HUMAN-COMPUTER INTERACTION
THIRD EDITION
DIX FINLAY ABOWD BEALE

chapter 14

communication and collaboration models

CSCW Issues and Theory

All computer systems have group impact
- not just groupware

Ignoring this leads to the failure of systems

Look at several levels – minutiae to large scale context:
- face-to-face communication
- conversation
- text based communication
- group working

Face-to-face communication

- Most primitive and most subtle form of communication

- Often seen as the paradigm for computer mediated communication?

Transfer effects

- carry expectations into electronic media …

  … sometimes with disastrous results

- may interpret failure as rudeness of colleague

e.g. personal space
- video may destroy mutual impression of distance
- happily the `glass wall' effect helps

Eye contact

- to convey interest and establish social presence

- video may spoil direct eye contact (see video tunnel, chap 19)

- but poor quality video better than audio only

Gestures and body language

- much of our communication is through our bodies
- gesture (and eye gaze) used for deictic reference
- head and shoulders video loses this

So … close focus for eye contact …
… or wide focus for body language?

Back channels

> **Alison:** Do you fancy that film … *err*[1] …
> `The Green' *um*[2] …
> it starts at eight.
> **Brian:** Great!

- Not just the words!

- Back channel responses from Brian at 1 and 2
  – quizzical at 1
  – affirmative at 2

Back channels (ctd)

- Back channels include:
  – nods and grimaces
  – shrugs of the shoulders
  – grunts and raised eyebrows

- Utterance begins vague …
  … then sharpens up *just* enough

Back channels -media effects

Restricting media restricts back channels

video	– loss of body language
audio	– loss of facial expression
half duplex	– lose most voice back-channel responses
text based	– nothing left!

Back channels and turn-taking

in a meeting …
  – speaker *offers* the floor
      (fraction of a second gap)
  – listener *requests* the floor
      (facial expression, small noise)

Grunts, '*um*'s and '*ah*'s, can be used by the:
  – listener to *claim* the floor
  – speaker to *hold* the floor
  … but often too quiet for half-duplex channels

e.g. Trans-continental conferences – special problem
  – lag can exceed the turn taking gap
      … leads to a monologue!

Basic conversational structure

> **Alison:** Do you fancy that film
> **Brian:** the *uh* (*500 ms*) with the black cat
> 'The Green whatsit'
> **Alison:** yeah, go at *uh* …
> (*looks at watch – 1.2 s*) … 20 to?
> **Brian:** sure

Smallest unit is the utterance

Turn taking ⇒ utterances usually alternate …

Adjacency pairs

Simplest structure – adjacency pair

Adjacency pairs may nest:

> **Brian:** Do you want some gateau?
> **Alison:** is it very fattening?
> **Brian:** yes, very
> **Alison:** and lots of chocolate?
> **Brian:** masses
> **Alison:** I'll have a big slice then.

Structure is: B-x, A-y, B-y, A-z, B-z, A-x
  – inner pairs often for clarification
  … but, try analysing the first transcript in detail!

Context in conversation

Utterances are highly ambiguous

We use context to disambiguate:

> **Brian:**   (*points*) that post is leaning a bit
> **Alison:**   that's the one you put in

Two types of context:
- external context – reference to the environment
  e.g., Brian's '*that*' – the thing pointed to ← *deictic reference*
- internal context – reference to previous conversation
  e.g., Alison's '*that*' – the last thing spoken of

Referring to things – deixis

Often contextual utterances involve indexicals:
   that, *this*, *he*, *she*, *it*

these may be used for internal or external context

Also descriptive phrases may be used:
- external: '*the corner post is leaning a bit*'
- internal: '*the post you mentioned*'

In face-to-face conversation can point

Common Ground

Resolving context depends on meaning
   ⇒ participants must share meaning
so must have shared knowledge

Conversation constantly negotiates meaning
   ... a process called *grounding*:

> **Alison:**   So, you turn right beside the river.
> **Brian:**   past the pub.
> **Alison:**   yeah ...

Each utterance is assumed to be:
   relevant – furthers the current topic
   helpful – comprehensible to listener

Focus and topic

Context resolved relative to current *dialogue focus*

> **Alison:**   Oh, look at your roses : : :
> **Brian:**   mmm, but I've had trouble with greenfly.
> **Alison:**   they're the symbol of the English summer.
> **Brian:**   greenfly?
> **Alison:**   no roses silly!

Tracing topics is one way to analyse conversation.
- Alison begins – *topic* is roses
- Brian shifts topic to greenfly
- Alison misses shift in focus ... *breakdown*

Breakdown

Breakdown happens at all levels:
      topic, indexicals, gesture

Breakdowns are frequent, but
- redundancy makes detection easy
  (Brian cannot interpret '*they're ... summer*')
- people very good at repair
  (Brain and Alison quickly restore shared focus)

Electronic media may lose some redundancy
   ⇒ breakdown more severe

Speech act theory

A specific form of *conversational analysis*

Utterances characterised by what they *do* ...
      ... they are *acts*
   e.g. '*I'm hungry*'
- propositional meaning – hunger
- intended effect – '*get me some food*'

Basic conversational act the illocutionary point:
- promises, requests, declarations, ...

Speech acts need not be spoken
      e.g. silence often interpreted as acceptance ...

Patterns of acts & Coordinator

- Generic patterns of acts can be identified

- Conversation for action (CfA) regarded as central

- Basis for groupware tool Coordinator
  - structured email system
  - users must fit within CfA structure
  - not liked by users!

Conversations for action (CfA)

Circles represent 'states' in the conversation
Arcs represent utterances (speech acts)

CfA in action

- Simplest route 1–5:

Alison:	have you got the market survey on chocolate mousse?	request
Brian:	sure	promise
Brian:	there you are	assert
Alison:	thanks	declare

- More complex routes possible, e.g., 1–2–6–3 ...

Alison:	have you got ...	request
Brian:	I've only got the summary figures	counter
Alison:	that'll do	accept

Text-based communication

Most common media for asynchronous groupware
 exceptions: voice mail, answer-phones

Familiar medium, similar to paper letters
 but, electronic text may act as speech substitute!

Types of electronic text:
 – discrete directed messages, no structure
 – linear messages added (in temporal order)
 – non-linear hypertext linkages
 – spatial two dimensional arrangement

In addition, linkages may exist to other artefacts
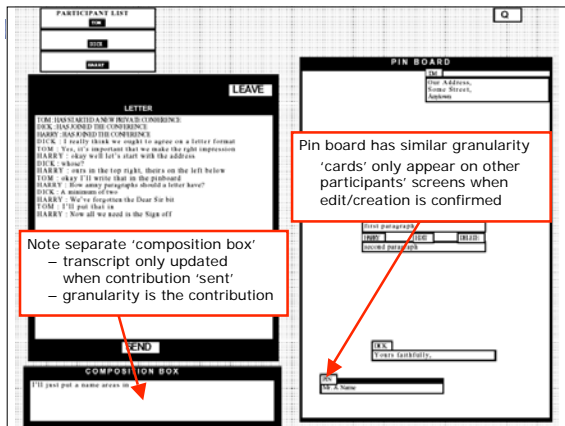
Problems with text

No facial expression or body language
 ⇒ weak *back channels*

So, difficult to convey:
 affective state – happy, sad, ...
 illocutionary force – urgent, important, ...

Participants compensate:
 'flaming' and smilies
 ; -)   : -(😊   : -)

example – 'Conferencer'

linear conversation area – LHS   RHS – spatial simulated pinboard

Note separate 'composition box'
– transcript only updated when contribution 'sent'
– granularity is the contribution

Pin board has similar granularity
'cards' only appear on other participants' screens when edit/creation is confirmed

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Grounding constraints

Establishing common ground depends on *grounding constraints*

cotemporality – instant feedthrough
simultaneity – speaking together
sequence – utterances ordered

Often weaker in text based communication
e.g., loss of sequence in linear text

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loss of sequence

Network delays or coarse granularity ⇒ *overlap*

1.	**Bethan:**	how many should be in the group?
2.	**Rowena:**	maybe this could be one of the 4 strongest reasons
3.	**Rowena:**	please clarify what you mean
4.	**Bethan:**	I agree
5.	**Rowena:**	hang on
6.	**Rowena:**	Bethan what did you mean?

Message pairs 1&2 and 3&4 composed simultaneously
– lack of *common experience*
  Rowena: 2 1 3 4 5 6
  Bethan: 1 2 4 3 5 6

N.B. breakdown of turn-taking due to poor back channels

Maintaining context

Recall *context* was essential for disambiguation

Text loses external context, hence deixis
(but, linking to shared objects can help)

1.	**Alison:**	Brian's got some lovely roses
2.	**Brian:**	I'm afraid they're covered in greenfly
3.	**Clarise:**	I've seen them, they're beautiful

Both (2) and (3) respond to (1)
… but *transcript* suggests greenfly are beautiful!

Non-linear conversation

1. **Alison:** Brian's got some lovely roses

2. **Brian:** I'm afraid they're covered in greenfly

3. **Clarise:** I've seen them they're beautiful

4. **Clarise:** have you tried companion planting?

hypertext-based or threaded-message systems maintain 'parallel' conversations

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Pace and granularity

Pace of conversation – the rate of turn taking
face-to-face – every few seconds
telephone – half a minute
email – hours or days

face-to-face conversation is highly interactive
– initial utterance is vague
– feedback gives cues for comprehension

lower pace ⇒ less feedback
⇒ less interactive

Coping strategies

People are very clever!
　　they create *coping strategies* when things are difficult

Coping strategies for slow communication
　　attempt to increase granularity:

　　eagerness – looking ahead in the conversation game
　　　　❚ **Brian:** Like a cup of tea? Milk or lemon?

　　multiplexing – several topics in one utterance
　　　　❚ **Alison:** No thanks. I love your roses.

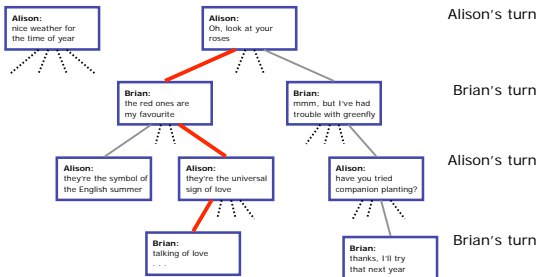---

The Conversation Game

Conversation is like a game

Linear text follows one path through it

Participants choose the path by their utterances

Hypertext can follow several paths at once

… like a game

participants
choose the path
by their utterances

Alison's turn

Brian's turn

Alison's turn

Brian's turn

Alison:
nice weather for
the time of year

Alison:
Oh, look at your
roses

Brian:
the red ones are
my favourite

Brian:
mmm, but I've had
trouble with greenfly

Alison:
they're the symbol of
the English summer

Alison:
they're the universal
sign of love

Alison:
have you tried
companion planting?

Brian:
talking of love
. . . .

Brian:
thanks, I'll try
that next year

Group dynamics

Work groups constantly change:
　– in structure　　– in size

Several groupware systems have explicit rôles
　– But rôles depend on context and time
　　　e.g., M.D. down mine under authority of foreman
　– and may not reflect duties
　　　e.g., subject of biography, author, but now writer

Social structure may change: democratic, autocratic, …
and group may fragment into sub-groups
　　Groupware systems rarely achieve this flexibility

Groups also change in composition
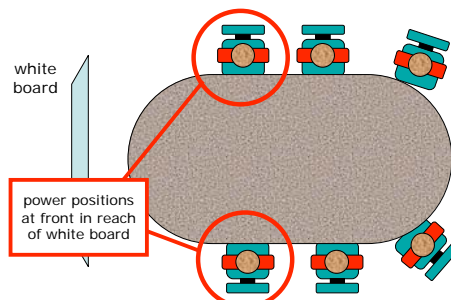　⇒ new members must be able to `catch up'
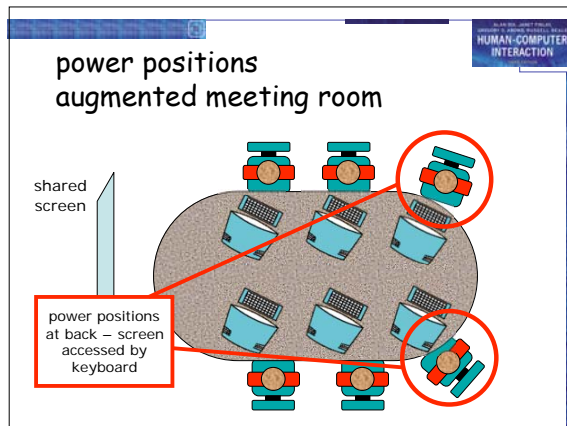

Physical environment

Face-to-face working radically affected by
　layout of workplace

　e.g. meeting rooms:
　– recessed terminals reduce visual impact
　– inward facing to encourage eye contact
　– different power positions

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power positions
traditional meeting room

white
board

power positions
at front in reach
of white board

power positions
augmented meeting room

shared screen

power positions at back – screen accessed by keyboard

Distributed cognition

Traditional cognitive psychology in *the head*

Distributed cognition suggests look to *the world*

Thinking takes place in interaction
- with other people
- with the physical environment

Implications for group work:
- importance of mediating representations
- group knowledge greater than sum of parts
- design focus on external representation