Imperial College London

An Initial Exploration into Factors Affecting Safety During Night Visual Approaches for Offshore Helicopters, as Perceived by Pilots

MSc in Human Factors and Safety Assessment in Aeronautics

School of Engineering, College of Aeronautics, 2008/9

Cranfield UNIVERSITY

Summary

Curriculum Vitae

CAA's Offer of Collaboration

MSc Research Methodology Flowchart

MSc Research Dynamics

MSc Research Conclusions

Possible Way Ahead

PhD Research Aims

PhD Research Objectives

Possible PhD Outcome

Questions

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Curriculum Vitae

Navy Officer/Navy Pilot in Brazil (1995-2008)

- BSc (Hons) in Naval Sciences and Electronics
- Helicopter and airplane attack pilot

M.Sc. in Human Factors and Safety Assessment in Aeronautics (2008-2009)

- Cranfield University (UK)
- Sponsored by British FCO
- Thesis in collaboration with the Joint Industry/CAA HSRMC
- Course Director's Prize for Best Thesis in academic year 2008/9

German DAAD – DLR Fellowship for Postgraduate Research (2009-2010)

- ALLFlight Project

Ph.D. in Transport Risk Management – Helicopter Safety (2010-2013)

- Imperial College London (UK)
- Sponsored by Lloyds Register Educational Trust (LRET)

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CAA's Offer of Collaboration for Research

April 2009

Safety Assessment of GPS-based offshore helicopter approaches

Safety Assessment of the visual segment of the instrument approach

- Task description
- Hazard identification
- Conflict scenario identification
- CS' severity X likelihood analysis
- Production of a report

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CAA's Offer of Collaboration for Research

April 2009

Safety Assessment of GPS-based offshore helicopter approaches

Safety Assessment of the visual segment of the instrument approach

- **TASK DESCRIPTION**
- **HAZARD IDENTIFICATION**
- **CONFLICT SCENARIO IDENTIFICATION**
- CS' severity X likelihood analysis
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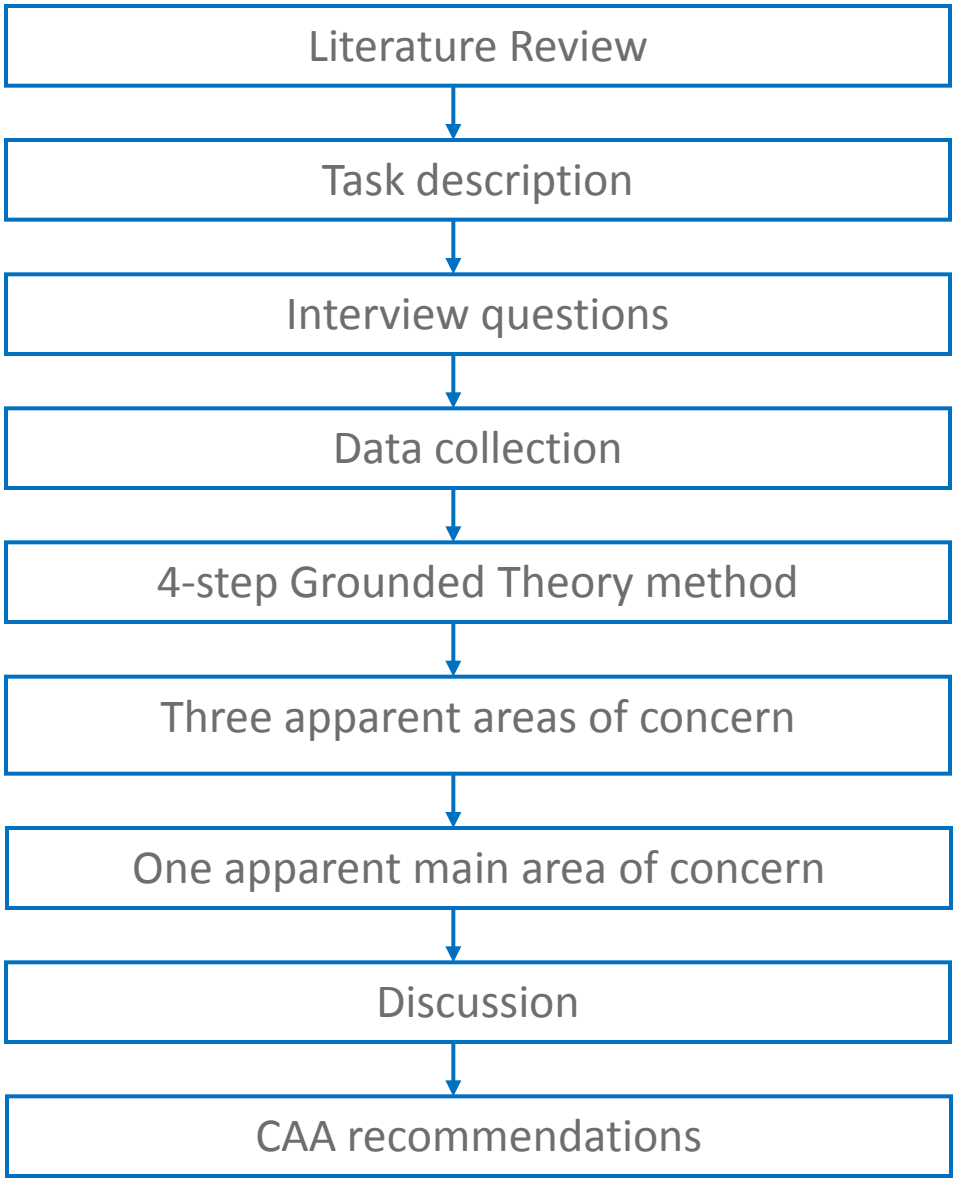
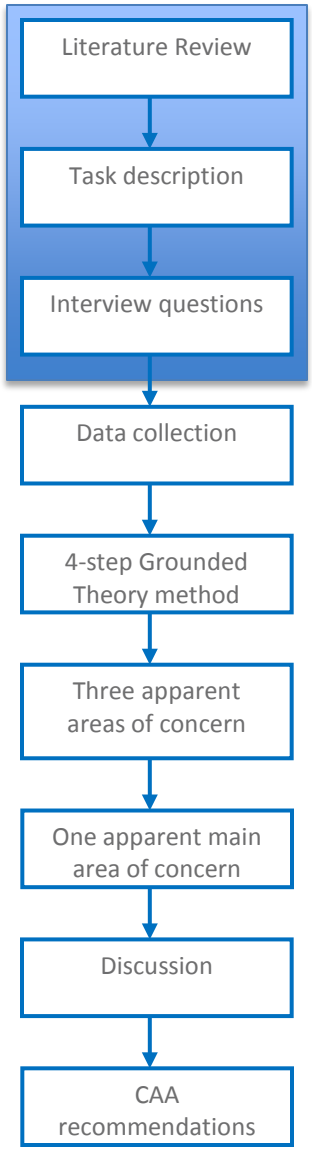
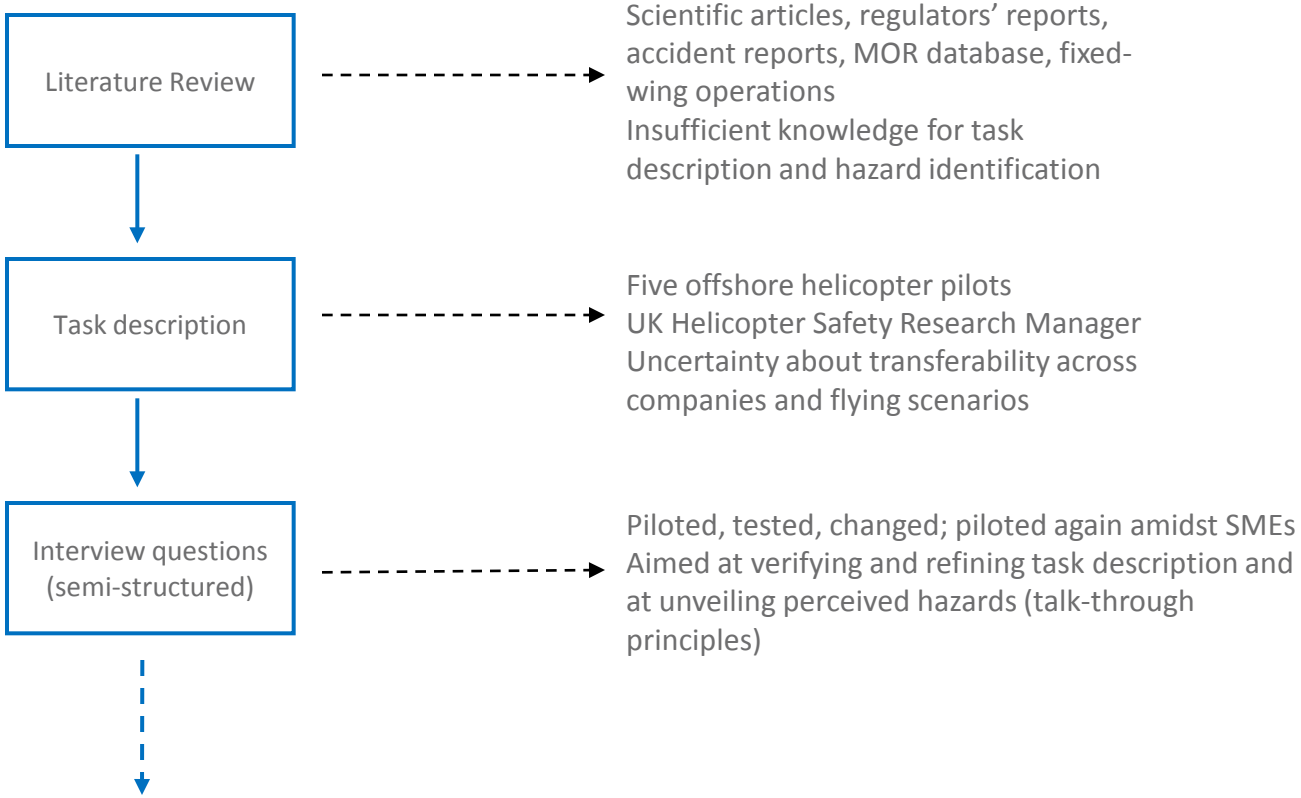
Research Methodology Flowchart



Research Dynamics





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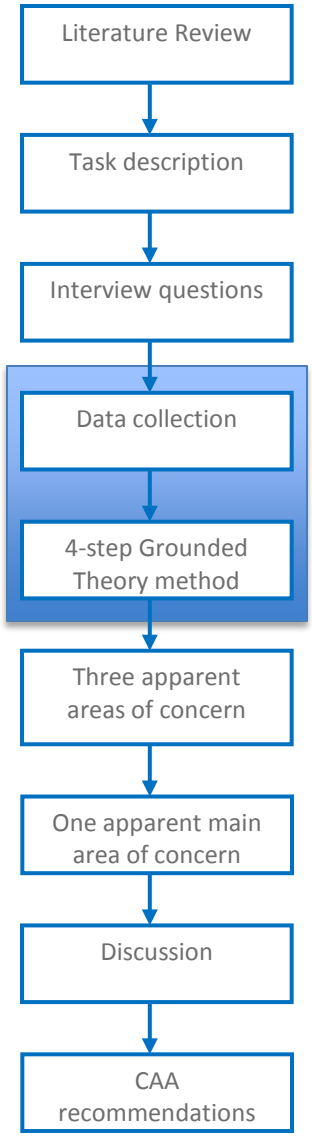

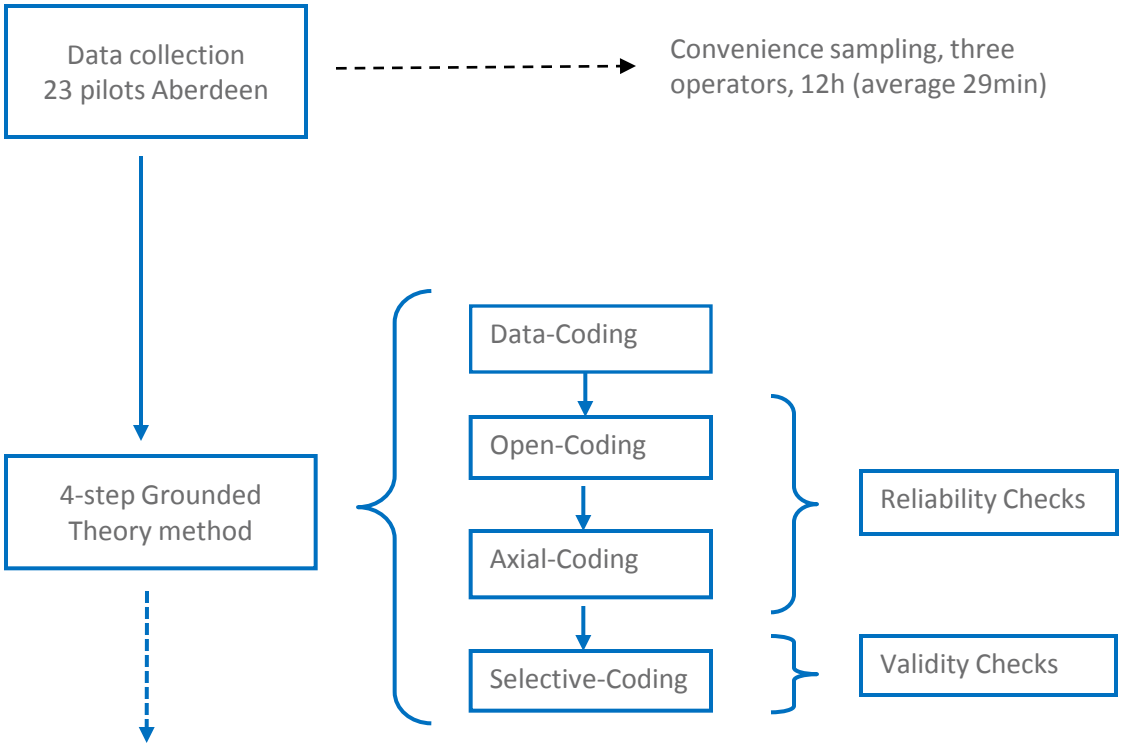

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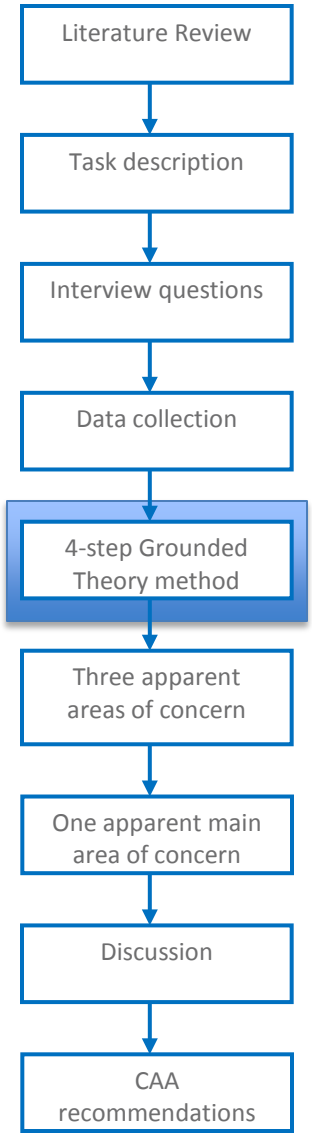
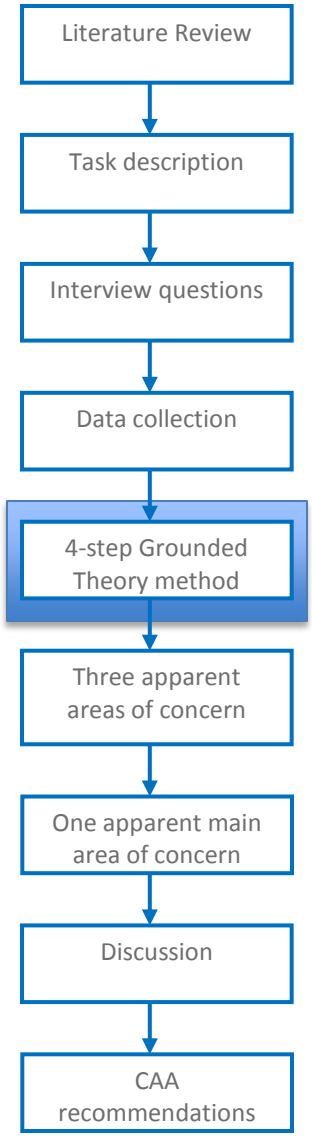


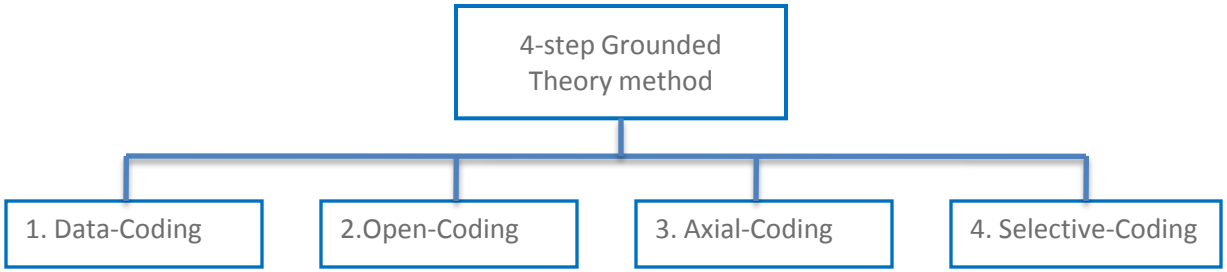
Grounded Theory

"Theory derived from the data is more likely to resemble the "reality" than is theory derived by putting together a series of concepts based on experience and solely through speculation."

Strauss and Corbin (1998, pp.12)

Research Dynamics





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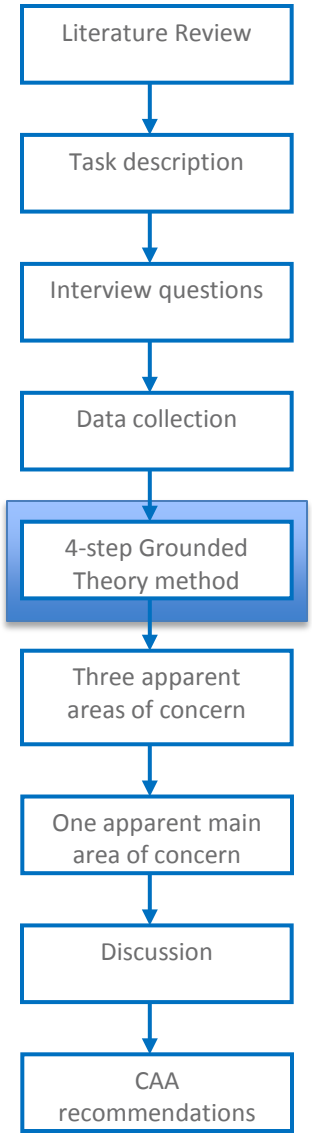
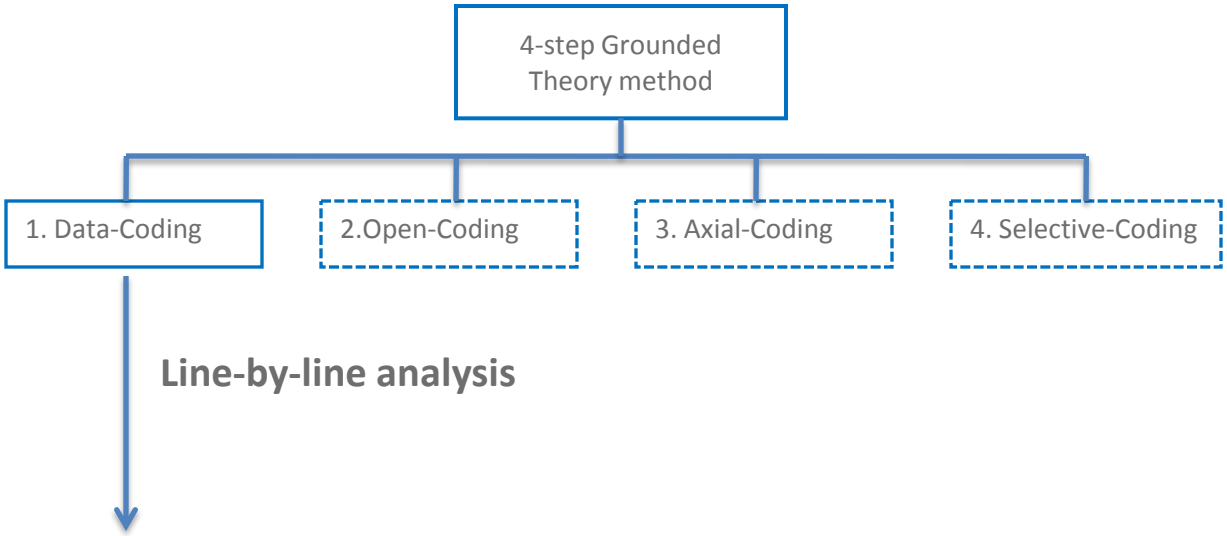
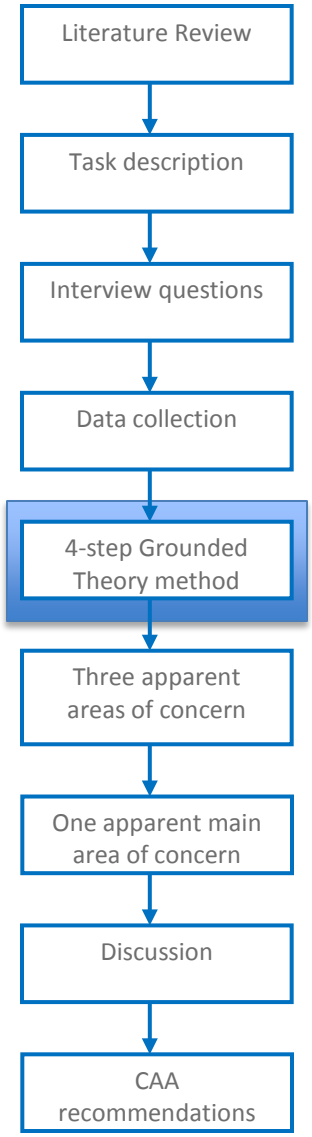
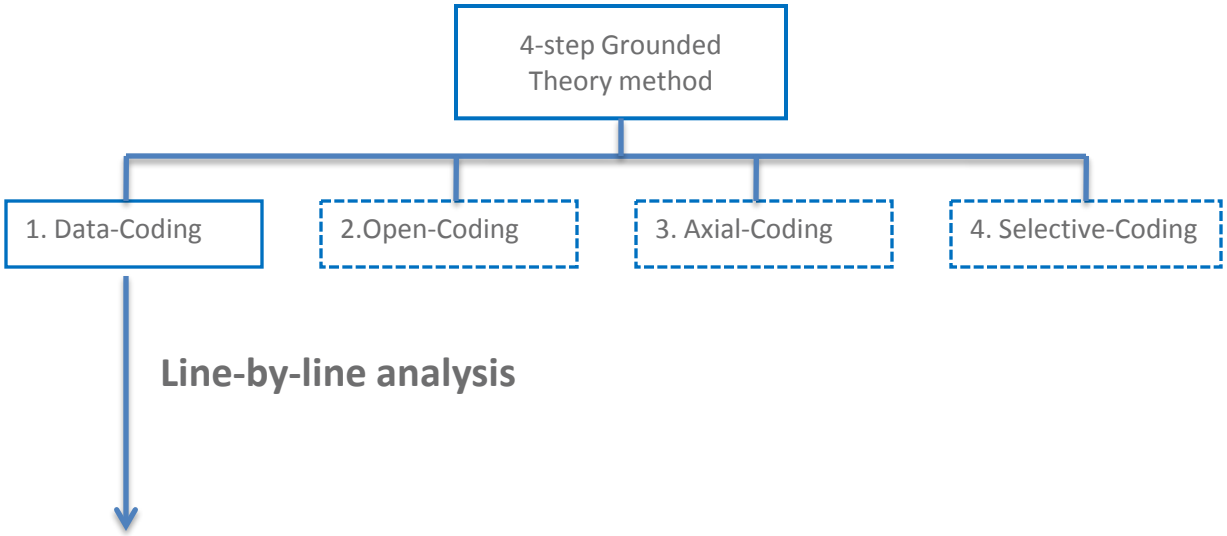




"It starts off very much as an instrument approach in the set up phase and you're flying on the instruments almost wholly because if you look outside the illusions are compelling!"

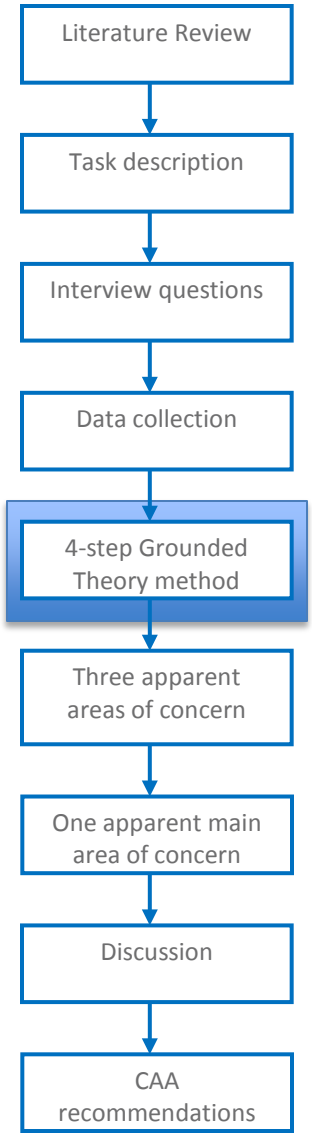
Research Dynamics

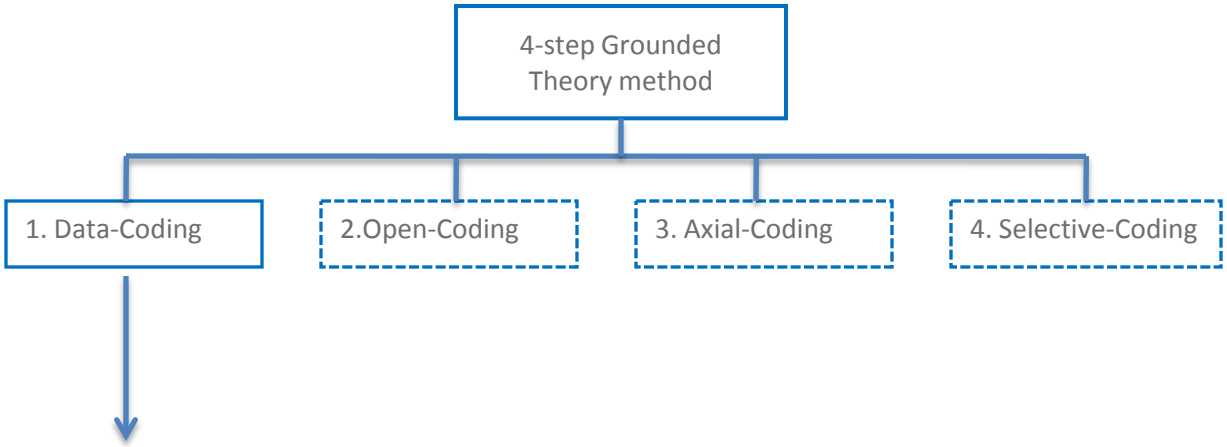




"It starts off very much as an instrument approach in the set up phase and you're flying on the instruments almost wholly because ***IF YOU LOOK OUTSIDE THE ILLUSIONS ARE COMPELLING!****"*

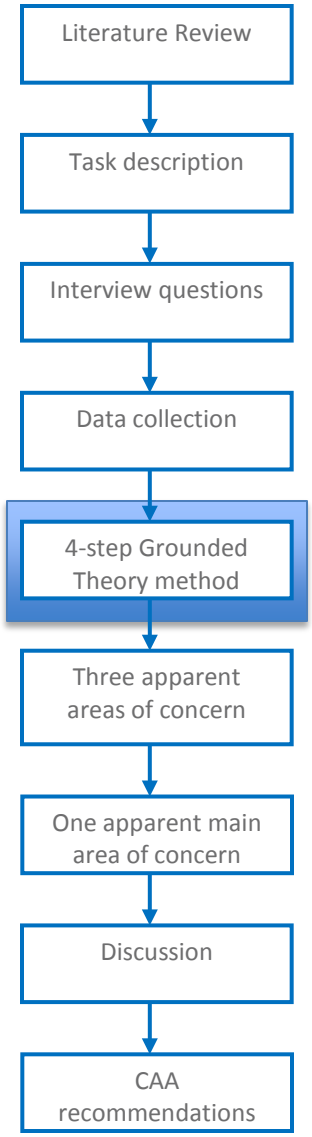
Research Dynamics

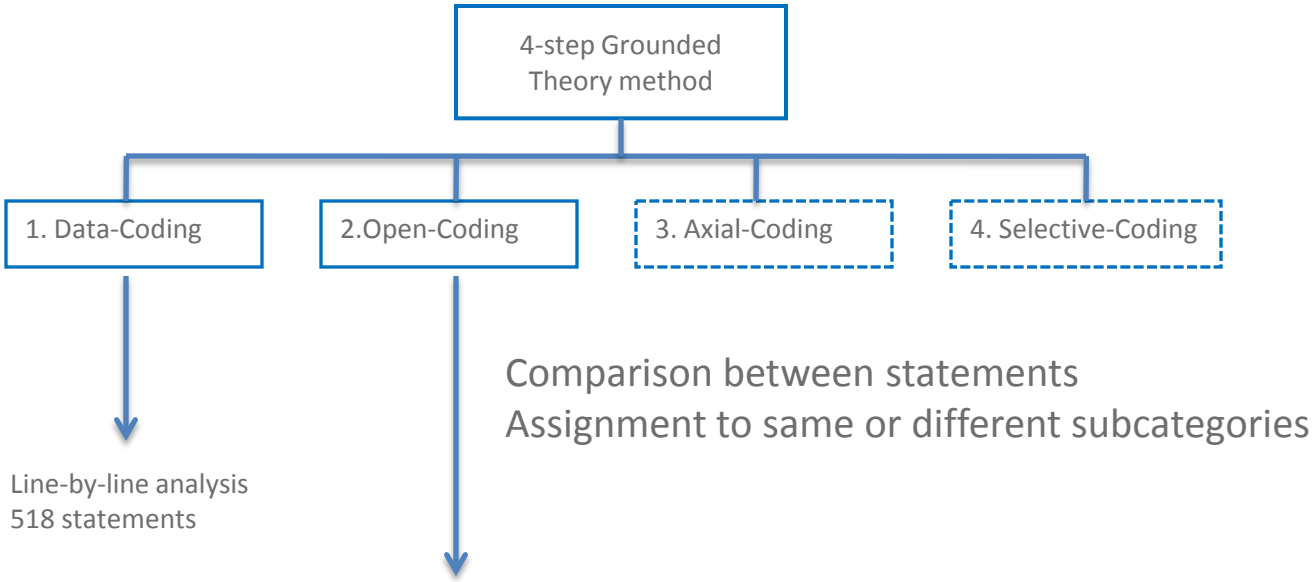




Line-by-line analysis
518 statements

Research Dynamics



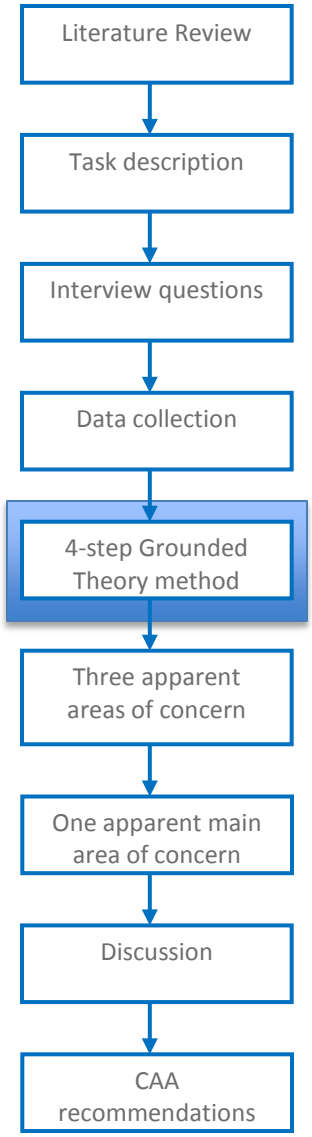


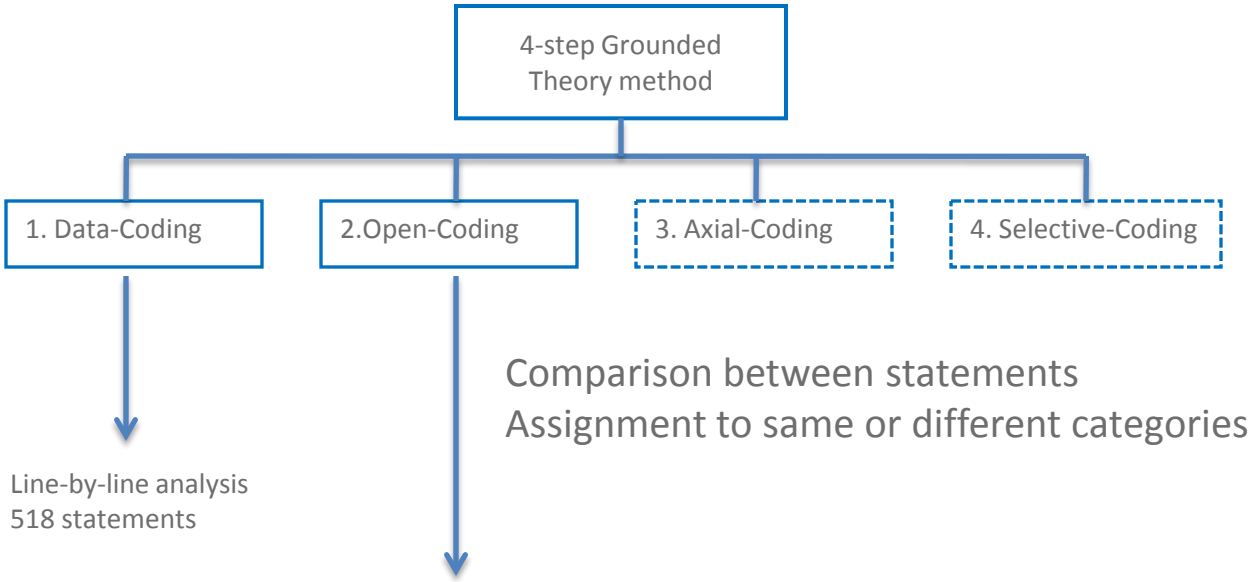
"...while I look at the rig I ... m at 1 mile or 5 miles, so the range ir ... ally erroneous..."

Different Subcategories

"...sor ... er to take out the automatics..."

Research Dynamics



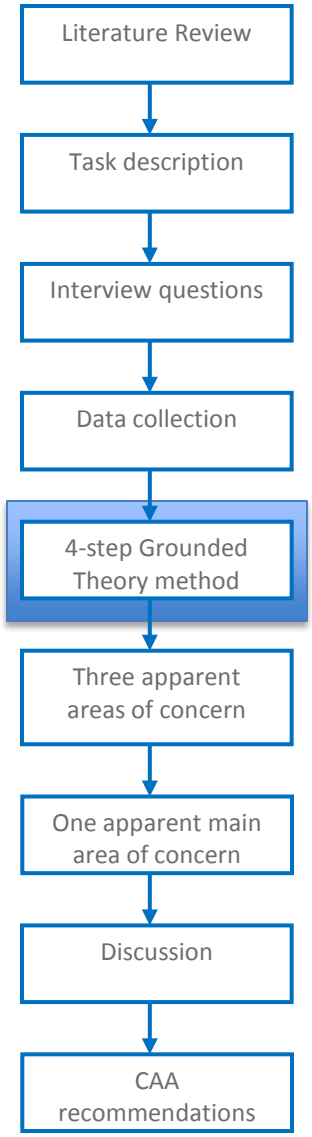


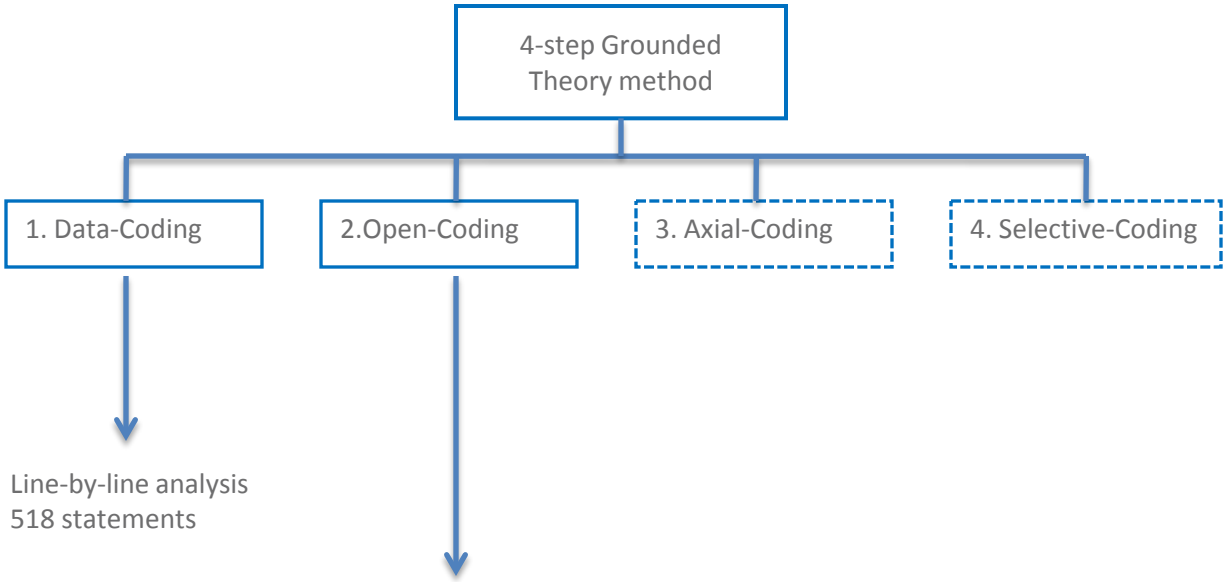
"...on the clear nights when you ha ... m seas and you have the so called gold fish ... cts, when it's all misty. Say you get no depth ... on at all [...] with all this misty lights it's very

"...flat sea ... ssessment of height of the sea is very difficult ... have the textural cues of the sea..."

Same Subcategory

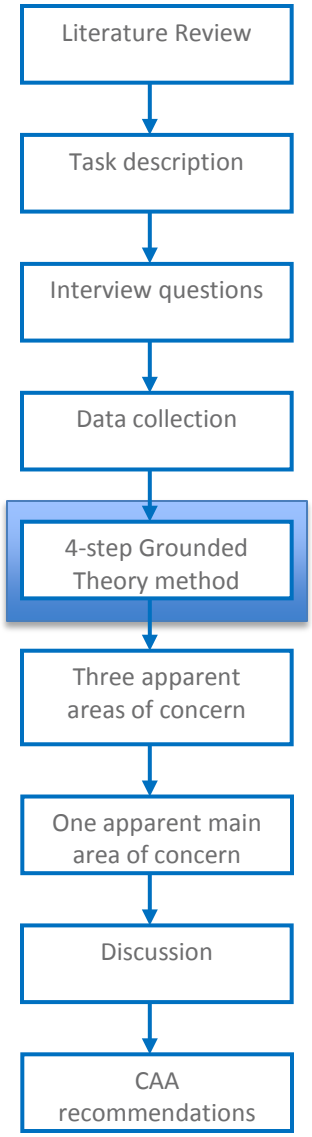
Research Dynamics

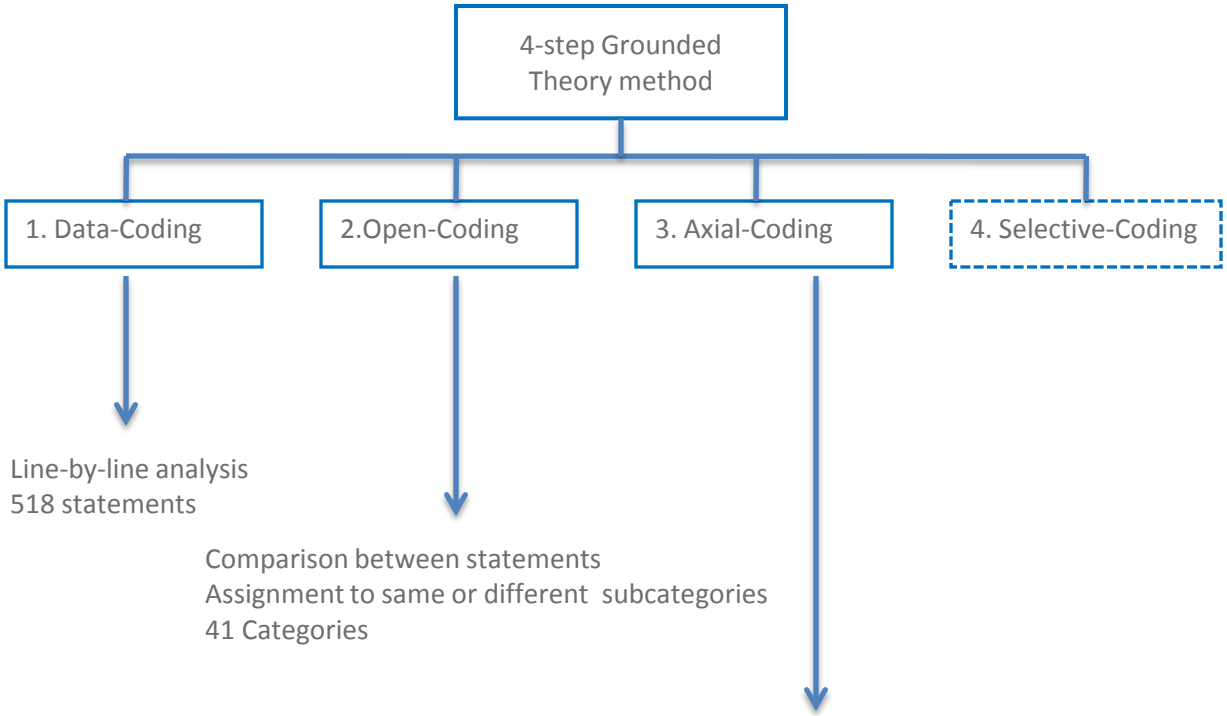




Comparison between statements
Assignment to same or different categories
41 Categories

Research Dynamics

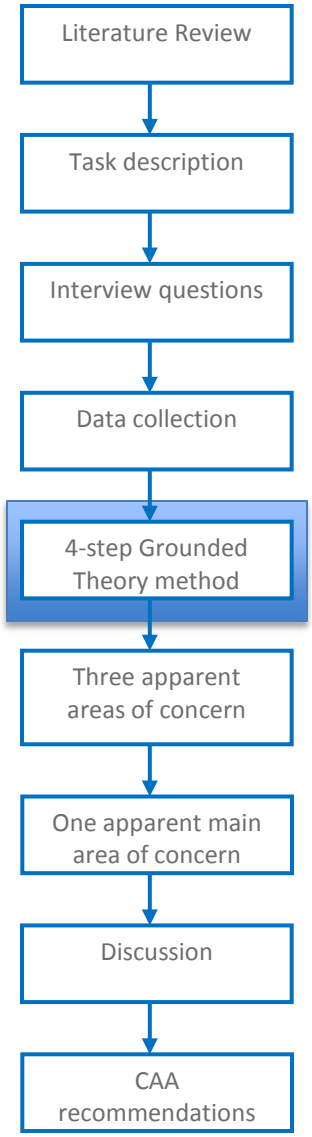


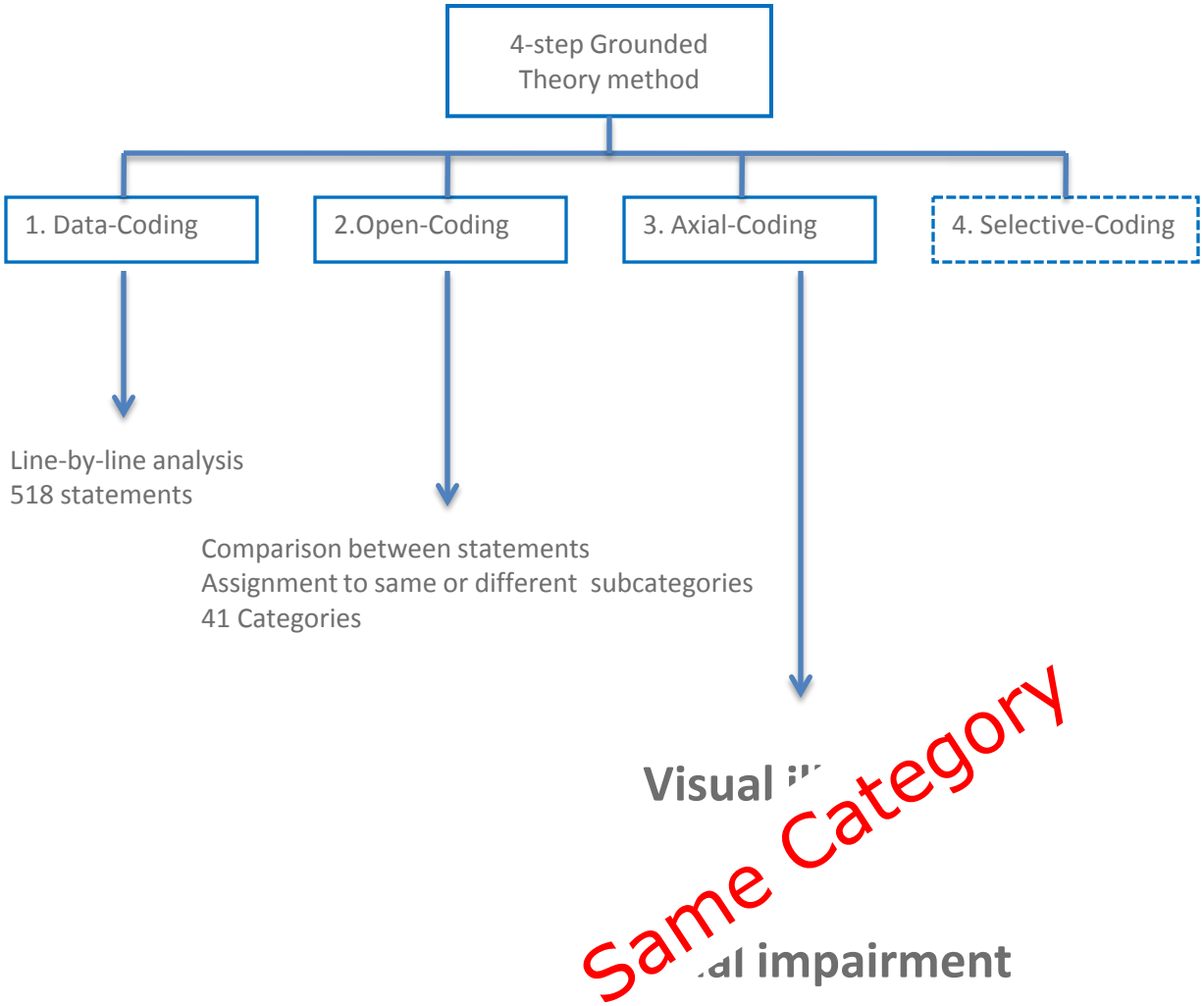


"the process of relating categories to their subcategories"

(Strauss and Corbin, 1998, pp.124)

Research Dynamics





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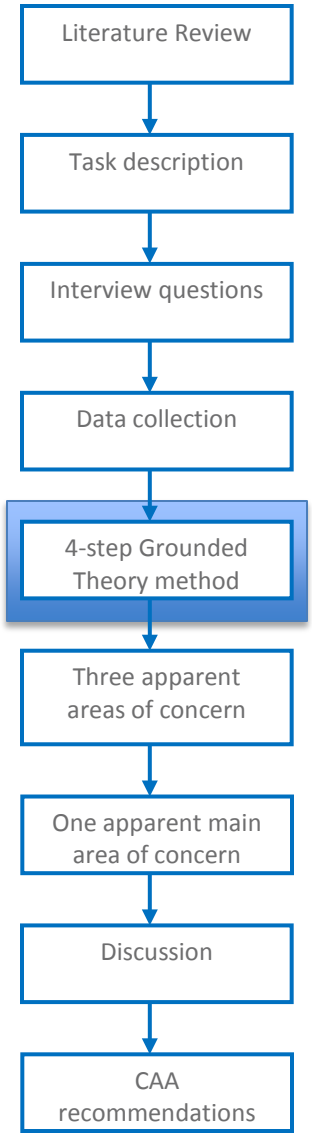

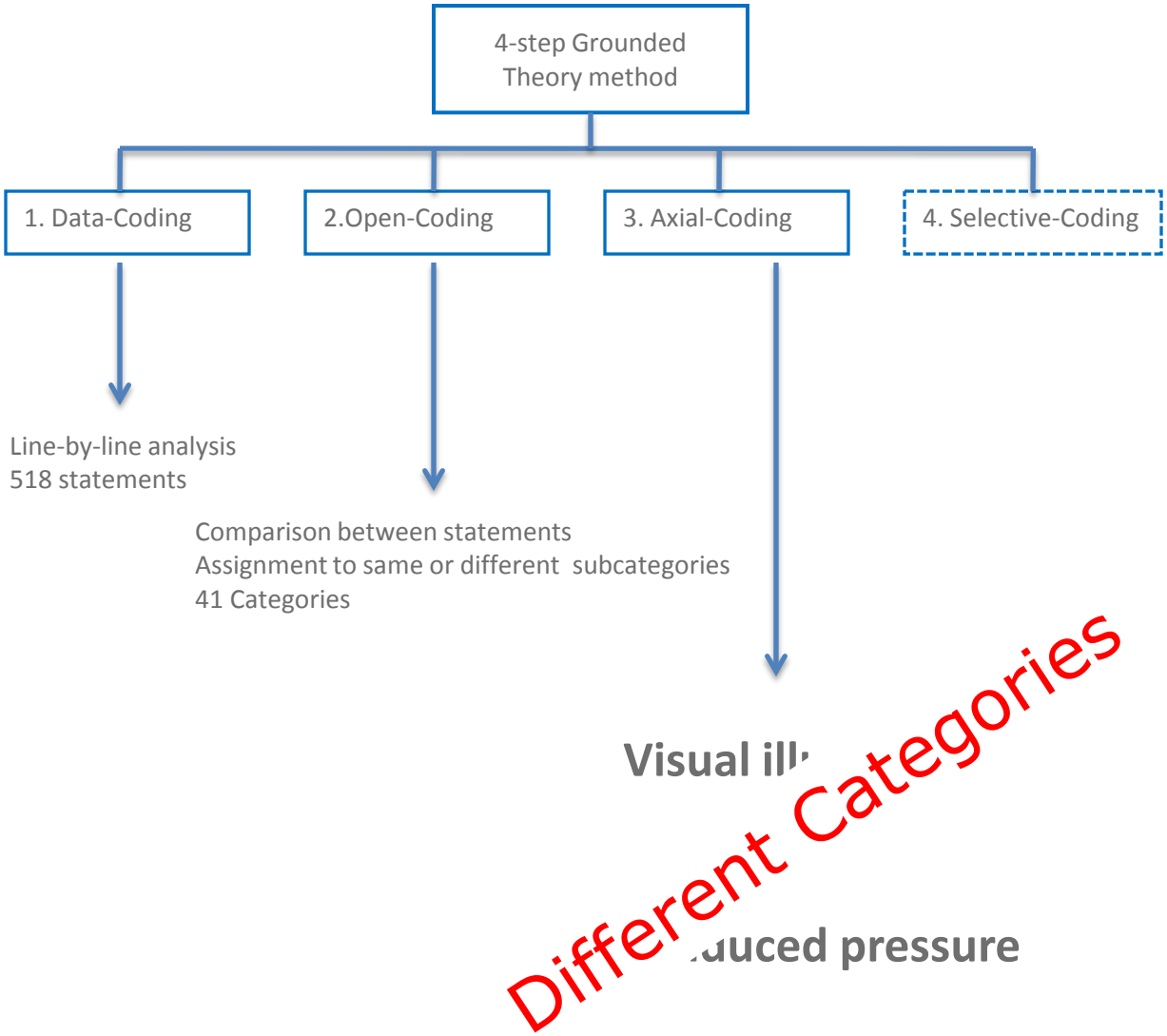

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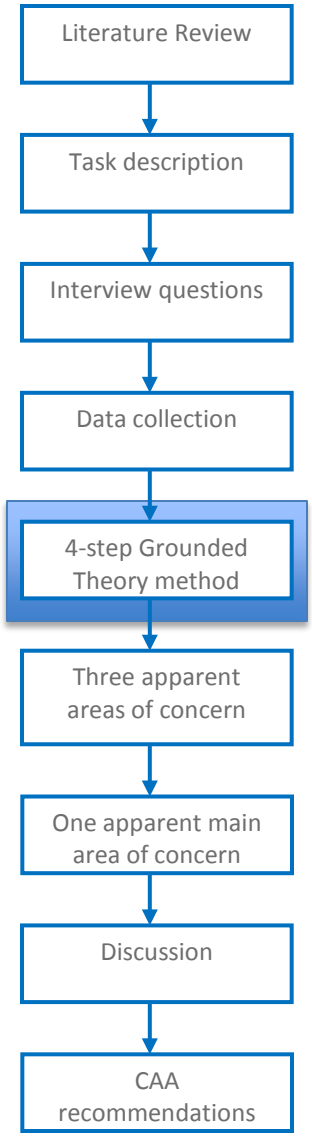

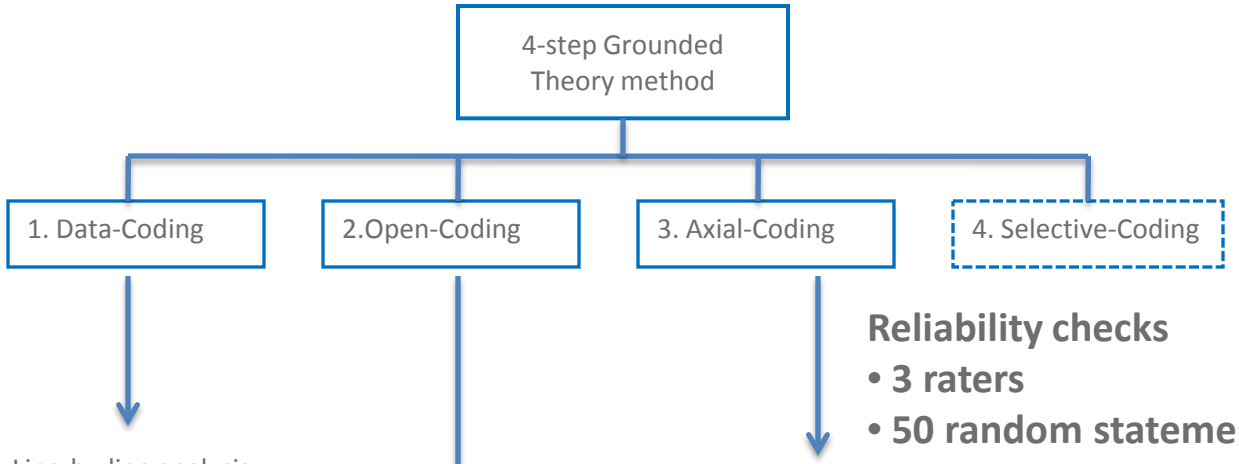

Line-by-line analysis
518 statements

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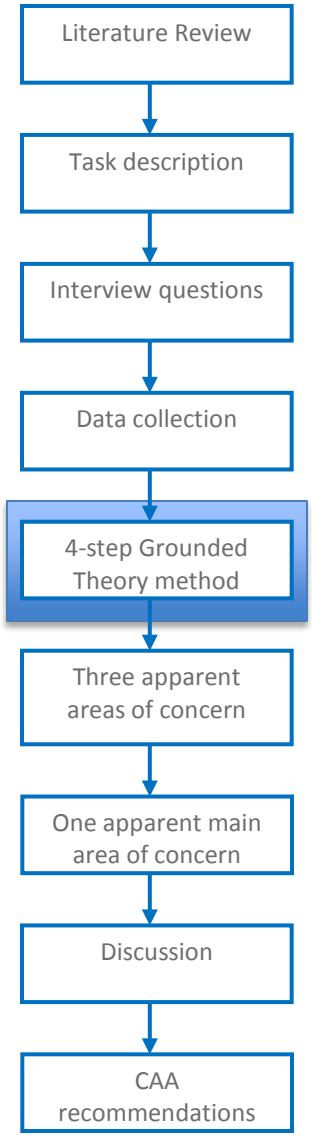
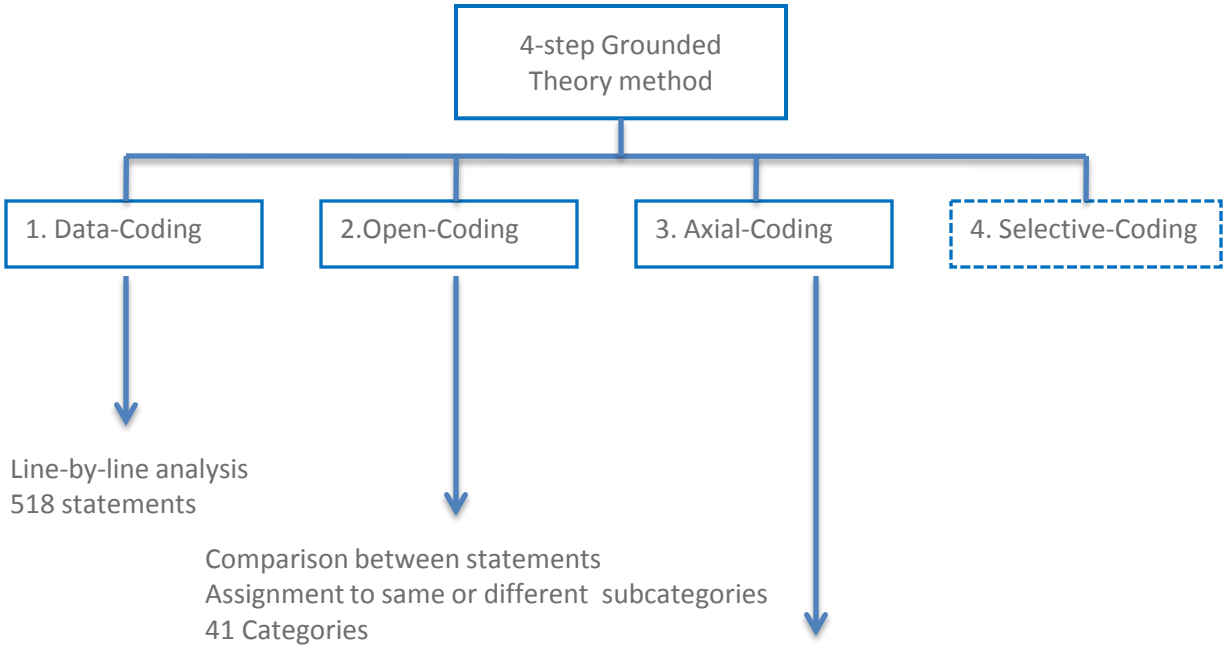
Reliability checks
- **3 raters**
- **50 random statements each**

Axial Code	Open Codes
Perceptual problems	Visual illusions
	Depth and texture perception
	Seeing small rigs
	Identifying the helideck
	Interpretative ovality technique
	Circling to the far side
	Impaired vision

Research Dynamics



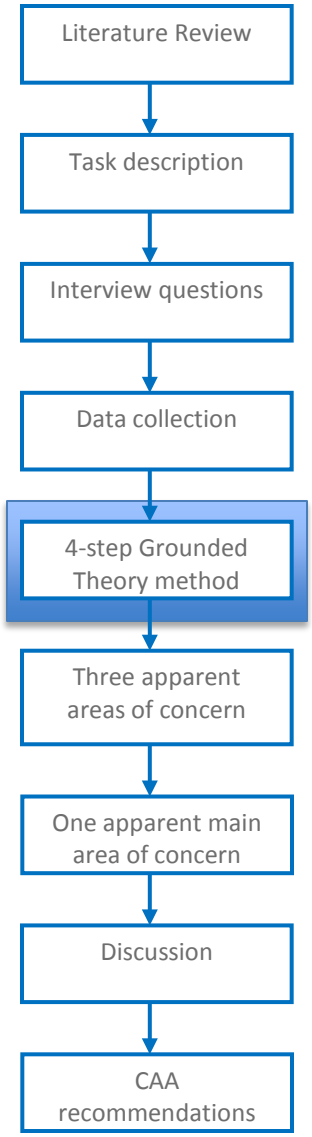


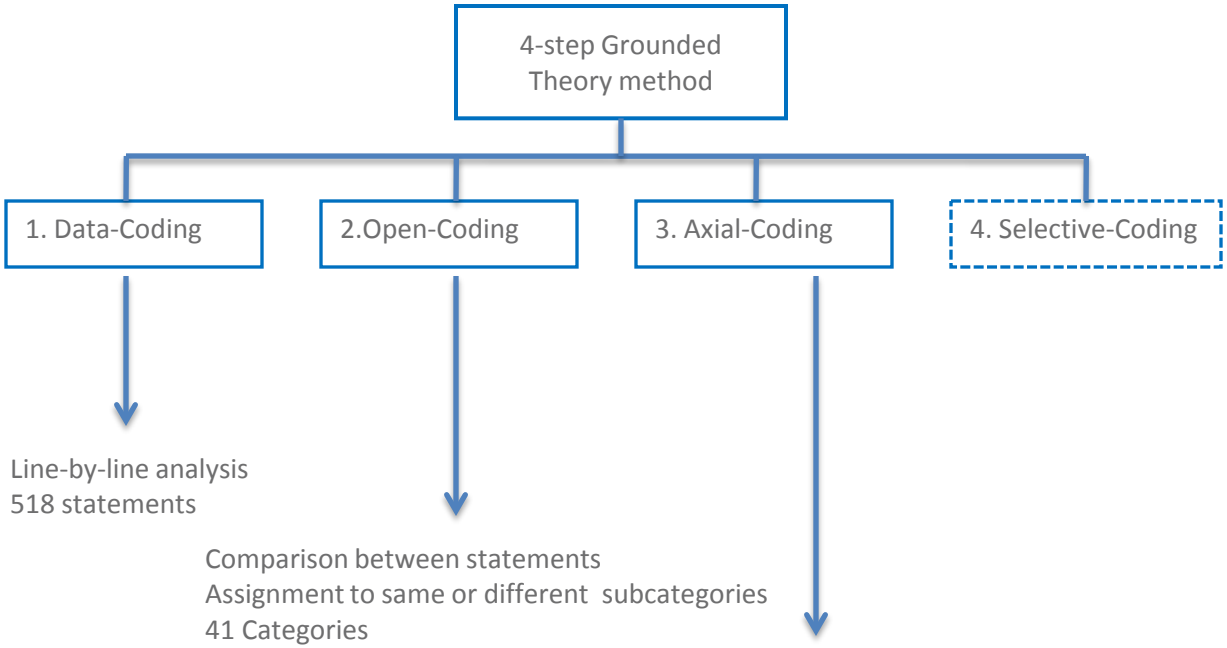
Reliability checks

- **3 raters**
- **50 random statements each**
- **minimum agreement 70%**

(Fleiss, 1981)

Research Dynamics





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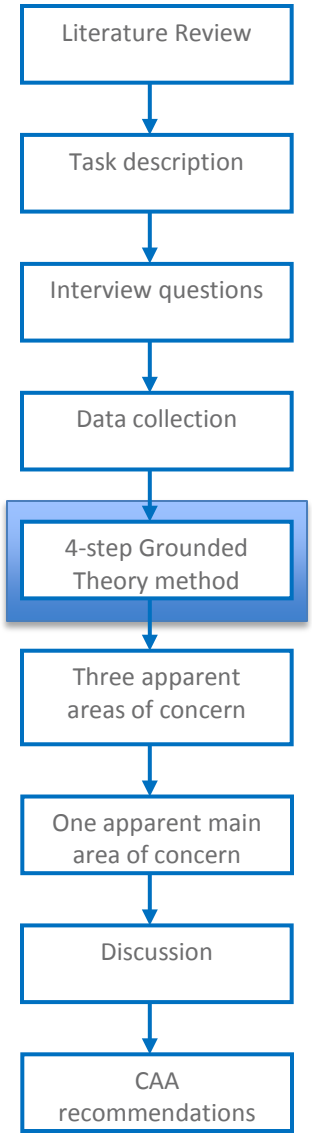
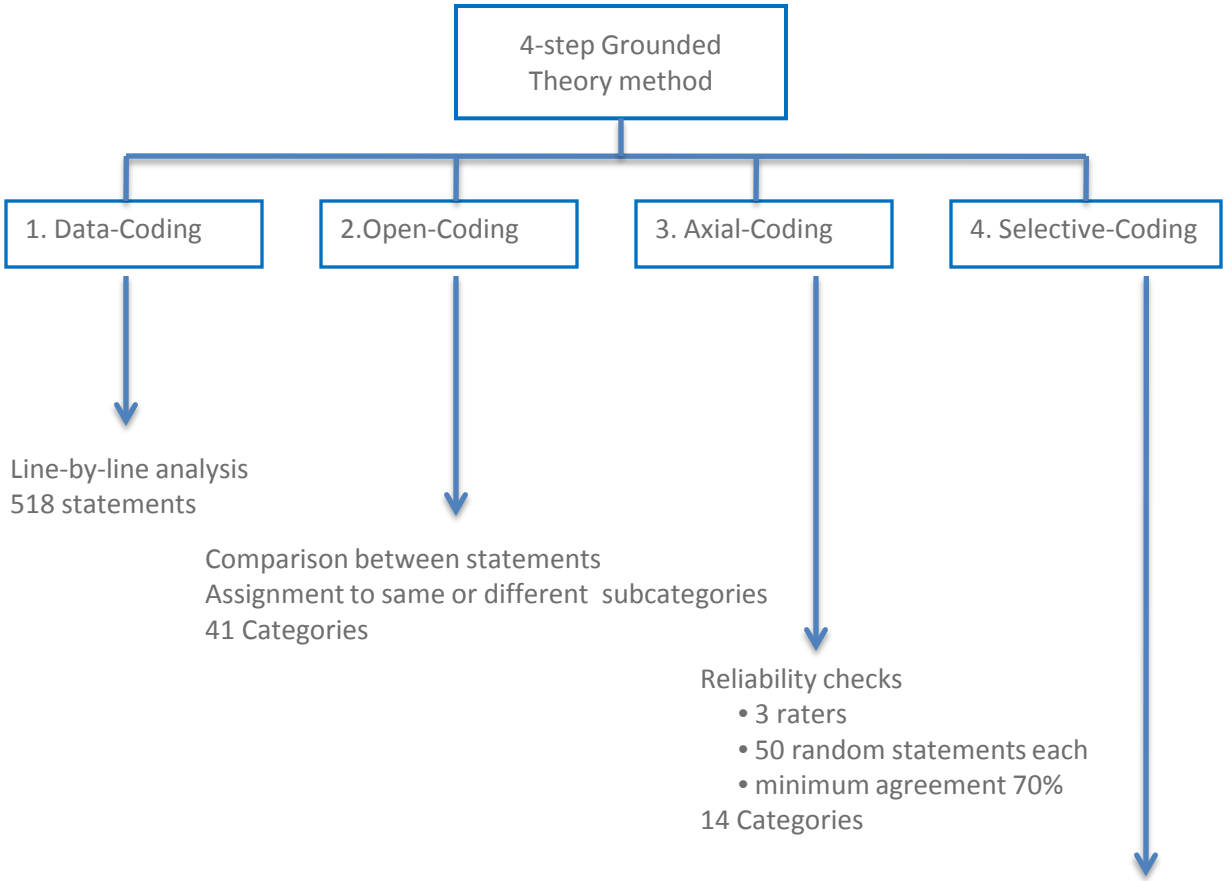
14 Categories

Research Dynamics

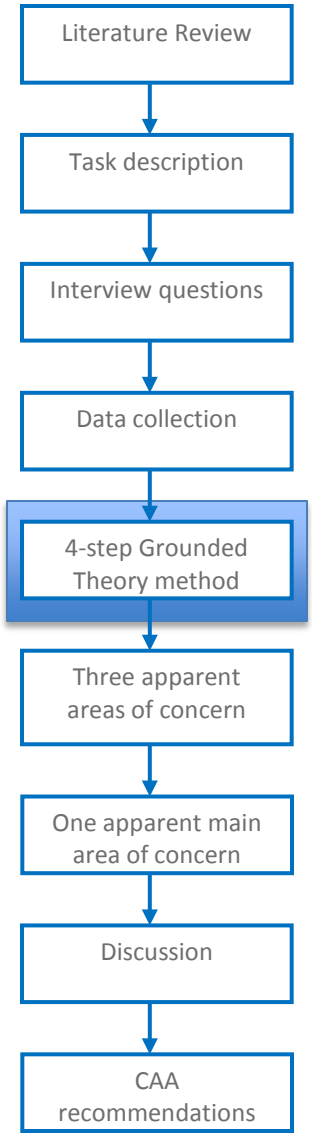


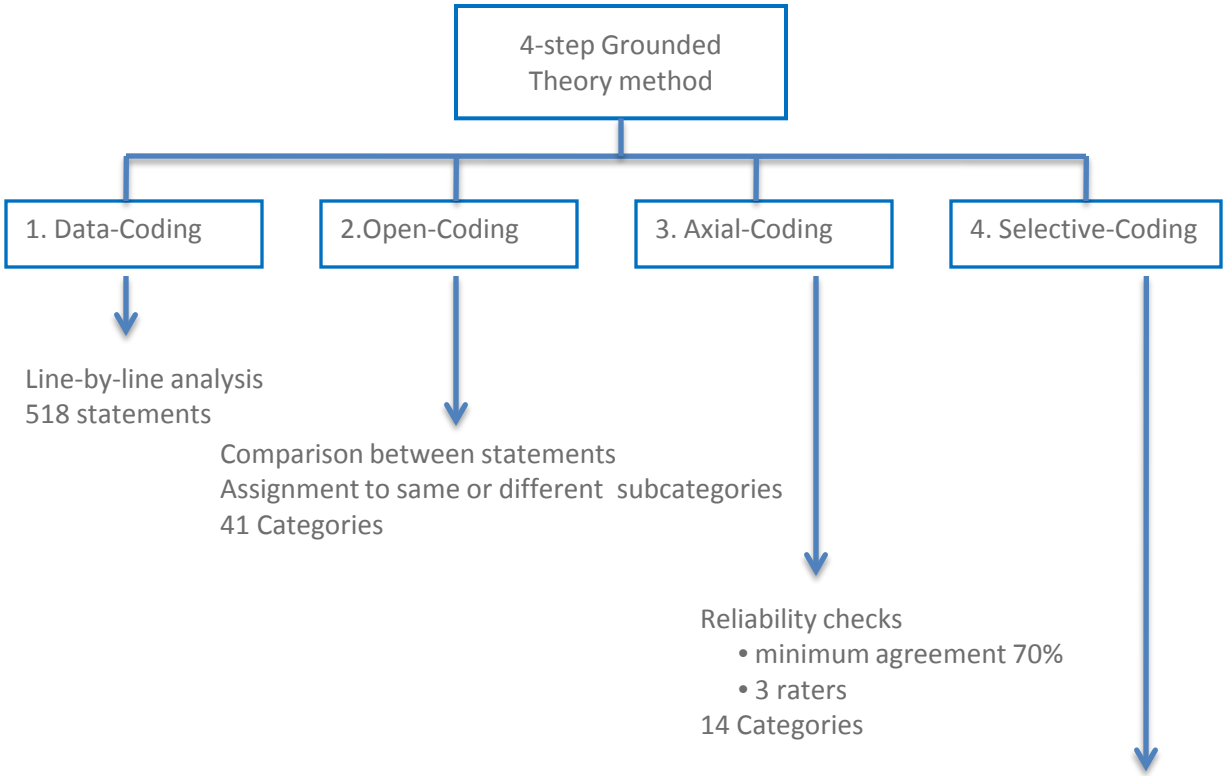


"the process of integrating and refining the theory" through a descriptive story *"of what the axial coding has produced"*

(Strauss and Corbin, 1998, pp.143-145; Robson, 2002, pp. 495)

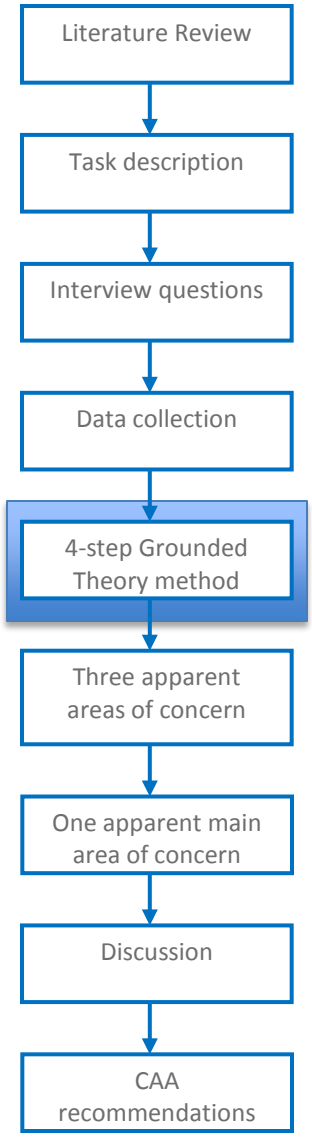
Research Dynamics

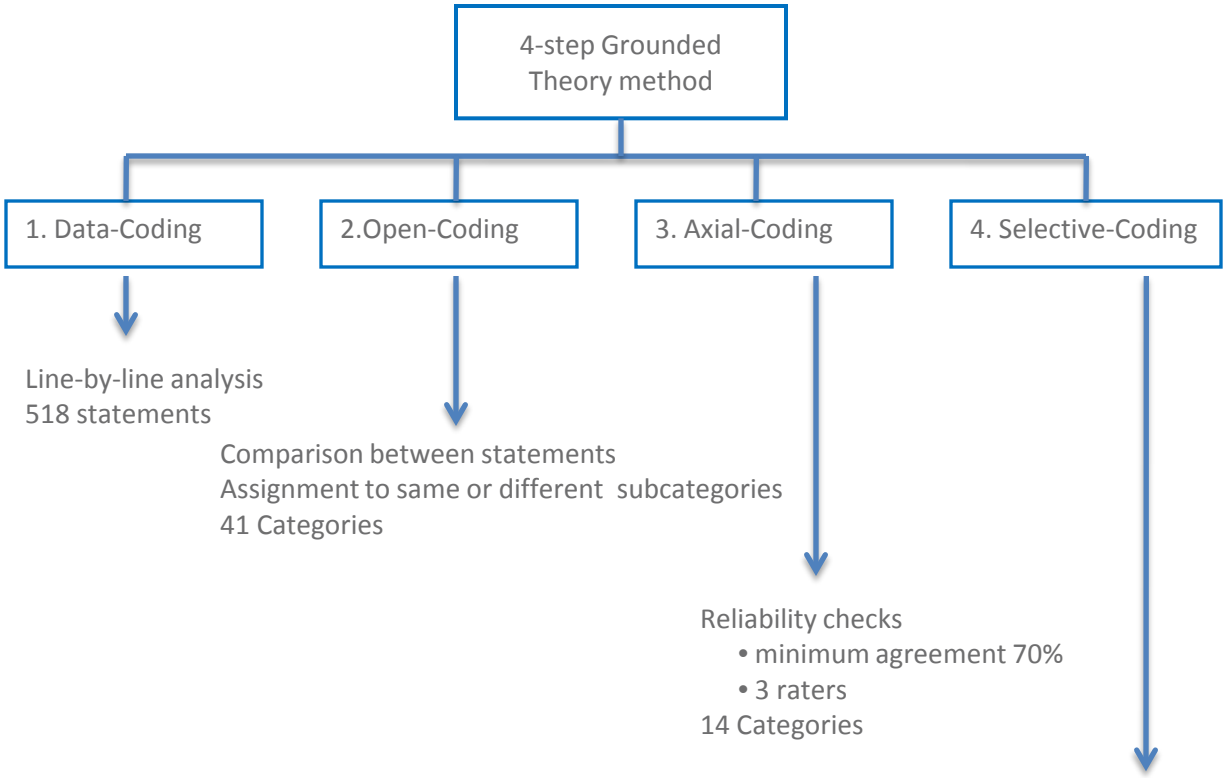




"The problems offshore helicopter pilots face while flying visual night approaches over the sea might relate to perceptual constraints caused by illusive, insufficient or absent visual cues to support flight conducted with external references, conditions which can be worsened by some particular environmental states [...]"

Research Dynamics



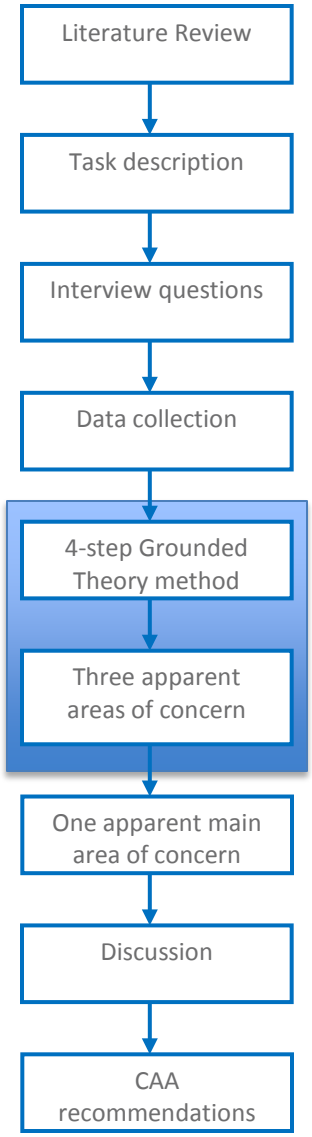


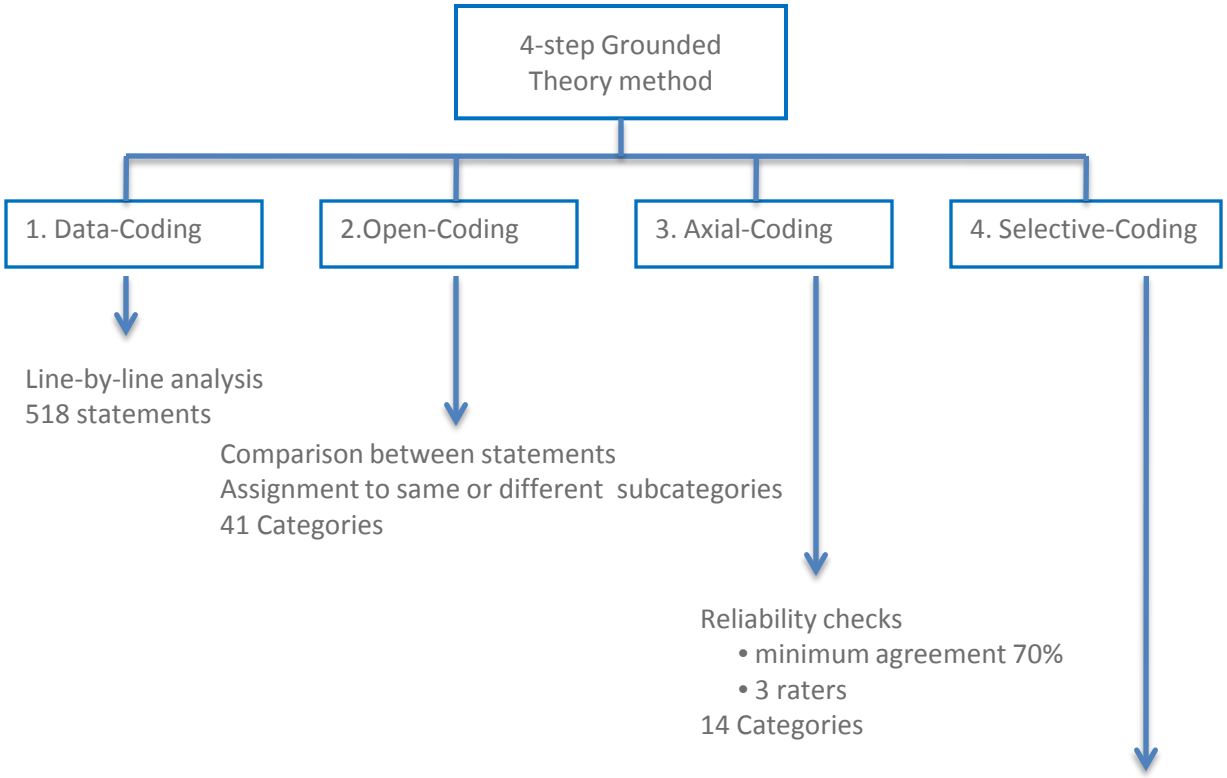
Validity

- **Story comparison against raw data**
- **6 SME**

(Strauss and Corbin, 1998, pp.159)

Research Dynamics





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From the story, 3 areas of concern

- **Visual Spatial Disorientation**
- **Decision-Making**
- **Rig Surroundings**

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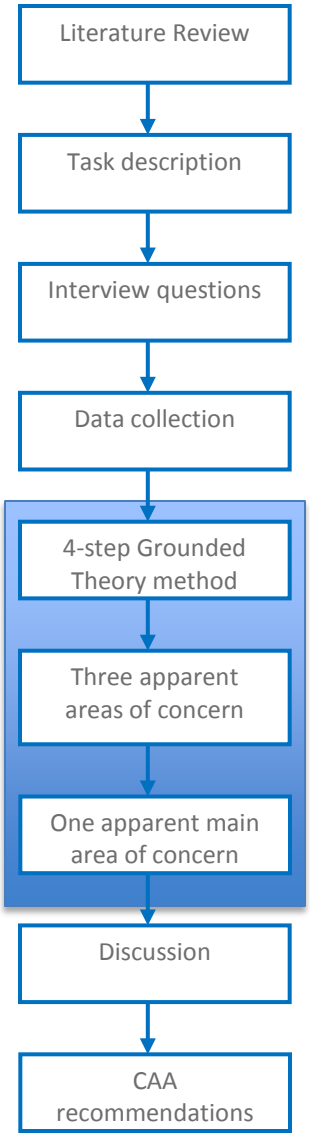
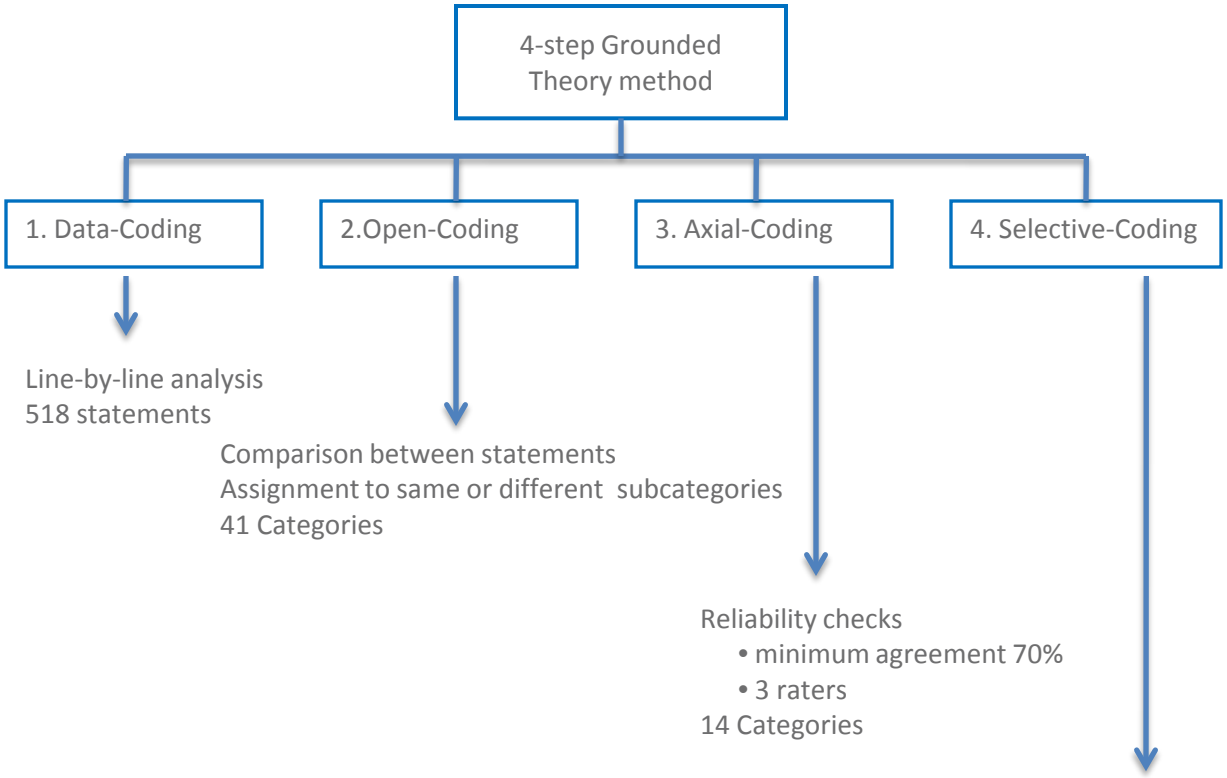
Research Dynamics





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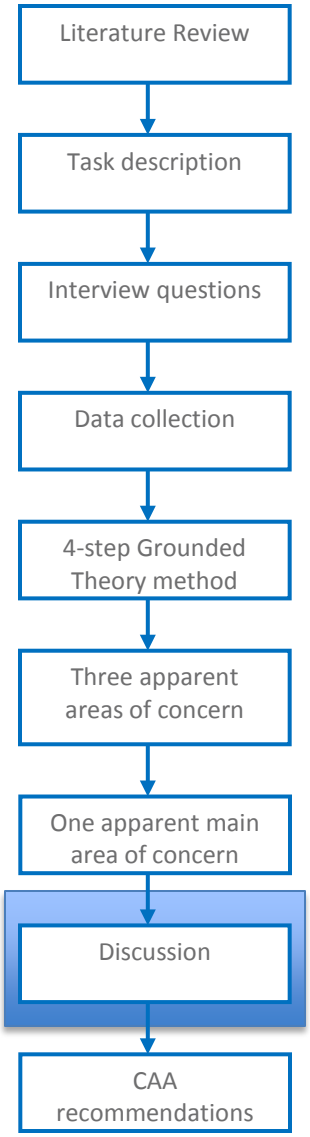
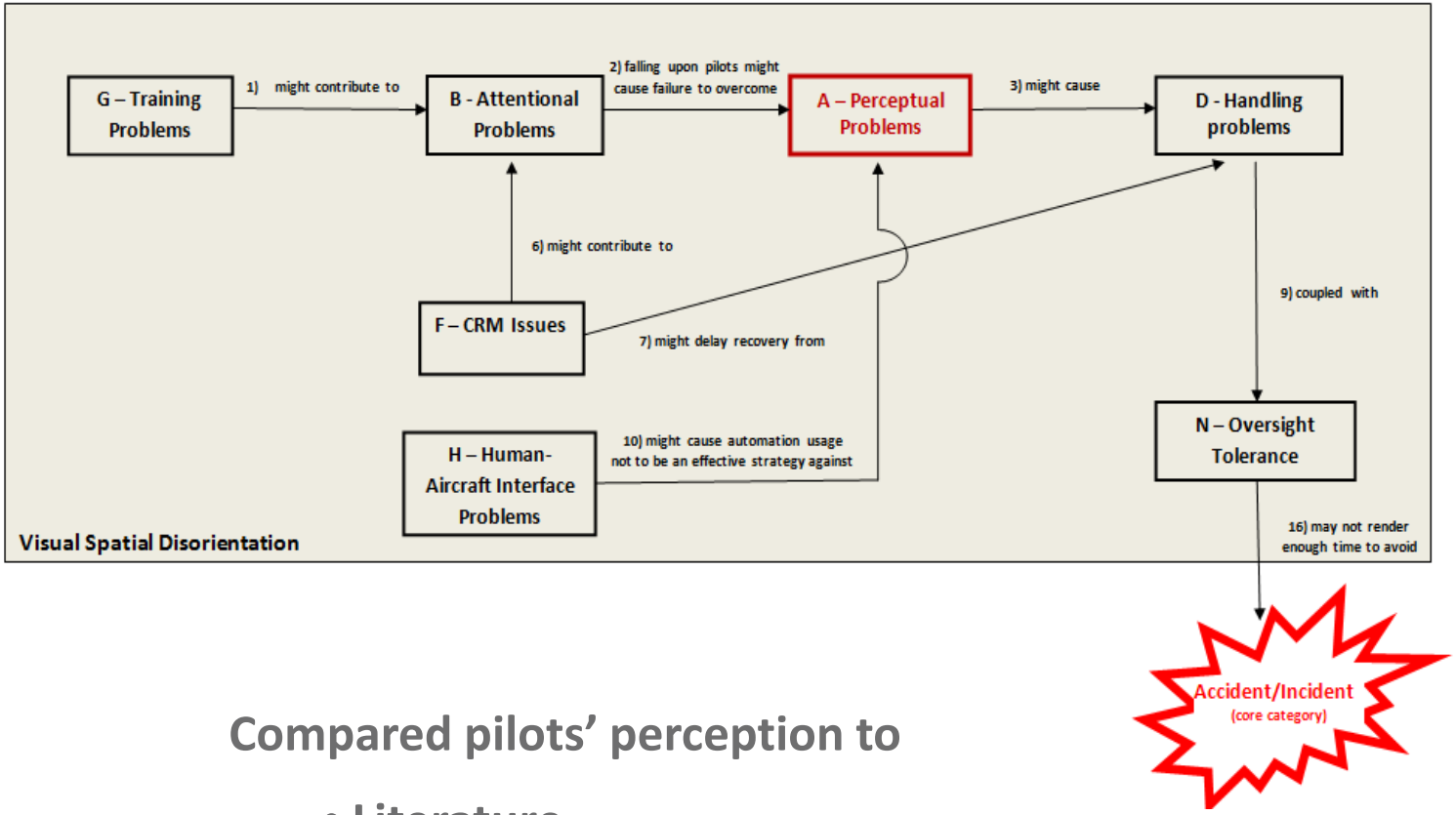
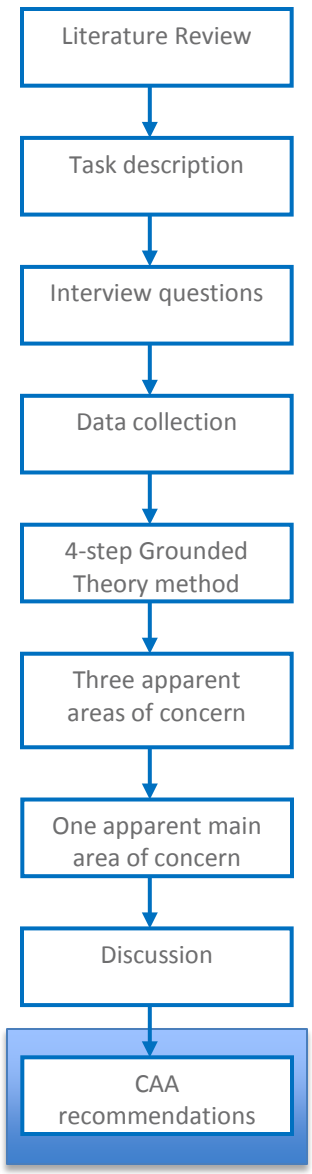




Compared pilots' perception to

- **Literature**
- **Accident reports**

Research Dynamics



1
- assess the effects of night flying recency and currency on workload and attention allocation mechanisms for offshore helicopter pilots

2
- standardise calls and procedures so that knowledge can be acquired from standard operating procedures and training rather than from in-flight experience

3
- assess pilots' workload during approach, in order to quantify the extent to which the switching of attention focus might constitute a safety issue

4
- assess at what distances from offshore destinations and under what conditions sufficient visual cues can be attained for the subsequent visually referenced flying task

5
- study whether the reduction of horizontal visibility minimum proposed by the new GPS-based procedure will affect pilots' hazard perception

Conclusions

Acknowledgement of limitations of the research

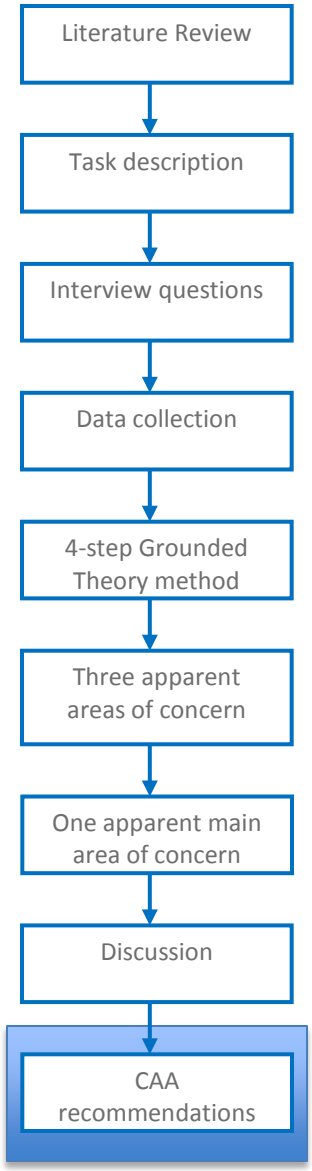
- Qualitative method (remember that's An Initial Exploration!)
- Low sample size for inferences
- Convenience sampling
- Hazard perception-based

For the time being

- Factors affecting safety possibly related to the potential for visual spatial disorientation
- Human perceptual limitation targeted by CAA
- Procedural standardisation?
- Training currency?
- Workload management?

Therefore further research seems needed

Possible Way Ahead



1
- assess the effects of night flying recency and currency on workload and attention allocation mechanisms for offshore helicopter pilots

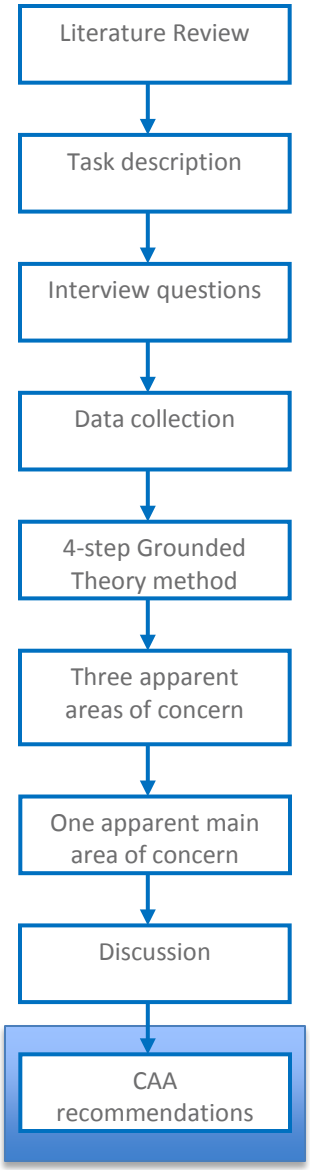
2
- standardise calls and procedures so that knowledge can be acquired from standard operating procedures and training rather than from in-flight experience

3
- assess pilots' workload during approach, in order to quantify the extent to which the switching of attention focus might constitute a safety issue

4
- assess at what distances from offshore destinations and under what conditions sufficient visual cues can be attained for the subsequent visually referenced flying task

5
- study whether the reduction of horizontal visibility minimum proposed by the new GPS-based procedure will affect pilots' hazard perception

Possible Way Ahead



Potential for providing Stable Approaches!!!

2
- standardise calls and procedures so that knowledge can be acquired from standard operating procedures and training rather than from in-flight experience

3
- assess pilots' workload during approach, in order to quantify the extent to which the switching of attention focus might constitute a safety issue

4
- assess at what distances from offshore destinations and under what conditions sufficient visual cues can be attained for the subsequent visually referenced flying task

PhD Research Aims

Aims

1. To model stable approach profiles for the visual segment of instrument approaches for helicopters operating offshore

2. To assess the transferability of such models to other helicopter domains subject to the hazards of flying under low visual cueing conditions

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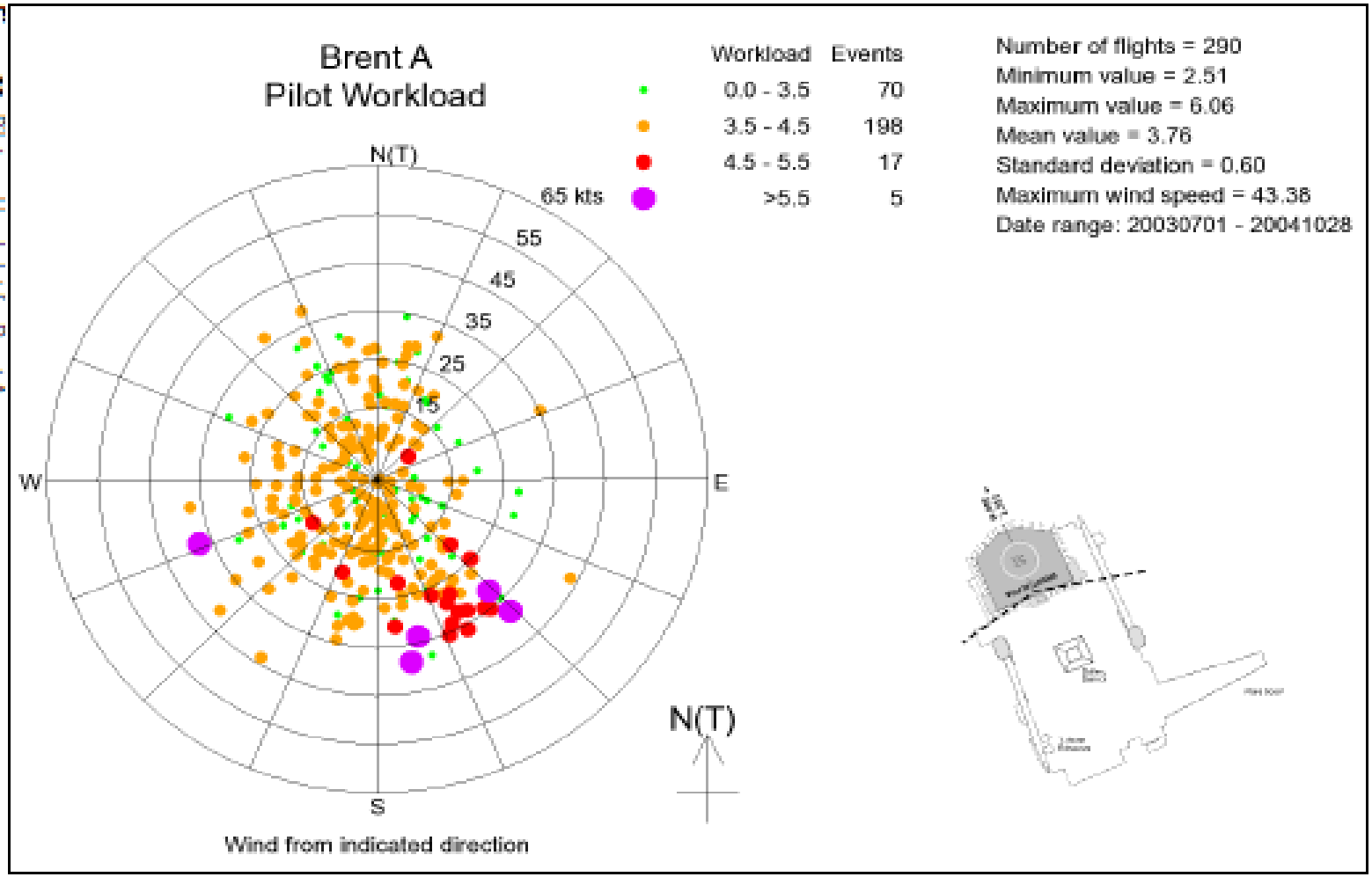
PhD Research Objectives

1. Explore what contextual factors affect safety during these low visibility/night visual segments
2. Assess pilot motor control outputs and workload as a function of these factors
3. Model stable flight profiles to be followed during these segments
4. Validate these profiles in simulated and/or real-world flight environments
5. Assess the transferability of such models to other helicopter mission types

Possible PhD outcome

Figure 28 Pilot workload plot for Brent A



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Questions?

Thank you!

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Further Information

Grounded Theory – references

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