Overview

All computer systems have group impact
. . . not just groupware

Ignoring this leads to the failure of systems

We look at several levels, from minutiae to large scale context:

- face-to-face communication
- conversation
- text based communication
- group working
- organizational issues

Face-to-face communication

- Most primitive and must 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
  (recall video tunnel, Ch. 13)
- 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 include:
    nods and grimaces
    shrugs of the shoulders
    grunts and raised eyebrows

Utterance begins vague
        then sharpens up *just* enough

Back channels II

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 used for turn-taking:

- 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

Trans-continental conferences – special problems

- 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 $\Longrightarrow$ utterances usually alternate

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: A-x, B-y, A-y, B-z, A-z, B-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 the previous conversation

e.g., Alison's '*that*' — the last thing spoken of

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'*

Common Ground

- Resolving context depends on meaning
  $\Longrightarrow$ participants must share meaning
  so must have shared knowledge

- Conversation constantly negotiates meaning
  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 breakdown

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 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
$\Longrightarrow$ 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, …

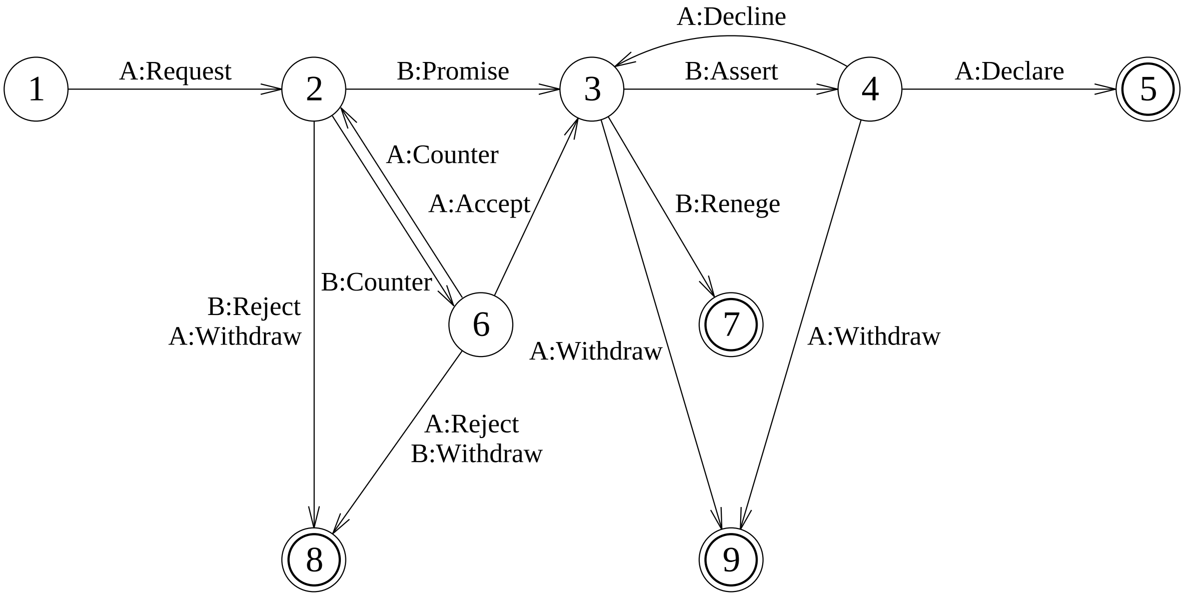
Speech acts need not be spoken
e.g., silence often interpreted as acceptance …

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



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

Simplest route 1–5:

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

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

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

Text based communication

Most common media for *asynchronous* groupware
  exceptions: voice mail, answerphones

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 (§13.6.3)

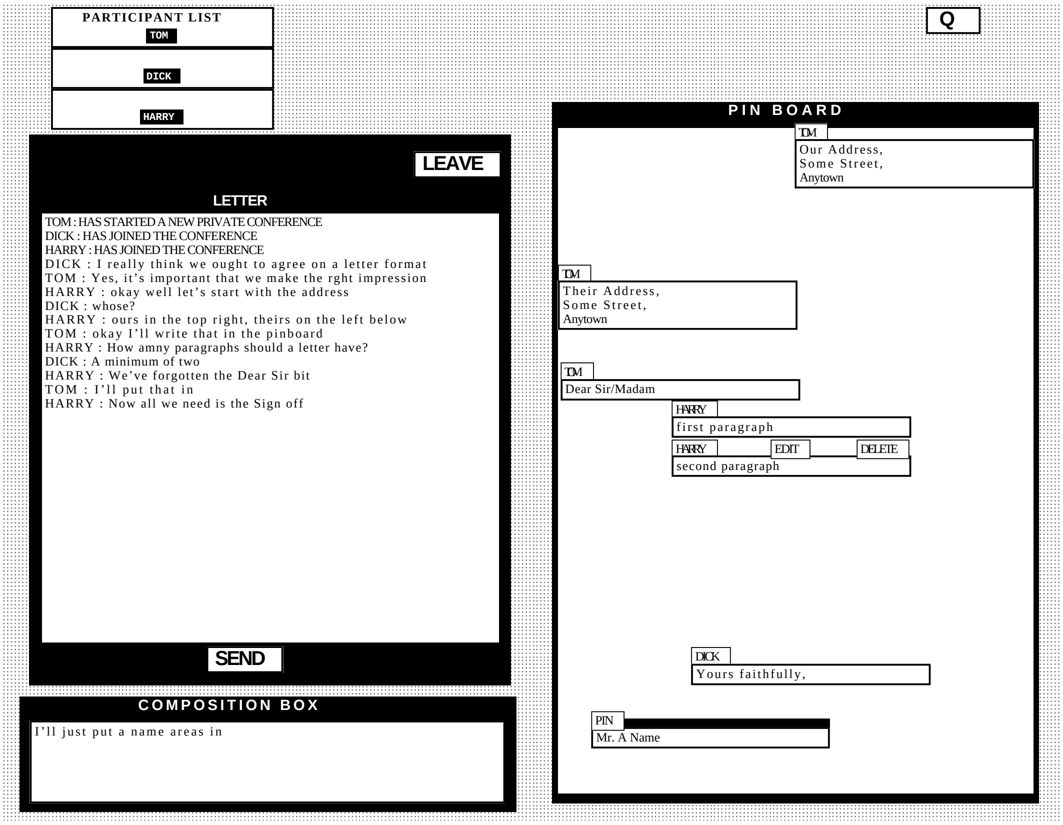
Most obvious loss, no facial expression or body language

- weak *back channels*

So, difficult to convey:

- *affective state* — happy, sad, ...
- *illocutionary force* — urgent, important, ...

Participants compensate by 'flaming' and smilies `;-)`



LHS — *linear* conversation area
RHS — *spatial* simulated pinboard

Note separate ‘composition box’

- transcript only updated when contribution ‘sent’
- em granularity is the contribution

Pin board has similar granularity

- ‘cards’ only appear on other participants’ screens when edit/creation is confirmed

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:
  network delays or coarse granularity $\Longrightarrow$ *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
  i.e., lack of *common experience*
  Rowena: 2 1 3 4 5 6
  Bethan: 1 2 4 3 5 6

- Above shows breakdown of *turn-taking*
  result of poor back channels

Maintaining context

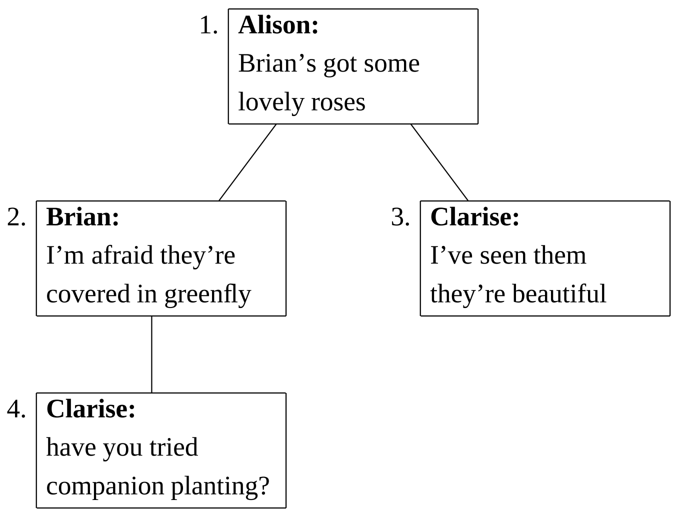
Recall *context* was essential for disambiguation

Text loses external context, hence deixis
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

Hypertext can maintain 'parallel' conversations



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

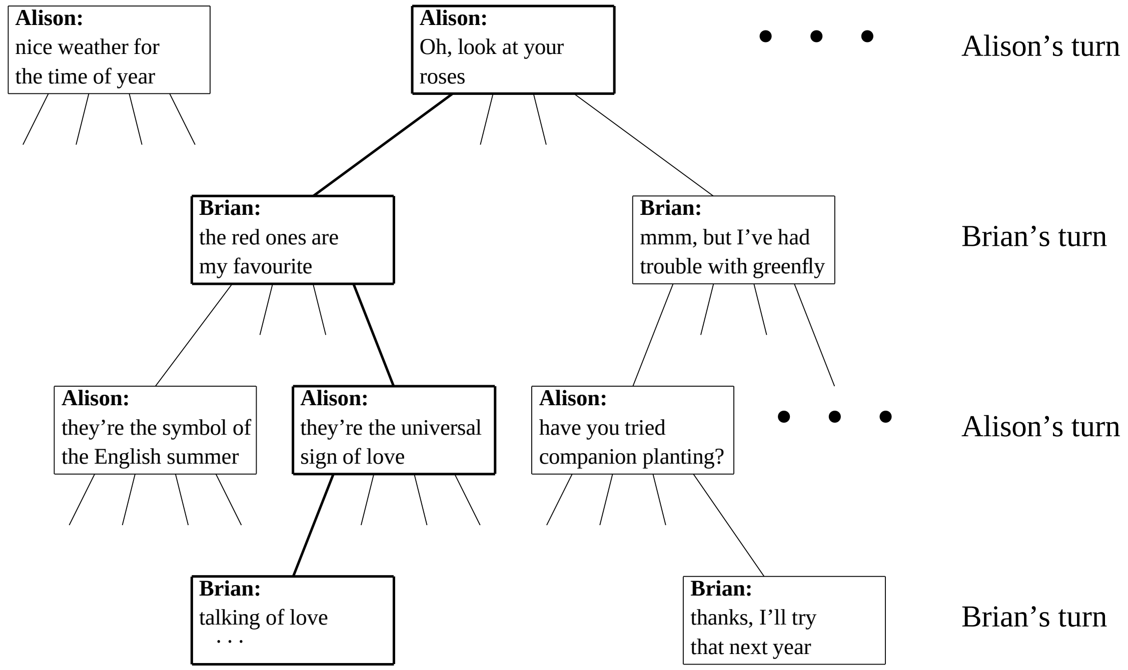
lower pace $\Longrightarrow$ less feedback
 $\Longrightarrow$ less interactive

Coping strategies 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

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
$\Longrightarrow$ 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* (see fig. 14.7)

Traditional cognitive psychology *in the head*

Distributed cognition suggests we look to the *world*

Thinking takes place in interaction with other people and physical environment

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

Experimental studies on groups

More difficult than single-user experiments

- Subject groups
  larger number of subjects $\Longrightarrow$ more expensive
  longer time to 'settle down'
  even more variation!
  difficult to timetable
  so … often only three or four groups

- the task
  must encourage cooperation
  perhaps involve multiple channels
  options:
  - creative task
    e.g., '*write a short report on …*'
  - decision games
    e.g., desert survival task
  - control task
    e.g., ARKola bottling plant

Experimental studies on groups (ctd.)

- data gathering
  several video cameras
  + direct logging of application
  problems:
  - synchronisation
  - sheer volume!

  one solution:
  - record from each perspective

- analysis
  N.B. vast variation between groups
  solutions:
  - within groups experiments
  - micro-analysis (e.g., gaps in speech)
  - anecdotal and qualitative analysis

  look at interactions between group and media
  controlled experiments may 'waste' resources!

Field studies

Experiments dominated by group formation

Field studies more realistic:
  distributed cognition $\Longrightarrow$ work studied in context
  real action is *situated action*
  physical and social environment both crucial
Contrast:
  psychology — controlled experiment
  sociology and anthropology — open study and rich data

Ethnography very influential:
  a form of anthropological study
  with special focus on social relationships
  does *not* enter actively into situation
  seeks to understand social culture
  unbiased and open ended

Contrast with *participatory design*
  In participatory design:
    workers enter into design context
  In ethnography (as used for design):
    designer enters into work context
Both make workers feel valued in design
  hence encourage workers to 'own' the products

Organisational issues

Organisational factors can make or break groupware

- Studying the work group is not sufficient
  any system is used within a wider context
  and the crucial people need not be direct users
- *Before* installing a new system,
  the designer must understand:
    - who benefits
    - who puts in effort
    - the balance of power in the organisation
    - and how it will be affected
- Even when groupware is successful
  it may be difficult to measure that success

Benefits for all?

Disproportionate effort

who puts in the effort $\neq$ who gets the benefit

Example: shared diary:
effort: secretaries and subordinates, enter data
benefit: manager easy to arrange meetings
result: falls into disuse

Solutions:
coerce use !
design in *symmetry*

Free rider problem

no bias, but still problem
possible to get benefit without doing work
if everyone does it, system falls into disuse

Example: electronic conferences
– can read but never contribute

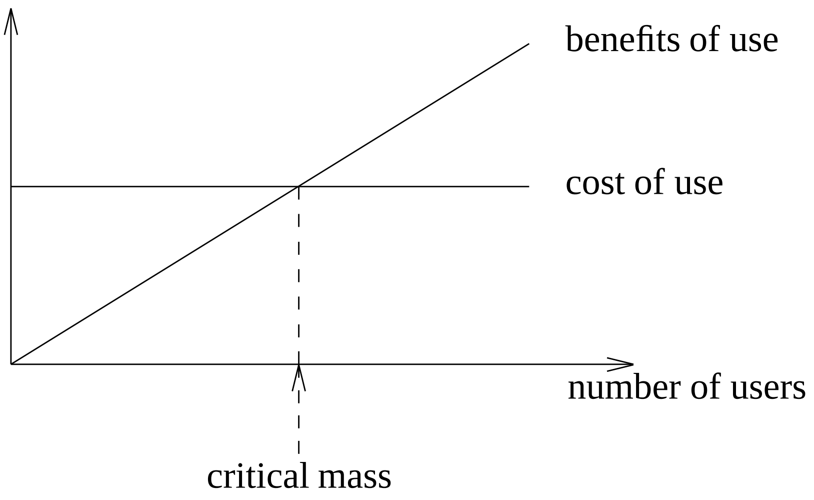
Solutions:
strict protocols (e.g., round robin)
increase *visibility* — rely on social pressure

Critical mass

Early telephone system:
- few subscribers — noone to ring
- lots of subscribers — never stops ringing!

Electronic communications similar:
- benefit $\propto$ number of subscribers
- early users have negative cost/benefit
- need *critical mass* to give net benefits

How to get started?
- look for *cliques* to form core user base
- design to benefit an initial small user base



Conflict and power

CSCW $\stackrel{?}{=}$ computer supported *cooperative* work

- people and groups have conflicting goals
- systems assuming cooperation will fail!

Example:

computerise stock control
stockman looses control of information
$\Longrightarrow$ subverts the system

- identify *stakeholders* — not just the users

Groupware affects organisational structures

- communication structures reflect line management
- email — cross-organisational communication
  disenfranchises lower management
  $\Longrightarrow$ disaffected staff and 'sabotage'
- Technology *can* be used to
  change management style and power structures
  - but need to know that is what we are doing
  - and more often an accident !

Invisible workers

Telecommunications improvements allow:

- neighbourhood workcentres
- home-based tele-working

Many ecological and economic benefits

- reduce car travel
- flexible family commitments

but:

- 'management by presence' doesn't work
- presence increases perceived worth
  problems for promotion

Barriers to tele-working are managerial/social
not technological

Evaluating the benefits of groupware

Assuming we have avoided the pitfalls!

How do we measure our success?

- job satisfaction and information flow
  - hard to measure
- economic benefit
  - diffuse throughout organisation

But . . .

costs of hardware and software
- only too obvious

Perhaps we have to rely on hype!