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Learning Outcome

Objectives of this chapter are: -

- Explain what is meant by social interaction.
- Describe the social mechanisms that are used by people when communicating and collaborating.
- Discuss how social media have changed the ways in which we keep in touch, make contact, and manage our social and working lives.
- Explain what is meant by telepresence.
- Give an overview of shareable technologies and some of the studies showing how they can facilitate collaboration and group participation.

Chapter 4 Social Interaction

Introduction

Imagine not having access to your smartphone or the Internet for a week. How would you cope? Would you get bored, start twitching, or even go stir crazy? Would you feel isolated and be constantly wondering what is happening in your online social network? Many people now cannot go for very long without checking for messages, the latest tweets, Facebook updates, emails, etc., even when on vacation. For many, checking their phone is the first thing they do when waking up. It has become a daily routine and an integral part of their social lives.

This is not surprising given that humans are inherently social because: -

- They live together
- Work together
- Learn together
- Play together
- Interact and talk with each other
- Socialize

There are many kinds of sociality and many ways of studying it. In this chapter our focus is on how people communicate and collaborate in their social, work, and everyday lives. We examine how the emergence of a diversity of communication technologies has changed the way people live – the way they keep in touch, make friends, and coordinate their social and work networks. We look at the conversation mechanisms that have conventionally been used in face-to-face interactions and examine how these have changed for the various kinds of computer-based conversations that take place at a distance. We describe the idea of telepresence, where novel technologies have been designed to allow a person to feel as if they are present or to give the appearance of being present at another location. We also outline some technologies that have been developed to enable new forms of interaction, focusing on how shareable technologies can facilitate and support collocated collaboration.

BEING SOCIAL

A fundamental aspect of everyday life is being social, interacting with each other. We continuously update each other about news, changes, and developments on a given project, activity, person, or event. For example, friends and families keep each other posted on what's happening at work, at school, at the pub, at the club, next door, in soap operas, and in the news.

Similarly, people who work together keep each other informed about their social lives and everyday happenings, as well as what is happening at work, for instance when a project is about to be completed, plans for a new project, problems with meeting deadlines, rumors about closures, and so on.

While face-to-face conversations remain central to many of our social interactions, the use of social media has dramatically increased. Many of us now routinely spend several hours a day communicating online, texting, emailing, tweeting, Facebooking, Skyping, using Yammer, instant messaging, and so on. The almost universal uptake of social media in mainstream life has resulted in many people now being connected in multiple ways over time and space, in ways unimaginable 25 or even 10 years ago. For example, the average number of friends adults have on Facebook was 338 in 2014 (Pew Research), while many people have over 500 or more work connections in LinkedIn, many more than those made through face-to-face networking. The way we make contact, how we stay in touch, who we connect to, and how we maintain our social networks and family ties have irrevocably changed.

A key question this raises is: -

- How do we cope with the dramatic increase in networking in our daily lives?
- Are the ways we live and interact with one another changing?
- Have the conventions, norms, and rules established in face-to-face interactions to maintain social order been adopted in social media interactions?
- Or have new norms emerged?

In particular, are the established conversational rules and etiquette – whose function it is to let people know how they should behave in social groups – also applicable to online social behavior? Or, have new conversational mechanisms evolved for the various kinds of social media?

For example: -

- Do people greet each other in the same way, depending on whether they are chatting online, Skyping, or at a party?
- Do people take turns when online chatting in the way they do when talking with each other face-to-face?
- How do people choose which technology or app to use from the diversity available today for their various work and social activities; for example, Snap Chat, WhatsApp, text message, Skype, or phone call?

In order to answer these questions, we next describe the core social mechanisms that exist in face-to-face interactions, followed by a discussion of the extent to which they remain or have been replaced with other mechanisms in online interactions.

Face-to-Face (F2F) Conversations

Talking is something that is effortless and comes naturally to most people. And yet holding a conversation is a highly skilled collaborative achievement, having many of the qualities of a musical ensemble.

Below we examine what makes up a conversation. We begin by examining what happens at the beginning: -

- A: Hi there.

- B: Hi!
- C: Hi.
- A: All right?
- C: Good. How's it going?
- A: Fine, how are you?
- C: Good.
- B: OK. How's life treating you?

Such mutual greetings are typical. A dialog may then ensue in which the participants take turns asking questions, giving replies, and making statements. Then when one or more of the participants wants to draw the conversation to a close, they do so by using either **implicit** or **explicit** cues.

Implicit - An example of an implicit cue is when a participant **looks at his watch, signaling indirectly** to the other participants that he wants the conversation to draw to a close. The other participants may choose to acknowledge this cue or carry on and ignore it.

Explicit - Either way, the first participant may then offer an explicit signal, by saying, 'Well, I must be off now. Got work to do' or, 'Oh dear, look at the time. Must dash. Have to meet someone.' Following the acknowledgment by the other participants of such implicit and explicit signals, the conversation draws to a close, with a farewell ritual. The different participants take turns saying, 'Bye,' 'Bye then,' 'See you,' repeating themselves several times, until they finally separate.

These conversational mechanisms enable people to coordinate their talk with one another, allowing them to know how to start and stop. Throughout a conversation further turn-taking rules are followed, enabling people to know when to listen, when it is their cue to speak, and when it is time for them to stop again to allow the others to speak.

Sacks et al (1978) – who are famous for their work on conversation analysis, describe these in terms of three basic rules: -

1. **Rule 1** - the current speaker chooses the next speaker by asking a question, inviting an opinion, or making a request.
2. **Rule 2** - another person decides to start speaking.
3. **Rule 3** - the current speaker continues talking.

The rules are assumed to be applied in the above order, so that whenever there is an opportunity for a change of speaker to occur, e.g., someone comes to the end of a sentence, rule 1 is applied. If the listener to whom the question or request is addressed does not accept the offer to take the floor, the second rule is applied, and someone else taking part in the conversation may take up the opportunity and offer a view on the matter. If this does not happen then the third rule is applied and the current speaker continues talking. The rules are cycled through recursively until someone speaks again.

To facilitate rule following, people use various ways of indicating how long they are going to talk and on what topic. For example, a speaker might say right at the

beginning of his turn in the conversation that he has three things to say. A speaker may also explicitly request a change in speaker by saying to the listeners, 'OK, that's all I want to say on that matter. So, what do you think?' More subtle cues to let others know that their turn in the conversation is coming to an end include the lowering or raising of the voice to indicate the end of a question or the use of phrases like 'You know what I mean?' or, simply, 'OK?' Back channeling (uhhuh, mmm), body orientation (e.g., moving away from or closer to someone), gaze (staring straight at someone or glancing away), and gesture (e.g., raising of arms), are also used in different combinations when talking, to signal to others when someone wants to hand over or take up a turn in the conversation.

Another way in which conversations are coordinated and given coherence is through the use of adjacency pairs (Schegloff and Sacks, 1973). Utterances are assumed to come in pairs in which the first part sets up an expectation of what is to come next and directs the way in which what does come next is heard. For example, A may ask a question to which B responds appropriately: -

- A: So, shall we meet at 8:00?
- B: Um, can we make it a bit later, say 8:30?

Sometimes adjacency pairs get embedded in each other, so it may take some time for a person 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?

For the most part people are not aware of following conversational mechanisms, and would be hard pressed to articulate how they can carry on a conversation. Furthermore, people don't necessarily abide by the rules all the time. They may interrupt each other or talk over each other, even when the current speaker has clearly indicated a desire to hold the floor for the next two minutes to finish an argument. Alternatively, a listener may not take up a cue from a speaker to answer a question or take over the conversation, but instead continue to say nothing even though the speaker may be making it glaringly obvious it is the listener's turn to say something. Often times a teacher will try to hand over the conversation to a student in a seminar, by staring at her and asking a specific question, only to see the student look at the floor and say nothing. The outcome is an embarrassing silence, followed by either the teacher or another student picking up the conversation again.

Other kinds of breakdowns in conversation arise when someone says something that is ambiguous and the interlocutor misinterprets it to mean something else. In such situations the participants will collaborate to overcome the misunderstanding by using repair mechanisms. Consider the following snippet of conversation between two people: -

- A: Can you tell me the way to get to the Multiplex Ranger cinema?

- B: Yes, you go down here for two blocks and then take a right [pointing to the right], go on till you get to the lights and then it's on the left.
- A: Oh, so I go along here for a couple of blocks and then take a right and the cinema is at the lights [pointing ahead of him]?
- B: No, you go on this street for a couple of blocks [gesturing more vigorously than before to the street to the right of him while emphasizing the word this].
- A: Ahhhh! I thought you meant that one: so, it's this one [pointing in the same direction as the other person].
- B: Uh-hum, yes that's right: this one.

Detecting breakdowns in conversation requires the speaker and listener to be attending to what the other says (or does not say). Once they have understood the nature of the failure, they can then go about repairing it. As shown in the above example, when the listener misunderstands what has been communicated, the speaker repeats what she said earlier, using a stronger voice intonation and more exaggerated gestures. This allows the speaker to repair the mistake and be more explicit to the listener, allowing her to understand and follow better what they are saying. Listeners may also signal when they don't understand something or want further clarification by using various tokens, like 'Huh?' or 'What?' (Schegloff, 1981), together with giving a puzzled look (usually frowning). This is especially the case when the speaker says something that is vague. For example, he might say 'I want it' to his partner, without saying what it he wants. The partner may reply using a token or, alternatively, explicitly ask, 'What do you mean by it?' Non-verbal communication also plays an important role in augmenting face-to-face conversation, involving the use of facial expressions, back channeling (aha and umm), voice intonation, gesturing, and other kinds of body language.

Taking turns also provides opportunities for the listener to initiate repair or request clarification, or for the speaker to detect that there is a problem and initiate repair. The listener will usually wait for the next turn in the conversation before interrupting the speaker, to give the speaker the chance to clarify what is being said by completing the utterance (Suchman, 1987).

SnapChat – Ephemeral Messaging

According to Forbes, over 50 million people were using SnapChat worldwide in 2014, of which most were teenagers. One of the reasons for its mass appeal is it is quick, fun, and easy to use. Another is that it is ephemeral. Teenagers like using the messaging app as it doesn't leave a digital trace, allowing them to express themselves in personal ways without fear it will get into the hands of their prying parents or future employers. Users simply take a photo or video, annotate it, and then decide how long the intended recipient has to look at it by selecting from a dial of 1–10 seconds. The recipient then has up to the allocated time set to view it before it disappears. Whether a sender chooses to assign a mere 2 or 3 seconds or a high 8 or 9 seconds to their SnapChat adds a bit of intrigue – the recipient can try to fathom out why so little or so much value was placed on that particular image.

Remote Conversations

The telephone was invented back in the nineteenth century by Alexander Graham Bell, enabling two people to talk to one another at a distance. A number of other technologies have since been developed that support synchronous remote conversations, including videophones, video chat, and VoIP (Voice over Internet Protocol). In the late 1980s and 1990s, new generations of media spaces were experimented with. The aim was to see whether it was possible for people, distributed over space and time, to communicate and interact with one another as if they were actually physically present. Audio, video, and computer systems were combined to extend the world of desks, chairs, walls, and ceilings (Harrison, 2009).



Figure 1 - phone conversation



Figure 2 - Video conversation

An early example was Xerox's Media Space that was designed to support the informal types of communication that occur in hallways and at water coolers, providing opportunities for people in the company, located in different offices, to engage in social chat while at their desks (Mackay, 1999).



Figure 3 - Xerox's Media space – Hydra system

Other media spaces include Cruiser, Hydra and Video Window Cruiser consisted of audio and video equipment on a person's desktop that allowed those connected to 'glance' at who was in their office and whether they wanted to talk or have coffee (Fish, 1989). The idea was to allow people to interact with each other via the video technology in a similar way to how they do when walking down a physical hallway. Hydra used spatialized audio-video to enhance communication with a group of

colleagues – separate units were placed at different places on someone's desk, one assigned to each person connected to the system. VideoWindow was built at Bellcore in 1989 as a shared space that allowed people in different locations to carry on a conversation as they would do if drinking coffee together in the same room. Two lounge areas that were 50 miles apart were connected by a 3-foot by 5-foot picture window onto which video images of each location were projected. The large size enabled viewers to see a room of people roughly the same size as themselves. A study of its use showed that many of the conversations that took place between the remote conversant were indeed indistinguishable from similar face-to-face interactions – with the exception that they spoke a bit louder and constantly talked about the video system (Kraut et al, 1990).

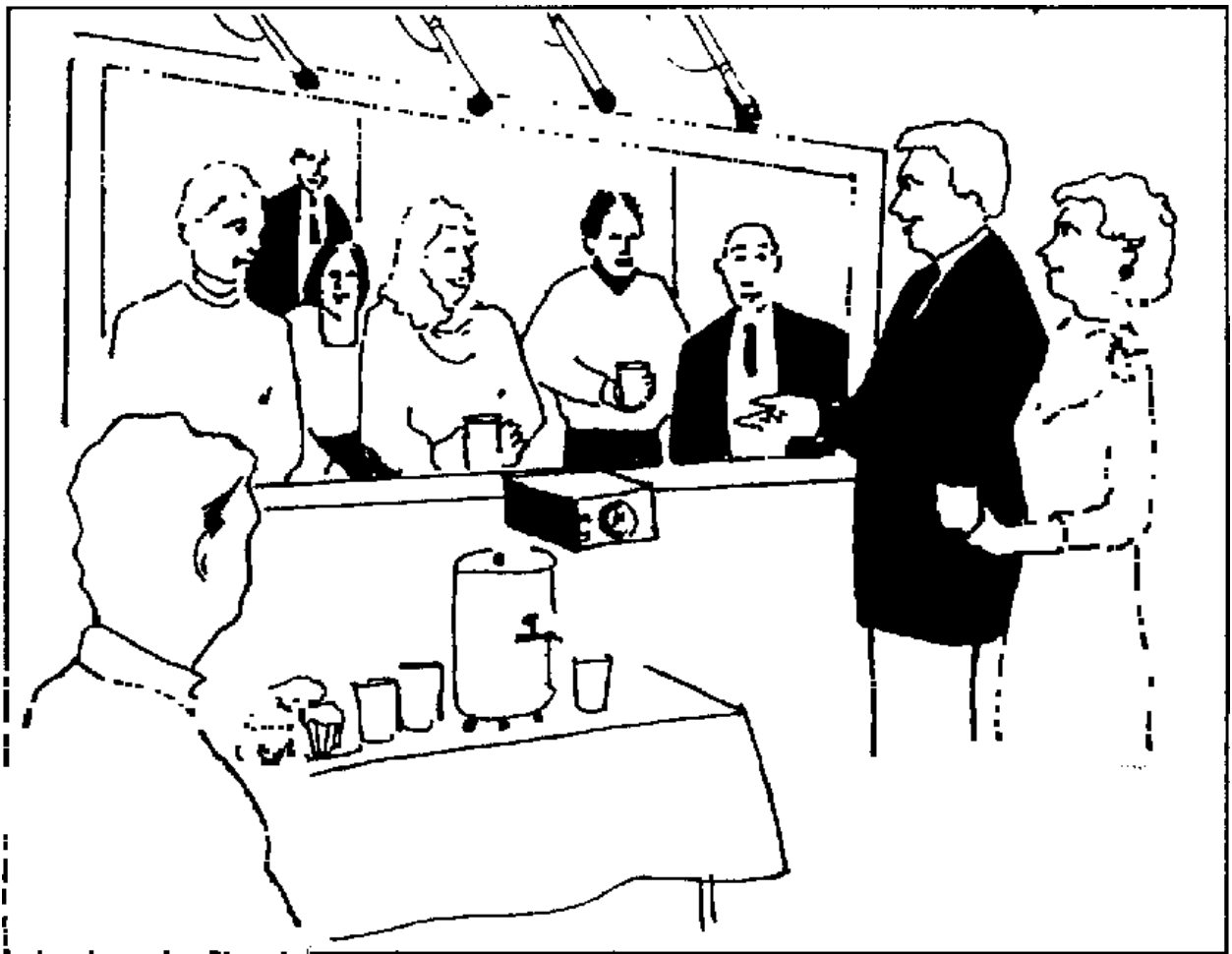


Figure 4 - Video Windows

Since this early research, there are now many technologies and messaging apps that are used worldwide for synchronous and asynchronous communication, including videoconferencing, texting, and chat groups.

However, despite the increasing ubiquity and popularity of online conversations (via phone, texting, chatting, and/or video-conferencing), they have yet to match the richness afforded by face-to-face conversations. To compensate for not being there, people have adapted the way they hold conversations to fit in with the constraints

of the respective technologies. For example, they tend to shout more when misunderstood over the phone. They also tend to speak more loudly when talking on the phone, since they can't monitor how well the person can hear them at the other end of the connection. Likewise, people tend to project themselves more when taking part in a videoconference. They also take longer conversational turns and interrupt each other less, while turn-taking appears to be much more explicit and greetings and farewells more ritualized.

Conversations via social media apps, including Twitter, WhatsApp, and Facebook, have also evolved their own particular style of interaction. Posting a status update and tweeting encourage a one-to-many broadcasting conversation, where people update their multiple friends and followers, respectively, while keeping abreast of what they are doing. They can also be one-sided, where some people don't post much about themselves, but are keen observers, avidly following and looking at their friends' latest whereabouts, activities, photos posted, and so on. Online chatting and instant messaging have also evolved their own forms of expressions that compensate for the constraints of the medium, such as the frequent use of shorthand, abbreviations, emoticons (humorous facial expression such as a smiley) that emerged through people using ASCII symbols tipped sideways in their email), and emojis (invented by Shigetaka Kurita in 1995 as a set of small pictorial icons, now widely used on smartphone apps that are often country-specific).



Figure 5 – emojis

Given the numerous ways of communicating now, how do people decide which one to use and when? In general, people move effortlessly between them, texting when wanting to send only a short message, emailing when wanting to send a longer message or other content, and chatting when online with a group of friends. However, now that many people have a number of messaging apps on their smartphone, it can sometimes be confusing to remember which one they are in or which group they are talking with. A mistake can easily be made, where someone fires off a message or sends a picture to the wrong person or group, not looking closely at who it is addressed to as they think they are still in conversation with someone else.

When planning and coordinating social activities, groups often switch from one mode to another. Most people send texts in preference to calling someone up, but may switch to phone calling or mobile group messaging (such as WhatsApp, GroupMe) at different stages of the planning. However, there can be a cost as conversations about what to do, where to meet, and who to invite multiply across people. Some people might get left off or others might not reply, and much time can be spent to-ing and fro-ing across the different apps and threads. Conversational overload can develop where the number of people involved in coordinating, the time over which it happens, and the unknowns that are not resolved all get out of hand. This is compounded by the fact that often people don't want to commit until close to the time of the event – in case an invitation to do something from another friend appears that is more interesting to them. Teenagers, especially, often leave it until the last minute to micro-coordinate their arrangements with their friends before deciding on what to do. They will wait and see if a better offer comes their way rather than making a decision for themselves a week in advance, say, to see a movie with a friend and sticking to it. This can make it very frustrating for those who initiate the planning and are waiting to book tickets before they sell out.

The speed of knowledge dissemination via digital volunteers during unexpected events and disasters can also have an immediate impact.

Social media has led to new ways of communicating and keeping in touch remotely. Another area of research where computer tools and services have been developed to support people who cannot be physically present during a meeting or social gathering is telepresence.

Telepresence

It is without question that face-to-face conversations with work colleagues, relations, and friends will continue to be preferable for many interactions, such as family occasions, work meetings, and simply going out partying.

However, there will always be times when it is not possible for people to be physically together for such events, much as they would like to be, and this concern has been the driving force behind much of the research into the design of telepresence technologies. These have been designed to allow a person to feel as if they were present or to give the appearance that they were present in the other

location by projecting their body movements, actions, voice, and facial expressions to the other location or person.



Figure 6 – telepresence

One line of research has been to superimpose images of the other person on a workspace. For example, ClearBoard was designed to enable facial expressions of participants to be made visible to others by using a transparent board that showed their face to the others (Ishii et al, 1993).



Figure 7 - ClearBoard

Remote gesturing can also help people perform tasks more easily. The presence of a remote instructor's hands as shadows overlaying the physical hands of a student in a workspace have been found to be effective at guiding them in assembling physical parts of a system.

One of the most innovative prototypes was BiReality, which used a teleoperated mobile robotic surrogate to visit remote locations as a substitute for physical travel (Jouppi et al, 2004). Much attention was paid to its design. An underlying principle was to make it seem like the person was actually there by making the surrogate look and sound like the remote person. Specifically, the robot had a life-size head shaped as a cube, with each side displaying a view of the remote person's face. The head sat on a human-shaped body base that was colored blue to match the color of business clothing. Multichannel bidirectional audio was also used to project the remote person's voice. To move in the physical space, the remote person would steer their surrogate using a console from inside their home linked into the remote meeting room. The real people in the meeting room would leave a gap at the table for the surrogate to sit with them.



Figure 8 - BiReality

To what extent do you think this kind of telepresence is compelling and could really enhance the conversation? How does it compare with high-quality videoconferencing systems, already now commercially available, called telepresence rooms? In these settings, remote people appear life-like, which is made possible by using multiple high-definition cameras with eye-tracking features and directional microphones.

Unfortunately, there have not yet been any user studies published to evaluate BiReality so it is difficult to tell if there is any significant difference in quality of conversation or perceived presence – from the point of view of both the surrogate and those physically at a meeting.

Instead of looking down at a mobile 2D screen all the time when using Facebook, SnapChat, Twitter, and so on, the future of social networking could soon become 3D, where we interact with our friends in the here and now, wearing 3D goggles. Rather than perpetually flicking through text and images on these apps, we will take part in a form of socializing that overlays the virtual and physical environments so as to make them appear seamless, where digital avatars and objects populate a world of real people and objects. And if we suspend our disbelief, we will find it difficult to know what is actual and what is digital.



Figure 9 - Oculus Rift: The overlaying of virtual and physical objects to make them appear seamless to the user

To enable a truly immersive social telepresence experience to happen, Will Steptoe and colleagues (Steptoe et al, 2014) have been experimenting with overlaying webcams on the Oculus Rift headset to fuse virtual and video spaces into one. In doing so, they hope to blur the lines between what is real and what is virtual. But could an immersive Facebook truly enhance our experience of how we interact and communicate with people remotely? How many of us would put on a pair of goggles, 10 or more times a day (the average number of times someone looks at Facebook on their phone each day is 14), in order to teleport to a friend's party, go for a walk in the park, or just hang out, without ever leaving our living room? While there have been numerous attempts over the last 30 years to create such virtual social spaces, notably Second Life, the Oculus Rift may just have that specialness to

Communicating via Virtual Hugging

Another approach to increasing the sense of presence and togetherness for people who are at a distance is the development of wearable devices that send hugs

between them. An early example was CuteCircuit's Hug Shirt. Embedded in the shirt are sensors that detect the strength of the wearer's skin warmth and heart rate and actuators that recreate the sensation of a hug through being buzzed on various parts of the body. More recently, Huggy Pajama (2009) was designed as a prototype system to promote physical interaction between a parent and child who are apart. When the parent wants to send a hug to their child, they interact with a sensing device that they hold. The child feels the hug through wearing a customized haptic jacket that uses air pressure actuation: as the parent presses the lower part of the body of the device, the lower part of the child is squeezed by the haptic pajama jacket.



Figure 10 - Virtual Hug shirt



Figure 11 - Virtual hugging

Co-presence



Figure 12 – Smartboard

Alongside telepresence there has been much interest in co-presence. Numerous shareable interfaces have been developed to enable more than one person to use them at the same time. The motivation is to enable co-located groups to collaborate more effectively when working, learning, and socializing. Examples of commercial products that support this kind of parallel interaction are Smartboards and Surfaces, which use multitouch, and Wii and Kinect, which use gesture and object recognition. To understand how these can support and enhance co-located collaboration and gaming, we first consider the coordinating and awareness mechanisms already in use by people in face-to-face interaction and then see how these have been adapted or replaced.

Physical Coordination

When people are working closely together, they talk to each other, issuing commands and letting others know how they are progressing. For example, when two or more people are collaborating, as when moving a piano, they shout instructions to each other, like 'Down a bit, left a bit, now straight forward,' to coordinate their actions. Much non-verbal communication is also used including nods, shakes, winks, glances, and hand-raising. In combination with such coordination talk to emphasize and sometimes replace it.

For time-critical and routinized collaborative activities, especially where it is difficult to hear others because of the physical conditions, people frequently use gestures (although radio-controlled communication systems may also be used). Various kinds of hand signals have evolved, with their own set of standardized syntax and semantics. For example, the arm and baton movements of a conductor coordinate the different players in an orchestra, while the arm and baton movements of a ground marshal at an airport signal to a pilot how to bring the plane into its allocated gate. Universal gestures, such as beckoning, waving and halting hand movement, are also used by people in their everyday settings.

The use of physical objects, such as wands and batons, can also facilitate coordination. Group members can use them as external thinking props to explain a principle, an idea, or a plan to the others. In particular, the act of waving or holding up a physical object in front of others is very effective at commanding attention. The persistence and ability to manipulate physical artifacts may also result in more options being explored in a group setting. They can help collaborators gain a better overview of the group activity and increase awareness of others' activities.

Awareness

Awareness involves knowing who is around, what is happening, and who is talking with whom. For example, when we are at a party, we move around the physical space, observing what is going on and who is talking to whom, eavesdropping on others' conversations, and passing on gossip to others. A specific kind of awareness is peripheral awareness.

This refers to a person's ability to maintain and constantly update a sense of what is going on in the physical and social context, through keeping an eye on what is happening in the periphery of their vision. This might include noting whether people are in a good or bad mood by the way they are talking, how fast the drink and food is being consumed, who has entered or left the room, how long someone has been absent, and whether the lonely guy in the corner is finally talking to someone – all while we are having a conversation with someone else. The combination of direct observations and peripheral monitoring keeps people informed and updated on what is happening in the world.

Another form that has been studied is situational awareness. This refers to being aware of what is happening around you in order to understand how information, events, and your own actions will affect ongoing and future events. Having good situational awareness is critical in technology-rich work domains, such as air traffic control or an operating theater, where it is necessary to keep abreast of complex and continuously changing information. This concept was specifically developed to inform the design of technologies that can support the opportunistic ways co-located groups move between working by themselves and then closely together on a shared activity, such as programming or project work.

People who work closely together also develop various strategies for coordinating their work, based on an up-to-date awareness of what the others are doing. This is especially so for interdependent tasks, where the outcome of one person's activity is needed for others to be able to carry out their tasks. For example, when putting on a show, the performers will constantly monitor what each other is doing in order to coordinate their performance efficiently.

Shareable Interfaces

How might shareable technologies be designed to exploit existing forms of coordination and awareness mechanisms? Several studies have been carried out investigating whether different arrangements of shared technologies can help co-located people work together better.

An assumption is that shareable interfaces provide more opportunities for flexible kinds of collaboration compared with single-user PCs, through enabling co-located users to simultaneously interact with digital content.

Fingertip actions are highly visible and hence observable by others, increasing opportunities for building situational and peripheral awareness. The sharable surfaces are also considered to be more natural than other technologies, enticing people to touch them without feeling intimidated or embarrassed by the consequences of their actions. For example, small groups found it more comfortable working together around a tabletop compared with sitting in front of a PC or standing in a line in front of a vertical display.

Collaborative Expression Through the Reactable Experience

The Reactable Experience (2010) was designed for groups of children, families, or adults to create music together in public spaces and institutions, such as museums and science centers. Based on the original Reactable (Jordà et al, 2005), colorful tangible pucks are moved and rotated on the surface of a translucent tabletop, which results in various digital annotations appearing and connecting them. A synthesizer creates immediate sounds in response to the various tabletop interactions. One of the main ideas behind the design was to enable groups to create music together on the fly. This is achieved through making visible everyone's interactions at the tabletop surface and by providing real-time feedback about what is currently happening.



Figure 13 – Reactable music table

Watch at: <https://youtu.be/x8WuWagPTwk>

One area of research has been to investigate whether group collaboration can result in more equitable interaction around a tabletop surface. This will depend on how obvious it is to the group members what to do at the interface and how to take turns to progress with the task. Of primary importance is whether the interface invites people to select, add, manipulate, or remove digital content from the displays and devices. A study by Rogers et al (2009) showed that a tabletop that allowed group members to add digital content by using physical tokens, using an RFID (radio-

frequency identification) reader, resulted in more equitable participation than if only digital input was allowed via icons and menus at the tabletop. This suggests that it was easier for people who are normally shy in groups to make a contribution to the task. Moreover, people who spoke the least were found to make the biggest contribution to the design task at the tabletop – in terms of selecting, adding, moving, and removing options. This reveals how changing the way people can interact with a shareable surface can have an impact on group participation. It shows that it is possible for more reticent members to make a contribution without feeling under pressure to have to speak more.



Figure 14 - Reflect Table

Other studies have also shown that under-participants tend not to increase their level of verbal contribution in small group meetings when provided with various kinds of support, such as awareness visualizations displaying who is contributing over time. Real-time feedback presented via ambient displays has also been experimented with to provide a new form of awareness for co-located groups. LEDs glowing in tabletops and abstract visualizations on handheld and wall displays have been designed to represent how different group members are performing, such as turn-taking. The assumption is that this kind of real-time feedback can promote self and group regulation and in so doing modify group members' contributions to make them more equitable. For example, the Reflect Table was designed based on this assumption. The table monitors

and analyzes ongoing conversations using embedded microphones in front of each person and represents this in the form of increasing numbers of colored LEDs.

A study investigated whether students became more aware of how much they were speaking during a group meeting when their relative levels of talk were displayed in this manner and, if so, whether they regulated their levels of participation more effectively.

In other words, would the girl in the bottom right reduce her contributions (as she clearly has been talking the most) while the boy in the bottom left increases his (as he has been talking the least)? The findings were mixed: some participants changed their level to match the levels of others while others became frustrated and chose simply to ignore the LEDs. Specifically, those who spoke the most changed their behavior the most (i.e., reduced their level) while those who spoke the least changed theirs the least (i.e., did not increase their level). Another finding was that participants who believed it was beneficial to contribute equally to the conversation took more notice of the LEDs and regulated their conversation level accordingly. For example, one participant said that she “refrained from talking to avoid having a lot more lights than the others”. Conversely, participants who thought it was not important took less notice. How do you think you would react?

An implication from the various user studies on co-located collaboration around tabletops is that designing shareable interfaces to encourage more equitable participation isn't straightforward. Providing explicit real-time feedback on how much someone is speaking in a group may be a good way of showing everyone who is talking too much but it may be intimidating for those who are talking too little. Allowing discreet and accessible ways for adding and manipulating content to an ongoing collaborative task at a shareable surface may be more effective at encouraging greater participation from people who normally find it difficult or who are simply unable to verbally contribute to group settings (e.g., those on the autistic spectrum, those who stutter, or those who are shy or are non-native speakers).

How best to represent the activity of online social networks in terms of who is taking part has also been the subject of much research. A design principle that has been influential is social translucence. This refers to the importance of designing communication systems to enable participants and their activities to be visible to one another. This idea was very much behind the early communication tool, Babble, developed at IBM by David Smith, which provided a dynamic visualization of the participants in an ongoing chat room. A large 2D circle was depicted using colored marbles on each user's monitor. Marbles inside the circle conveyed those individuals active in the current conversation. Marbles outside the circle showed users involved in other conversations. The more active a participant was in the conversation, the more the corresponding marble moved towards the center of the circle. Conversely, the less

engaged a person was in the ongoing conversation, the more the marble moved towards the periphery of the circle.

Since this early work on visualizing social interactions, there have been a number of virtual spaces developed that provide awareness about what people are doing, where they are, and their availability, with the aim of helping them feel more connected. Working in remote teams can be isolating, especially if you are part of a virtual team and rarely get to see your colleagues face to face. Also, you miss out on the office gossip and coffee room chats, where great ideas often start. There are various communication services that have been designed to make people feel more connected. One is the virtual office system, Sococo, that uses the spatial metaphor of a floor plan of an office to show where people are, who is in a meeting, and who is chatting with whom.



Figure 15 - Sococo Virtual Office

It provides a bird's-eye view of each floor so that everyone connected can see where everyone is at any given time. It also makes it easy to pop in and say hello to someone – in the same way office workers might do if they were in the same building. You simply click on a room and virtually pop your head round the door and start talking with the person inside. Or you can shut your door and that lets others know you are busy and not to be disturbed. Before entering a meeting, you can see who is already there by the

presence of their avatar icon. There are also 'water cooler' and lobby areas where users can jump over just for a spontaneous conversation with someone.

Software tools are available that visualize social networks using social media (e.g., tweets) or data collected about a group or a community that is entered into a spreadsheet.

For example, NodeXL (Hansen et al, 2011) provides an easy way of showing relationships between people or topics that interest them. More generally, Social Network Analysis (SNA) can be used to analyze big data in a social context, enabling researchers to visualize the impact a person has in a given social network, showing who they are talking to and what hot topics are being talked about.

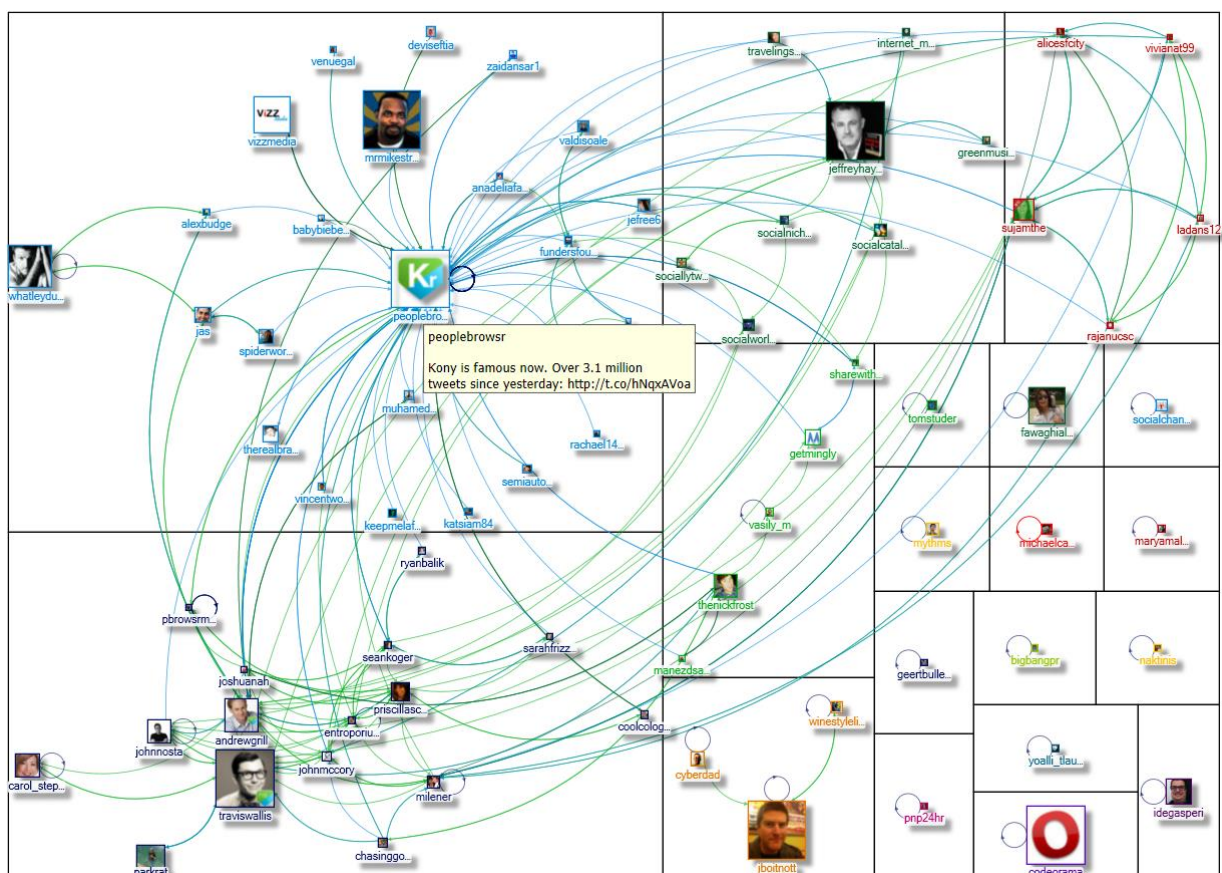


Figure 16 – NodeXL describes the networks you create

How might less intrusive mechanisms be developed using collaborative technologies? One line of research has investigated how computer- based matchmaking techniques can be used, based on algorithms that determine which preferences and views shared among people would make them suitable conversational partners. The profiles of like-minded people are revealed to one other when in close proximity via LCD name tags that light up or as icons that appear on a person's cell phone display.

While such explicit revelations of what is normally hidden and discreet can be entertaining for some, for others it can feel invasive and an unnatural way of meeting someone.

An alternative approach is to design a physical space where people can enter and exit a conversation with a stranger in more subtle ways, i.e., one where people do not feel threatened or embarrassed, and which does not require a high level of commitment. The Opinionizer system was designed along these lines, with the aim of encouraging people in an informal gathering to share their opinions visually and anonymously. The collective creation of opinions via a public display was intended to provide a talking point for the people standing beside it. Users submitted their opinions by typing them in at a public keyboard. To add color and personality to their opinions, a selection of small cartoon avatars and speech bubbles were available.

Interactive shared displays have been placed in various public spaces, e.g., hallways, reception areas, and shopping malls, with the aim of encouraging people to meet, interact with each other, and socialize. Early systems were designed for people to send notes, news items, and other materials from the PCs in their offices to a large public display, e.g., the Notification Collage system and the Plasma Posters. The Dynamo system went one step further by enabling communities to readily share and exchange a variety of media on a large shared display by hooking up their memory sticks, laptops, cameras, and other devices in the vicinity of the display.



Figure 17 - the Break-Time Barometer

A range of technological interventions have been developed and placed in physical work settings with the aim of encouraging people to socialize and talk more with each other. For example, the Break-Time Barometer was designed to persuade people to come out of their offices for a break to meet others they might not talk with otherwise.

An ambient display, based on a clock metaphor, shows how many people are currently in the common room; if there are people present, it also sends an alert that it would be a good time to join them for a break. While the system nudged some people to go for a break in the staff room, it also had the opposite effect on others who used it to determine when breaks weren't happening so that they could take a break without their colleagues being around for company.

Dilemma

Mindless versus mindful interaction

We are increasingly living in our own digital bubbles. Even when physically together as families and friends in our living rooms, outdoors, and in public places. We have our eyes glued to our own phones, tablets, and laptops, sometimes oblivious to our family, friends, and colleagues who we might be sitting with, eating with or traveling with.



Figure 18 – They are Even when physically together but their eyes glued to their phones

Teenagers have become 'screenagers.' Young kids are having their screen time rationed. Many of us are lost without our smartphones, constantly flipping them out of our pockets and purses to catch up on the latest gossip, news, or snap – at the expense of appearing rude to those around us. The new generation of 'all about me' health and fitness gadgets, which is becoming more mainstream, is making this phenomenon worse. Do we really need smart shoes that tell us when we are being lazy and glasses that tell us what we can and cannot eat? Is this what we want from technology – ever more forms of mindless interaction and data addiction? By

mindless is meant indifferent to, unaware of, and blind to what is going on around us. How can we begin to rethink our relationship with future digital technologies that is more mindful? By this is meant being alive and aware or conscious of someone or something. It could be through thinking more about how we can do things together using shared devices, tools, and data-technology that encourages us to be more thoughtful of each other and our surrounding environments.

Summary

Human beings are inherently social. People will always need to collaborate, coordinate, and communicate with one another, and the diverse range of applications, web-based services, and technologies that have emerged are enabling them to do so in more extensive and diverse ways. In this chapter we have looked at some core aspects of sociality, namely communication and collaboration. We examined the main social mechanisms that people use in different conversational settings when interacting face-to-face and at a distance. A number of collaborative and telepresence technologies designed to support and extend these mechanisms were discussed, highlighting core interaction design concerns.

Key points: -

- Social interaction is central to our everyday life.
- Social mechanisms have evolved in face-to-face and remote contexts to facilitate conversation, coordination, and awareness.
- Talk and the way it is managed are integral to coordinating social interaction.
- Many kinds of computer-mediated communication systems have been developed to enable people to communicate with one another when in physically different locations.
- Keeping aware of what others are doing and letting others know what you are doing are important aspects of collaboration and socializing.
- Social media have brought about significant changes in the way people keep in touch and manage their social lives.