



SASTRA

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Chapter 4

Designing for Collaboration & Communication

B.Tech CSBS
VII Semester

Handled by
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Outline

1. Social Mechanisms
2. Ethnographic Studies
3. Conceptual Frameworks

- Humans are inherently social
 - Live together
 - Work together
 - Learn together
 - Play together
 - Interact and talk to each other
 - Socialize
- It is natural to develop interactive systems that support and extend different kind of sociality

Social mechanisms in communication and collaboration

- Fundamental aspect of everyday life is talking
 - Pass on knowledge to each other
 - News
 - Changes
 - Developments
 - Activity
 - Person
 - event



- Kinds of knowledge circulated in different social circles are
 - Diverse
 - Varying among social groups
 - Across cultures
- Frequency of knowledge disseminated is also highly variable
 - Throughout the day
 - Once a day
 - Weekly
 - infrequently

- Means of communication

Face to face



Telephone



video phone



Messaging



email



fax



- Non-verbal communication augments face-to-face conversation
 - Facial expressions
 - Back channeling (aha's and mms)
 - Gesturing

- Main categories of social mechanisms and design of technological systems facilitating these
 - the use of conversational mechanisms to facilitate the flow of talk and help overcome breakdowns during it
 - the use of coordination mechanisms to allow people to work and interact together
 - the use of awareness mechanisms to find out what is happening, what others are doing and, conversely, to let others know what is happening

Conversational Mechanisms

- Holding a conversation is a highly skilled collaborative achievement
- What make up a conversation
 - Start by greeting
 - Participants take turns
 - asking questions
 - Giving replies
 - Making statements
 - One or more participants wants to draw the conversation close

- Sacks, Schegloff and Jefferson (1978)-
 - famous for their work on conversation analysis
 - describe conversation in terms of three basic rules
 - rule 1—the current speaker chooses the next speaker by asking an opinion, question, or request
 - rule 2—another person decides to start speaking
 - rule 3—the current speaker continues talking

- Adjacency pairs – another way of conversations
- Utterances are come in pairs
 - First part sets up an expectation of what is to come next
 - Second part follows the first part

A: So shall we meet at 8:00?

B: Um, can we make it a bit later, say 8:30?

- Adjacency pairs get embedded in each other
 - May take some time to get a reply to their initial request or statement

A: So shall we meet at 8:00?

B: Wow, look at him.

A: Yes, what a funny hairdo!

B: Um, can we make it a bit later, say 8:30?

- Breakdowns in conversation
 - Participants
 - overcome misunderstanding using repair mechanisms
 - Speaker & listeners attending what other says
 - When listener misunderstands what has been communicated
 - Speaker repeats what is said earlier using
 - Stronger voice intonation
 - Exaggerated gestures
 - Allows speaker to repair the mistake and be more explicit to the listener

Kinds of conversations

- Argument
- Discussion
- Heated debate
- Chat
- Telling-off

- Types of communication

- Formal
- Informal

- Types of communication
 - Formal
 - Assigning certain roles to people
 - Prescribing ‘a priori’ types of turns that people are allowed to take in a conversation
 - Eg: Board meeting
 - Decided
 - Who is allowed to speak
 - Who speaks when
 - What participants are allowed to talk about

- Informal
 - Chat when people socialize
 - Occurs
 - Corridors
 - At Coffee machine
 - When waiting in line
 - Walk down the street

- In office settings, informal conversations have been found to serve number of functions
 - Coordinating group work
 - Transmitting knowledge about office culture
 - Establishing trust
 - General team building
- People who are in close proximity are close to one-another
- Companies and organizations design their office space
 - To put people who need to work closely in the same physical space

- Designers should consider
 - How different kinds of communication can be facilitated and supported
 - How to prevent from obstacles that are happening naturally
- Central concern
 - Develop systems to allow people to communicate when they are
 - Physically at different locations
 - Geographically separated

- Well-known examples
 - Email
 - Videoconferencing
 - Videophones
 - Computer conferencing
 - Chatrooms
 - messaging

- Less familiar systems

- Collaborative virtual environments (CVEs)

- People meet and chat

- 3D graphical world

- Explore rooms and spaces by teleporting themselves

- Media spaces

- Distributed systems

- Comprising

- Audio

- Video

- Computer systems

- Collaborative technologies have been designed to support
 - Communication
 - Informal to formal
 - From one-to-one to many-many conversations
 - Collectively referred as
 - Computer mediated communication (CMC)

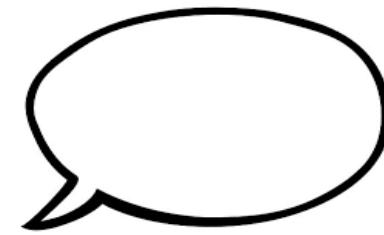
- Classification of computer-mediated communication
 - Synchronous communication
 - Asynchronous communication
 - CMC with other activity

- Learn each CMC
 - Examples
 - New functionalities
 - Benefits
 - problems

- Synchronous Communication
 - Conversations in real time are supported by letting people talk
 - using their voices
 - Through typing
 - Support non-verbal communication to varying degrees

- Examples

- Talking with voice
 - Video phones
 - Video conferencing
 - Media spaces
- Talking via typing
 - Text messaging
 - Instant messaging
 - Chat rooms
 - Collaborative virtual environments



- New kinds of functionality
 - Allow communication to take place via
 - Combination of graphical representations of self with
 - Separate chat box/
 - Overlaying speech bubbles
 - Allow people to represent themselves as
 - Virtual characters
 - <https://www.youtube.com/watch?v=rsW9f33XkGc>
 - Taking new personas (opposite gender)
 - https://www.youtube.com/watch?v=eZ8_6jaOD_4
 - Expressing themselves in ways not possible in face-to-face settings
 - CVEs, MUDS(Multi user Domain) and chatrooms have enabled new forms of conversation
 - Multi-turn-taking
 - Number of people contribute and keep track of multi-streaming text-based conv..
 - Instant messaging allows users to multitask by holding numerous conversation at once

- Benefits
 - Not having to physically face people increase shy people's
 - Confidence
 - Self-esteem
 - To converse more in 'virtual' public
 - Allows people to keep up-to-date without having to move from their office
 - Enables user to send text/images instantly b/w people using instant messaging
 - Instant messaging allows user to fire off quick questions and answers without
 - Time lag of email or phone-tag

- Problems

- Lack of adequate bandwidth plagues video communication

- Poor-quality images

- Frequently break-up

- Judder

- Appear as unnatural images



- It is difficult to establish eye contact in
 - CVEs
 - Video conferencing
 - Videophones
- Having the possibility of hiding behind a persona/Avatar in a chatroom
 - gives people the opportunity
 - To behave
 - Differently
 - Aggressive
 - Intrusive

- Asynchronous Communication

- Communication between participants takes place
 - remotely
 - At different times
- Relies not on time-dependent turn-taking
- Participants
 - initiate communication
 - Respond to others
 - When they want/able to do so

- Examples
 - Email
 - Bulletin boards
 - Newsgroups

- New kinds of functionality
 - Attachments of different sort
 - Annotations
 - Images
 - Music
 - Messages can be archived and accessed using various search facilities

- Benefits

- Ubiquity: can read any place, any time
- Flexibility: greater autonomy and control
- Powerful: can send same message to many people
- Makes something easier to say:
 - do not have to interact with person
 - Can be easier to say things than face to face
 - Providing feedback on someone's performance

- Problems

- Flaming
 - Writing angry mail expressed in uninhibited language
 - Use of impolite statements
 - Exclamation marks
 - Charged communication
 - lead to misunderstanding/bad feelings among the participants

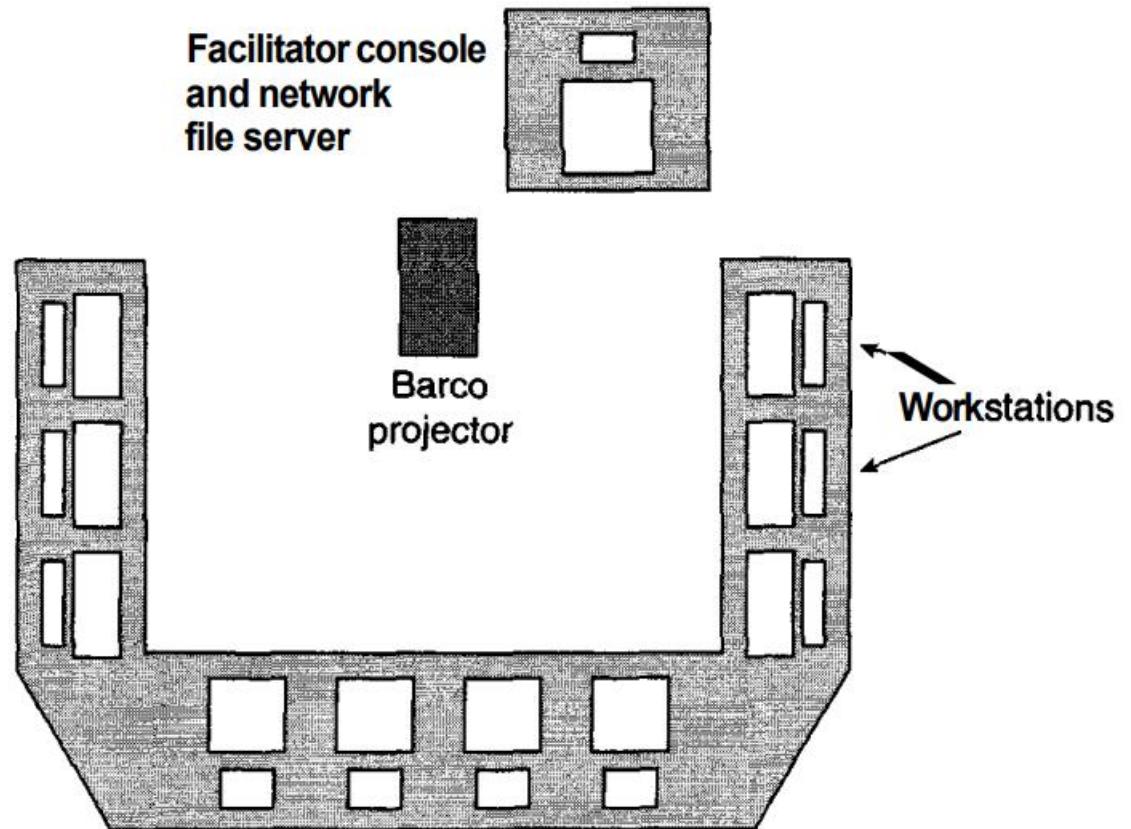
- overload
 - Receiving over 30 mails or other messages a day
 - Lengthy mails and messages
- False expectations
 - Assumption
 - People read their messages several times a day & reply them there and then
 - Reality
 - People treat email more like postal mail, reply them when they have time

- CMC combined with other activity
 - People often talk with each other while carrying out other activities
 - Eg:
 - Brainstorm together in meetings
 - Drawing on whiteboards
 - Making notes

- Teaching involves
 - Talking with students
 - Writing on the board
 - Getting students to solve problems collaboratively
- Various meeting – and decision –support systems are developed to help people
 - Work
 - Learn
 - While talking together

- Eg:
 - Customized electronic meeting rooms that support people in face-to-face meetings, via
 - Use of networked workstations
 - Large public displays
 - Shared software tools
 - Together with various techniques to help decision-making

White board Wall mounted projection screen White board



University of Arizona's Group system

- <https://www.youtube.com/watch?v=i5yB8jkQ6qk>

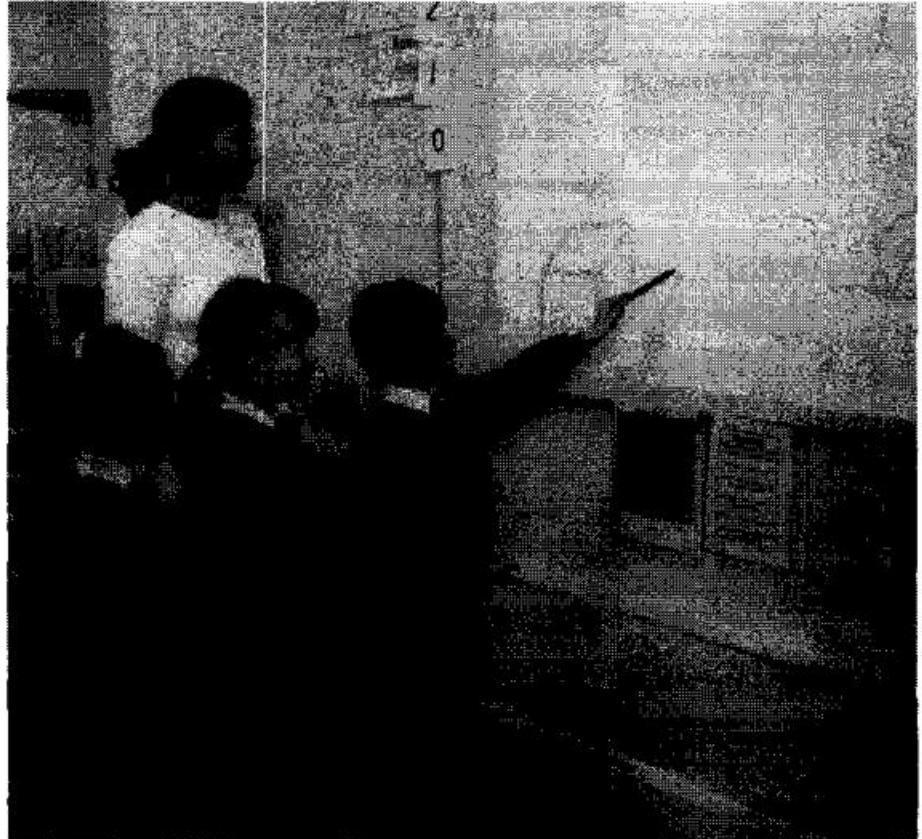


Figure 4.3 An ACTIVBoard whiteboard developed by Promethean (U.K. company) that allows children to take control of the front-of-class display. This allows them to add comments and type in queries, rather than having to raise their hands and hope the teacher sees them.

Networked classrooms

- Wireless communication
- Portable devices
- Interactive whiteboards
- Integrated classroom settings
- Allow teacher & students to learn/communicate

Argumentation tools

- Record
 - design rationale
 - Other arguments
 - Lead to decisions in a design
- Mainly designed for people working in the same physical location

Shared authoring and drawing tools

- Allow people to work on
 - Same document
 - At same time
 - Remotely over the web
 - Shredit

New kinds of functionality

- Allows new ways of collaboratively creating and editing documents
- Supports new forms of collaborative learning
- Integrates different kinds of tools

Benefits

- Support multitasking
 - Talking while carryout other activities at the same time
- Speed and efficiency
 - Allows multiple people working on same document same time
- Greater awareness
 - Allows users to see how one another are progressing in real time

Problems

- What you see is what I see
 - Difficult to see what other people are referring to, in remote locations
 - Different users have different parts of the document on their screens
- Floor control
 - Users may want to work on the same piece of text/design
 - Resulting in file conflicts
 - Can be controlled by floor-control policies

- Hyper Mirror
 - https://www.youtube.com/watch?v=Mevanz_yjkI
- Video Window
 - <https://www.youtube.com/watch?v=vPB2CBZEDlc>

Coordination Mechanisms

- Takes place when
 - Group of people act/interact together to achieve something
 - Eg: playing basket ball
 - Plan set of tactics to win
 - Need to follow the rules
 - Incredible amount of co-ordination is required within a team/between competing teams



Collaborative activities require coordination

- Playing a team game
- Moving a piano
- Navigating a ship
- Working on a large project
- Constructing a bridge

Number of coordinating mechanisms

- Verbal and non-verbal communication
- Schedules, rules and conventions
- Shared external representations

Verbal and non-verbal communication

- When people work closely together
 - Talk to each other
 - Issuing commands
 - Letting others know how they progress with their part

Moving a piano

- Shout commands like
 - Down a bit
 - Left a bit
 - Go forward

In conversation, the coordination is ensured by

- Nodding
- Shaking
- Winking
- Glancing
- Hand-raising

In formal meetings

- Activities are coordinated by
 - Agendas
 - Memos
 - minutes

Meetings

- are chaired
- Minutes are taken & recorded
- Plans and actions are agreed upon
- Minutes are distributed to members
 - To remind what was agreed
 - To act upon what was agreed



Time-critical and routinized collaborative activities

- Sometimes difficult to hear others
- Gestures are frequently used
 - Various kinds of hand signals have evolved with set of
 - Standardized syntax
 - Semantics
 - Eg.
 - Arm and baton movements of coordinator of orchestra
 - Arm and baton movements of a ground marshal at an airport signal to pilot



Schedules, rules and conventions

- Organizations use various kinds of schedules to organize
 - University manages to coordinate people with its available resources
 - Allocating thousands of lectures & seminars with small number of rooms available
 - A schedule is devised with numerous rules and constraints
 - A student cannot attend more than one lecture at a given time
 - A professor cannot give more than one lecture at a given time
 - A room cannot be allocated to more than 1 seminar at a given time
 - Only a certain number of students can be placed in a room, depending on its size

Other coordinating mechanisms employed by groups

- Formal/informal
 - Compulsory attendance
 - Writing monthly reports
 - Filling in timesheets
 - Keeping quite in a library

Shared external representations

- Commonly used to connect people
 - Eg.
 - Shared calendars
 - Forms
 - Checklists
 - Tables
 - Presented on public noticeboards/as part of other shared spaces
 - Attached to documents and folders

Provide external information of

- who is working on what
- When
- Where
- When a piece of work is supposed to be finished
- Who it goes to next

Shared table for a design project

- members take a glance and update model
- If project is going to take longer than planned
 - Can be indicated on a chart or table by extending the line representing it
 - Others see the change when pass by/glancing at the whiteboard

Sheet no	Gary copied in	Kate & Gary plot file created	Mark checked by Phil	Kate plot sent	Mark plot file created	Mark plot sent mylar
596S6	✓	✓				
S7	✓	✓				
S8	✓					
S9	✓					
S10	✓					

Shared externalizations allow

- People to make various inferences about
 - Changes
 - Delays
 - With respect to their effect on their current activities
 - Accordingly
 - Need to reschedule the work and annotate shared workplan

Designing collaborative technologies to support coordination

- Collaborative tools that support coordination
 - Shared calendars - https://www.youtube.com/watch?v=8_pGm2Q3bhc
 - Electronic schedulers
 - Project management tools
 - Workflow tools

A shared workspace system (POLITeam) supports

- Email
- Document sharing
 - Allow
 - Politicians to work together at different sites
 - includes
 - Organization of files and folders in the shared workspace

when designing coordination mechanism, it is important to consider it is

- Acceptable by people
 - Failing to do so simply abandoning it
- Eg:
 - File locking
 - Prevent users from clashing when trying to work on same part of shared document
 - Whenever some one working on a file/part of it
 - Becomes inaccessible to others
 - info about who is using and for how long may be made available

Flexible coordination include social policy of floor control

- When user wants to work on shared document/file
 - Initially request the “floor”
 - No one else use the specified section/file that time
 - Part of the document/file becomes locked
 - Preventing others from access to it
- If others want to access
 - The current user is notified
 - The negotiation may take place
 - Permission may be granted based on negotiation
- The coordination mechanism provide
 - Provides more scope for negotiation between users on
 - How to collaborate
 - Rather than “permission denied” message

Awareness Mechanisms

- Awareness involves knowing
 - Who is around
 - What is happening
 - Who is talking with whom
- When at party
 - Move around physical space
 - Observing what is going on
 - Who is talking to whom
 - Passing gossip on others

Peripheral awareness

- A specific kind of awareness
 - Ability to maintain
 - Constantly update
 - A sense of what is going on in the physical and social context
 - Eg:
 - Noting whether people are in a good/bad mood
 - Who has entered/left the room
 - How fast the drink or food is being consumed
 - How long someone has been absent

People are updated by

- Combination of
 - Direct observations
 - Peripheral monitoring

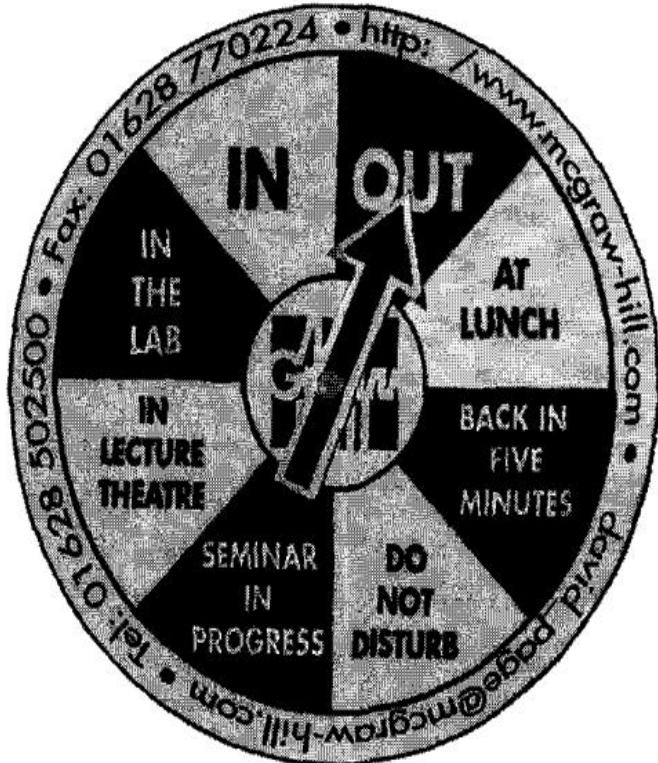


Figure 4.9 An external representation used to signal to others a person's availability.

People

- organize work & physical environment to be monitored by others
 - Give subtle cue/blatant cue
 - Subtle cue
 - Leave door slightly open to be approached
 - Blatant cue
 - Closing the door with a “do not disturb” notice



Overhearing and overseeing

- When people work together
 - Have up-to-date awareness for coordinating work
- Coordination & awareness are interdependent tasks
- Eg: Stage show
 - Performers constantly monitor one another to coordinate their performance

Designing collaborative technologies to support awareness

- Portholes
 - Digitized video images of people in offices from different locations
 - Images are shown in a matrix display
 - Clicking on an image provides
 - Information about the individual



Notifications



- Babble (developed by IBM)
 - provides a dynamic visualization of the participants in an ongoing chat-like conversation

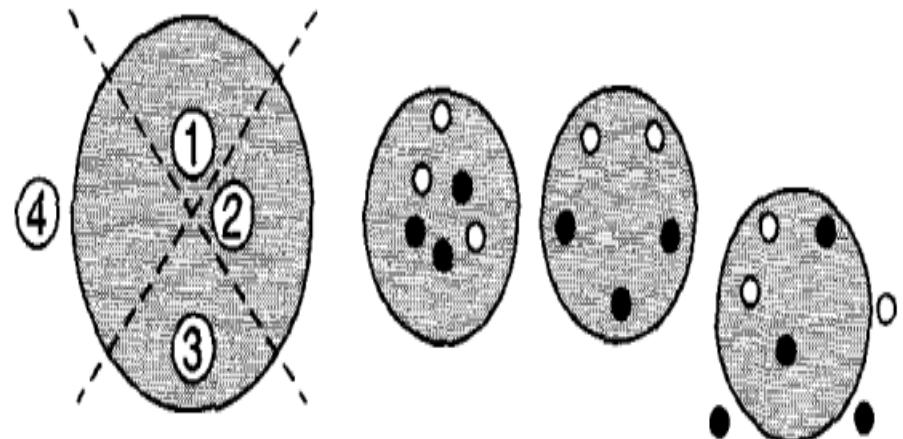


Figure 4.12 The Babble interface, with dynamic visualization of participants in ongoing conversation.

Ethnographic Studies of Collaboration and Communication

- Design of collaborative study should take into account of
 - Field study
 - Home
 - Work
 - School
 - Public place
 - Existing technologies

The studies can be

- Illuminating
- Revealing how people currently manage the work & environment
- Provides basis for
 - improvement
 - Enhancement of new ideas

Conceptual Frameworks

- Conceptual frameworks of “social” adapted from
 - Sociology
 - Anthropology
 - Cognitive approaches provide analytic frameworks and concepts to design concerns
 - Two well-known approaches
 - Language/action framework
 - Distributed cognition

The language/action framework

- People
 - act through language
 - Use language in every day activities
 - Most notably, speech act theory

Speech act theory

- Concerns with function statements in conversations
- Common function
 - Request asked indirectly
 - Eg.
 - ‘It’s hot in here’
 - Meaning
 - It would be OK to open the window to get some fresh air

5 categories of speech acts

- **Assertive** - Commit the speaker to something being the case
- **Commissive** – commit the speaker to some future action
- **Declaration** – pronounce something has happened
- **Directive** – get the listener to do something
- **Expressive** – express state of affairs, such as apologizing/praising someone

1. Assertive

- Commit the speaker to something being the case
- Speaker confidently expresses a point of view or statement of fact
- Eg.
 - Socrates is bald
 - $2 * 2 * 2 = 8$
 - Joe Biden is the president of the United States



2. Commissive

- Utterances to commit the speaker to some future course of action
 - Eg.
 - I promise to exercise everyday
 - I solemnly swear to tell the truth
 - I'll be there at 10'o clock



"Do you solemnly swear to tell the truth, the whole truth,
and nothing but the truth in exchange for immunity?"

3. Declarative

- Utterance of a change/ pronounce something has happened
 - Eg.
 - The meeting is adjourned
 - I now pronounce you husband and wife
 - This note is a legal tender for all debts public and private



4. Directive

- get the listener to do something
- Eg.
 - Please bless my family
 - Go to your room
 - Pass the salt
 - Vote for me



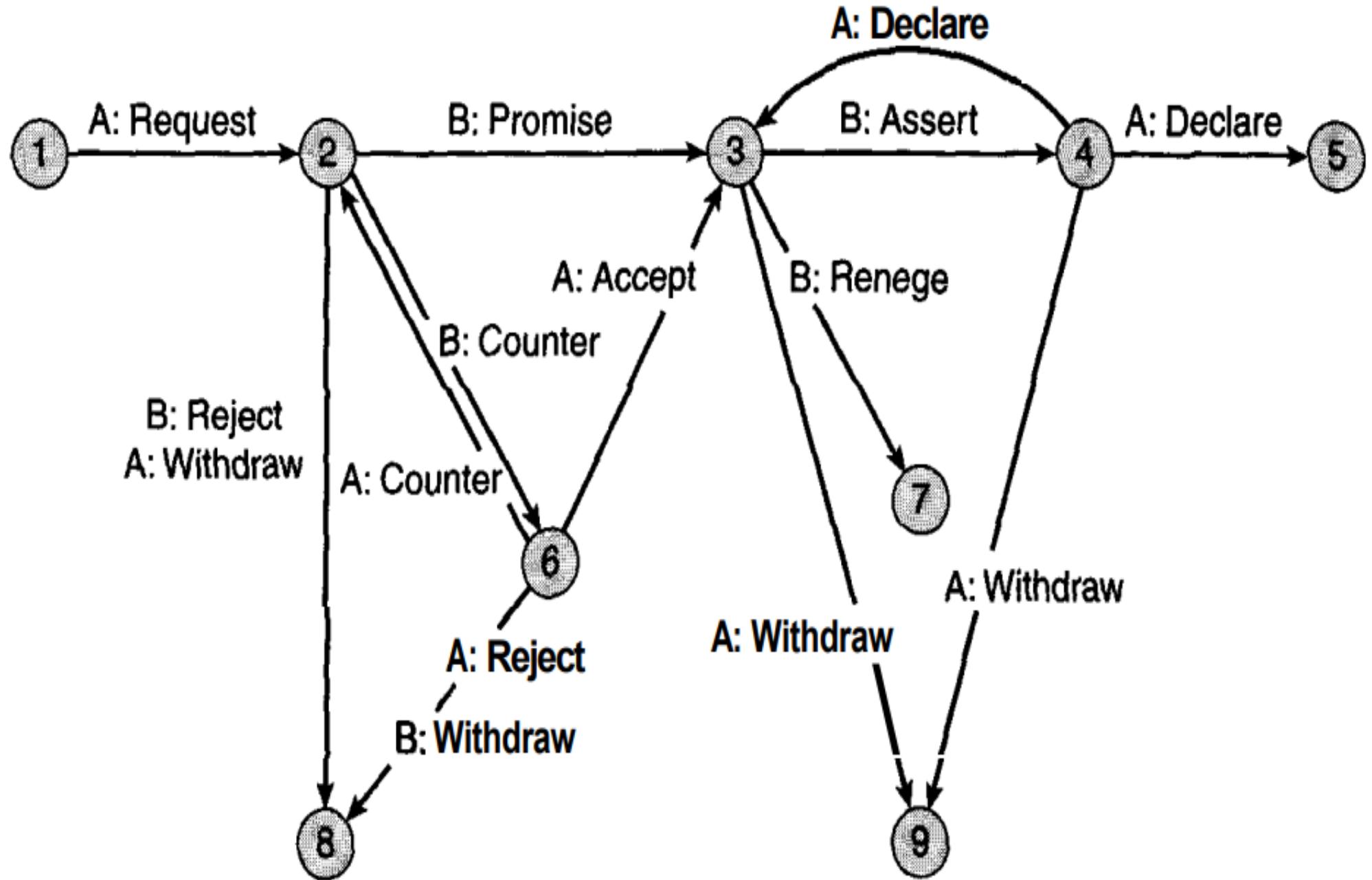
5. Expressive

- express a state of affairs
 - Eg.
 - Thank you for giving me the money
 - congratulations on marrying a libertarian
 - I apologize for stepping on your face



Language/action approach developed into

- Conversations for action (CfA) framework
 - Depicts conversation as kind of ‘dance’
 - Involves a series of steps
 - Following various speech acts
 - Involves progressing from state 1 to state 5



CfA framework was used as a

- basis of a conceptual model for a commercial software product ‘Coordinator’
- Facilitated communication in a variety of work settings
 - Sales
 - Finance
 - General management
 - Planning

Coordinator was designed to enable

- Electronic messages to be sent between people in the form of explicit speech acts
 - When sending someone, a request,
 - The sender had to select the menu option ‘request’
 - Request option was placed on the header
 - Explicitly specify the nature of the speech act

Other speech-act options of Coordinator

- Offer
- Promise
- Inform
- question

Table A: Menu items for initiating a new conversation.

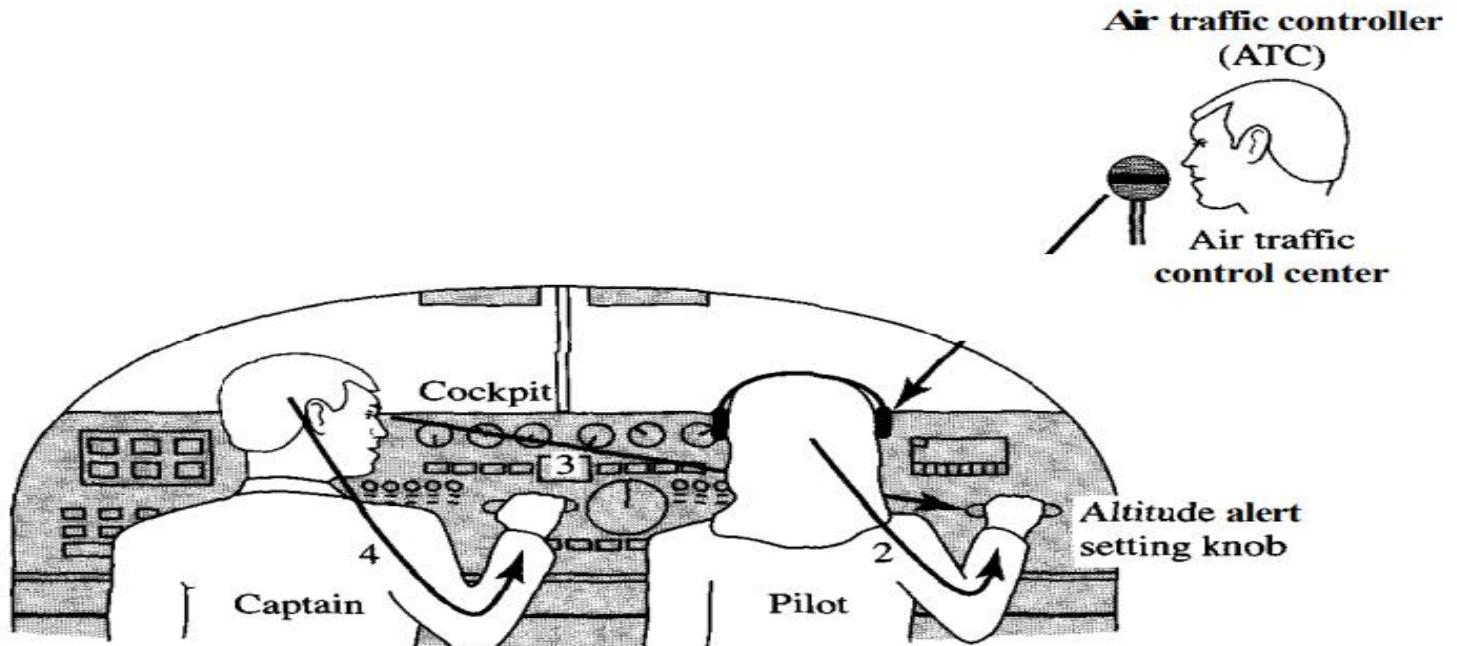
Request	Sender wants receiver to do something.
Offer	Sender offers to do something, pending acceptance.
Promise	Sender promises to do something (request is implicit).
What if	Opens a joint exploration of a space of possibilities.
Inform	Sender provides information.
Question	A request for information.
Note	A simple exchange of messages (as in ordinary E-mail).

- Offices using the Coordinator system
 - Abandoned/resorted to use free-form message facility
 - Coordinator system failed bcoz
 - user had to change the way communicated and worked

Distribution Cognition

- Ed Hutchins developed distribution cognitive approach for
 - Conceptualizing human work activities
 - Describes what happens in a cognitive system
 - Explains
 - Interactions among people
 - Artifacts they use
 - The environment

- Eg: Airline cockpit – top level goal is to fly the plane
 - Pilot, co-pilot and air traffic controller interacting with one another
 - Pilot and co-pilot interacting with instruments in the cockpit
 - Pilot and co-pilot interacting with the environment in which the plane is flying



Propagation of representational states:

- 1 ATC gives clearance to pilot to fly to higher altitude (verbal)
- 2 Pilot changes altitude meter (mental and physical)
- 3 Captain observes pilot (visual)
- 4 Captain flies to higher altitude (mental and physical)

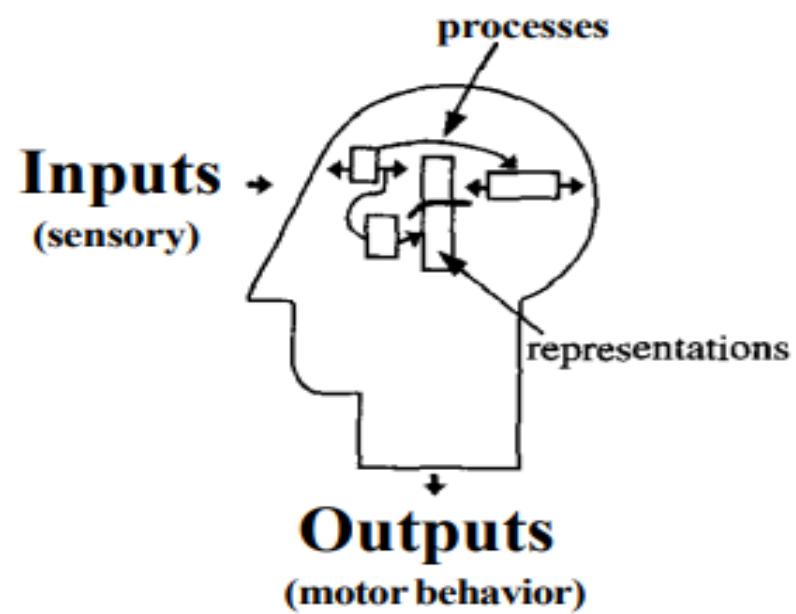
Figure 4.16 A cognitive system in which information is propagated through different media.

Primary objective of distributed cognition

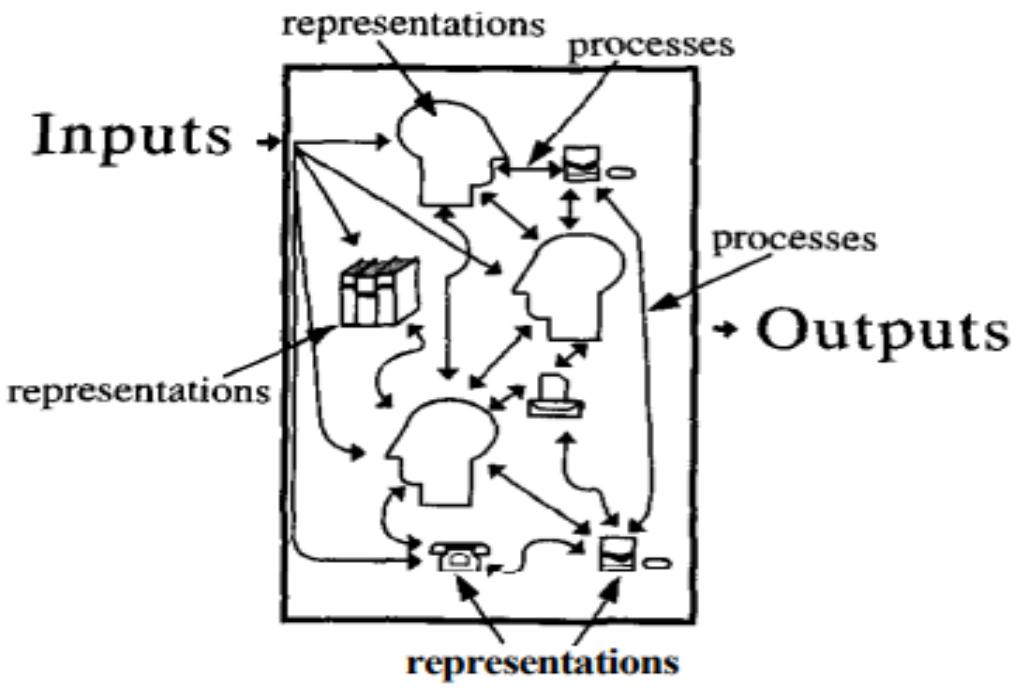
- Describes
 - how information
 - propagated through different media
 - Represented/ re-represented as it moves
 - across individuals
 - Array of artifacts (maps, instrument readings, scribbles)

A distributed cognition analysis typically involves examining:

- the distributed problem solving that takes place (including the way people work together to solve a problem)
- the role of verbal and non-verbal behavior (including what is said, what is implied by glances, winks, etc., and what is not said)
- the various coordinating mechanisms that are used (e.g., rules, procedures)
- the various communicative pathways that take place as a collaborative activity progresses
- how knowledge is shared and accessed



1. Traditional model



2. Distributed model

Figure 4.15 Comparison of traditional and distributed cognition approaches.

THANK YOU