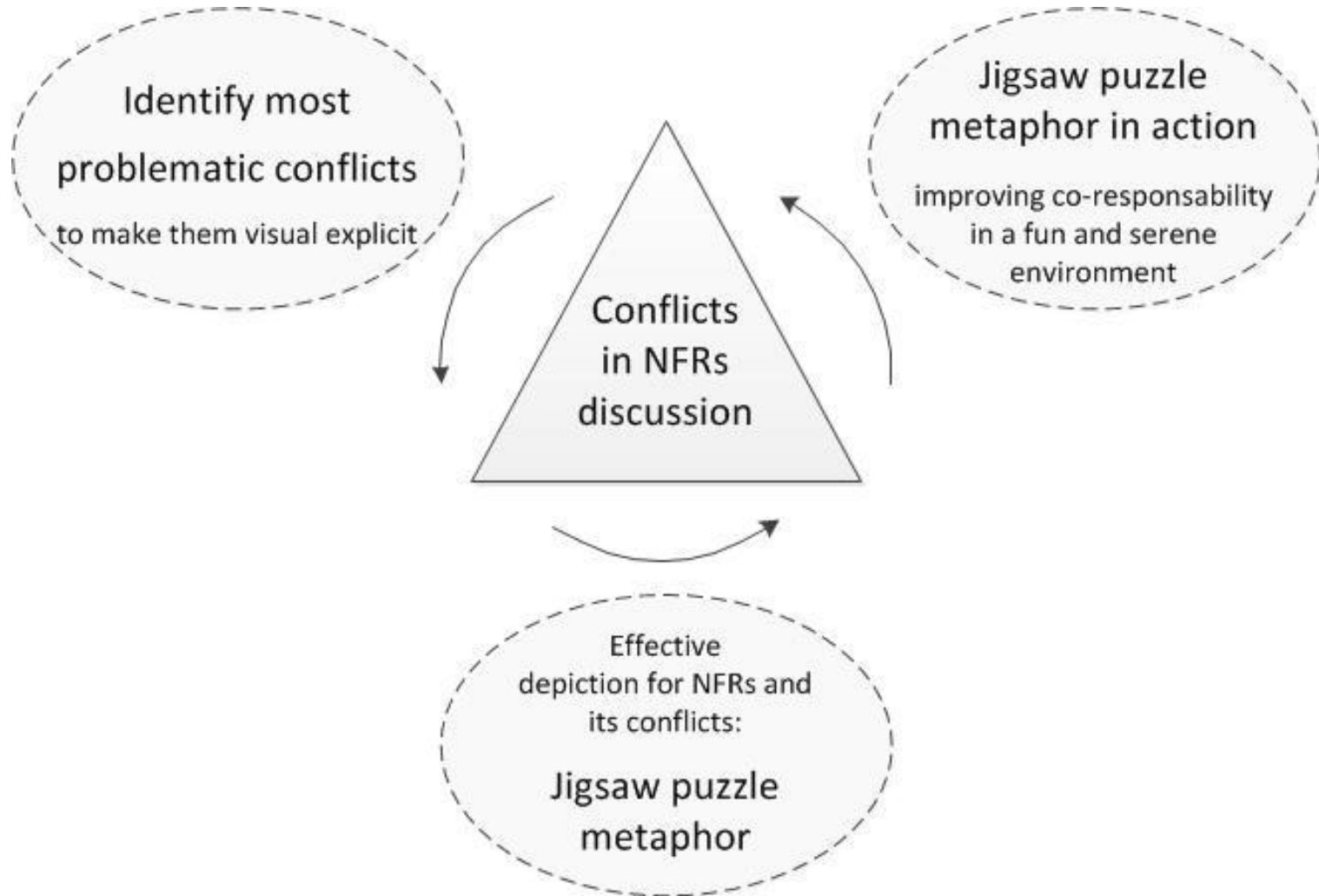
1. The **control centre** shall receive and update the following information on an on-going crisis at intervals not exceeding 30 seconds: resources deployed; civilian casualties...
2. The delay in communication of information between control centre and rescue personnel as well as amongst rescue personnel shall not exceed 500 milliseconds.

# Proposal - Crisis Management System jigsaw puzzle





# Proposal



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# Evaluation - hypotheses

- H1: Jigsaw puzzle game promotes a relaxed environment
- H2: Increased effectiveness in communication and handling of conflicts, when compared with text
- H3: Foster team work and communication improving co-authoring and co-responsibility

# Evaluation - methodology

- Experiments emulating a meeting planned for 2hrs
  - Collaborated as group, offering comments
  - Handled the pieces, picking them up of the table and showing to others
  - Assembled the puzzle, trying different strategies
  - Discussed conflicts, searching for consensus
  - Handwrote a consensus list of conflicts and possible solutions
  - Found all the conflicts we were aware + some we had not thought a priori
  - Had fun!

# Evaluation - analysis

- Users do prefer the jigsaw puzzle than textual presentation
- The detection of conflicts was almost always more efficient with the jigsaw puzzle presentation
- Users easily engaged in team work
  - co-responsibility and creative attitude
- Users would like to have a digital jigsaw puzzle
  - but some do not want to abandon the physical puzzle



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# Evaluation - conclusions

- Jigsaw puzzle metaphor and its work mode
  - promotes fun, relaxation, creativity
- no need to introduce a game in the meeting
  - the tool in use is a game - jigsaw puzzle !
- the participants scan for conflicts
  - increases stakeholders' awareness that this is their problem too, and thus commitment

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# Evaluation - conclusions

- Jigsaw puzzle metaphor and its work mode
  - the participants use a common “document”
    - instead of each one its own (usual mode)
  - promotes team cooperation
- meetings perceived as fun
  - eases the recruitment of participants

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# Evaluation - threats to validity

- Clarify bias
  - Formatting of the text in the pieces
  - Investigators also acting as meeting facilitators
  - Reporting and analysing results
- Rich thick descriptions
- Report discrepant information
- Avoid familiarity and learning – different examples
- Tiredness effect – reverse the order of text/jigsaw
- Give ‘same’ information for text as for jigsaw puzzle

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# Conclusion

- Jigsaw puzzle metaphor
  - **adequate relevant communication means to**  
discuss requirements / conflicts - makes them explicit
    - Easily understandable language
    - Gaming nature of the language
- **Crucial separation** of processing information  
about conflict from communication of conflicts

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# Future work

- Develop realisation of the approach
  - integration of the tools to detect/rank conflicts
  - connection between conflict detection and communication mechanism
  - Jig3P: what text treatment? how lay down pieces?
  - integration with the remaining tasks of system development

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# Future work

- Jigsaw puzzle supported digitally
  - real-time intelligent interaction
    - add/update/remove requirements
  - collaborative functionalities: differentiate each participant's contributions
  - digital recognition of work done in physical pieces
    - enable work with both physical and digital pieces

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# Thanks!

■ Do you have any questions?

# Evaluation – design

- Unit of analysis – small group (3 to 5) participants
  - Experiment 1 – all requirement engineers
  - Experiment 2 – at least one RE expert, others engineers from computing and no computing
  - Experiment 3 – one RE expert, one engineer with no RE knowledge, and a manager
- Data collection techniques
  - Participant observation (audio and video record analysis)
    - Brainstorm and think aloud
  - Reports written by one element on behalf of the group
  - Questionnaires