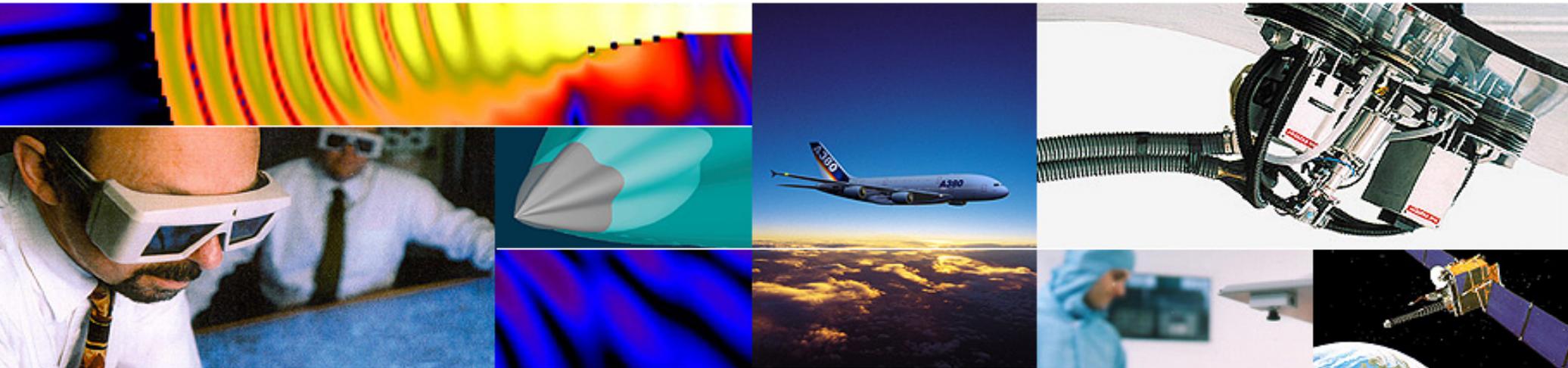


# Information Trust and Distrust in a Sensemaking Task: Experiment II

Andrew Leggatt & Barry McGuinness



# Overview

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- Information Trust
- Sensemaking Experiment (#1)
  - Summary & paradigm
- Sensemaking Experiment (#2)
  - Hypothesis
  - Method
  - Results
  - Discussion

## *Thanks to...*

- CCRP
  - *Dr Alberts, DoD*
  - *Dr Hayes, EBR Inc*
- Defence Academy UK
  - *Laura Kenyon*
  - *Jeremy Smith*
  - *Charles Kirk*
  - *All SMEs*

# An Achilles' Heel?

- Increasing dependence on information
- Pitfalls
  - Too much information
  - Complexity of info domain = uncertain provenance, reliability, currency, accuracy
  - Attacks on information systems
  - Attacks on perception (deception)
- *Lack of trust in information impedes proactive decision-making*



# A Human Issue in NCO

- Judgement:- what info to trust/distrust?
- Causes of good/bad judgement
- Effects of good/bad judgement
- Effects of workload and time pressure

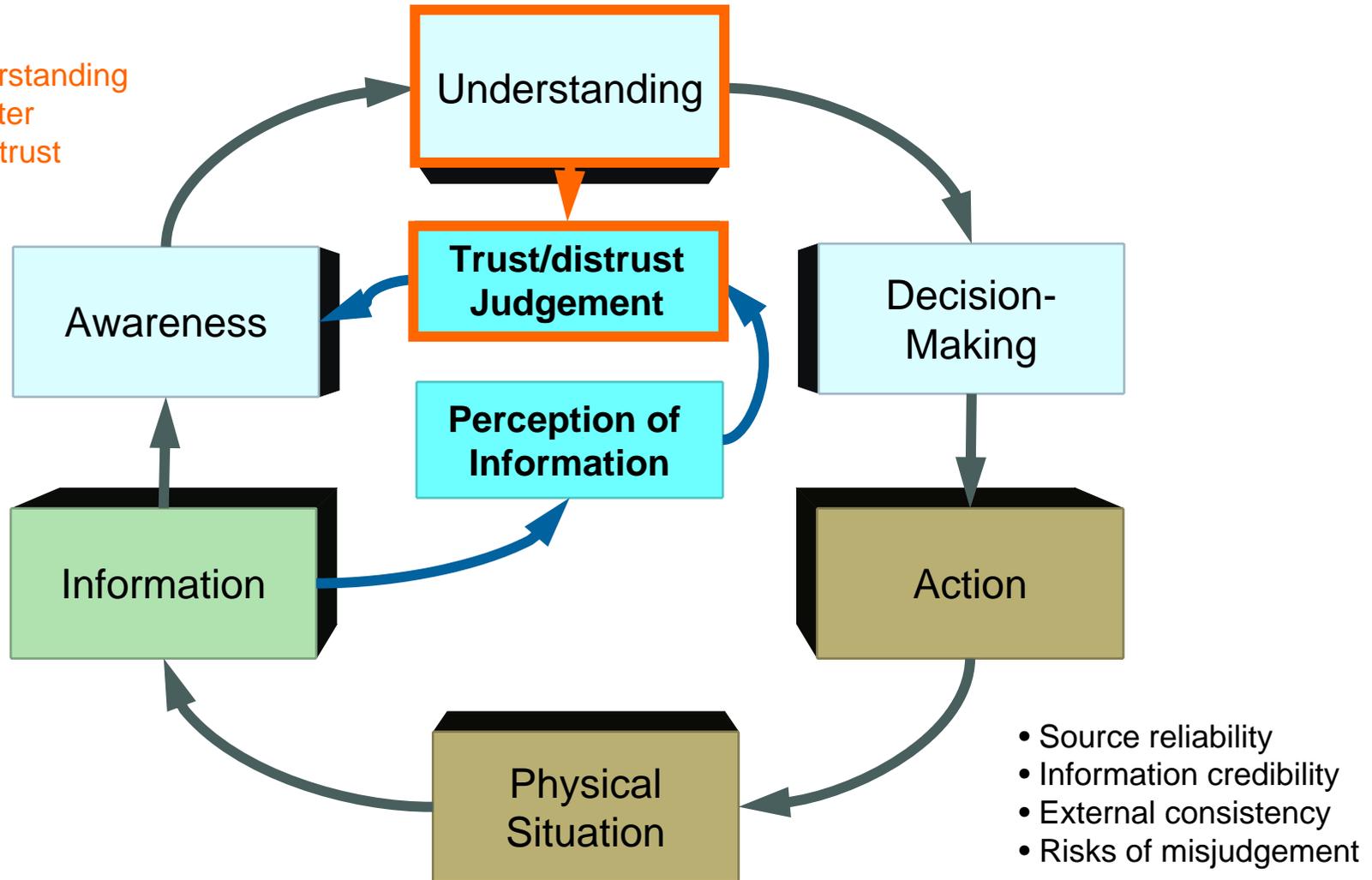


# Experiment 1

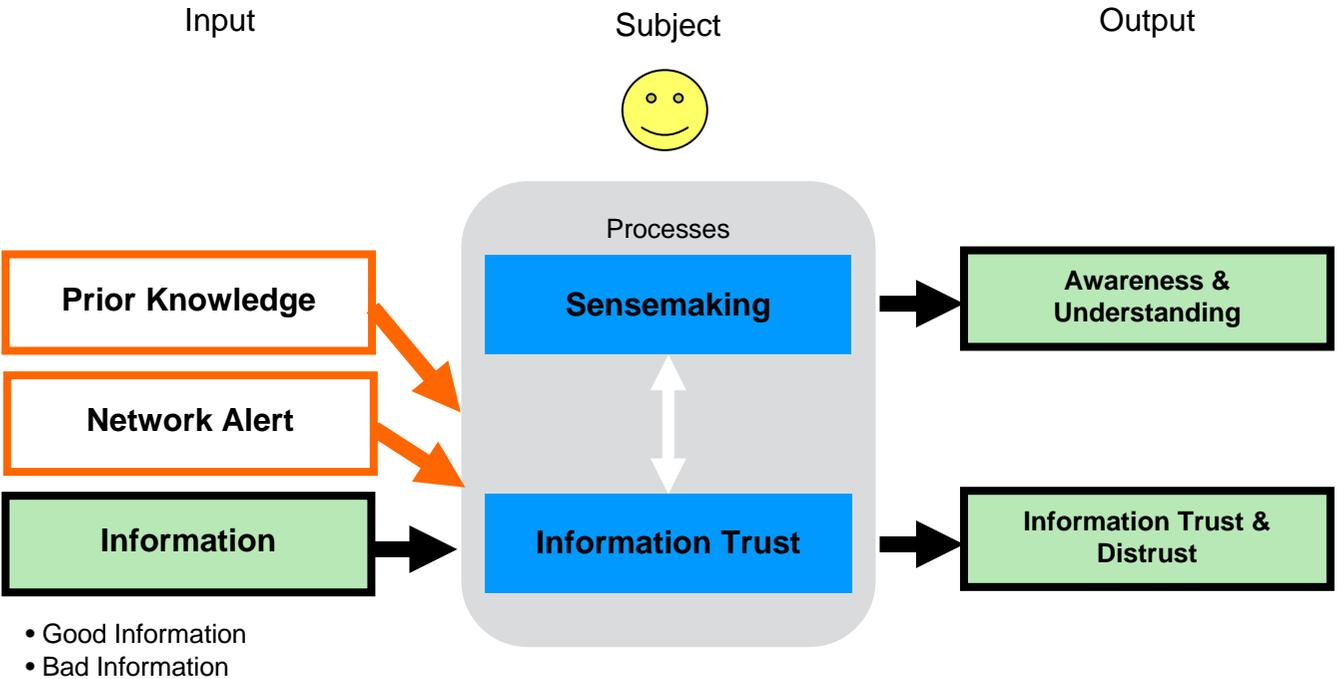
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# Sensemaking and Information Trust

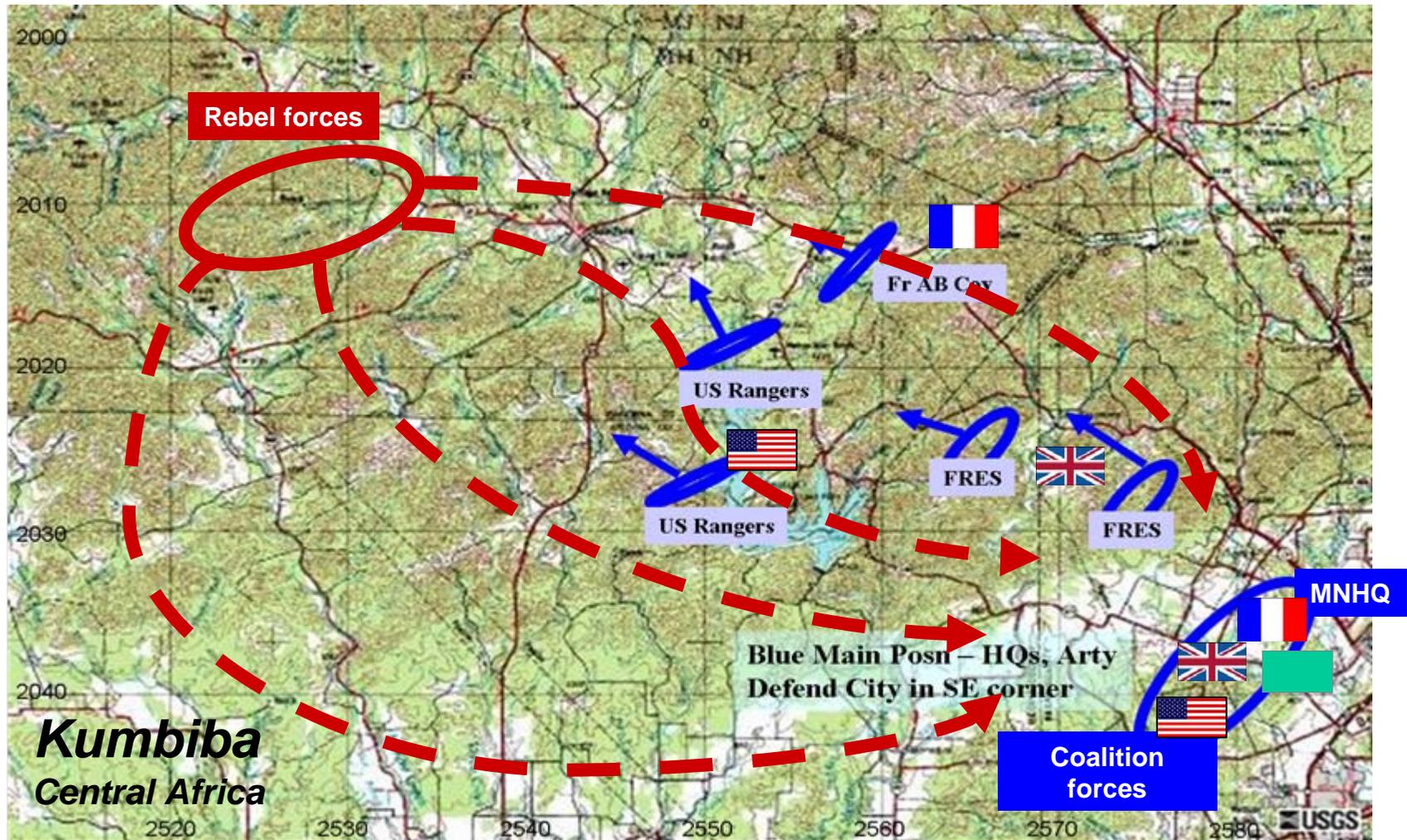
**H1:**  
Better understanding  
leads to better  
information trust  
judgements



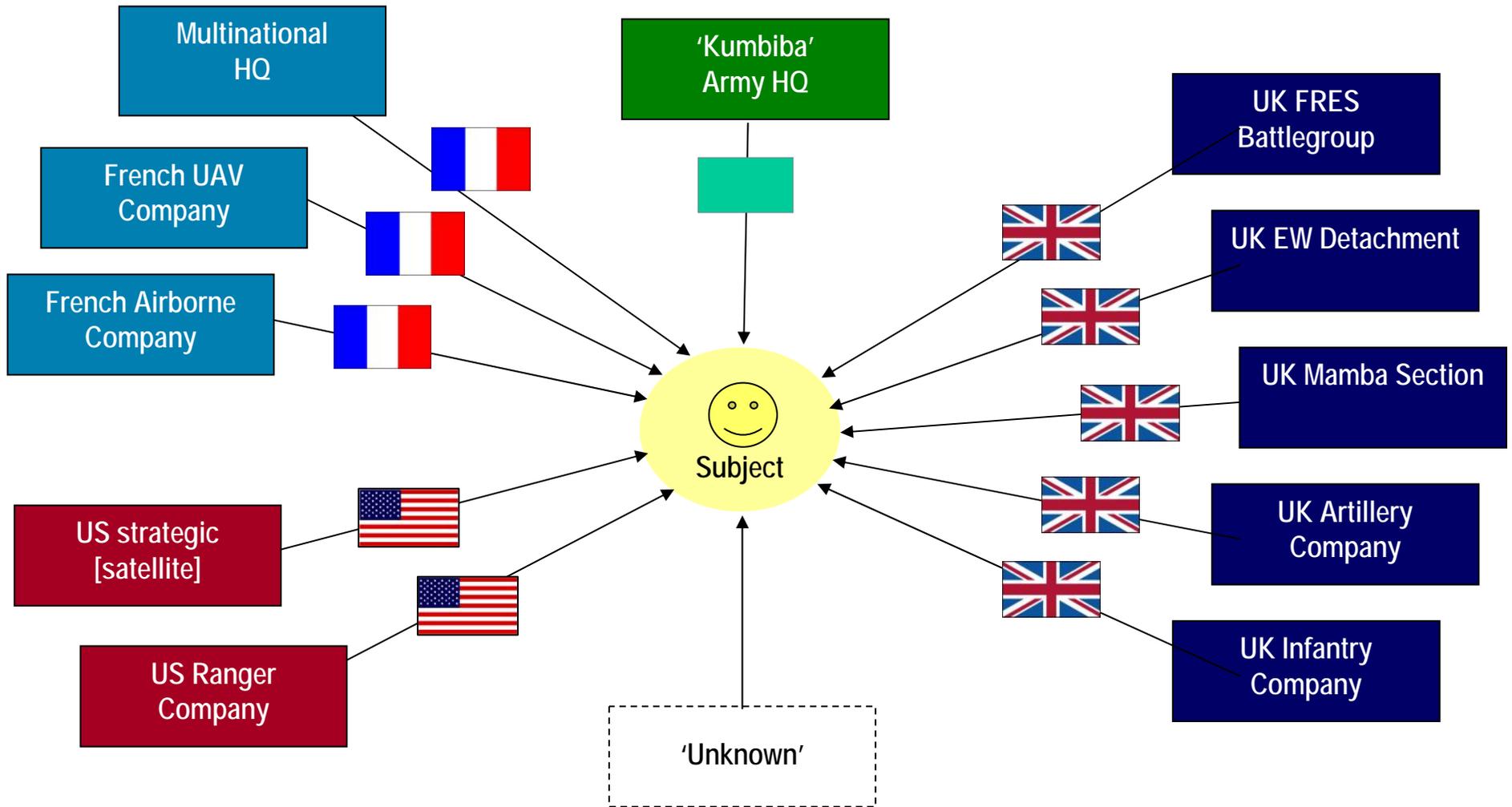
# Experimental Paradigm



# Sensemaking Task



# Information Sources



# Dependent Variables

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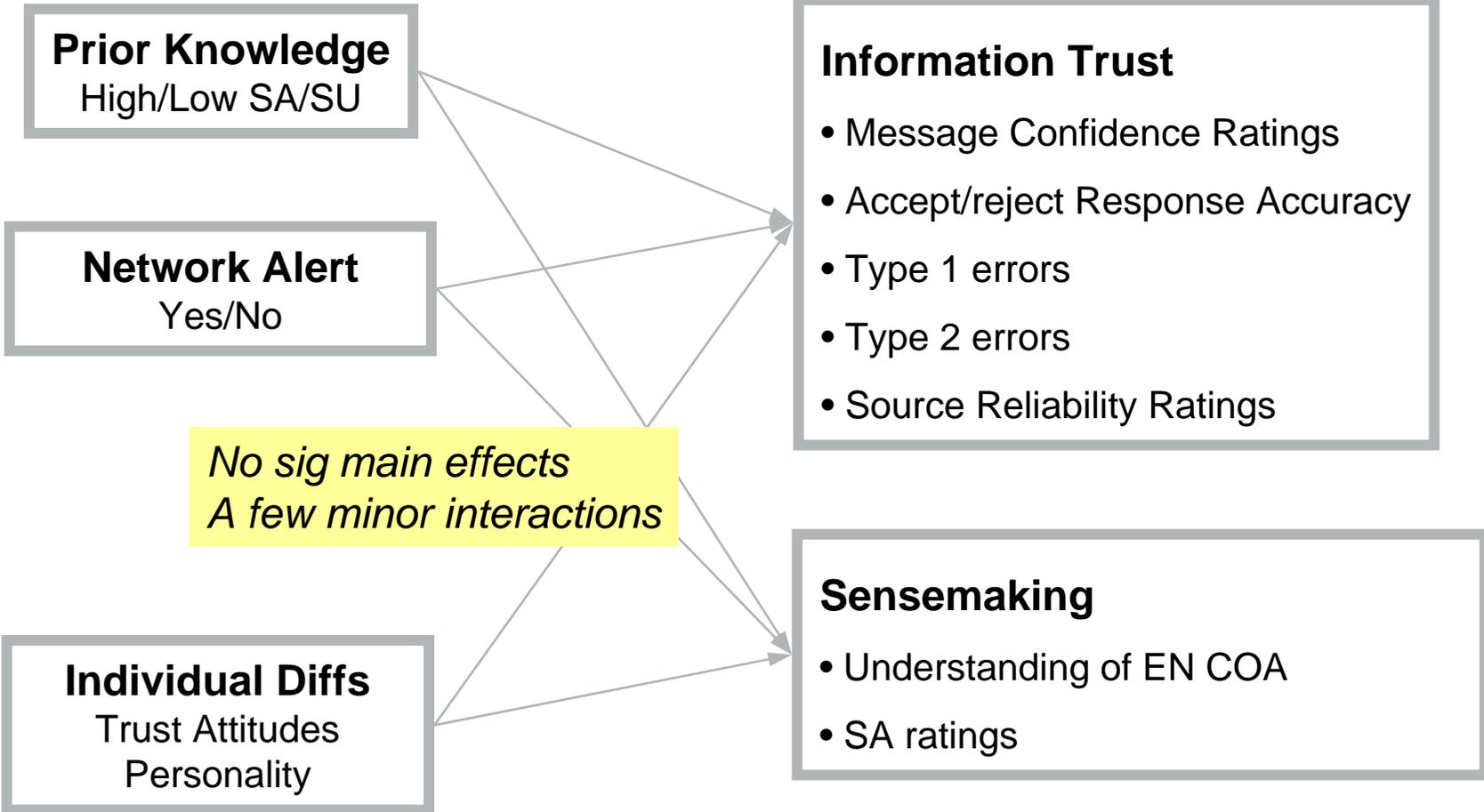
## Information Trust

- Confidence Ratings (Message Reliability) per message
- Accept/Reject response accuracy
- Type 1 / 2 Error Rate
- SDT analysis
- Source Reliability Ratings

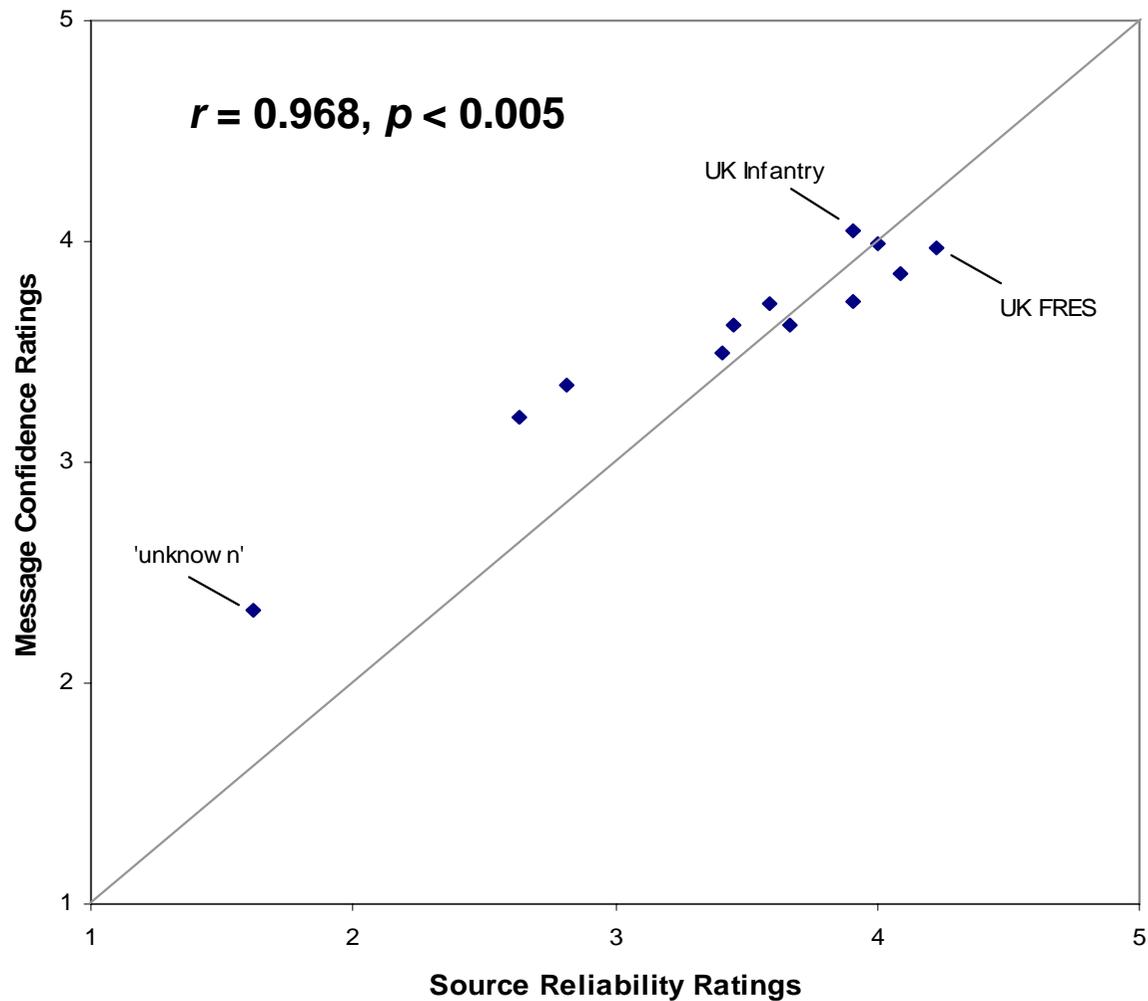
## Sensemaking

- Understanding of EN COA
- SA Ratings

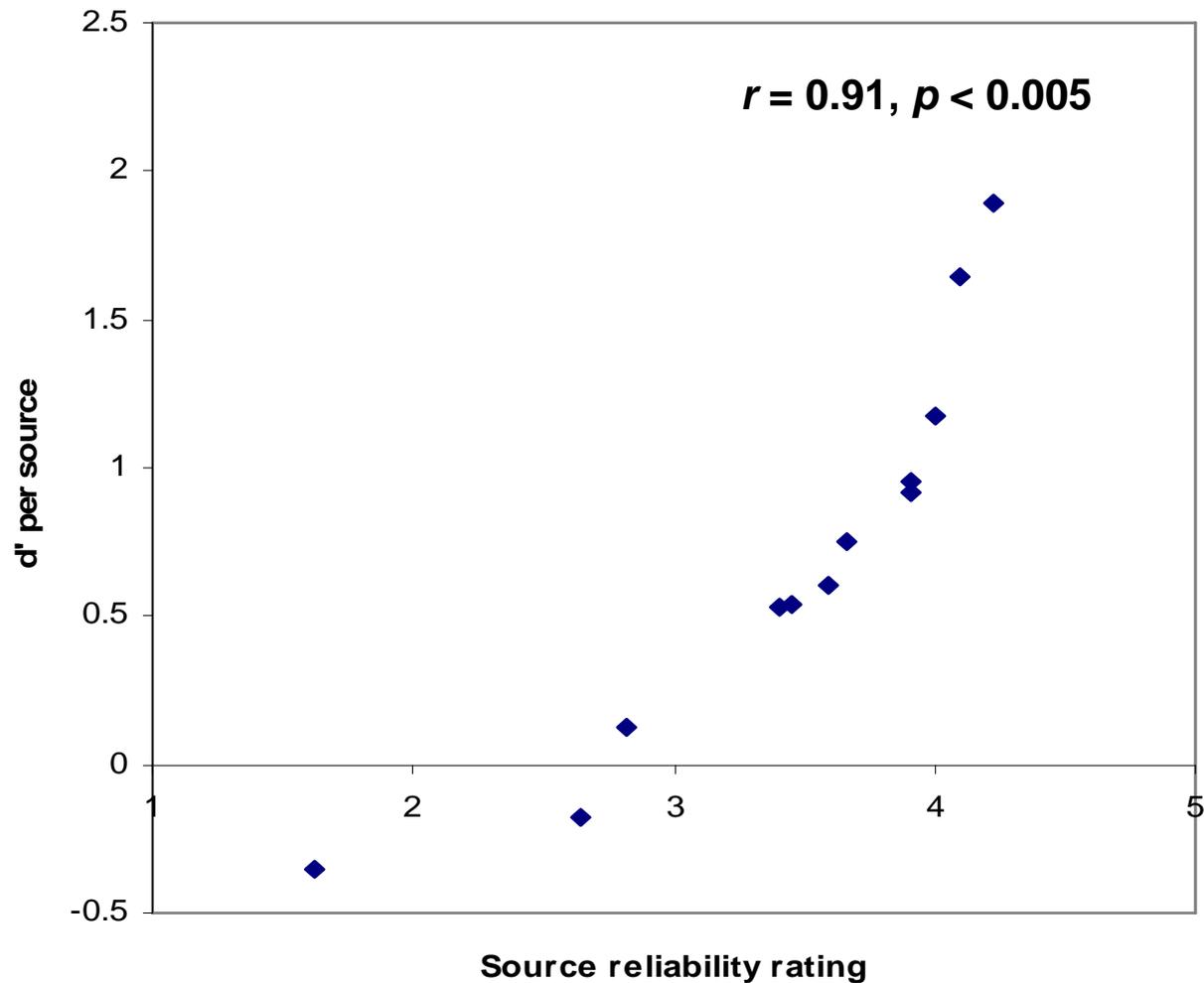
# Overall Findings



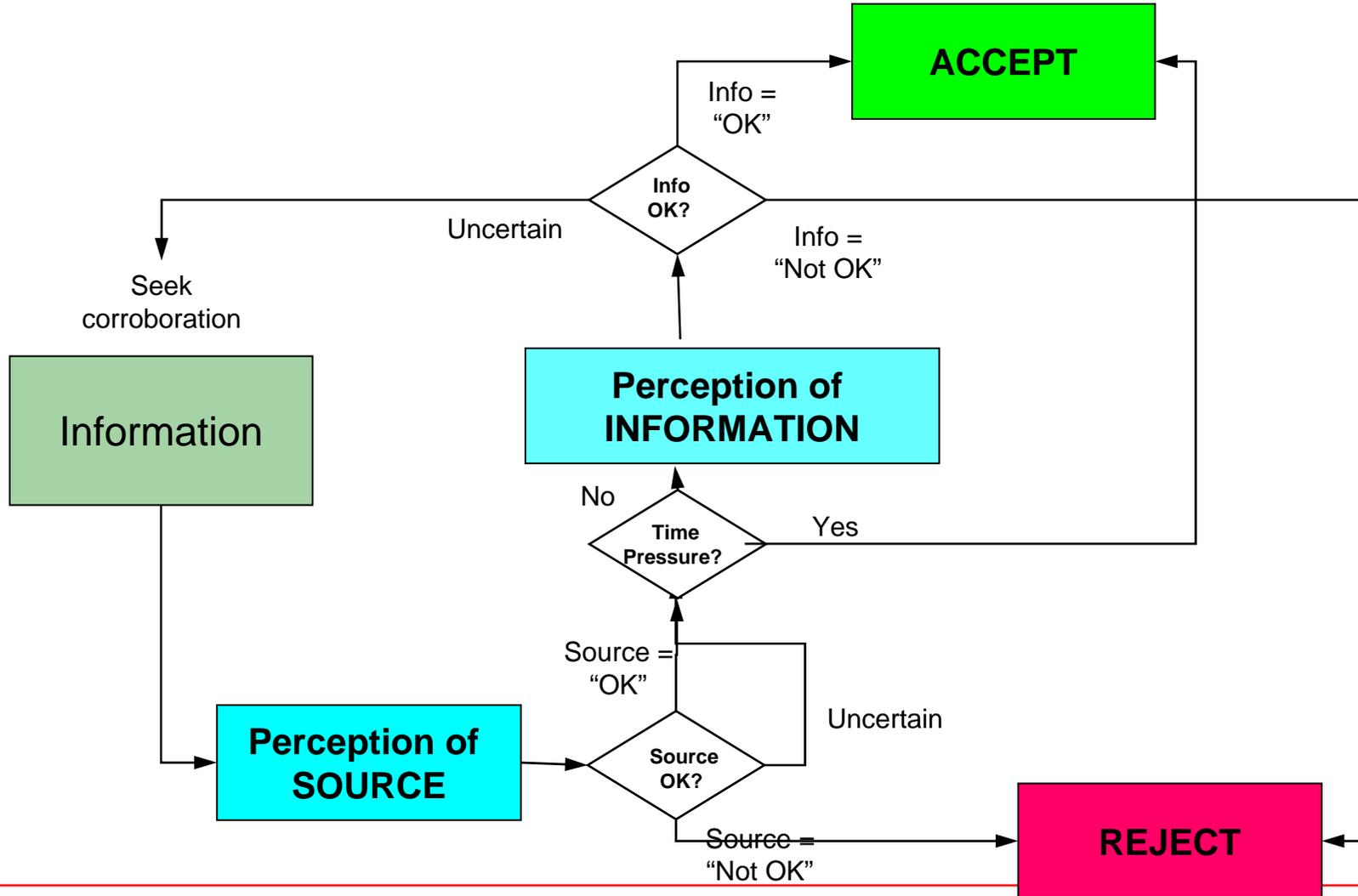
# Correlation of Subjective Ratings



# Correlation of Source Rating with d'



# Conclusions from experiment 1

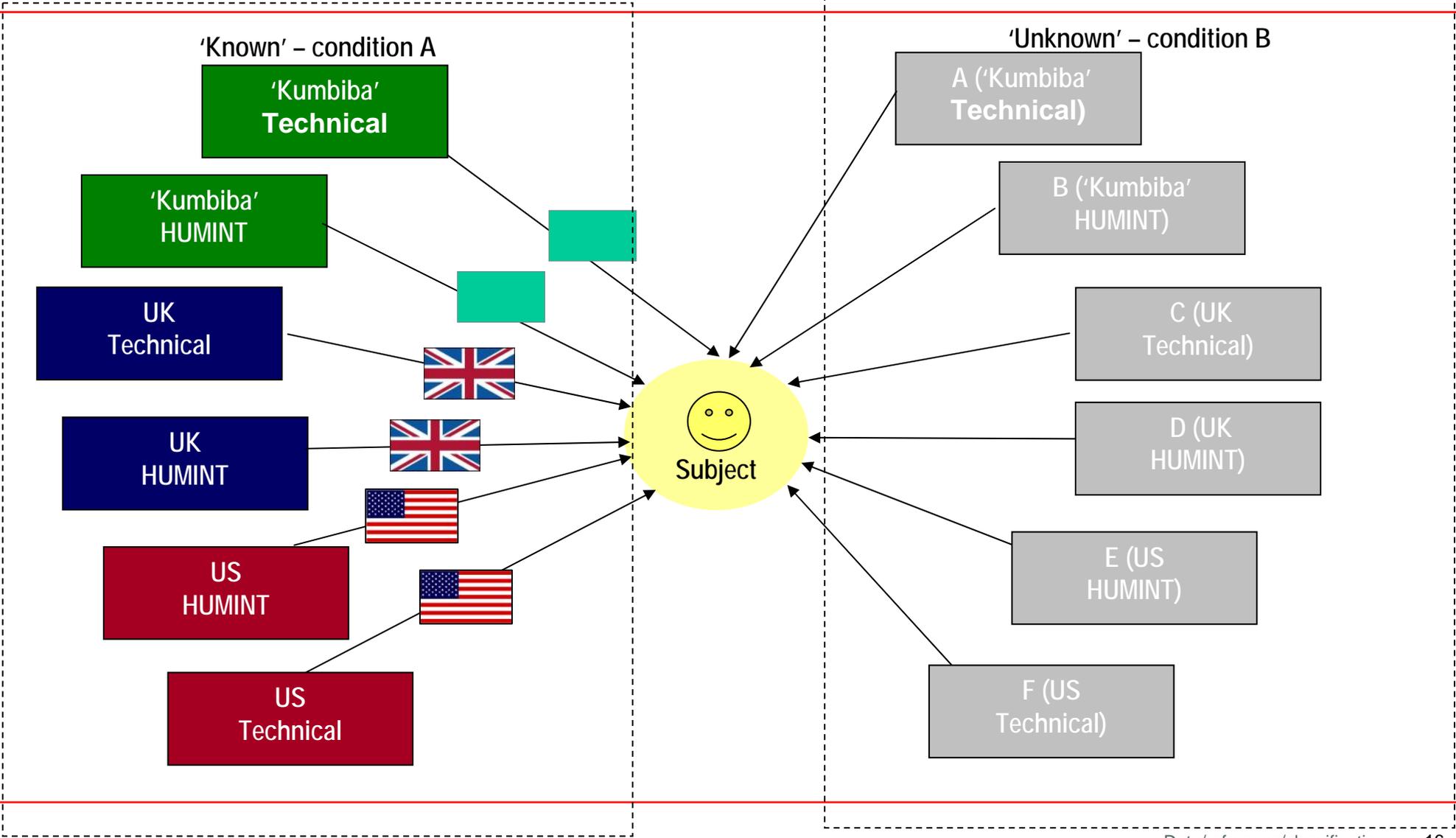


## Experiment II: Investigation of source and team assessment

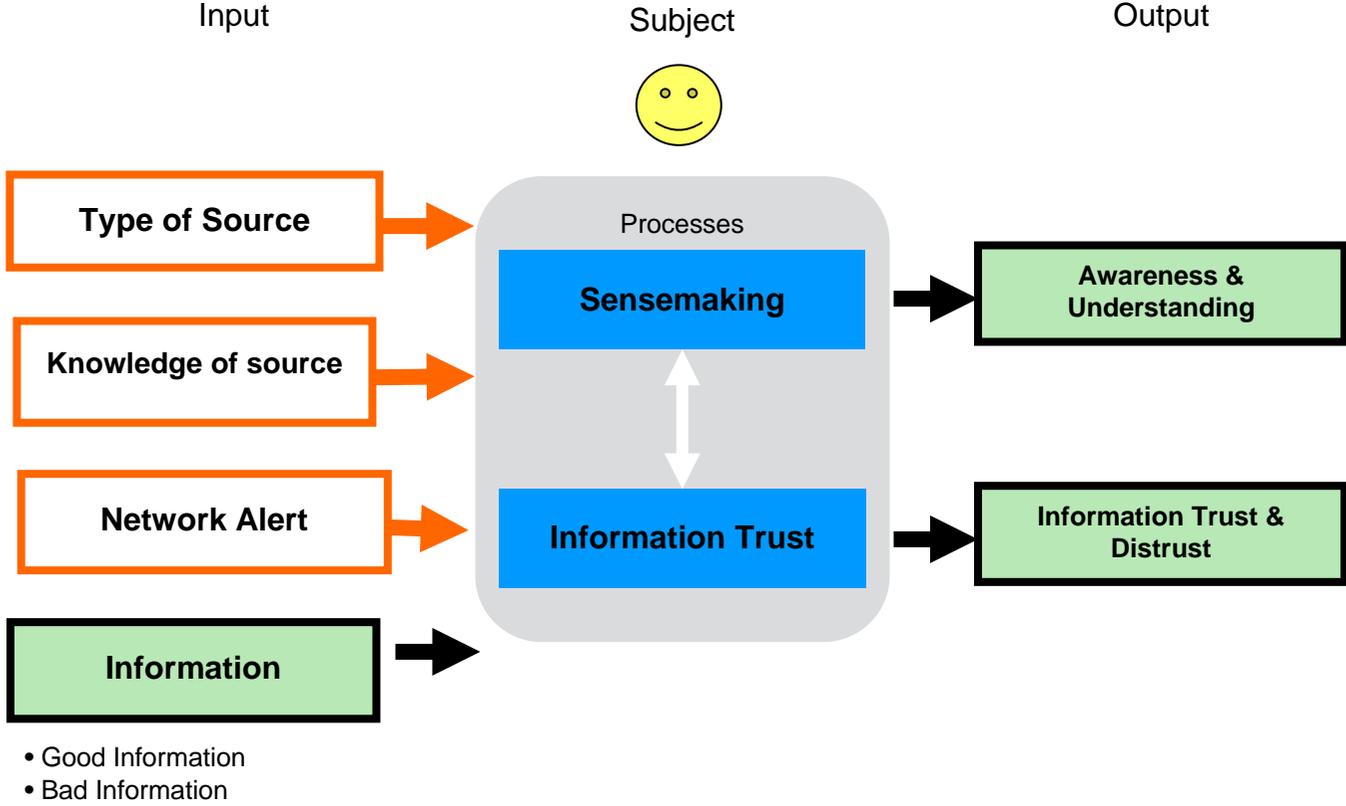
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- Is there a fundamental difference in the way participants trust HUMINT and Technical INT?
- If data source is so important to trust judgements and trust judgements are generally too distrusting, can information judgements be improved by removing source information?
- Do network alerts influence participant's trust judgements even when source information is restricted?

# Information Sources



# Experimental paradigm



# Sensemaking Task

The map displays several red diamond markers with numbers 9, 10, 13, 16, and 17. A yellow diamond marker is labeled 'MANY VEH'. A blue circle highlights a region on the map. The 'Intelligence Monitor' window is open, showing the following data:

Inbox	
15: 07:00:32: sighting: Unknown	
2: 06:41:32: sighting: US Range	
17: 07:02:00: sighting: UK arty	
18: 07:05:00: sighting: FR UAV	

Processed Message Log	
12: 06:57:00: sighting: FR UAV	
13: 06:58:44: sighting: MN HQ:	
16: 07:01:00: sighting: US Range	

**Message Viewer**

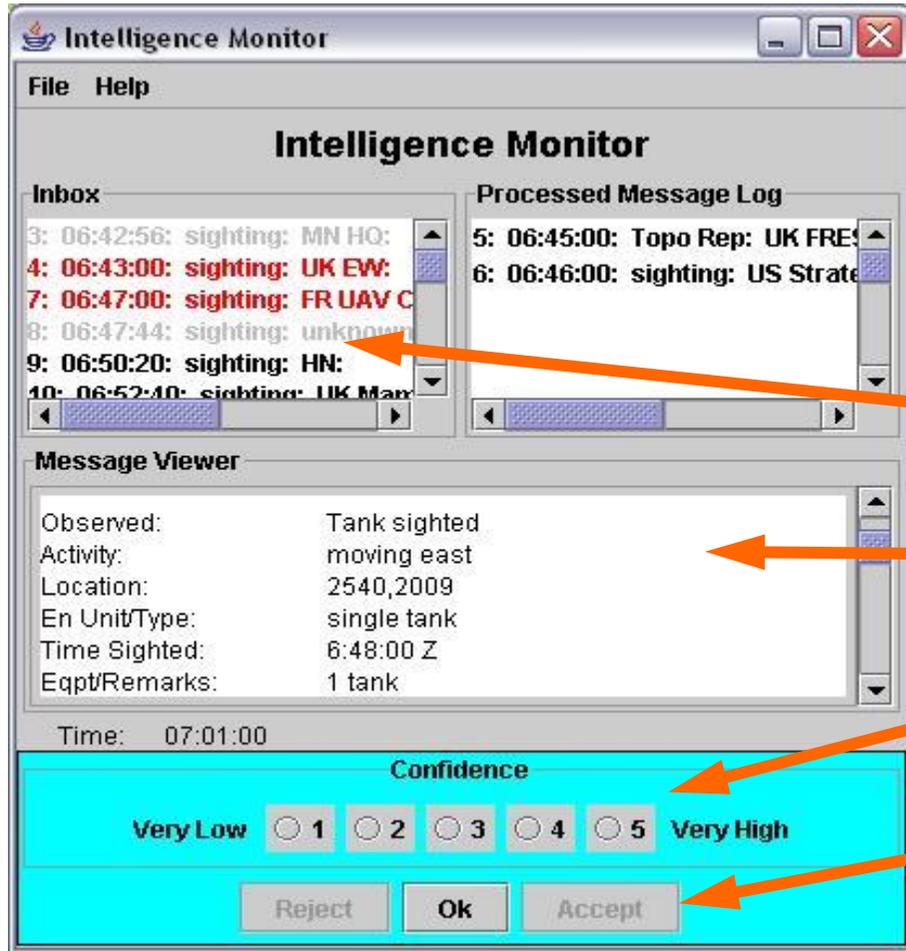
Observed: Tank Tp observed  
Activity: moving east  
Location: 2545,2011  
En Unit/Type: MBT Tp  
Time Sighted: 7:06:00 Z  
Eqpt/Remarks:

Time: 07:06:36

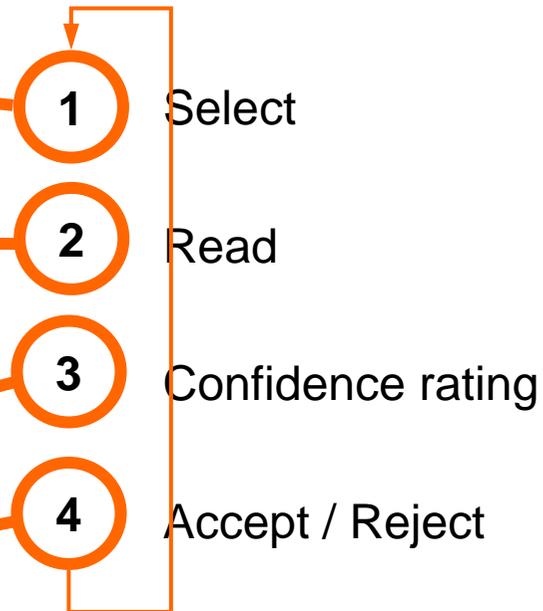
**Confidence**  
Very Low Very High

Buttons: Reject, Ok, Accept

# Sensemaking Task



- 48 messages per run
  - 75% good information
  - 25% bad information



# Experimental design

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- Standard mixed design
  - All participants experienced both anonymous and known source conditions
  - Running order was counterbalanced.
  - A network alert was provided on one of these runs (in either known or anonymous conditions)

# Experiment Participants

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- 12 British Army Majors at RMCS Shrivenham undertaking staff courses.
- Male with 8 – 14yrs experience.
- Age range 32 – 38.
- Additional 8 retired military & defence science staff

# Independent Variables

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## Message quality

- 75% good info
- 25% bad info – clearly wrong

## SA about source

- Full source information
- Source information removed

## Network Alert

- Yes
- No

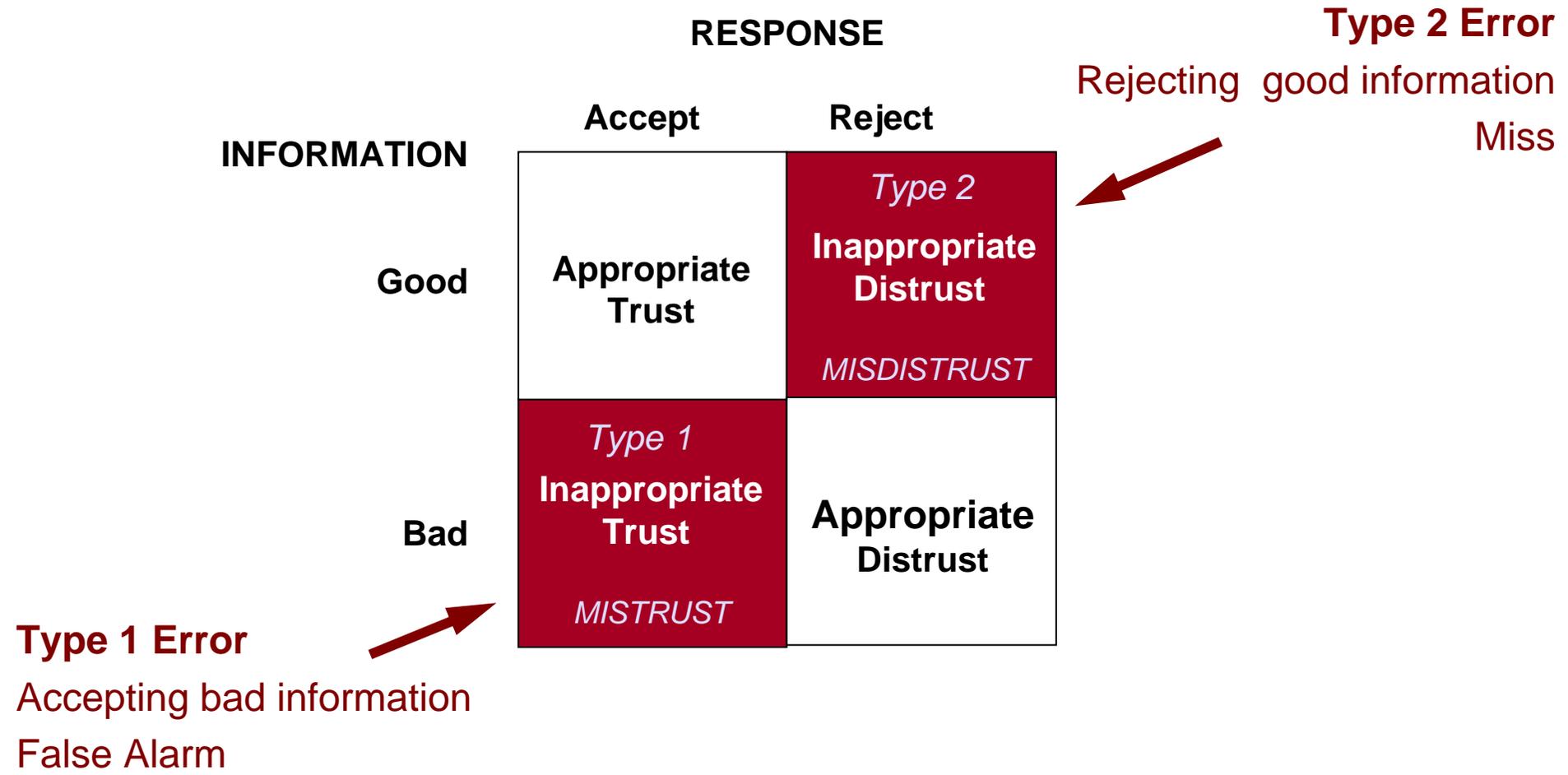
## Individual Differences

- Background
- Trust Attitudes

# Dependent variables

- Objective measure
  - Type 1 Error (proportion of incorrect messages accepted – False alarms)
  - Type 2 Error (proportion of correct messages rejected - Misses)
- These error rates can be converted into the signal detection measures of:
  - $d'$  – sensitivity of the participant to discriminating between signal and non signal information
  - $\beta$  - predisposition to be cautious or liberal in accepting incoming msg when uncertain (AKA bias).
- Reliability rating of sources **before** and **after** experimental task.
- Confidence rating of each message during experiment

# Two Types of Information Trust Error



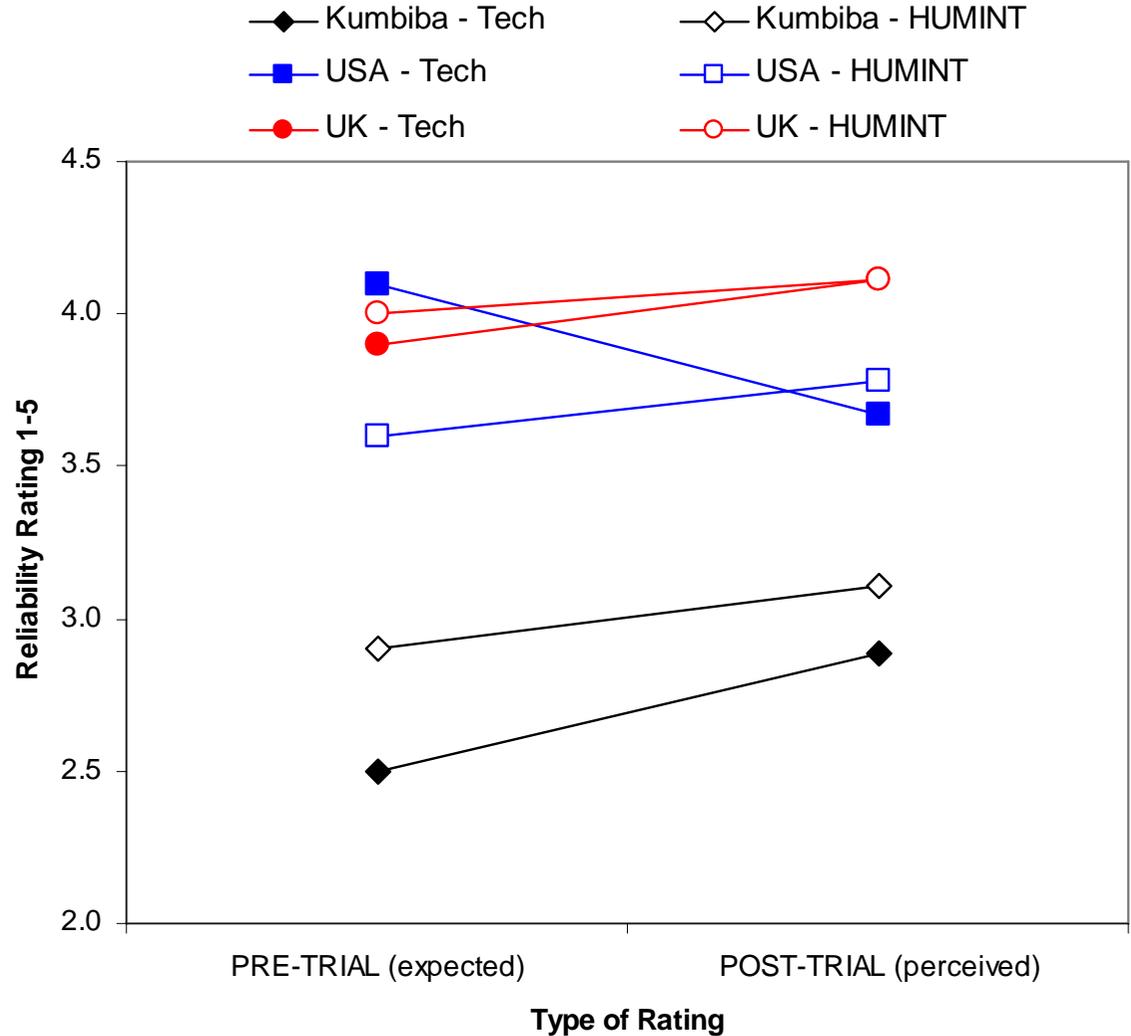
# Findings

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- Source reliability ratings
- Information confidence ratings
- Error rates
- Signal detection analysis

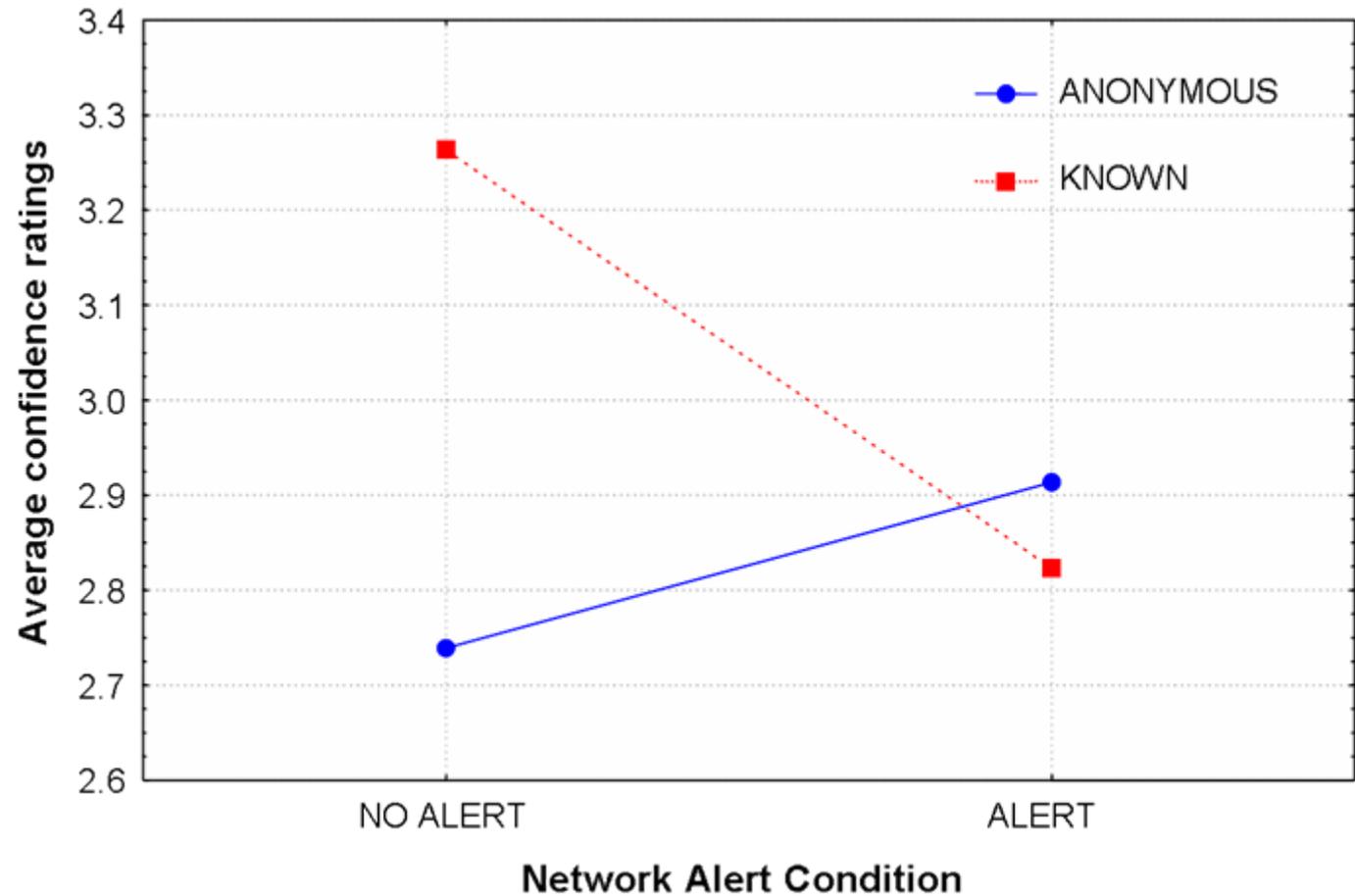
# Source reliability ratings

- Difference between Kumbiba & US/UK sources
- No significant difference between HUMINT and Technical sources
- NB all sources equally unreliable

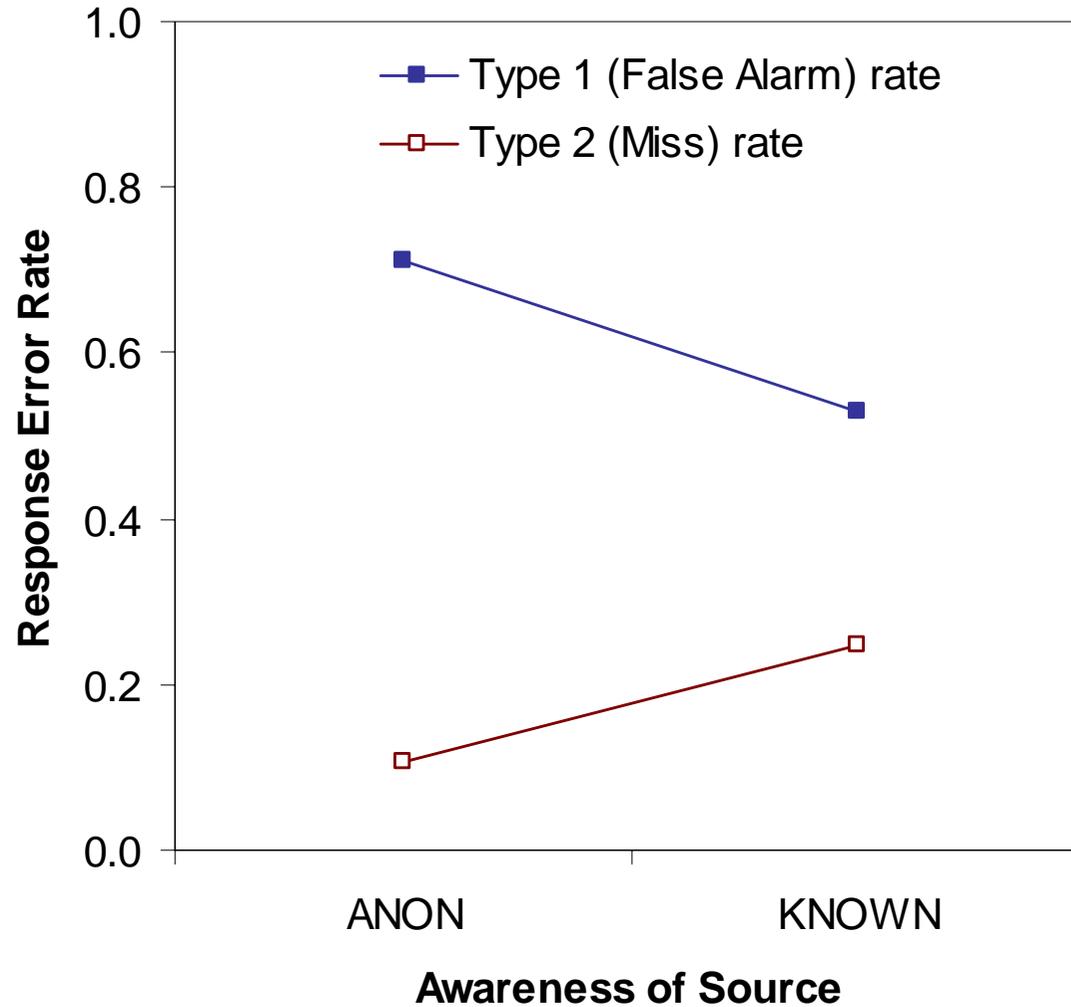


# Information confidence ratings

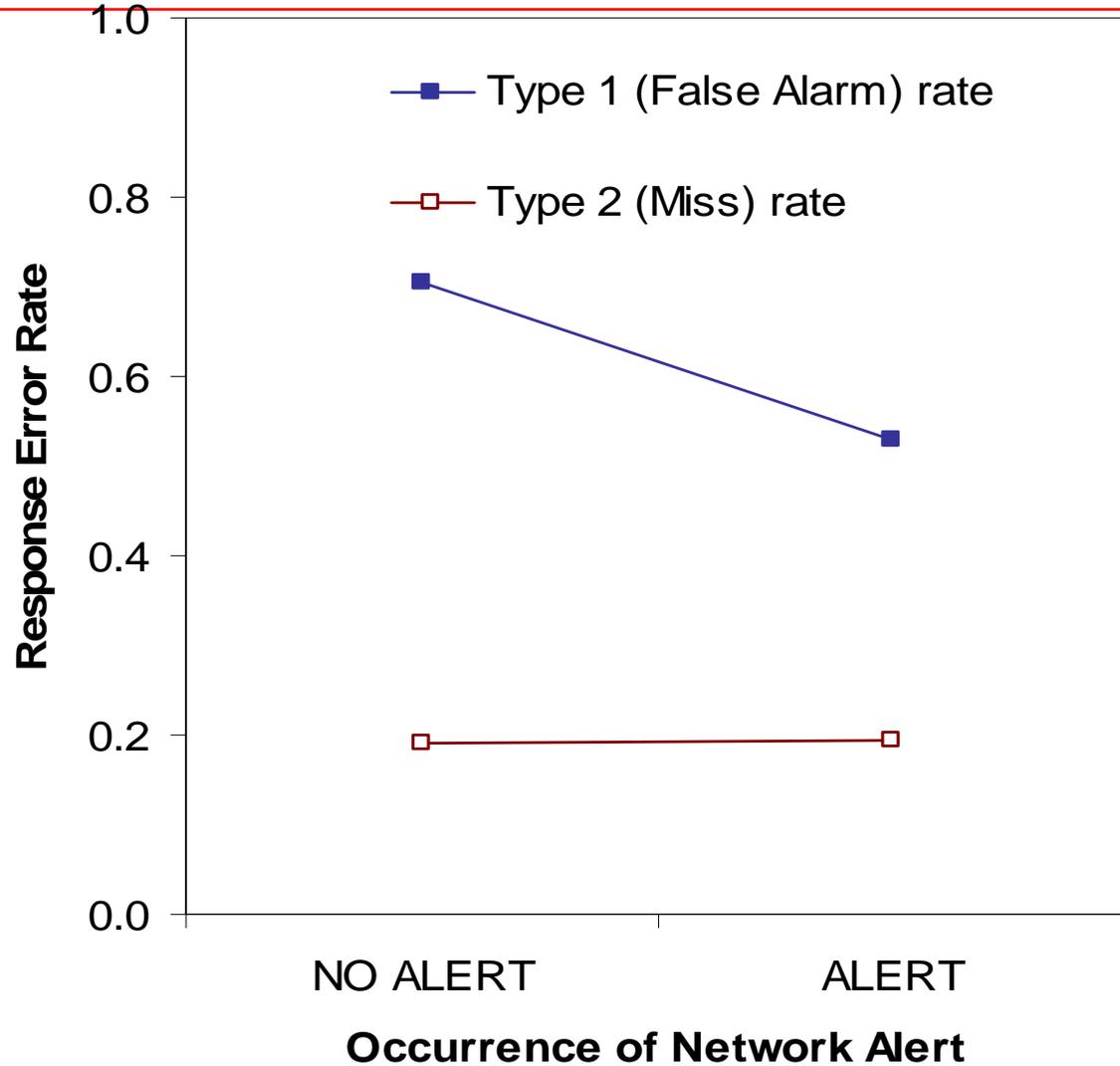
- No main effects
- Interaction between network warning and knowledge of source type



# Error rates – source knowledge

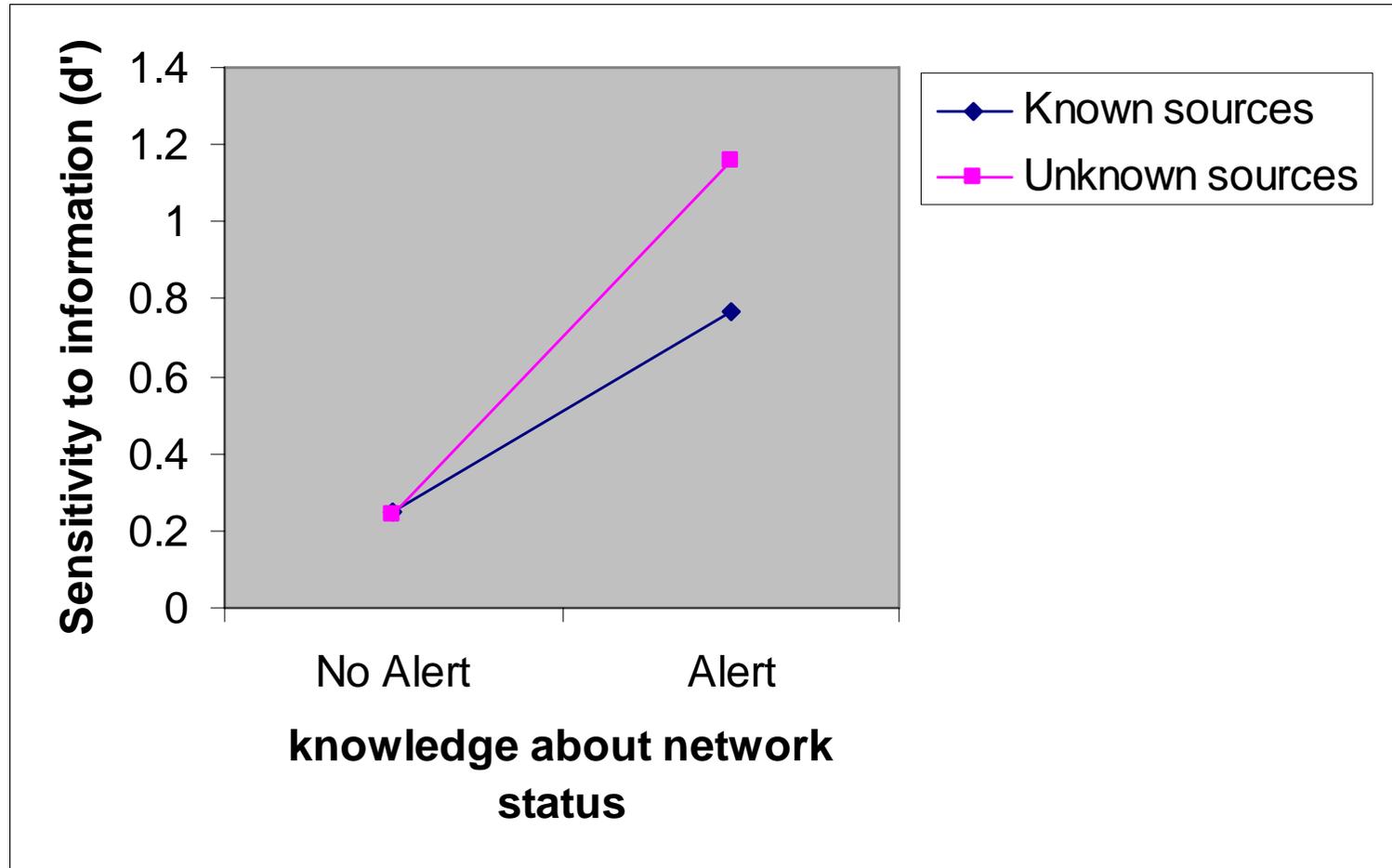


# Error rates – network alert

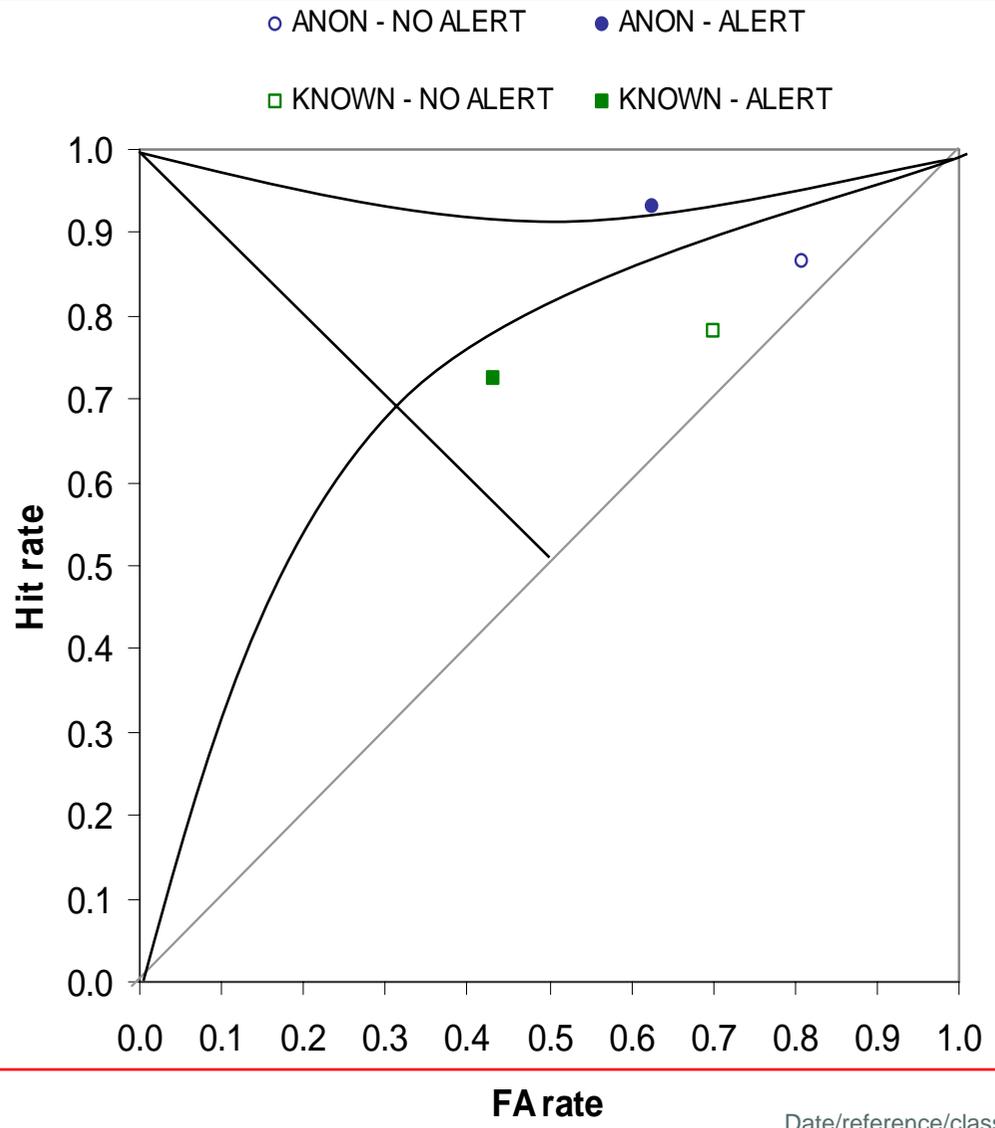


# Error rates – signal detection analysis ( $d'$ )

- No main effects
- Interaction between network warning and knowledge of source type



# SDT – ROC analysis



# Conclusions I

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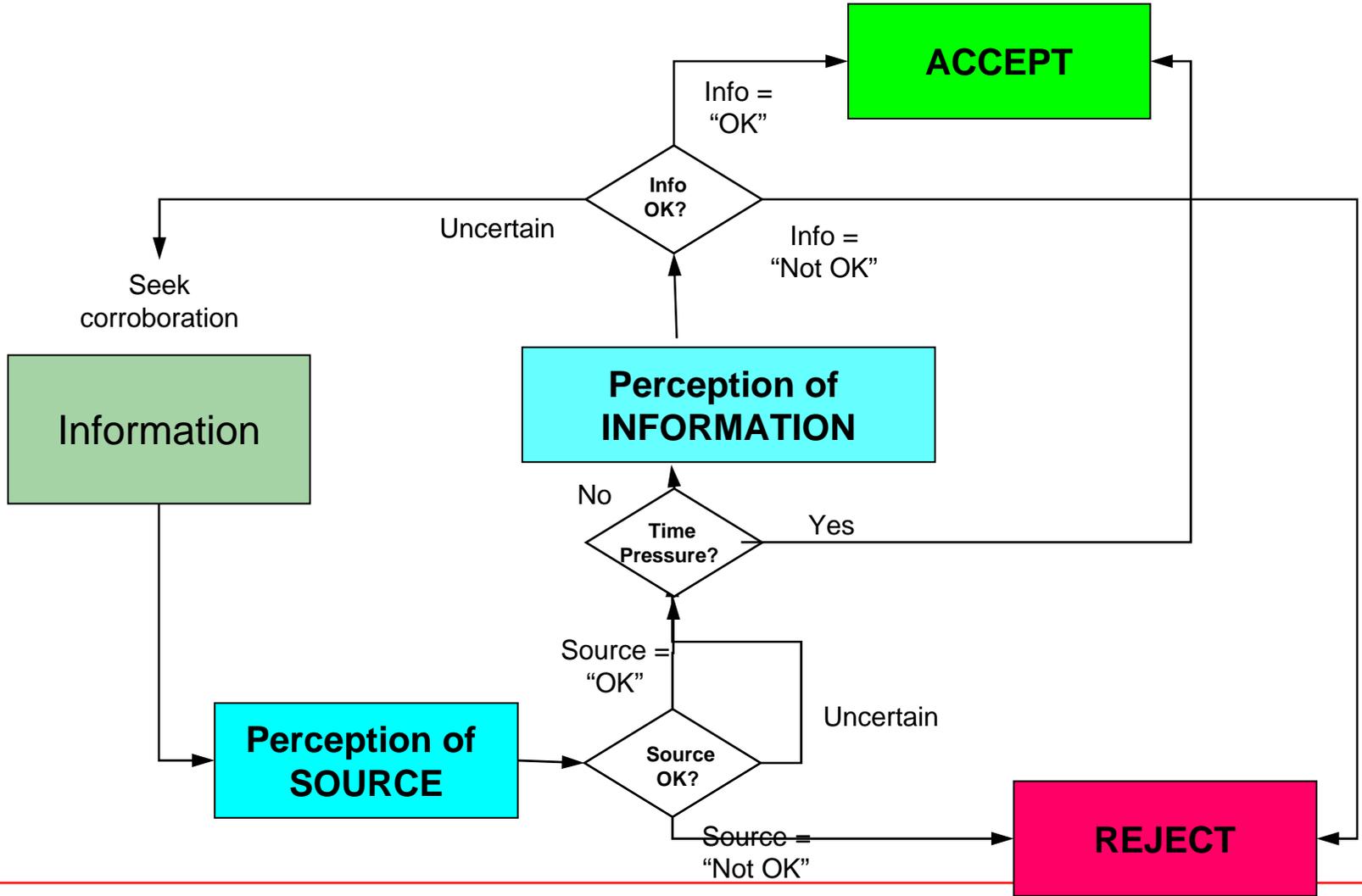
- Findings generally supported hypothesis with small qualification
  - Making sources anonymous improved participants' ability to discriminate between good and bad information
  - This improvement in discrimination was assisted by participants being warned that there may have been a network violation and hence poor data on the network.
- This suggests that the way in which participants treated information in this instance is likely to be the following:
  - Information deemed to come from a probably reliable source could be examined but under time pressure could be automatically accepted (more false alarms)
  - Information deemed to come from a probably unreliable source will be automatically rejected (more misses)
  - Information from a source which is ambiguous or unknown the user will consider the content of the information itself (does it fit with other information) & will seek further evidence to corroborate it.
- Information does not need to come from a definitely reliable source but just probably reliable.

## Conclusions II

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- Thus source is habitually used as the basis for gating incoming information
- Without source knowledge or the source being perceived to be more ambiguous (network alert) the content of information is attended to in more detail.
- This improves the discrimination between good and bad information. ie reducing the type 1 errors (detecting bad information more readily) and discerning more good information from what would have been considered non-trusted sources, resulting in fewer type 2 errors.

# Conclusions III



## Further Questions

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- Can information trust errors be avoided?
  - Information design
  - Task procedures
- Can information trust judgement be improved?
  - Training
  - Feedback
- Do different organisations/cultures show different patterns of information trust?
- Can this type of method be used to assist the balance of investment assessments of different kinds of INT?

# Information Trust and Distrust in a Sensemaking Task

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