Interview Review:
an empirical study on detecting ambiguities in requirements elicitation interviews

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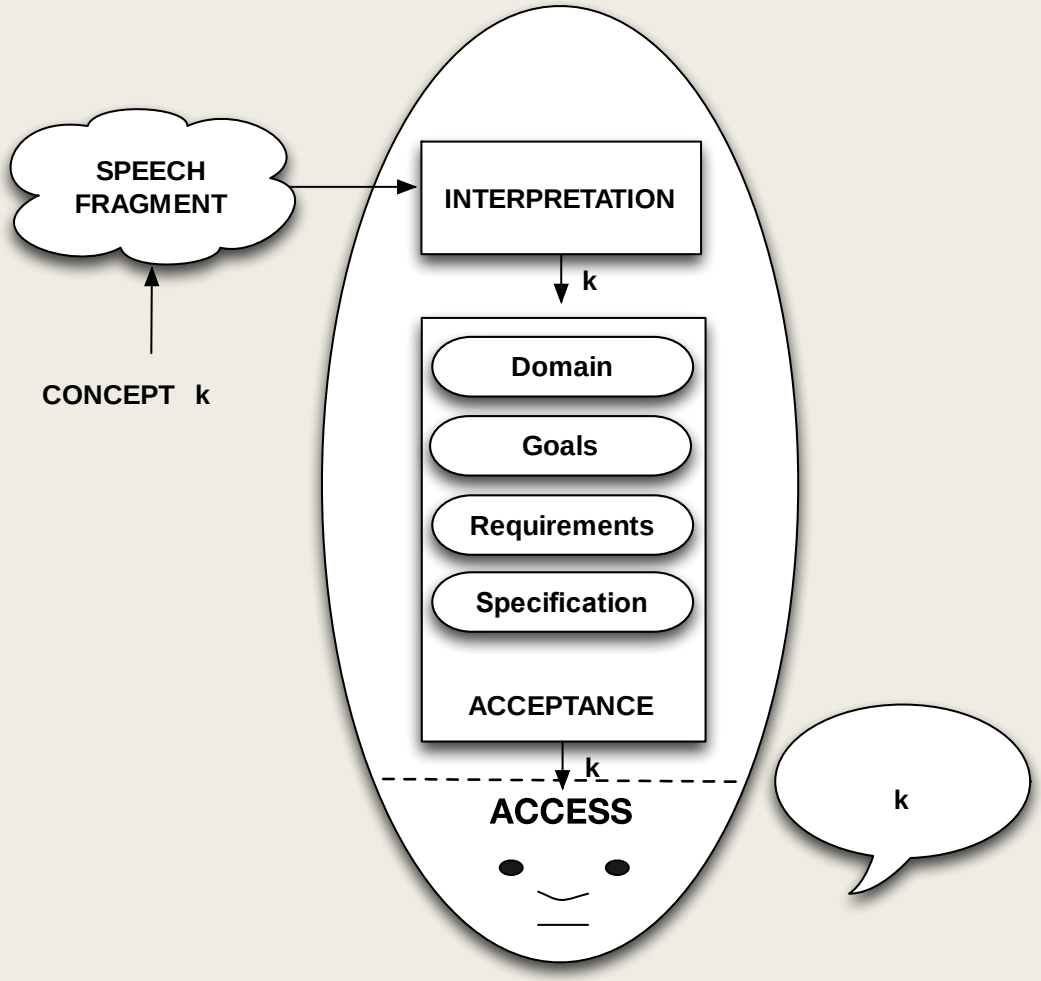
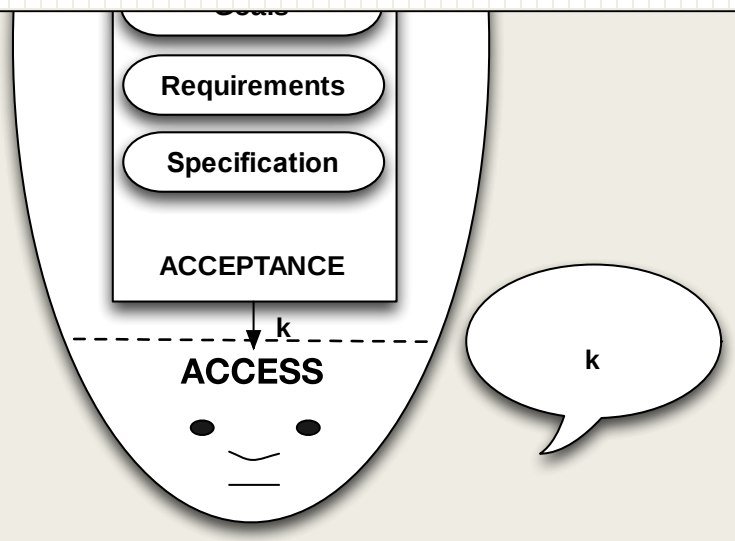
Ambiguities



Ambiguities

An ambiguity occurs when a customer articulates a unit of information, and the meaning assigned by the requirements analyst to such articulation differs from the meaning intended by the customer



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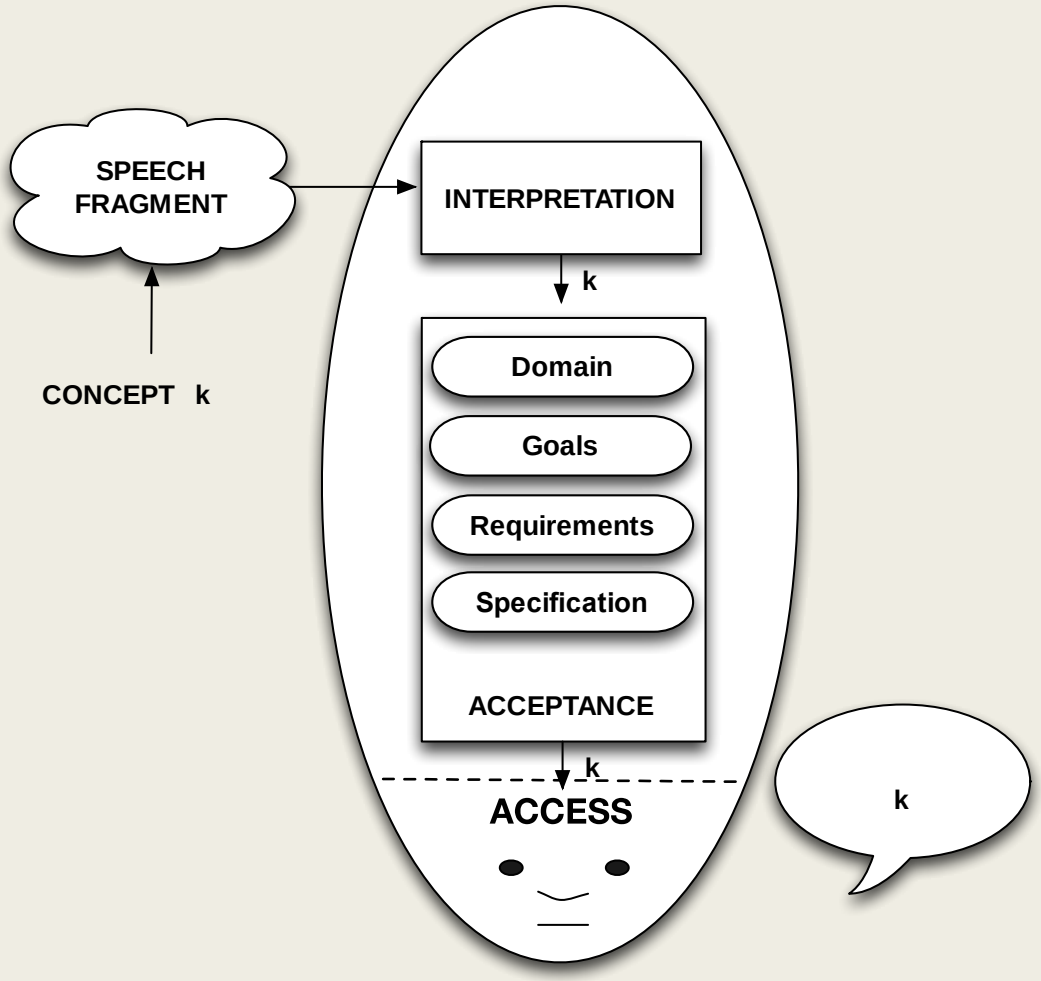

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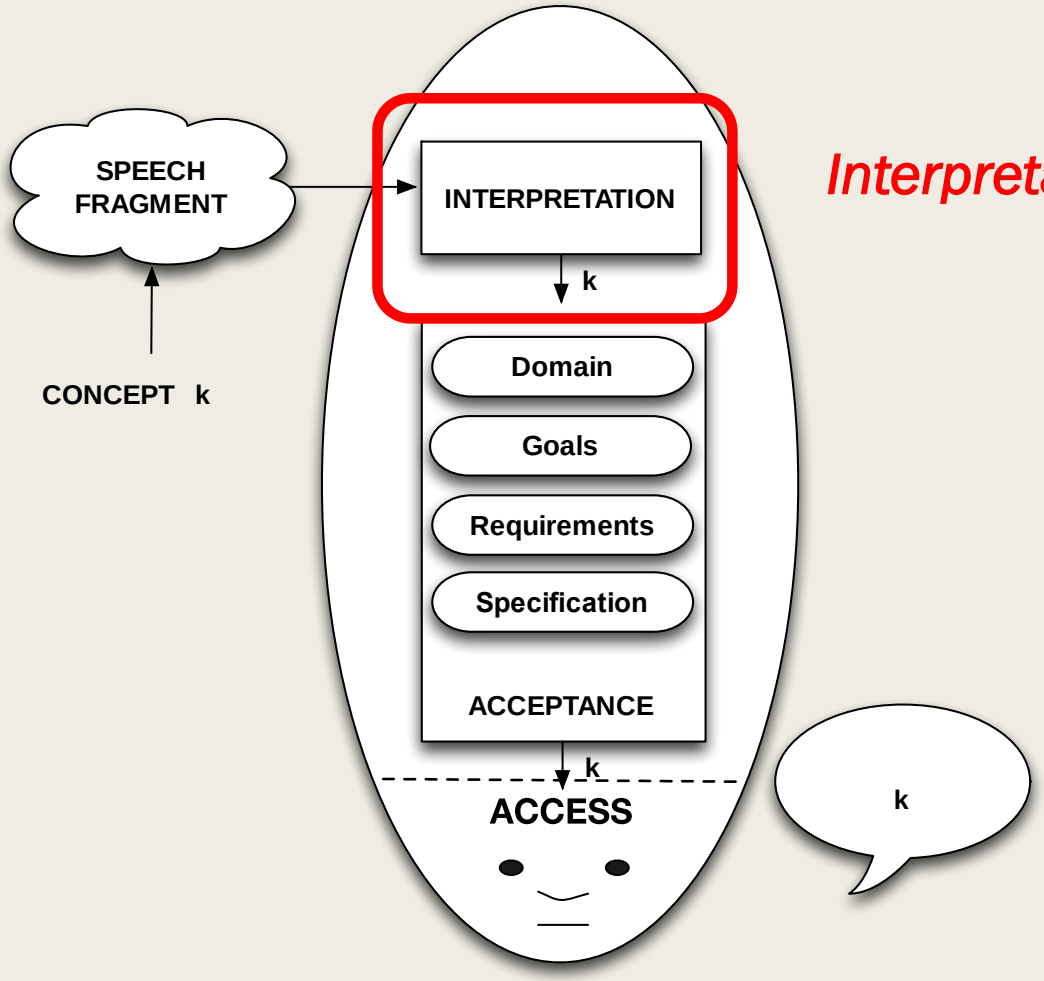
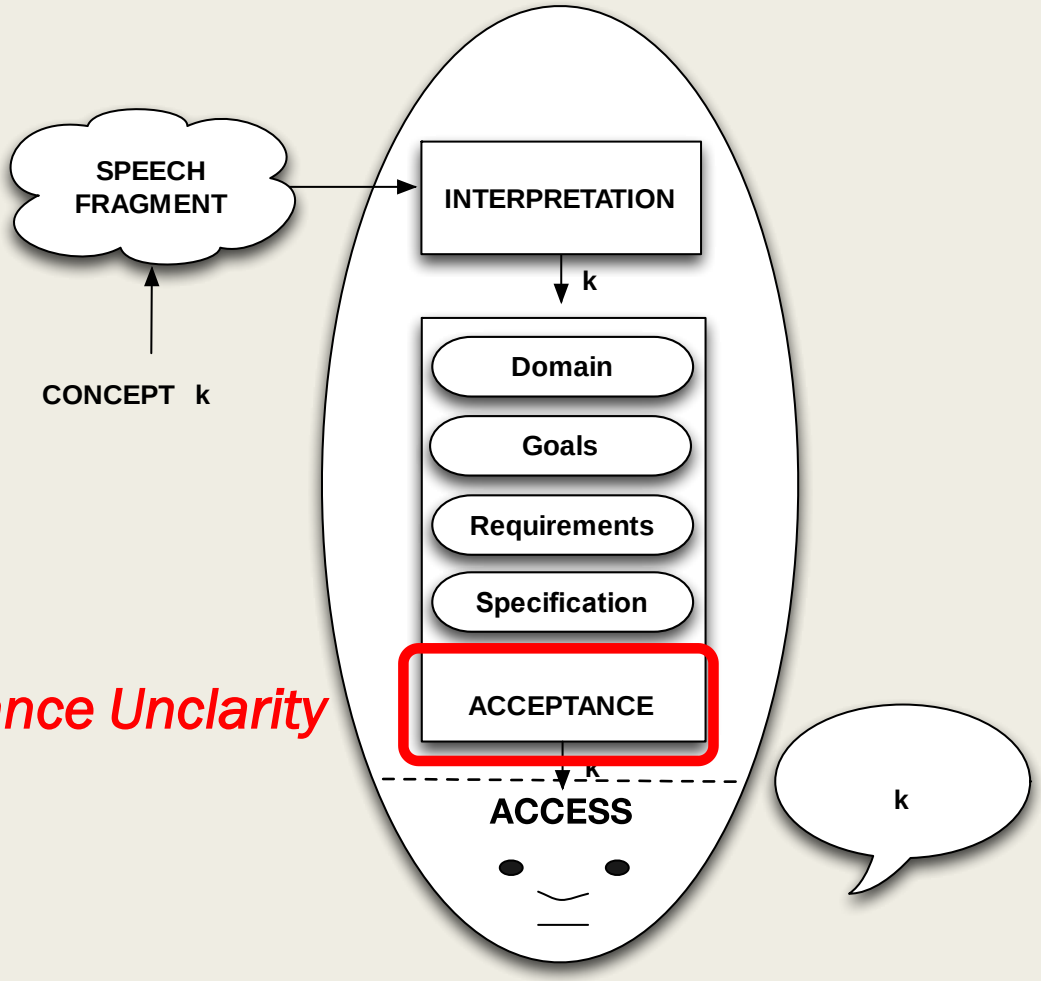


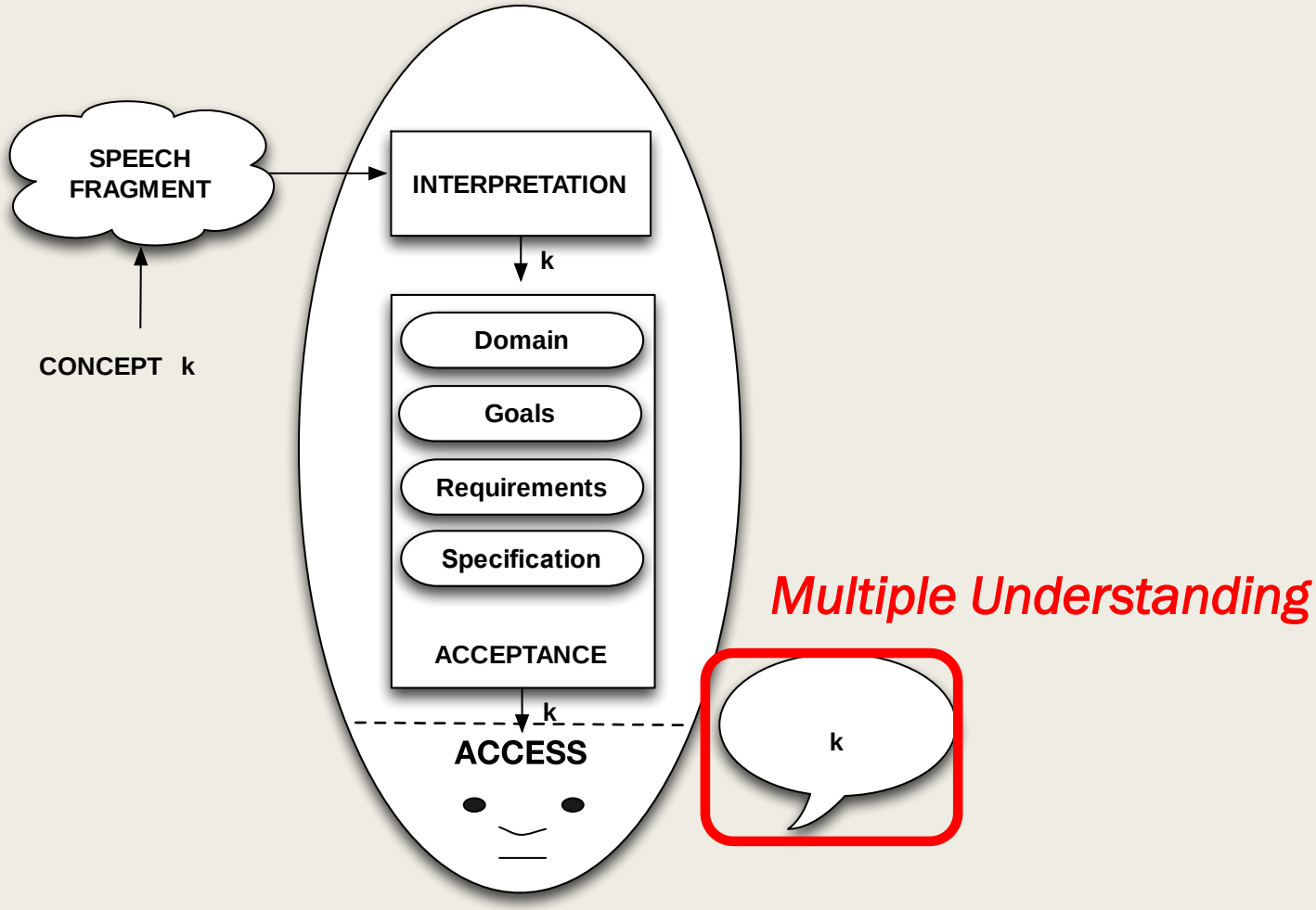
Interpretation Unclarity

Ambiguities



Acceptance Unclarity

Ambiguities



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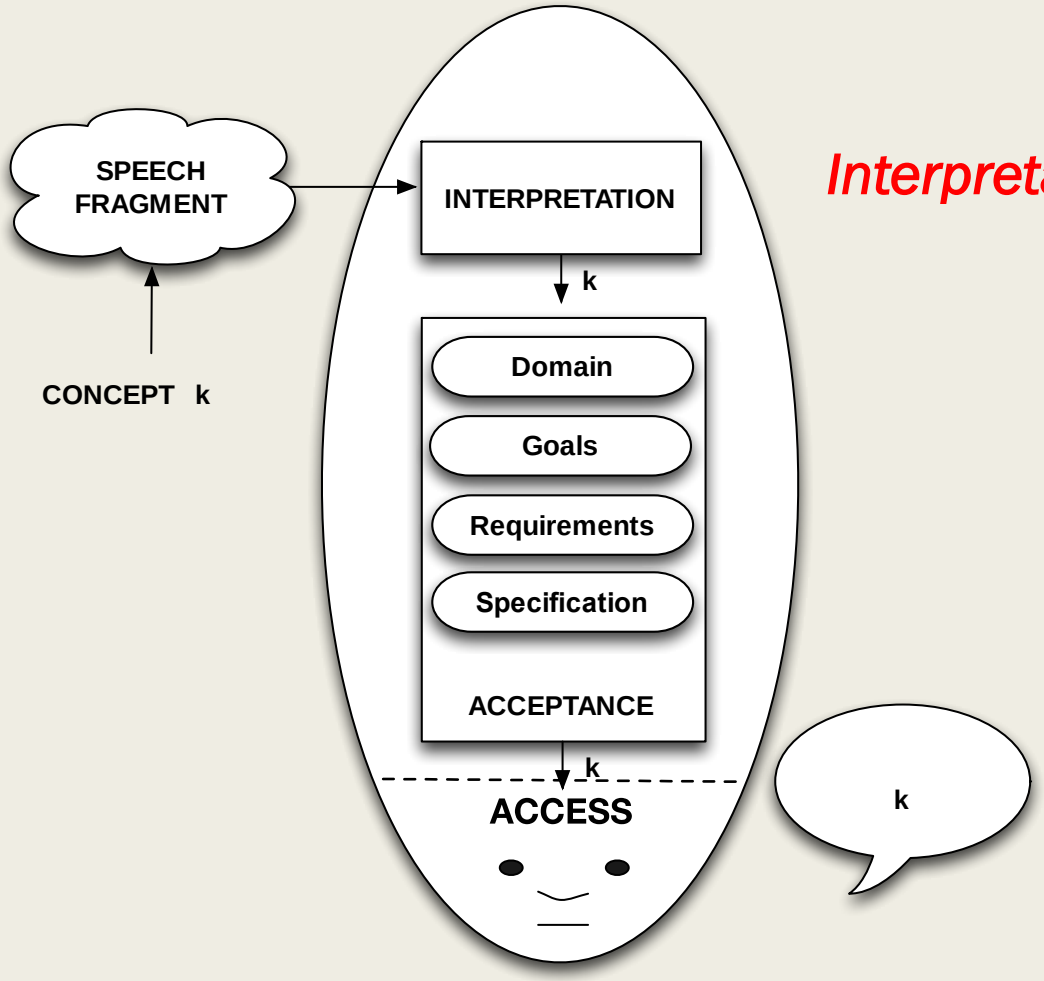

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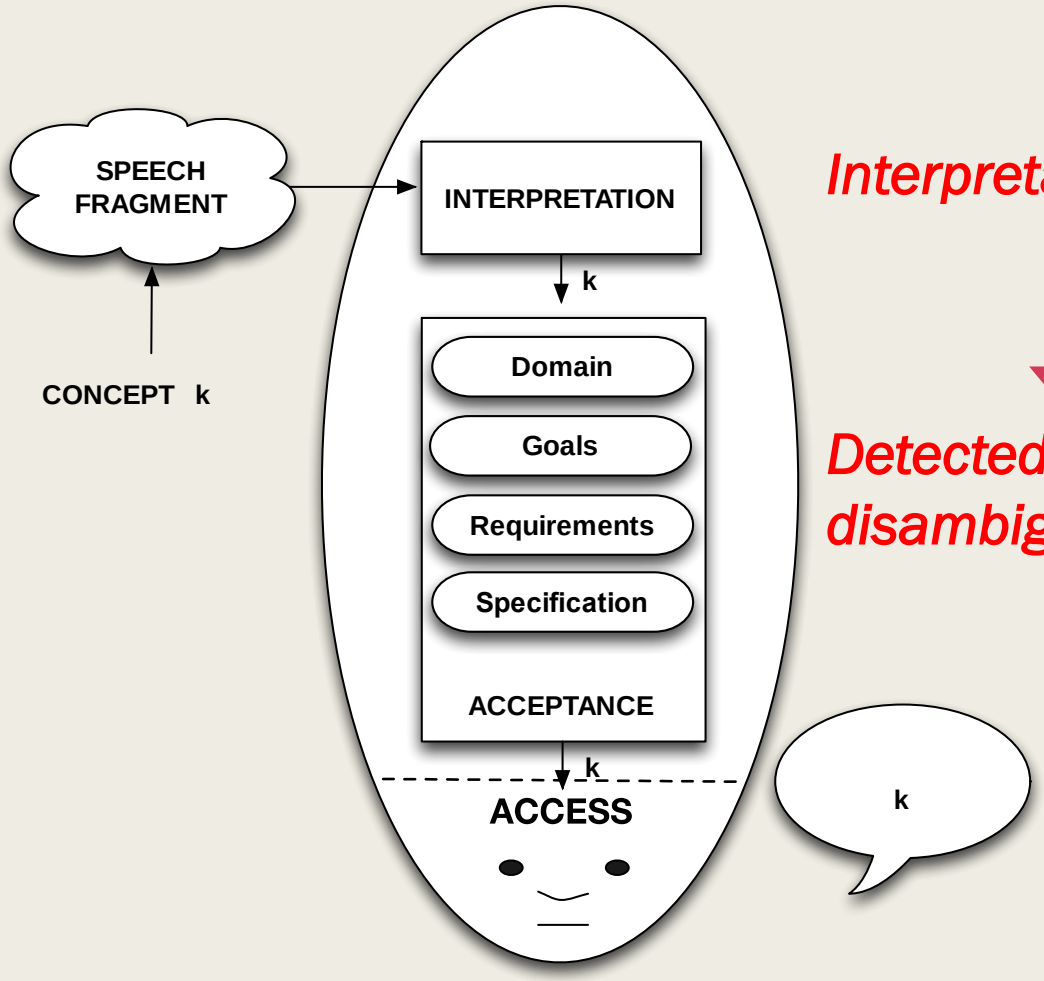
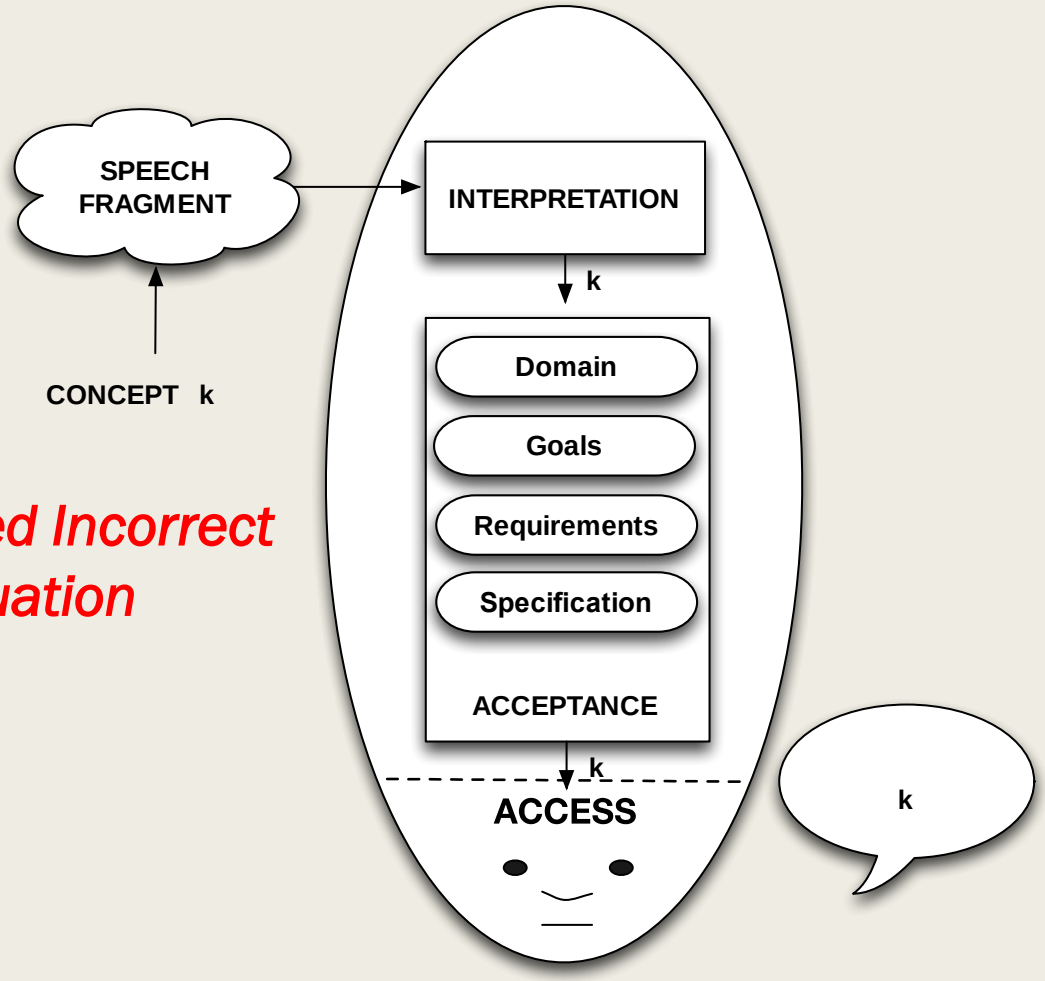


Interpretation Unclarity

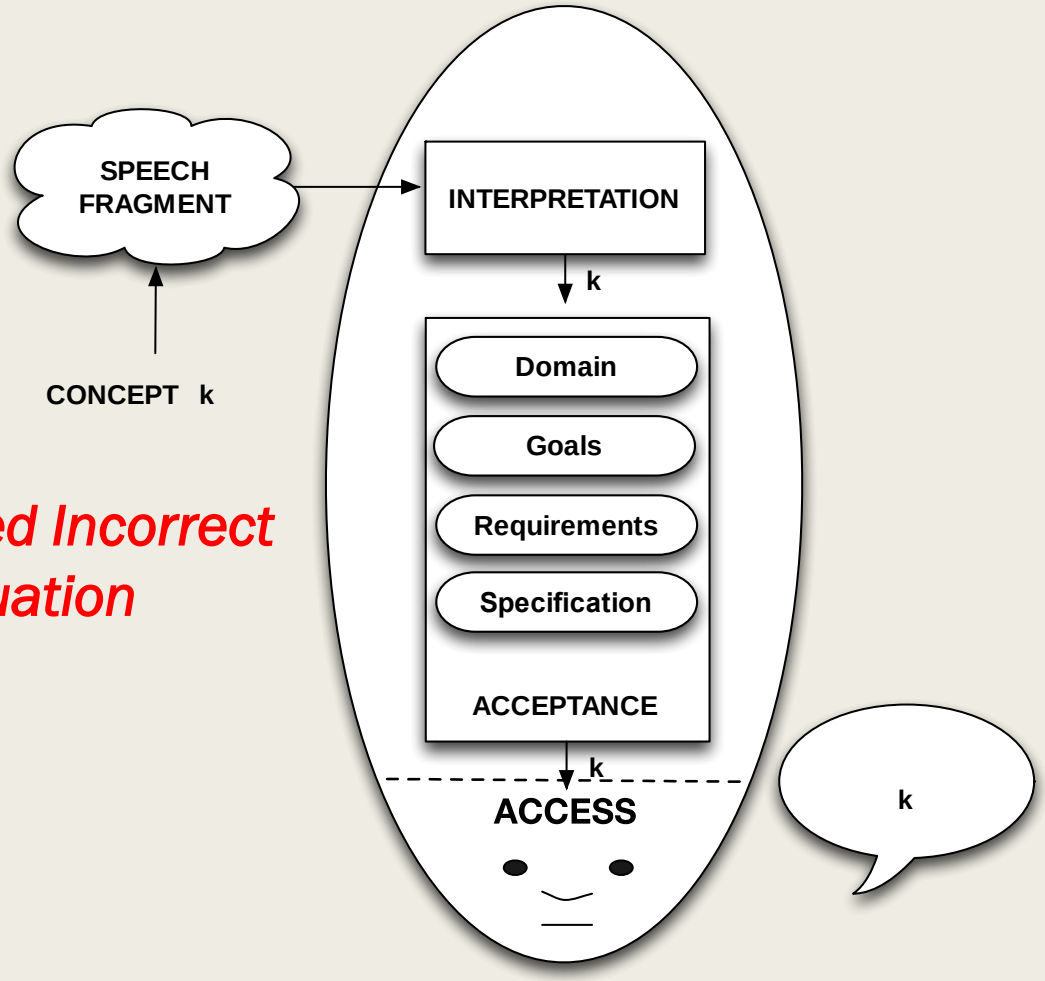
Detected Incorrect disambiguation

Ambiguities



Undetected Incorrect disambiguation

~~Ambiguities~~ *Misunderstanding, conflicting situations…*



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Reviews

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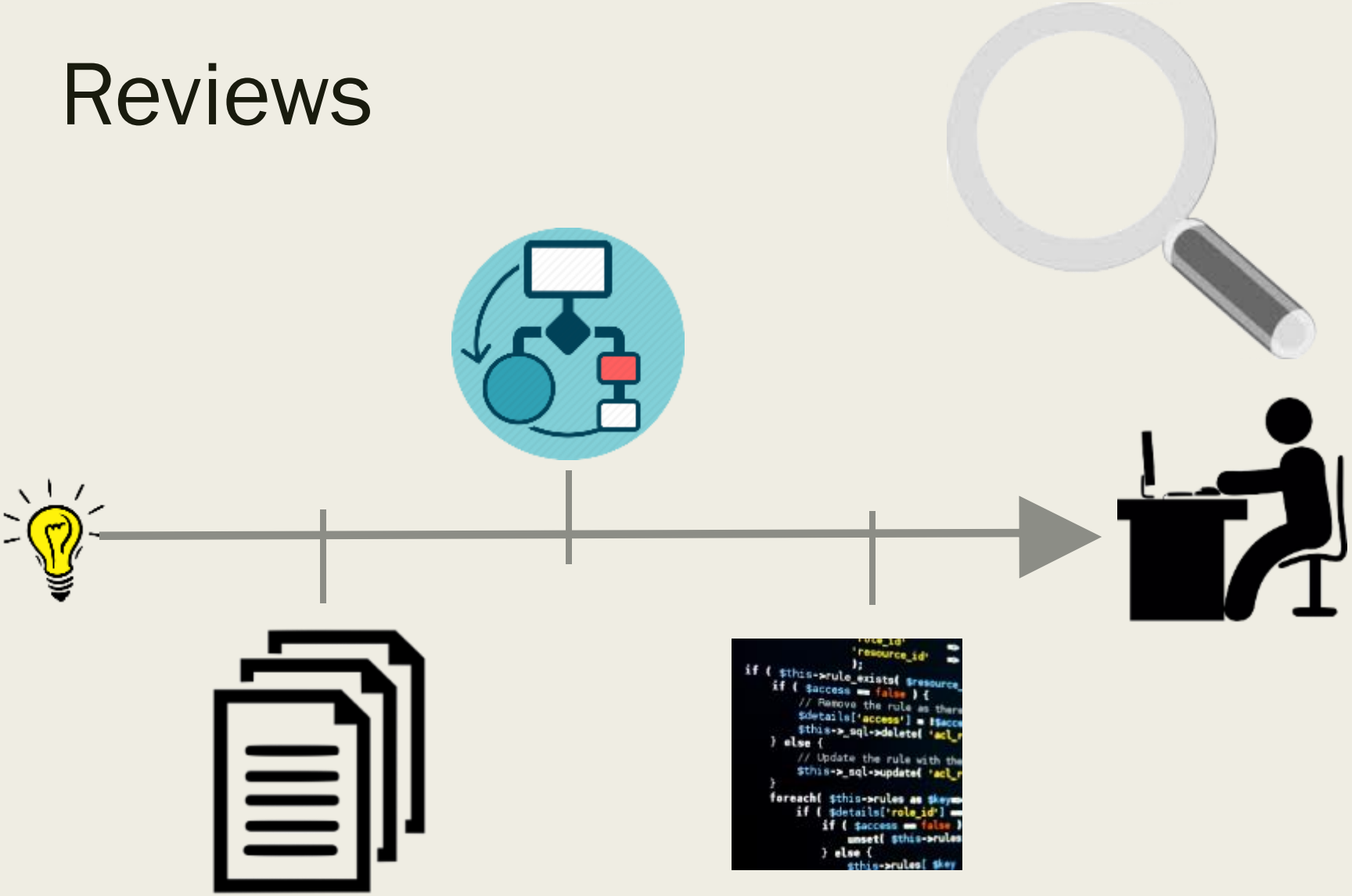

How are reviews effective?

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- Often effective in identification of defects in requirements specifications
- Widely used in the industry

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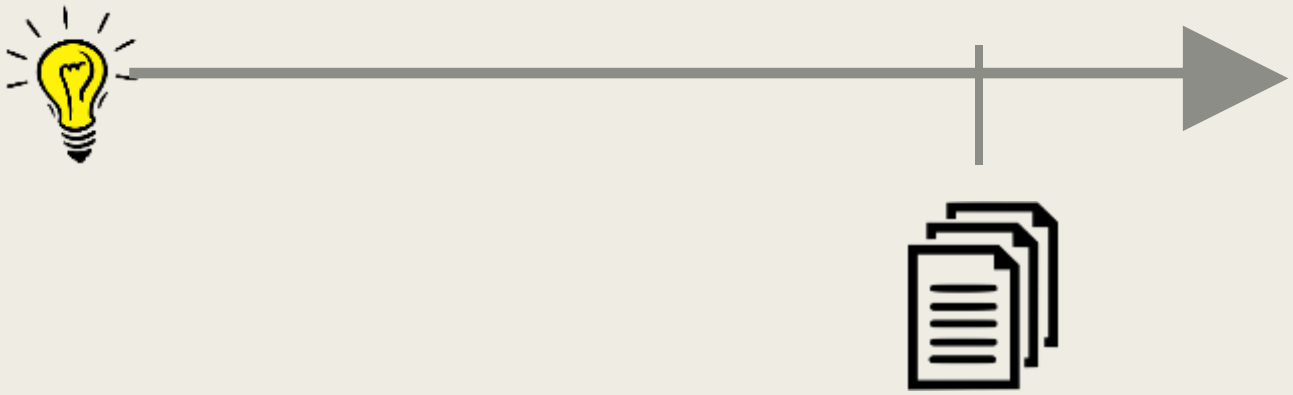

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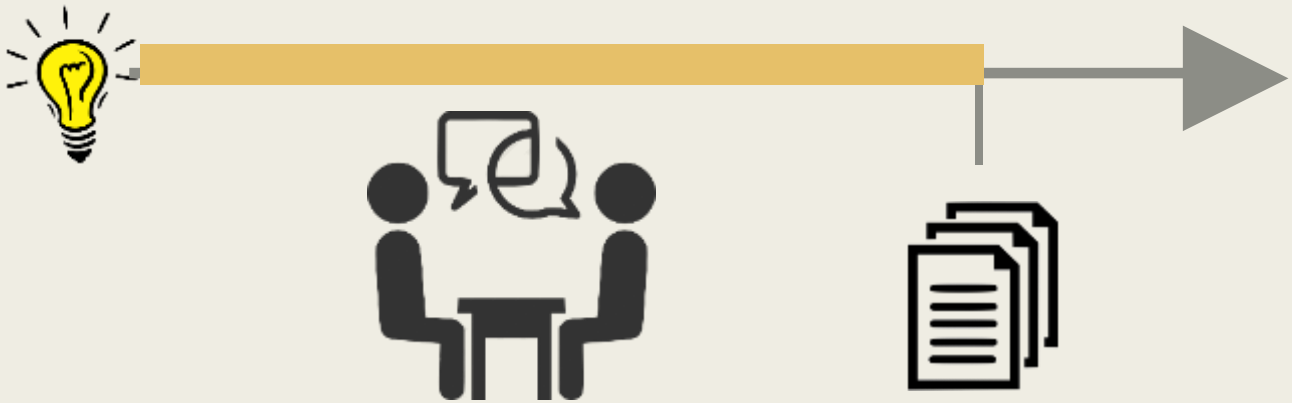

Interview Review

to perform requirements elicitation and support knowledge transfer between a customer and a requirements analyst. Ambiguity in communication is often perceived as a major obstacle for knowledge transfer, which could lead to unclear and incomplete requirements documents. In this paper, we analyse the role of ambiguity in requirements elicitation interviews. To this end, we have performed a set of customer-analyst interviews to observe how ambiguity occurs during requirements elicitation. From this direct experience, we have observed that ambiguity is a multi-dimensional cognitive phenomenon with a dominant *pragmatic* facet, and we have defined a phenomenological framework to describe the different types of ambiguity in interviews. We have also discovered that, rather than an obstacle, the occurrence of an ambiguity is often a *resource* for discovering tacit knowledge. Starting from this observation, we have envisioned the further steps needed in the research to exploit these findings.

LIVE

BREAKING NEWS

AMBIGUITY AS A RESOURCE TO DISC

11:36 AMBIGUITY IN ELICITATION INTERVIEWS CAN HELP TO DISCLOSE TACIT KNOWLEDGE

I. Introduction

Requirements elicitation is the process of discovering requirements for a system by accessing available knowledge sources, such as stakeholders who elicitation techniques (e.g., workshops, focus groups, scenarios, prototypes [3], [4]), inter-

the customer, to the absorptive capacity of the requirements

ligence techniques [25], [29]–[31]. However, all these works study ambiguity at the level of written NL requirements, and the role of ambiguity in elicitation interviews that use NL in its oral form has not been thoroughly investigated yet.

The work presented in this paper aims at filling this gap, with the rationale that understanding ambiguity in interviews, which precede the definition of requirements documents, can cast new light on the concept of ambiguity in textual requirements. To this end, we decided to directly observe the occurrence of ambiguity by simulating a set of realistic interviews between a requirements analyst and a set customers who wish to develop novel software-intensive products. From this study, we have seen that the concept of ambiguity in NL requirements documents, and its classical lexical, syntactic, semantic clues [16], were accounting for a very limited set of ambiguity phenomena that occur at the level of requirements elicitation, where the *pragmatic*, contextual aspect appeared to be dominant. Therefore, we defined a framework to categorize ambiguities in requirements elicitation interviews, on the basis of the work performed by Gervasi *et al.* [33] on *tacit knowledge*. Tacit knowledge in requirements engineering [2], [9], [33] is defined as the knowledge that a customer has, but and, though process solutions exist [9], means are required to

powerful tool to discover tacit knowledge during requirements

3,

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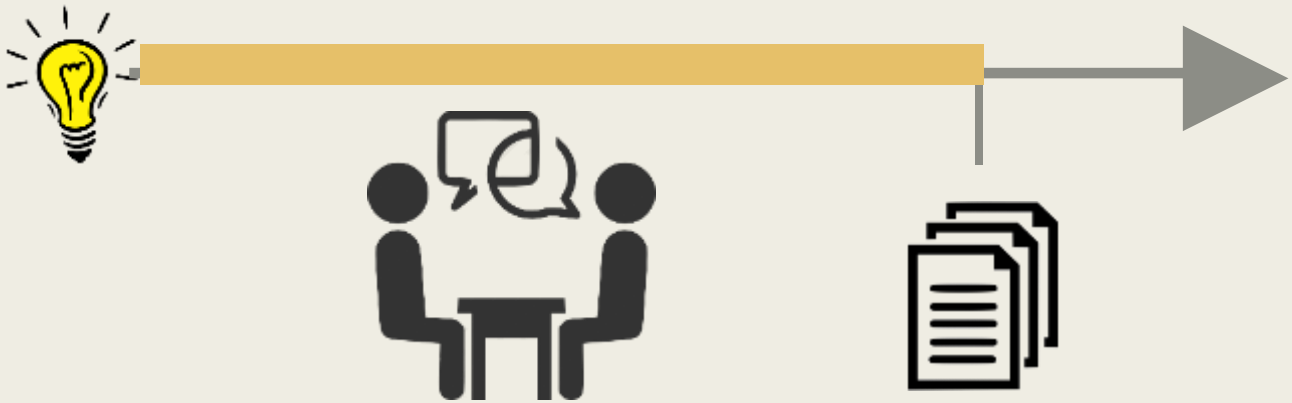

Intuition: Review of requirements elicitation interviews allows identifying ambiguities that can be leveraged to ask useful follow-up questions in future interviews.

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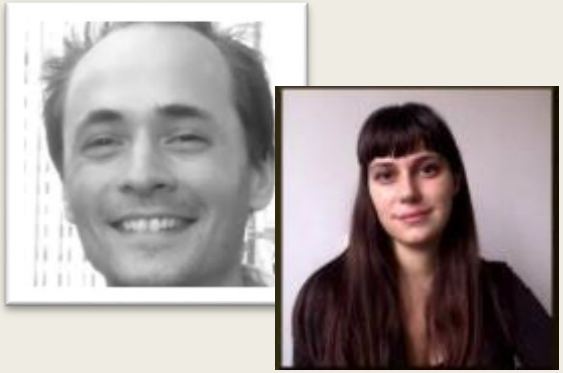
RQ3: Can the ambiguities identified during interview review be used to ask *useful* questions in future interviews?

Exploratory study

- 38 students from KSU, 19 interviews
  - *Software intensive system*
  - *20 minutes per interview*
  - *2 hour lecture on elicitation*

- 2 reviewers, 10 interviews
  - *Researcher in requirements elicitation*
  - *Professional analyst*



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Variables

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- Independent variable: **Perspective**
  - *Role*
  - *Moment*

Variables

AI

- Independent variable: **Perspective**
  - *Role*
  - *Moment*

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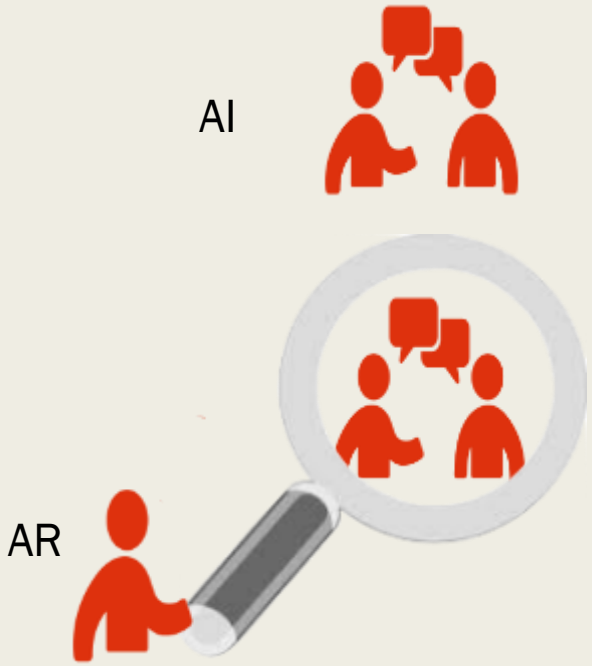

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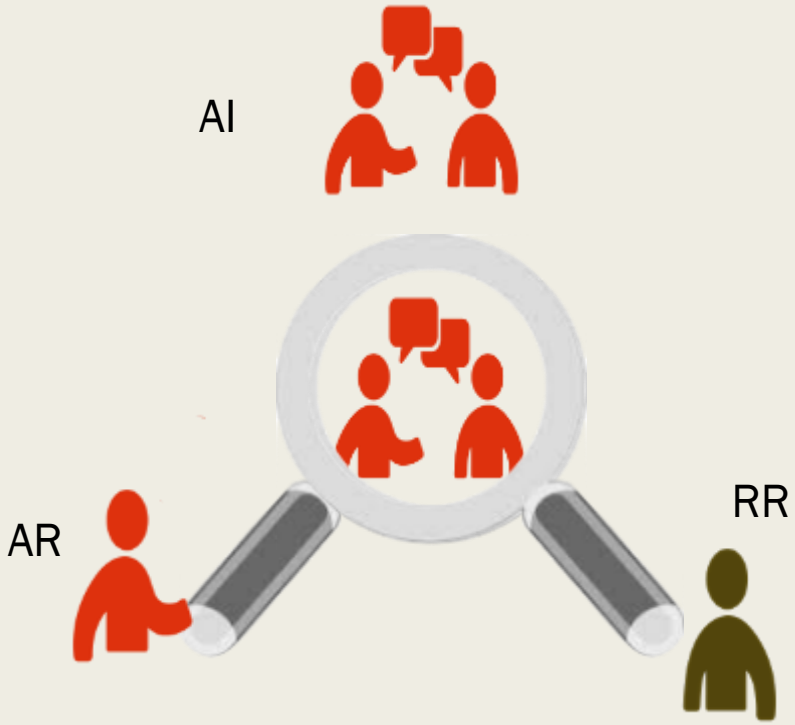

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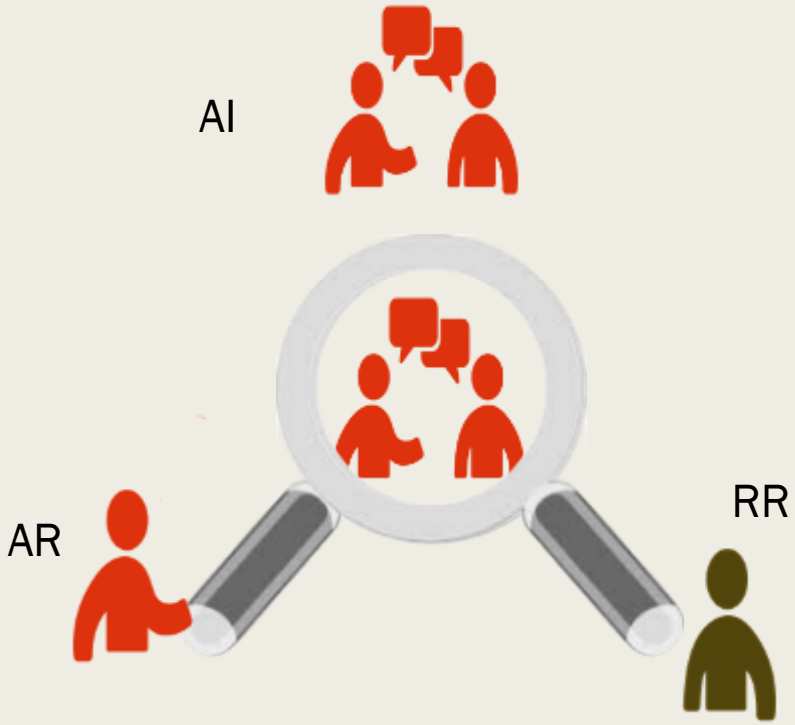

- Independent variable: **Perspective**
  - *Role*
  - *Moment*

- Dependent variable: **Performance** in detecting ambiguities
  - *Set of found ambiguities*
  - *Total number*

Hypotheses

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- $H1.1_0$: The reviewer's performance during the review is irrelevant with respect to the analyst's performance during the interview;

Hypotheses

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- $H1.1_0$: The reviewer's performance during the review is irrelevant with respect to the analyst's performance during the interview;
- $H1.2_0$: The analyst's performance during the review is irrelevant with respect to the analyst's performance during the interview.

Hypotheses

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RQ2: Is there a difference between ambiguities identified by the analyst when s/he listens to the interview recording, and ambiguities identified by a reviewer who listens to the interview recording?

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- $H2.1_0$:The analyst's performance during the review is irrelevant with respect to the reviewer's performance during the review;

Hypotheses

RQ2: Is there a difference between ambiguities identified by the analyst when s/he listens to the interview recording, and ambiguities identified by a reviewer who listens to the interview recording?

- $H2.1_0$:The analyst's performance during the review is irrelevant with respect to the reviewer's performance during the review;
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Experiment settings

- Students from KSU and UTS
  - *Software intensive system*
  - *Limited time per interview*
  - *Lecture on elicitation*

- Reviewers are students
  - *A customer in another interview*
  - *The student analyst*

Reviews

- Guidelines to identify ambiguities
  - *You have not understood the meaning of what you heard*
  - *You have not understood the purpose of what you heard*
  - *What you heard is too general*
  - *…*
- Content
  - *Time: when the fragment happened*
  - *Fragment: the fragment that triggered the ambiguity*
  - *Question: the question that you would ask to the customer to clarify*

Overall evaluation

	Min	Max	Median	Mean	Std dev
$\|a_{AI}\|$	0	20	4	5.1905	5.91286
$\|ao_{AI}\|$	0	19	4	4.8095	5.80189
$\|a_{AR}\|$	0	15	4	4.9524	4.58777
$\|ao_{AR}\|$	0	13	3	4.1905	3.88097
$\|a_{RR}\|$	2	18	5	7.619	5.04456
$\|ao_{RR}\|$	2	17	4	6	4.58258

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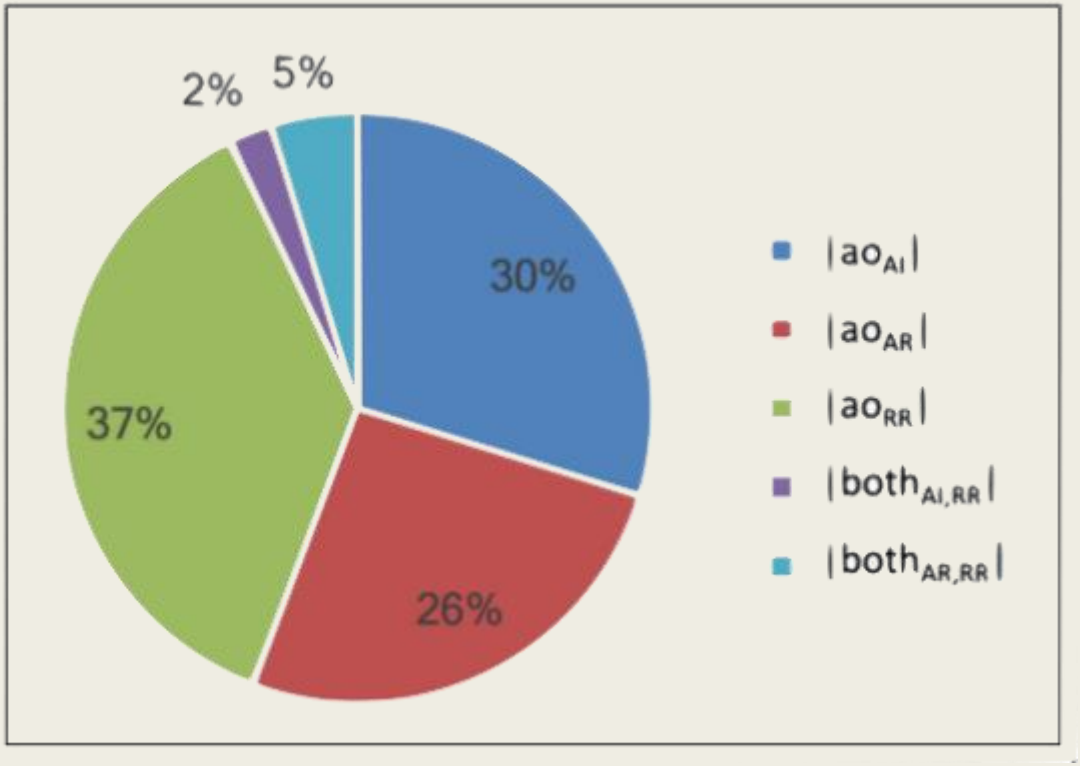

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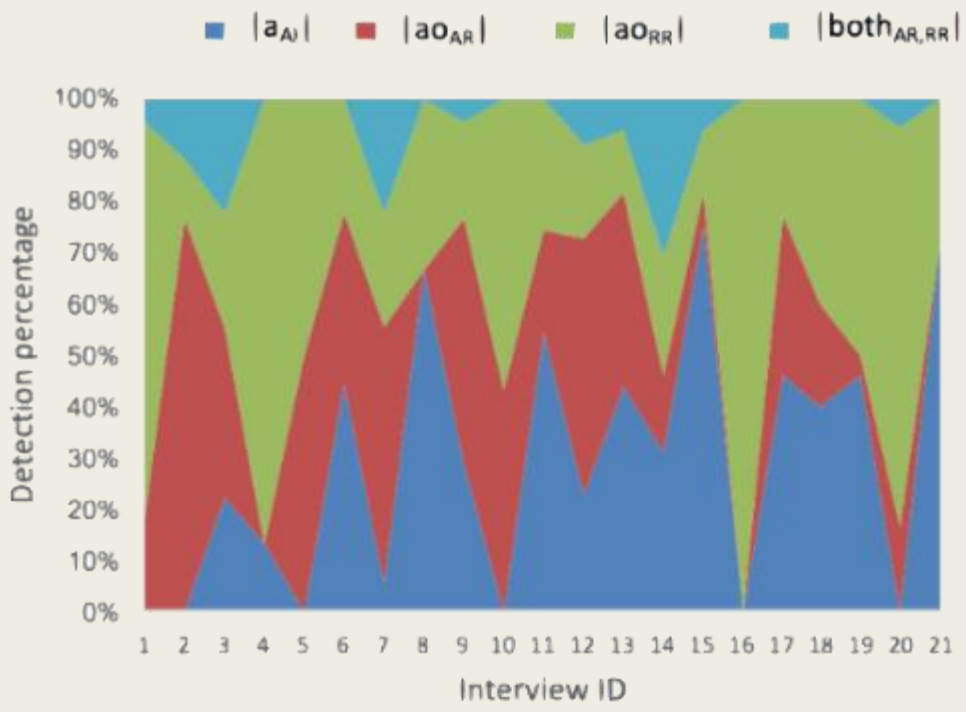
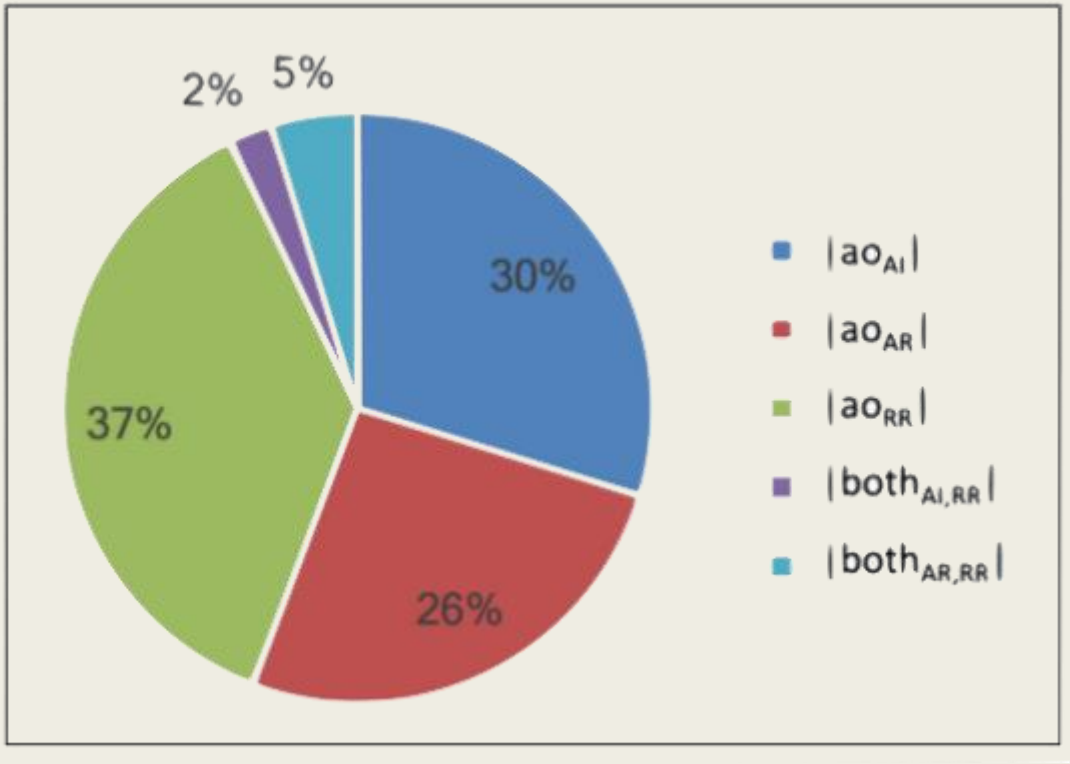


RQ1: Contribution of the review



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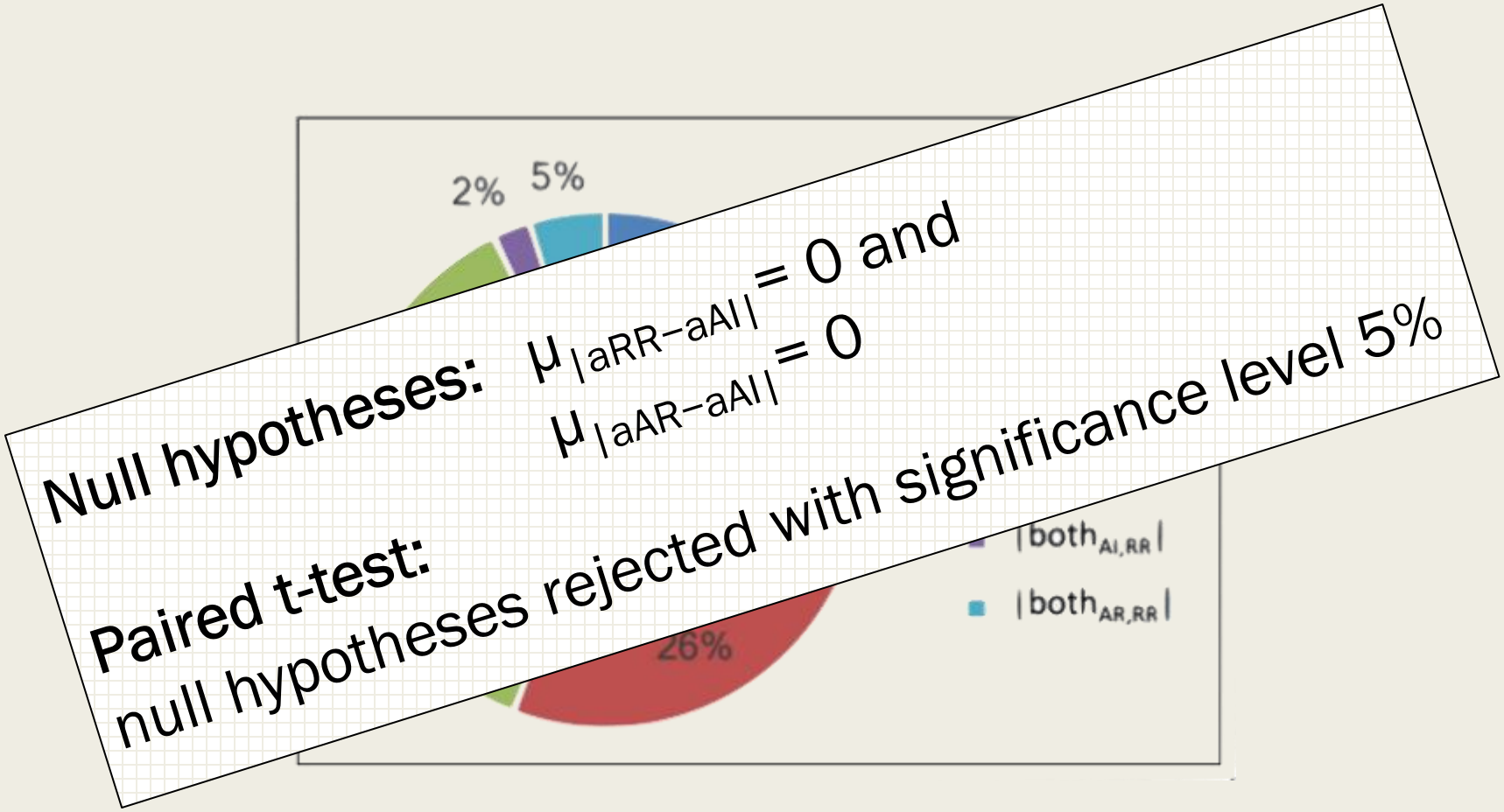
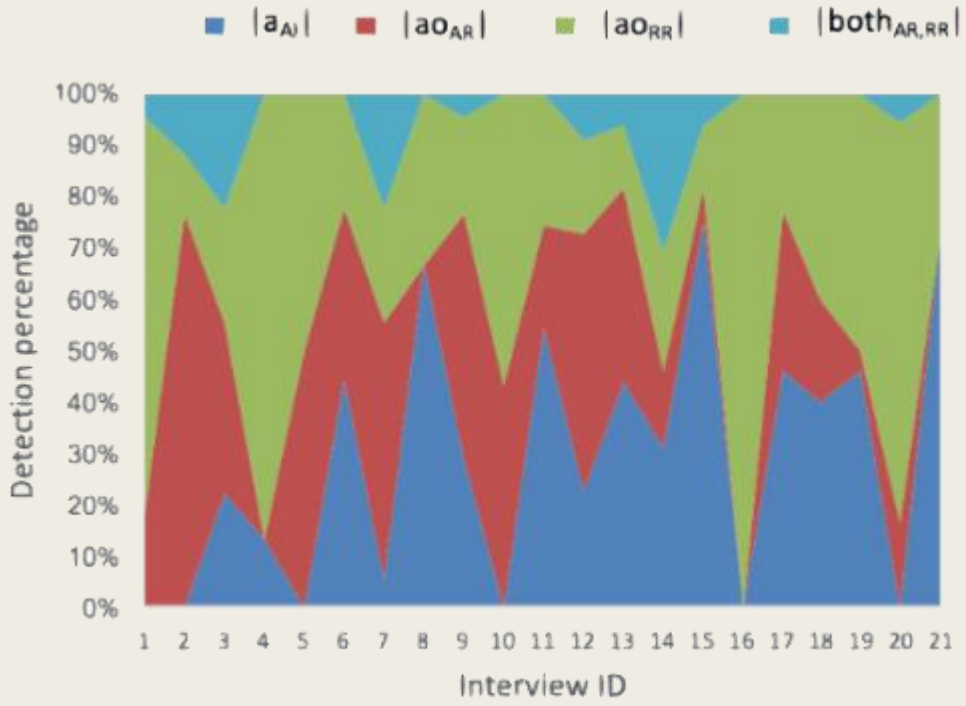


Null hypotheses: $\mu_{|aRR-aAI|} = 0$ and $\mu_{|aAR-aAI|} = 0$

Paired t-test: null hypotheses rejected with significance level 5%

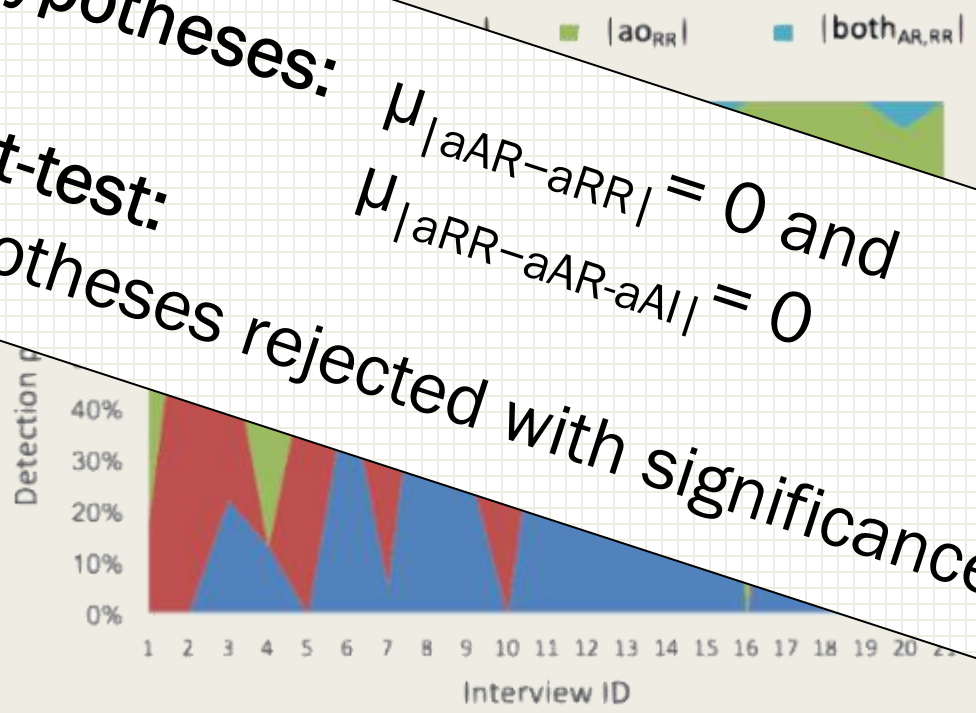
RQ2: Contribution of different reviews



RQ2: Contribution of different reviews

Null hypotheses: $\mu_{|aAR-aRR|} = 0$ and $\mu_{|aRR-aAR-aAI|} = 0$

Paired t-test: null hypotheses rejected with significance level 5%



Threats to validity

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- Graduate students vs undergraduate students

Kennesaw State University

UTS
UNIVERSITY OF TECHNOLOGY SYDNEY

Threats to validity

- Graduate students vs undergraduate students

- Previous experience

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- Experiment run with students

Conclusion

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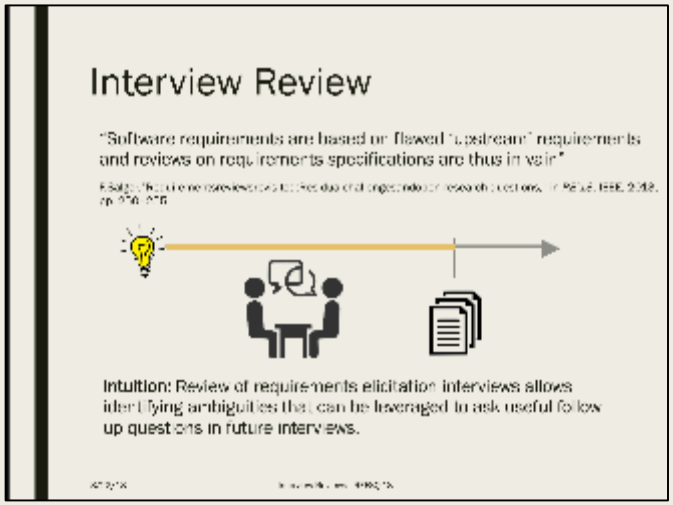
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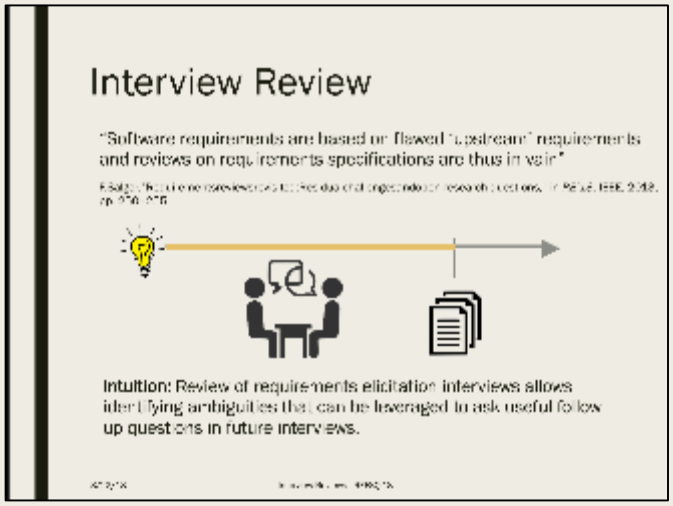
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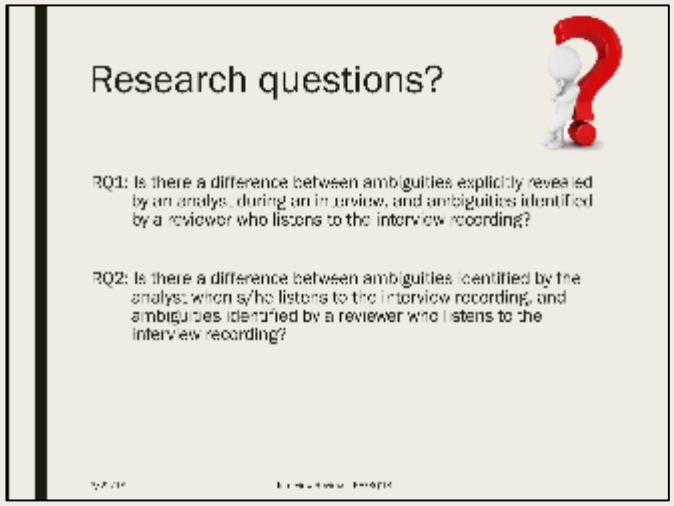
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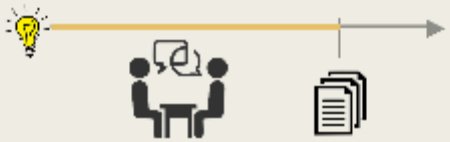

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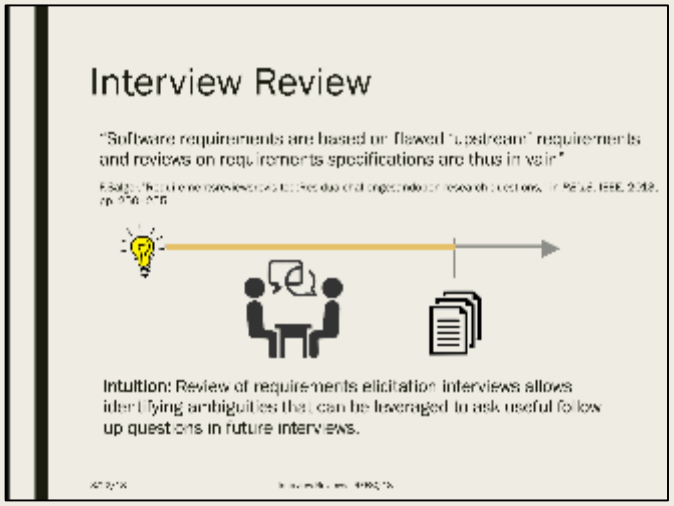
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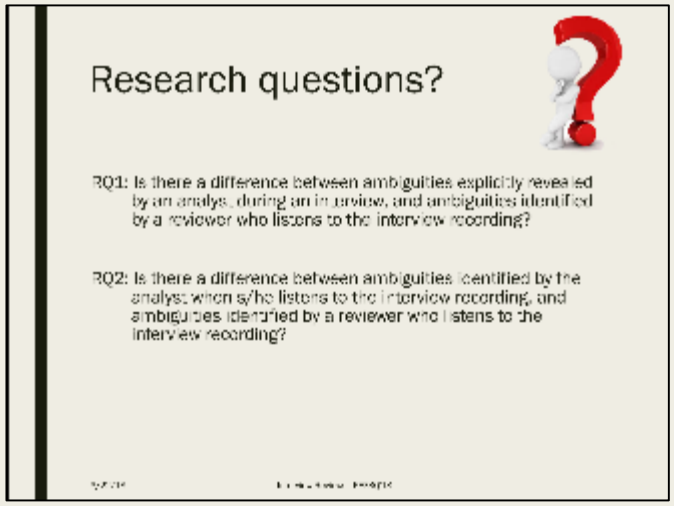
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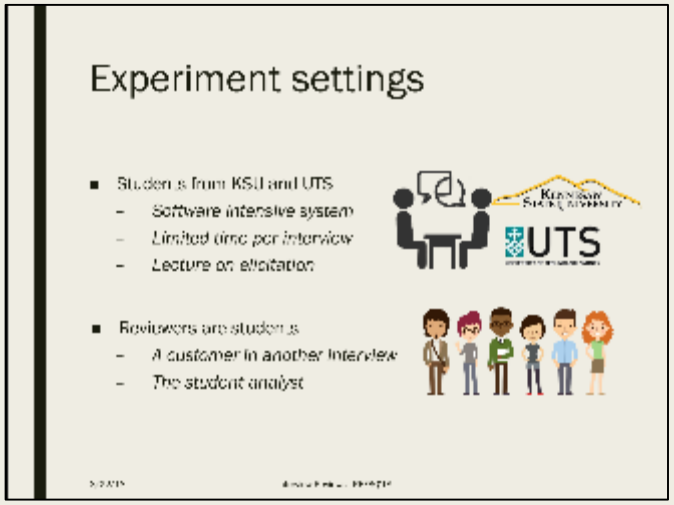
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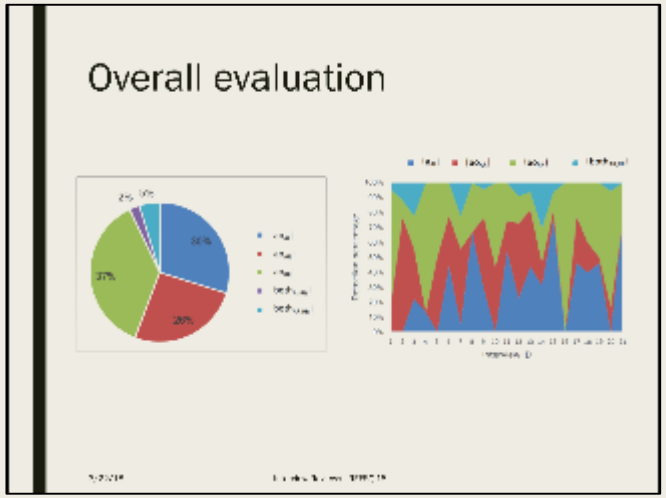
Overall evaluation

Future work

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- The protocol is applied in real world
- The useful of the questions generated by the protocol will be measured
  - *Perceived usefulness*
  - *Actual usefulness*

Results

Fragment	Time	D	Type	Question
I want an app in which the people can log into the system	00:10	B	mul und	A: Which kind of platform would you use? R: Is it an application for mobile, is it a Web app, or something else?
I'm gonna put a text into a field, I'm gonna set a time, I'm gonna set the recipient, and it's gonna text that person at that time	00:30	A	-	A: Why would you need that?
I can do quick text as well	08:02	R	int unc	R: What is quick text?

- Identified ambiguities:
  - Analyst: 23
  - Both: 21
  - Reviewers:38

- Time
  - Recordings: 2 hours and 37 minutes,
  - Reviewer 1: 5 hours
  - Reviewer 2: 8 hours and 33 minutes