Administrivia (Week 10, July 12th)

- Project interim report feedback
  - Some of this may come across as harsh (I rather push now)
  - But if you got a good grade, don't be complacent either!
- Next project deliverables!
  - 5 min video of your project (post and share in class)
  - Reminders: If GitHub does not show your contributions, you need a personal log. Submit peer evaluations without nagging
  - Ethics?
  - Report format/structure – see example/ask for feedback
- Next week: Role of data in software dev workshop
  - Blog post (open ended, reflect on what you learned so far)

War Stories in CSCW

Margaret-Anne Storey

July 2018

Ten efforts on wasted collaboration

1. *Divergence*—wasted effort due to politics and mismatch of goals.

2. *Misunderstanding*—disconnect in understanding.

3. *Undercommunicating*—excess or not enough time spent in communication.

4. *Interpreting*—time spent interpreting communication or artifacts.

5. *Searching*—time spent searching for information and/or relationships.

6. *Motion*—handoff of artifacts or communications.

7. *Extra processing*—excess creation of artifacts or information.

8. *Translation*—time spent conforming objects to new outputs.

9. *Waiting*—delays due to reviews, approvals, and bottlenecks.

10. *Misapplication*—incorrect use of methods and technologies.

https://www.pmi.org/learning/library/team-collaboration-tools-benefits-pitfalls-6183

- Assorted War Stories and Challenges faced in CSCW
  - "Failure of CSCW Tools" presented by Haotian Shen (20 mins)
  - "CSCW&Education, Challenges and Future", presented by Leon (15 mins)
  - "The Role of Social Media in MOOCs (and challenges encountered)" presented by Jian Wu (20 mins)
  - "When distributed situation awareness goes wrong" presented by Peggy Storey (15 mins)
- BREAK!
- Ethics and CSCW
  - Videos and Short presentations by Hamzah, Lucas and invited guest Jorin Weatherston (50 mins)
  - A Fishbowl panel: "Ethical considerations and CSCW" Moderated by Hamzan and Lucas (20 mins)

When distributed situation awareness goes wrong!

- Air France 447 crash – 2009 Airbus A330 stalled and fell into the Atlantic Ocean

- Series of events unfolded after the autopilot disconnected following the freezing of the aircraft Pitot tubes

- "The aircrew" suffered loss of awareness of what was going on

From the black box recorder...

02:11:21 *Pilot Not Flying (PNF)*: We still have the engines! What the hell is happening? I don't understand what's happening.

02:11:32 *Pilot Flying (PF)*: Damn it, I don't have control of the plane, I don't have control of the plane at all!

02:11:37 *PF*: Left seat taking control!

02:11:43 *Captain (returning from rest)*: What the hell are you doing?

02:11:45 *PF*: We've lost control of the plane!

02:11:47 *PNF*: We've totally lost control of the plane. We don't understand at all... We've tried everything.

Initial report...

- Suggested the aircrew was not aware of various aspects of flight and what procedure was required, and so they did not respond appropriately

- This conclusion is not uncommon... But many question this citing moral, ethical and theoretical issues labelling this as "an individual's loss of situation awareness as the cause of the accident"

- Such a view may limit our ability to design safer socio-technical systems

- Humans should be viewed as assets rather than the source of problems!

(Lack of) situation awareness

- Is often blamed for accidents
- But such accidents are usually caused by multiple, interacting factors across overall systems
- The "system" not an individual lost awareness…

Situation awareness should be viewed from a system's perspective

- Distributed situation awareness should instead be considered

- Dynamic nature of "activated knowledge" for a specific task that changes constantly

- Systems may be considered as a network of information elements, linked by salience and activated by tasks that belong to different agents (like a hive mind)

- Need to consider "transactions" between agents throughout the course of a task

Situation awareness networks
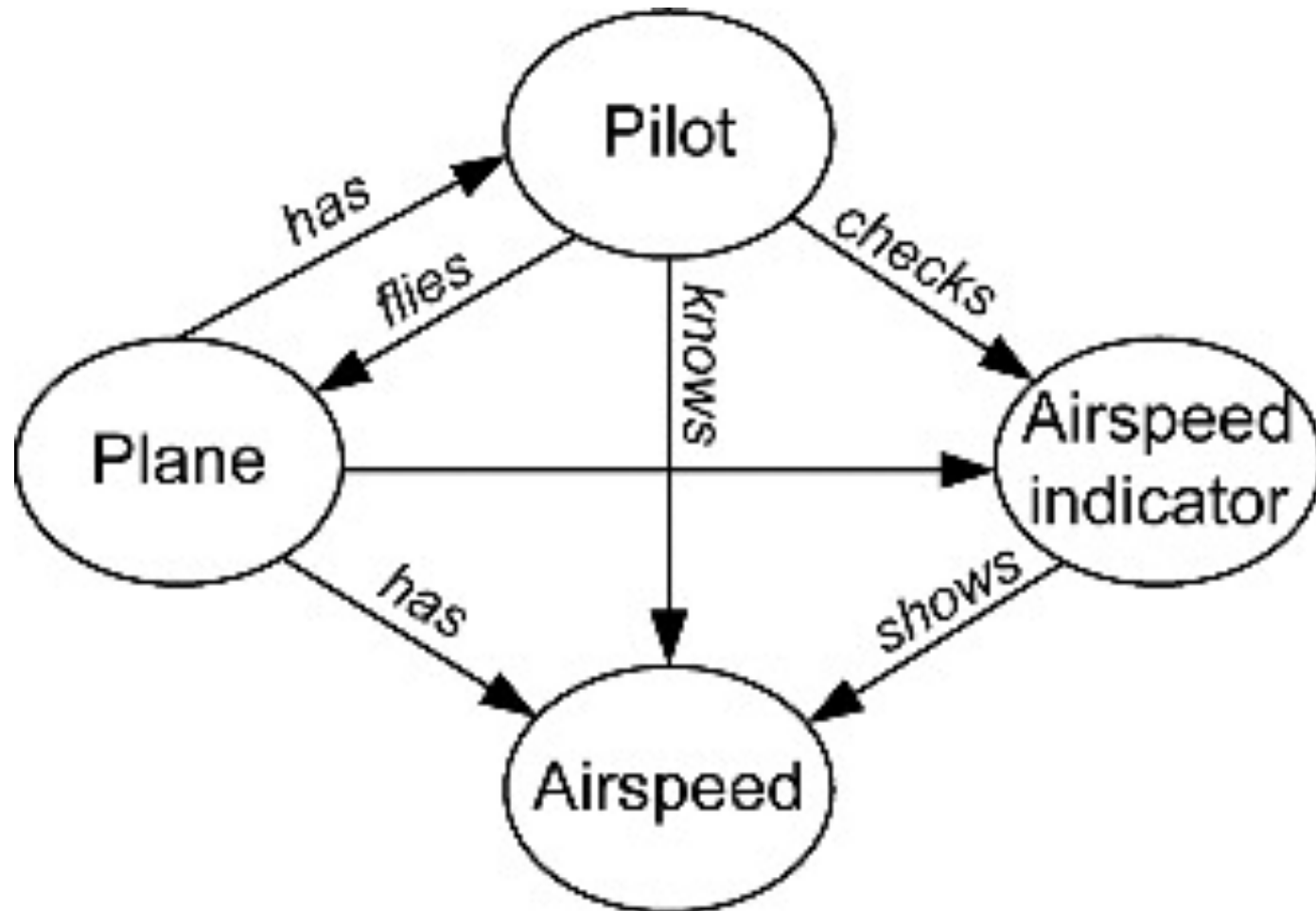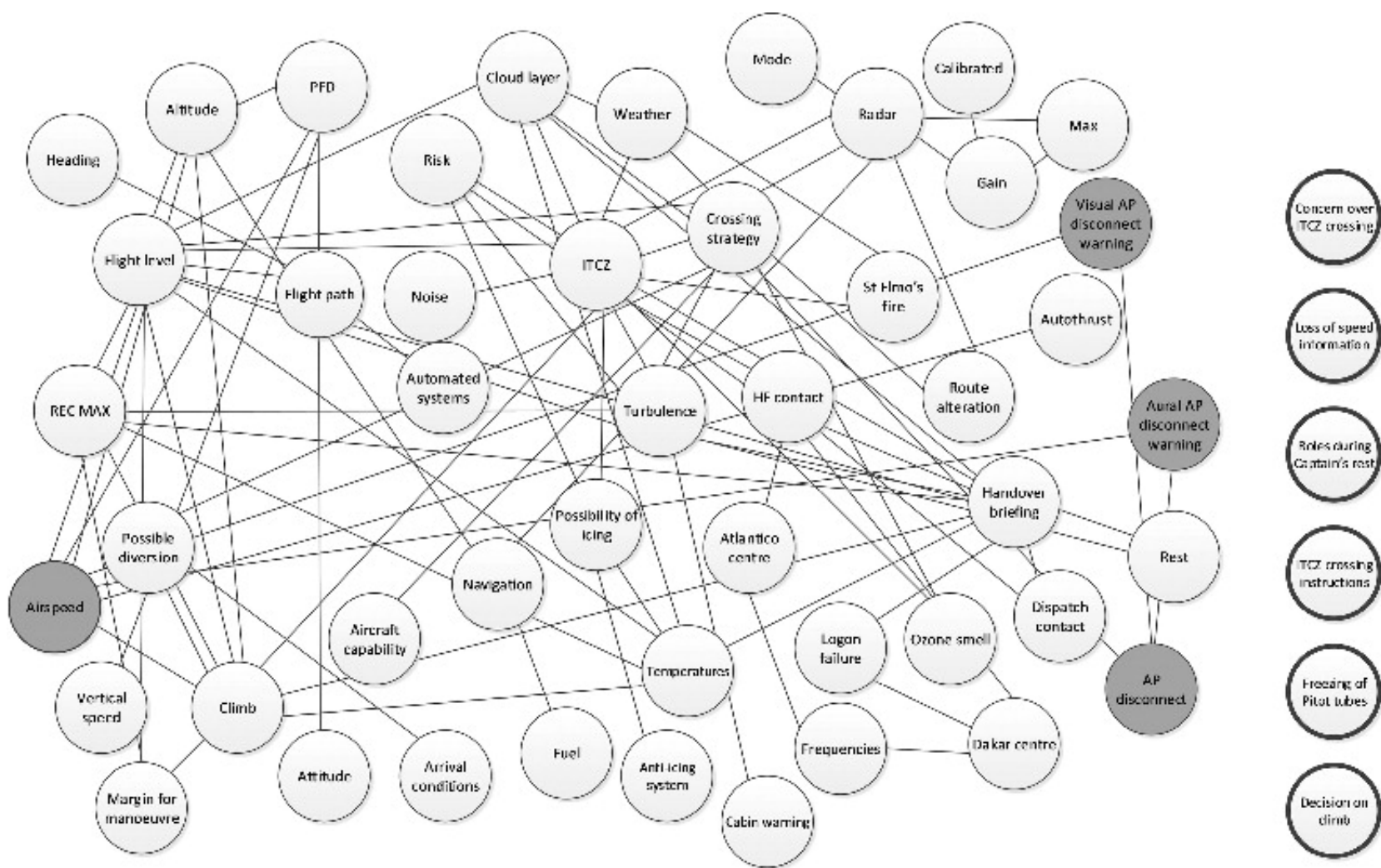
Failures in transactions...

- Have been tied to the root of all adverse aviation events...

- One should not distinguish between human and non-human agents

- This paper analyzes the Air France accident in detail using this approach

- Situation awareness is not something to be held by an individual alone..., and in this multiple failed transactions were the cause of lost of awareness

Analysis

- Phase 1. Entrance into the ITCZ until autopilot system disconnection.

- Phase 2. Aircrew's initial response to autopilot disconnection.

- Phase 3. Return of Captain to cockpit.

- The analysis involved constructing situation awareness networks for each of the three phases.

Concept map nodes:

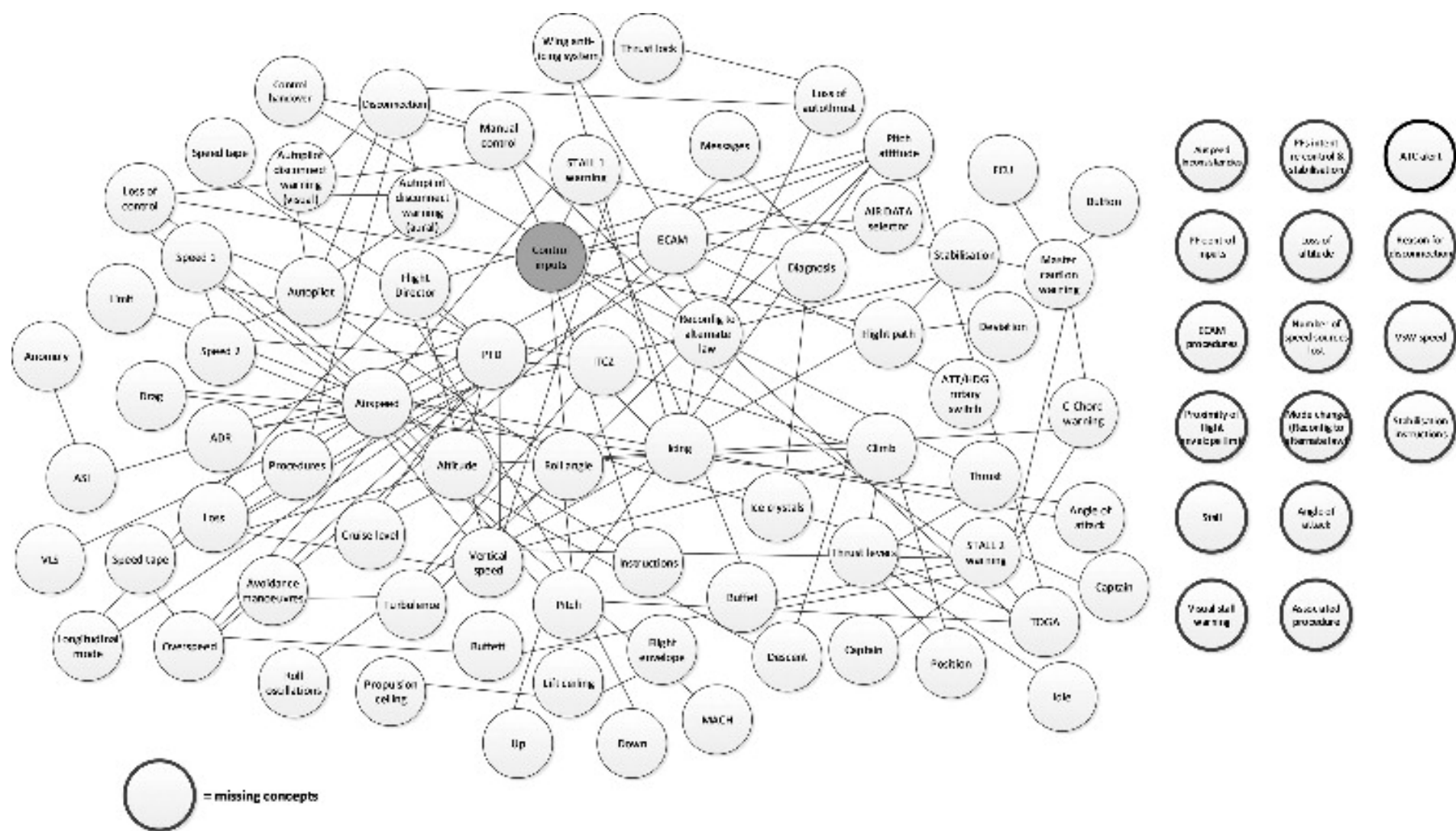Heading, PFD, Altitude, Cloud layer, Weather, Mode, Calibrated, Radar, Max, Risk, Crossing strategy, Gain, Flight level, Flight path, Noise, ITCZ, St Elmo's fire, Visual AP disconnect warning, Autothrust, REC MAX, Automated systems, Turbulence, HF contact, Route alteration, Aural AP disconnect warning, Possible diversion, Possibility of icing, Atlantico centre, Handover briefing, Rest, Airspeed, Navigation, Ozone smell, Dispatch contact, Vertical speed, Climb, Aircraft capability, Temperatures, Logon failure, Frequencies, AP disconnect, Margin for manoeuvre, Attitude, Arrival conditions, Fuel, Anti-icing system, Dakar centre, Cabin warning

Legend nodes:

Concern over ITCZ crossing, Loss of speed information, Roles during Captain's rest, ITCZ crossing instructions, Freezing of Pitot tubes, Decision on climb

= missing concepts

= missing concepts

STALL 1 warning

C-Chord warning

STALL 2 warning

Buffet

Flight path

Pitch attitude

Thrust parameters

Pitch

PF and PNF comms

Loss of control

Control inputs

PF and PNF actions

PF and PNF confusion

Climb

Warnings

Altitude

Descent

Airspeed

Ground proximity warning system

Instructions

Level wings

Cruise level

PF control inputs

Stall

Diagnosis of situation

= missing concepts

Transaction failure type	Transaction required	Agents involved
	Phase 1: Entry into tropical convergence zone to disconnection of autopilot	
Absent transaction	When he left the cockpit for his rest break the Captain had not discovered the PF's level of concern over crossing into ITCZ	Captain and PF
Absent transaction	The risk of loss of speed information related to high-density ice crystals was not discussed between the PF and the PNF	PF and PNF
Absent transaction	Definition of co-pilot roles during Captain flight rest time	Captain, PF, and PNF
Absent transaction	Before leaving the cockpit for his rest break, the captain did not leave any instructions regarding the ITCZ crossing	Captain, PF, and PNF
Absent transaction	No explicit indication in the cockpit informing the aircrew that the pitot tubes had frozen	Pitot tubes, cockpit displays, PF, and PNF
Inappropriate transaction	Inappropriate airspeed information	Pitot tubes and cockpit systems
	Phase 2: Aircrew's initial response to autopilot disconnection	
Transaction failure type	Transaction required	Agents involved
Absent transaction	Reason for autopilot disconnect	ECAM, PF, and PNF
Inappropriate transactions	ECAM displays succession of messages	ECAM, PF, and PNF
Absent transaction	Appropriate action or procedure on ECAM	ECAM, PF, and PNF
Absent transaction	PF's intentions/objectives regarding control and stabilisation of flight path	PF and PNF
Misunderstood transaction	Stall warning (STALL 1 and STALL 2)	Stall warning, PF, and PNF
Absent transaction	PF's control inputs	PF, PNF, sidesticks
	Phase 3: Return of Captain to cockpit	
Transaction failure type	Transaction required	Agents involved
Absent transaction	Discussion of stall warning	PF, PNF, and Captain
Incomplete transaction	Discuss sequence of events	PF, PNF, and Captain
Misunderstood transaction	Stall warning	Stall warning, PF, and PNF

Transaction failures

- Four forms of transaction failure played a role in the incident:
    - absent transactions,
    - inappropriate transactions,
    - incomplete transactions, and
    - misunderstood transactions.
- The agents involved in all forms of failed transaction were both human and non-human!

Takeaways...

Countermeasures should focus on enhancing the transactions required during both routine and non-routine flight situations. For example, what information is required, how best it can be communicated in high-workload situations, and who or what it should be communicated by are important considerations.

The missing information surrounding the PF's inappropriate control inputs provides an appropriate case in point. Here, the PNF was not aware that the PF had been applying nose up inputs throughout the unfolding incident. By considering the role of non-human agents in DSA and examining the overall cockpit system (as opposed to the PF and PNF alone), it could be ascertained that this information should be communicated between the PF and PNF both verbally as part of the aircrew's threat and error management activities and also by the cockpit systems (e.g. via sidestick feedback).