Chapter 5.
Models of Human Behavior: Social Interaction and Social Structures

Groups, organizations, and even societies process and use information. The previous chapter focused on how individuals use information. Here we consider how groups of people seek for and use information as well as how information affects the social interaction. Applications of information systems. Toward the end of this chapter, we will consider education, which combines individual and social aspects. Broader implications for society are described in Chapter 8.

Understanding the way that information is communicated through different types of structures can give us insight into both ourselves and new information system designs. There is a continual interplay between the social environment and the individual with one influencing the other. Here we emphasize interpersonal interaction. later we will consider large-scale economic and political systems. People are almost always evaluating what other people are doing. Expectations and representations predominate. In social systems, like other complex systems, making changes in one factor may have an unexpected effect in other, seemingly unrelated, parts.

People are highly social and a lot of the information people obtain is from others. We are all embedded in a complex network of social interactions. Ultimately, social interaction reflects ways in which people meet biological needs such as food, shelter, and family. This is the root of most norms. Information exchange is a big part of social bonding, but the information is not always unbiased.

Society is simply booming and buzzing. It's difficult to capture much about it in a systematic way. Social as a relationship rather than an entity. Interaction level of analysis. Intermediate level of analysis for how people create, live with, interpret, and change social structures[47].

In short, there is a question about the best level of analysis for huamn behavior. Is it at the level of the individual, the level of society, or some combination of the two. There should be a balance between the individual and society. The key notion is the interdependence of agency and structure. Social aspects of activity theory (3.5.1). There is a difficulty in applying the techniques of natural science to social science (9.2.1).

The previous section included several aspects of social structure, but of course, structure and process work together. Societies may be aggregates of several different cultures and social rules facilitate interaction across those social unit. There are many aspects to human interaction and the cumulative result of all of these interactions is society. One model for social organization suggests that it is composed of subsystems[80]: Goals, resources, coordination, persistence across time. Political, economic, and cultural sub-systems. Other models assume there are interacting components but assume that the structures are more ad hoc (5.1.2). These subsystems are continuously finding an interplay. For instance,

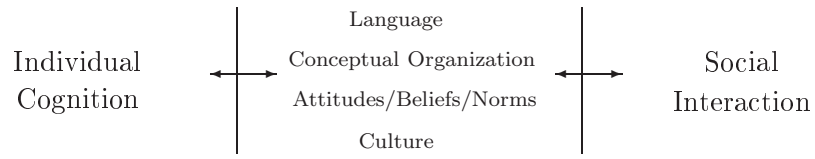


Figure 5.1: There is a continual interplay between individual cognition and social interaction. Language, culture, and attitudes mediate between the two levels. Indeed, the personal and social are so intertwined that it is often helpful to consider them as two sides of the same coin.

the balance of politics and economics is seen continual interaction of government and commerce.

Grand social theories ((sec:socialtheory)). Cohesion models. Conflict theory. Structural models vs functional models.

Social networking systems have given a voice to many individuals and contributes to the claims of the "wisdom of crowds". Surely, this is not a universal effect and there is also "madness of crowds". When people have minimal information, they often follow other people what other people are doing[61]. However, in many cases, this works out well but it can also create a herd mentality. In the extreme, we observe fads and manias.

Socialization is the effective meshing of individuals into the social fabric. Social media and social reading. Socio-technical systems.

5.1. Social Structures and Social Networks

In any social group, there many types of social interaction: family, friends, work, clubs, neighbors. These can be characterized by sets of nodes and links. We can model the interaction among people as links in a network in which the individuals are nodes. Charting the path of information and the means by which it is spread can tell us a great deal about the efficient transfer of information and the way that individuals gather it. Structure and processes. Ultimately, we many want to consider more dynamic interactions among people but the network model give us a good place to start. These mirror Web structure and information networks (2.6.3).

Literal social networks can be modeled by graph theory (-A.3.0). However, social interactions are often not tidy. These cover a wide variety of phenomena and they show systematic patterns. Social networks are an idealization. They do not show organizational structure very well. They show more complex patterns and eventually need to expand to other phenomena. We can think there being several layers to social networks. A social network as a simple network as a graph formalism is simplistic but is a good place to start. There are distinct links based on kinship and social roles. Nonetheless, this the notion of a social network is a useful conceptualization. Organizational interactions as a type of social network. One has to be careful that the measure of social networks actually represents engagement among the participants.

5.1.1. Everyday Social Structures and Activities

Beyond simple version of a social network there are, of course, rich types of social interaction. Pleasure of sociability. Group dynamics and cohesion. Conversation (6.4.0). Social dominance. Social skills such a relationship planning.

Social interaction tends to become structured. Structural view of social relationships. How have information systems affected family structure and interaction. Perhaps they have strengthened other institutions which serve some of the functions that families used to serve. These many be thought of as constituting community and culture. People interact to develop shared meaning.

Institution roles such family, school and professions provide structure. Social interaction as creating

obligations and responsibilities.

The aggregate social interaction is society. Interacting with people is an inherent part of being human, but it can be seen as a bargain we accept – we accept society's rules in return for its benefits. This view of why we participate in society is known as the "social contract" [16].

Impression management revealing information to others. Impression management following roles [49]. Roles as determines behavior versus a result of other factors.

Structure and Interpersonal Interaction

There are common elements to all social groups; structure and shared expectations are such elements, though they can take many forms. Each group develops its own social contract that specifies the various member roles as they pertain to different elements and/or responsibilities. It is not clear what effect the information systems have on social interaction in the long run. Can different systems counteract the isolating effects of geographical separation? Do information systems help us to communicate better with the people around us, or do they usurp our attention? Division of labor. Social representation.

Structural properties of graphs. Triadic closure.

Social balance theories[55] are related to the gestalt principles which we discussed earlier (4.2.1). This is illustrated in Fig. 5.2 and it is related to the earlier discussions of field theory and gestalt psychology. Society can be viewed as a self-organizing system. The dynamics of such balance theories rapidly becomes more complex if Pat is a woman and the others are men. Signed network.

Figure 5.2: Two examples of stable valenced social networks. "Mutual admiration" (left) and "The enemy of my enemy is my friend" (right). A "+" means likes and a - means dislikes.

Some organizational structures are better suited to certain tasks, or actions. The theory of structuration [?, ?]. proposes that the relationship between structure and action (of any system involving people) is dynamic — that is, one affects the other and vice versa. The structure of an organization will affect the way the intended task is carried out, but the task that is to be carried out will, in turn, affect the way an organization is structured. Allowing for this relationship, the structure and processes of an organization with a given goal or task should be emergent; that is, they should be allowed to grow out of the demands of the task, while at the same time being stringent enough to accomplish the original goal. Intermediation between the social and individual.

Family, Clan, Tribe, and Culture

Family support and interaction. Emotional need satisfaction. Complex relationships. Parents, values. Factors such as imitation and familiarity are large determinants of learning. A type of social capital (5.2.1). These social groups are based in biology, emotion, and those inclinations are further enhanced by interactions such as gift exchange.

While some information systems have resulted in greater isolation among people; for instance, many people spend more time viewing television alone[84] and less time interacting with each other.

On the other hand, many other information systems allow people to interact more easily with one another by means other than face-to-face interaction. Closer family interaction through video links. amily interaction with through email. Family members who are physically separated can keep in touch with each other via computer, while a remote Internet camera allows parents to see their children during the day at pre-school. Family-entertainment games. Overall, interactive information technology seems

to bring people together more than isolating them. Effects of television viewing on social attitudes[78]. This type of anonymous interaction has consequences.

Supporting how children play together. Many forms of exchange in these social interactions including nuanced exchange of information.

Home. Roles in household chores.

Computer-mediated family communication.

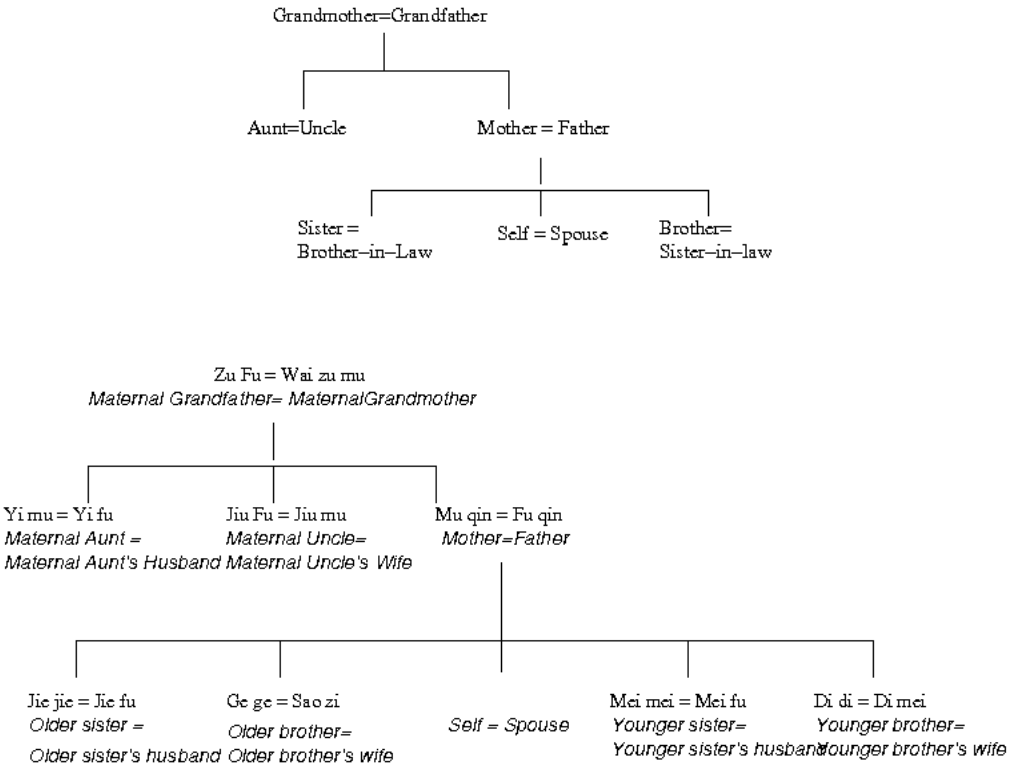


Figure 5.3: Chinese kinship (lower panel) relationships are much more specific and complex than those in Western European cultures (upper panel). (redraw)

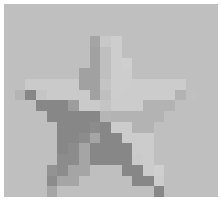


Figure 5.4: Ching ming.

Extended families. Clans. Tribe. Culture (5.8.2). May have norms and rules of their own.

Friendship

People bond and form friendships. There is a Web of friendship. For both family and friends there are affective relationships such as caring, empathy, and jealousy. Simple factors such as physical proximity is a significant factor in friendship; distance can have a great effect on the likelihood of interaction between people[44](Fig. 5.5). It is easier to establish and maintain friendships when there is a physical presence. Information systems have extended the opportunities for social interaction and overlaps in

cyber-space can also lead to friendships. Physical proximity also has a big effect on collaboration among researchers[20].

Figure 5.5: To a surprising extent, friendship in an apartment complex is determined by simple factors such as whether people's apartments face each other. In the student housing complex shown in the picture, those students whose apartment exits faced each other were more likely to be friends than those students whose apartments faced away from the others (adapted from[44]). (check permission)

Sociability is congenial engagement in social interaction. Beyond simply completing tasks, people develop friendships, empathy, and perhaps community. Sociability can simply be pleasurable. Information exchange as a mechanism for social bonding. On one hand, games can be very isolating. Some people spend hours playing games. However, some interactive games and other types of social interaction sites, can increase sociability[83]. Indeed, sociable displays facilitate social interaction. However, there can also be negative sociability such as spiteful comments and back biting.

Impression management for online presentation. Do we believe the information as entered?

Matchmaking. Similarity predicts long-term relationship success. Niche dating sites. Compatibility index and examples of compatibility factors. Interpersonal attraction. Sharing calendars.

Language similarity contributes to the stability of relationships. Relationship development. Bonding from sharing information. Social skills (5.2.1). Sociability.

5.1.2. Social Rules and Structuration

Where do social structures come from? Structure and function (1.6.3). Social interactions can be fluid but for most situations, we have expectation about how behavior. Typically, there are "rules" that govern group behavior and practice. These rules may be tacit (social norms); or, they may be formal procedures instituted by an organization or even the written laws of the nation or state. These rules, formal (such as the second one below which taken from *Roberts Rules of Order*) or otherwise, provide structure and for a group to function effectively. Task groups also need to be effective at information processing. Agency. Tradition. Adaptive structuration as changes evolve.

> I'm going to skip the remaining items on the agenda. I'll assume that everyone agrees with them. If you have questions, let me know by email.

> 2. What Precedes Debate. Before any subject is open to debate it is necessary, first, that a motion be made by a member who has obtained the floor; second, that it be seconded (with certain exceptions); and third, that it be stated by the chair, that is, by the presiding officer.

5.1.3. Social Networks

We all have a circle of acquaintances. We can think of these acquaintances as forming a web or network of social contacts. Especially if we focus on those contact with which we have a specific type of interaction, we might think of the network of interactions in formal terms. A social network is

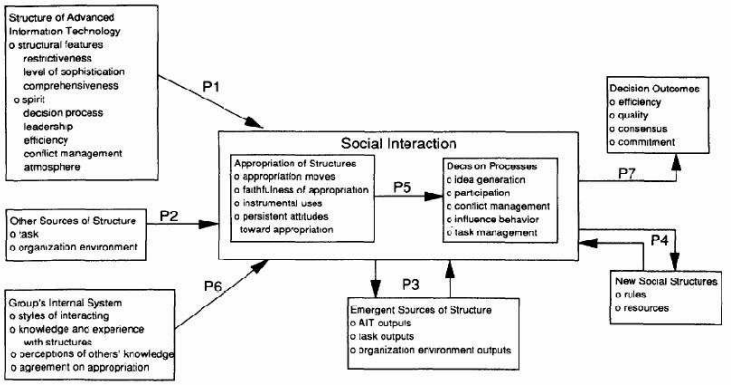


Figure 5.6: Factors affecting adaptive structuration. (DeSanctis and Poole) (check permission) (redraw)

sometimes considered in this formal sense and other times the notion is used more loosely. Interaction with some of those people is restricted to a specific topic while with others we have a spectrum of interactions. The strength of weak ties.

Formal Models of Social Networks

Describing social networks with graphs. Simple graph theory approach. These implement single-link-type social networks. This is highly constraining because relationships among people a highly nuanced. Like a hypertext, the link is either present or absent. However, that is probably a simplistic model. Although the expression social network is widely used, its definition is more complex.

A social network may simple be formalized as matching formal graph structures. Friendship networks. Affiliation networks (-A.3.0).

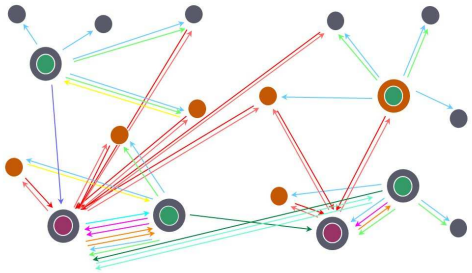
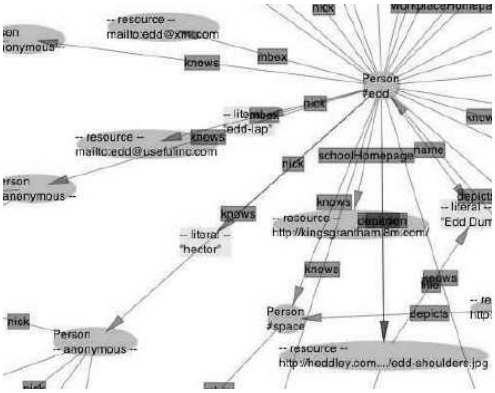


Figure 5.7: Because social interactions are complex, a social network should be thought of as an idealization. Of course, people are not all the same and the links between people are multifacetted. (redraw)

While social networks are often modeled with simple connections among undifferentiated nodes, actual social networks involve many groups of people and different ways of interacting with them. Many attempts have been made to develop formal descriptions of social networks based on graph theory (-A.3.0). In some cases, there complexity of social relationships is reduced to one dimension. For instance, a Friend-of-a-Friend (FOAF) network uses URIs to identify people and the mapping between people is accomplished through RDF. (2.3.3) (Fig. 5.8).

Many factors affect the developed of social relationships such as: proximity and eulture. Work relationships are often influenced by organizational structures and professional relationship. Forming interest groups and coalitions.

To the extent we accept that social networks are simple collections of nodes and links, we can calculate properties. For instance, we might characterize the participants by their centrality in the network.

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<rdf/rdf:RDF
   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:foaf="http://xmlns.com/foaf/0.1/">
<rdffoaf:Person>
   <rdffoaf:name>Edd Dumbill</foaf:name>
   <rdffoaf:mbox rdf:resource="mailto:edd@xml.com" />
<rdf/foaf:Person>
<rdf/rdf:RDF>
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Figure 5.8: Example of a FOAF network and fragment of RDF for it[7]. FOAF is often use for personal URIs. (redraw) (check permission)

People may try to move to the center. This creates the self-organizing system (-A.10.4).

Dynamics of social networks. From social networks to agent simulations. There can be multiple interlocking social networks.

Spread of Information in a Social Network

There are several different ways people get information from other people and for such person-to-person communication, the structure of a social network and a person's position in it affects the information they receive. In terms of the the entire network, we can view diffusion of information. Consider the communicative patterns of people in the hypothetical communications network in Fig. 5.9. Medical information (9.9.0).

Protocols for coordinating communication within a network.

These variations in structure across organizational boundaries have obvious implications for management — managers must determine whether a more controlled or a more spontaneous environment t suits the goals of the group. Social networks are not just passive, but may be actively developed. Informal social networks may be cultivated to obtain information that may exist outside normal organizational channels.

Interaction of groups of specialists which have to work together but they do not have the same terminology. In some situations the information flows through the links but in other situations the basic network is not a good description. When a new idea emerges, it spreads, or diffuses, across individuals or across group boundaries. People learn about it and accept it at different rates, often at a rate that depends on their connectivity. Diffusion of information is facilitated by communication, and, of course, the pattern of diffusion is affected by communication patterns. Fig. 5.9 shows how information might be communicated by spreading person to person. Cultural change. Beyond communication, social networks impose constraints on their members. This is the "strength of weak ties".

Doctors in small towns. Emergent phenomena. Viral contagion and epidemics (-A.3.5). Gmail "Don't forget Bob" service. Information cascades from diffusion finally catching hold.

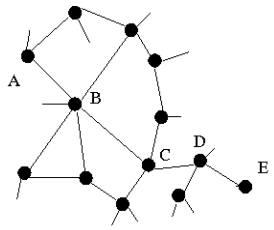

Figure 5.9: Information may diffuse across networks of individuals. Information held by Person A can be communicated through a series of individuals eventually reaching Person E.

One example of diffusion within a defined group is how awareness of a procedure spreads through the medical community. This can be contrasted with how information spreads through the blogosphere, or Web log community on the internet. In this example, information or awareness spreads almost exponentially as it pops up in different forums and chat rooms across the Internet (-A.3.5). Social networking with technology. Information systems can greatly affect social interaction. MySpace.

As we suggested above, the simple view of social networks is only a first approximation. In our information-rich society, there are also other ways to get information such as by broadcast media. Spread of information by media.

As we have seen with mobile networking Cellphones. Twitter. 140 character limit. Micro-blogging. Twitter is ofter used for asking questions of a close circle of friends. Frequent updates of data and low propagation delays.

Fig. 5.10. (10.11.2).

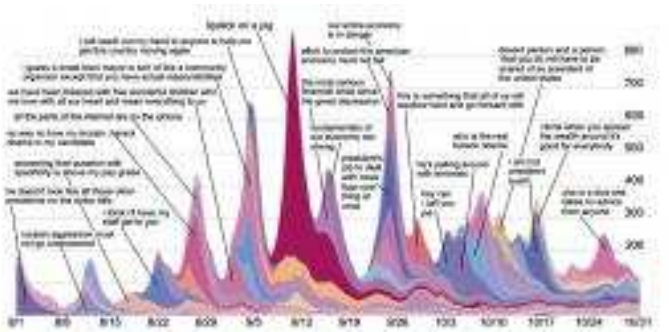

Figure 5.10: The frequency of postings about a given topic are a function of two factors. The figure shows data about items from the 2008 US Presidential Election. (from Kleinberg). (check permission)

Rumors which spread from person-to-person. are an example the diffusion of information; Urban legends. Debunked at snopes.com. This is a type of viral dissemination and in some cases, it can be described as an epidemic contagion. Rumors regard something people are willing to believe. However, this model is too simple; the spread of information may be seen as related to the spread of a disease (5.1.3). In fact, information diffusion is also affected by factors such as the message and the communication channels. Because it occurs like a disease spreading this is sometimes called viral dissemination. This could be implemented in a whisper campaign or it could be circulated by blogs. Person-to-person information exchange is rarely the only was people get information. There are many types of communication models. Micro-blogging.

5.1.4. Social Media

Social media supports social interaction beyond simple communication In many cases, social media are based on social networks. Location-based social media. Coordination with traditional media. Social

search. Sentiment analysis.

Posting personal information on sites. Mining personal information. Social media networks are different from basic social networks as they project recommended links. Social media as an extension of physical world. See faces of the people you are linking to (Fig. 5.11). Greater customer feedback and the chance to market goods through social media.

Personalized newspapers in the sense of telling you what your friends are doing.

Real-time trends identified from social media. Mining social media.

Social media and advertising based on knowledge of people the personal data people provide in the network.

Cliques and linking. Harassment. Cyber-bullying.

Social media and impression management. What people reveal about themselves.

Figure 5.11: Social networking sites allow people to specify sets of links.

Some people reveal a lot about themselves in these sites and they forget that the information can often be widely seen. Postings and links to friends may be systematically mined by either the platform provider or by others who gain access to it. Privacy issues. Scraping personal information from social media sites. Evolution of social media networks. These also allow social interaction and building social relationships. Reciprocity. Niches.

Using Social Networks to Facilitate Social Interaction

Platform (7.8.2). Social, mobile, cloud. One-way links vs mutual (two-way) linking. Many advantages of platforms in coordinating services. This coordination occurs both in terms of the content but also in terms of the usage. Designing social networks and designing online communities (5.8.2).

Social media Networking to keep in touch with people. Citizen journalism (8.13.7). Twitter. Social media have led to aggressive direct marketing to the voters. Social media contributes to viral marketing. Social decision making (8.4.3). Build by buzz and exclusion. How to get re-tweeted.

Supporting Sociable Interaction

Postings on social media sites as publishing. Social gaming. These social networks are different from natural social networks. Automated and immediate communication with all friends. Supports social exchange. Games (11.7.0). Fig. 5.12 Supporting sociable interaction. From the gaming sites perspective, the goal is often to get people to interact more to get them to reveal more personal and social interaction details and which which can be monitized through advertising.

Self-improvement from social interaction even when it is computer-mediated.

User enriched web resources in which people have added value to a repository such as Ancestry.com.

Social media approach to brand management.

Figure 5.12: Farmville. (check permission).

Crowd-powered systems.

Inciting violence or criminal activity with mobile phones.

Political activism with social media. Facilitate low-risk activism.

Social Media Business Models

Building loyalty to the site through engagement. Eventually want to monetize the association. Optimizing metrics to rate the rate of conversion from non-paying. Retention on site. Related to romantic Match making (5.1.1).

Social media analytics.

Spreading opinions quickly. "Dell Hell" Controlling firestorms of negative publicity.

Linking social media to TV viewing. Commentary about TV shows.

EdgeRank is a weighting formula for showing newsfeed messages. It weighs several factors from multiple sources. Is a message from somebody you "like"? Have other people responded to a message?

$$Liking * Goodpost * How\ old \tag{5.1}$$

Search from social media (10.11.1). Facilitating search with social networks. Questions sent to Facebook pages. Characteristics of different social media sites.

Text data mining for social web sites as a predictor of events and trends (10.5.0).

Personal data in social media sites has proven extremely valuable to advertisers.

5.1.5. Connectivity

Modern information systems allow people to connect in many ways such as email, SMS, social networking. Modality (5.6.5).

Time management and prioritizing email based on understanding of user characteristics.

Social networks don't tell us about the amount or type of interaction exchanged between people. Across time and space.

The Internet and mobile communication devices have greatly expanded the speed and amount of connectivity.

Families ((sec:families)) and connectivity. Online communities.

5.2. Social Capital

Social capital consists of social resources which help people to accomplish their goals. Social capital is distinct from economic capital but it can, sometimes, translate into economic capital. Social capital

is often based on non-political groups such as the family but social capital can sometimes blend into political power There are several forms of social capital based on social relationships such as interpersonal trust and reputation.

5.2.1. Social Relationships

There are two types of social capital for relationships: Bonding and bridging [84]. Participation in communities of practice (5.8.2) can build social capital. Social skills such as putting people at ease.

These are social resources which allow people to take advantage of social interaction. Some sources of social capital include family, and physical proximity but social capital can be built by networking. Social capital as filling holes in the social network [32] and [31] (Fig. 5.13). In fact, we recognize the importance of social networking. Building social capital from social exchange.

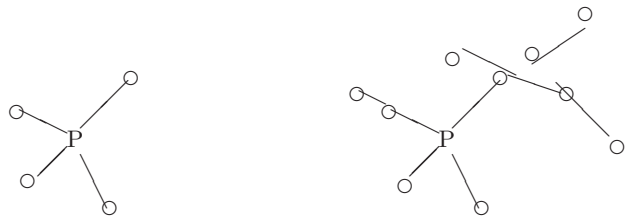

Figure 5.13: The person (P) on the right would be said to have more social capital than the person on the left because that person connects more people. Indeed, social capital can be created by growing networks around them.

Centrality and position in social networks.

5.2.2. Reputation

Personal and Organizational Reputation

Reputation are expectations about another person. be it the work they will do, the advice they might give, or the opinion they will hold. Reputation can affect a person's position in society. A good reputation leads to trust which we discuss below. Reputation is context dependent. Organizational reputation. Privacy vs. reputation.

Email phishing often depends on people having inadequate models for what is trustworthy [13]. Reputation and trust can also be attacked by smears. Rumors spread fast on the net. Sorting out what offers are believable can be a challenge. Scams. There is a danger that reputation and trust can be manipulated. Manipulating reputation and trust of con-artists. Whitewashing. Attacking a person's reputation online is known as a "Joe job". Reputation improvement as a type of public relations.

For online interaction, we often form a judgment about a person's reputation based on relatively little evidence. Online companies, such as online auctions, which connect people to other people take steps to make sure their buyers and sellers have a credible reputation. Many such reputation systems are based on history — buyers and sellers on auction sites have a generalized record of their transactions available to the public. If they have a history of making bad deals, people will be hesitant to do business with them, and they may even be barred from using the system. Reputation management systems should not be able to be spoofed. Nonetheless, it is possible to develop an elaborate scam for fraud. By setting up numerous bogus identities that all vouch for the superior character of the target individual an individual's trust rating can be artificially inflated. An individual could buy and sell items to and from themselves over a period of time, thus artificially creating an excellent buyer/seller rating.

Social media background checks.

Linking many sources of reputation together. Should conduct a type of due diligence.

Product and Service Reputation

Reputation requires great consistency in performance and outcomes. Reputation allows people to hold

people or organizations responsible. Professional reputation.

A brand name is developed by having a reputation for fulfilling promises, providing quality information, or delivering a good product, A brand name can provide evidence of predictable levels of quality (8.12.5), and boosts user/buyer confidence. Thus, branding plays a large role in maintaining user loyalty [90]. Branding involves both a consistent product and a consistent message about that product. Branding in a market niche often commands a premium price. While a brand is a valuable asset, it's value can be lost by mismanagement. Brand control versus interactive brand development through social media [?].

Attempts to provide a quantitative system for reputation (5.2.2) for establishing trust include metrics such as Karma points. Reputation economics. Points economy. Economy of recognition (Fig. 5.14).

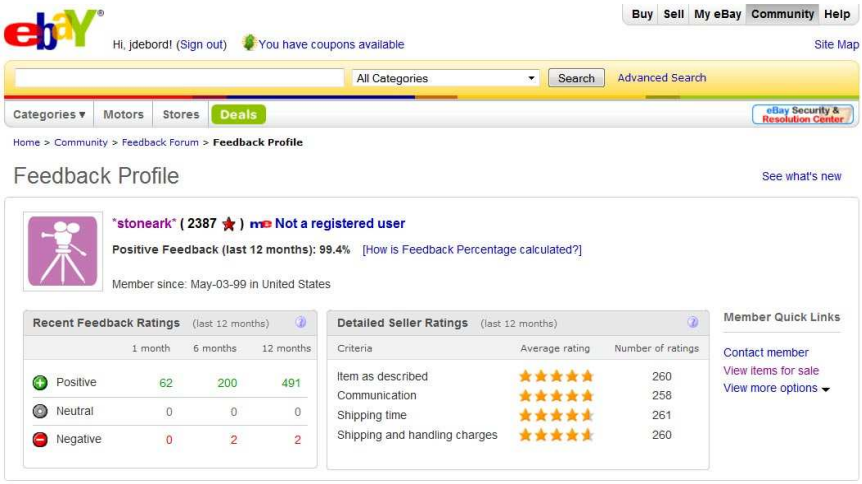

Figure 5.14: Reputation ratings from eBay. (check permission)

5.2.3. Trust

Reputation is one factor which enable trust. Emotional aspectsof trust and rational/technological aspects. Trust is the expectation that other social agents will do what they have committed to doing. Trust from reliable procedures.

Perception of trust is naturally related to reputation. While people often do what they are promise, and to function in society we need trust. However, people can't always be trusted. Trust from professional status (e.g., information professionals). Ultimately, trust stems from reciprocal power. Trust from having a way to get revenge - a balance of power.

Contract example.

Trust is often the result of constrains outside a given interaction. One of the foundations for trust is family and other social ties. Trust from a contract (8.11.5). But, of course, that contract must be enforceable. Many applications which need trust. Trusted systems (8.5.4). Trust for documents and records (7.5.1).

Trust from spot checking actual results. Trust information organization, sharing, and prioritization.

Trusted Information Sources: Reputation is developed by good practices, which signal a respect for quality information. Information sources should be cited, and there should be an indication that the information is timely. Perception of trust. Authorities. Reference works.

Interpersonal Trust

There are many other sources of trust. Past experience with a person (agent) often give us trust. Likewise, cultural similarity may also give a sense of trust. There can also trust for organizations

provided they earn it. We consider many sources of evidence when deciding about trust whether it is trusting a person or trusting information. However, many of these are subjective and depend, for instance, on attribution (5.5.2). Furthermore, as we noted earlier, such subjective trust can be abused with a systematic attempt at distortion. Knowing the history of a resource – its provenance – is essential for trusting it.

Trust is essential for social interaction. We often need laws to back up trust and reputations. Trusting what other people say[107]. Many organizations or systems can be, and often are, trusted on the basis of reputation without direct individual contact.

Trusting friends based on a network of social relationships. Value of verbal commitments and promises.

At the interpersonal level, trust is a matter of perception and attributions (5.5.2) — if we like someone, we might trust them in spite of our own better judgment. When people act in social situations, other people may form opinions of them; a person's reputation is the impression of that person held by others. This reputation is dependent to a large degree on the trust which is associated with them. Trust is typically established from a combination of two things: association with or recommendation from another trusted individual, or past behavior. Reputation management systems track electronic reputations, and they typically work on one or both of the previously mentioned principles (recommendation or history).

Developing procedures which create trusting interactions among people. It is difficult, if not impossible, to function in society without trust. That trust can also be abused.

Formal Models of Trust and Trusted Systems

Reputation and a history of providing accurate information help to establish trust with the public. Trusted systems (8.5.4). When institutions and laws help to build trust, people are more willing to participate with them. Ecommerce applications for trust (8.12.5). Security and banking supported by institutional metrics such as audits.

Informal trust is often not enough, stronger social constraints such as legally enforced contracts (8.11.5) have been developed. A contract has explicit consequence for actions. With formal mechanisms (such as enforceable contracts) trust can be propagated from one entity to others. If I trust you, then people who trust me may also trust you. Chain of trust. Fig. 5.15

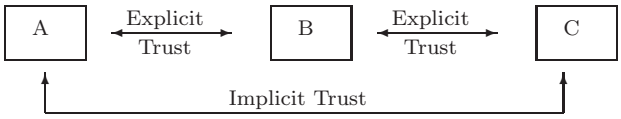

Figure 5.15: Chain of trust. A and B trust each other and B and C trust each other. Should A and C trust each other? For instance, if I am a trusted computer user on system A should I also be a trusted user on system C?

5.2.4. Managing Online Reputation

5.3. Social Control

Rewards vs coercive control. Groups have many ways to control their members such as censure, punishment, and economic control. Bullying.

5.3.1. Norms and Social Practices

Norms are expectations people have about appropriate social behavior. Norms help to maintain social structure and culture. Each culture has its own conventions for proper conduct (5.8.2). The differences may be relatively small, such as the topical differences that exist between Western European cultures, or they may be more significant, like the differences between Middle Eastern and Western European cultures. Members of a particular culture (5.8.2) take in these conventions through the process of socialization.

Networks and interrelationships of norms in shaping society. Norms for information behavior. Norms, as the name implies, are the expected behaviors in society and culture. There are norms for privacy (8.3.1), for courteous behavior, and for decency. of course, not everyone in a society agrees about or follows all norms. Thus, they are, roughly, the average attitude of the people who make up a society. Ultimately, some norms are formalized as rules and laws (8.5.1). Norms for culture. Norms and conversation (6.4.1). Norms provide expectations which help us understand situations.

Individual behavior is often the result of a balance between personal attitudes and social norms. Within any society, individuals exhibit varying degrees of deviance from the norms or conventions. While some individuals may deviate in small, and in many cases almost un-noticeable, ways from the average conventions of society, other individuals exhibit more extreme forms of deviation. Typically, these individuals attract the attention of the society or community at large, which then attempts to enforce its norms through social disapproval and/or sanctions.

Norms often provide simplified decision rules for complex situations. They can propagate a culture's values. Some norms are followed for communication interactions such as telephone calls and letters. In the same way, Email, a relatively new communication medium, is beginning to develop conventions that dictate its proper use. Netiquette describe the conventions of Internet use. And, though it is a new medium and its conventions are in flux, there is already discussion about what constitutes deviation from the norms of the internet community; what materials are allowed to be posted, and what actions constitute a crime. Over time, the conventions that develop will become more solidified and accepted, perhaps forming an amalgamation of different cultural norms from around the world. However, it is worth noting that not all traditions are constructive.

Norms and culture frequently change. Indeed, it's characteristic of human society that one generation creates a new culture for the next generation.

Deviance is straying from a cultural norm.

Norms in virtual worlds and with multi-agent systems.

5.3.2. Social Power

Force versus persuasion.

5.3.3. Disinformation

People often have very different explanations of an event. This may simply be because people have very different belief systems, because self-presentation and persuasion are very human activities, or perhaps even malicious obfuscation and distortion. Many people do not focus on obtaining accurate information.

Differing viewpoints versus intentional disinformation.

Argumentation can go beyond a person's considered opinion. The are situations where there are strong incentives to lie and cheat. Indeed, they often distort it. It may reflect an aggressive campaign of disinformation.

Managing public opinion (8.4.3). Out-right aggression.

There are many strategies for deceiving people beyond simply lying.

Information will often be manipulated and distorted to meet people's goals. Even if there isn't outright deception, people often accept simple narratives or those that are consistent with their prior beliefs (4.5.0). There are many examples of distortion. In synchronous interaction, there are many attributes which are difficult for a communicator to control. What's a lie anyway. Lies versus saving face.

Politicians often seem to induce confusion by over-simplification of a complex issue. Similarly, they may attempt to frame the debate – that is to emphasize particular issues and alternatives – with perspectives

in their favor. Apply persuasion and attitude change techniques. People may have an incentive to use ambiguous categories. For instance, Robin Hood is viewed as either a hero or a criminal.

obfuscation example

Partial truths, Snow jobs. Inventing words or using common words with a non-standard meaning. Selecting presentation of information. Intentional distortion of information. Attitudinal change (4.5.2). Distortion of information in organizations. In a competitive situation, knowledge gamesmanship (8.13.3). Gaming the system. "Human beings are a political animal". Incentives for distortion. Such as by con-men (Fig. 5.16). At the extreme, this may include outright lying.

Figure 5.16: In a confidence game, the con-man attempts to gain the trust of the mark. *The Sting* portrays an example of a long con. That is a particularly involved con job. (check permission)

Several steps may help to minimize false persuasion. Holding people accountable for their actions. Separating opinion and persuasion from fact. Roles, such as journalism, which promote a neutral perspective. Compensate for distortions via information and media literacy (5.12.2).

Because of these tendencies, organizations can become badly distorted and mismanaged. They may not have effective internal check and balances. Reward structures in organizations can also alter the organizational culture, and organizational functions and economic considerations may affect the adoption of technology. "Who does the work and who gets the credit" is a common question regarding the introduction of anything, but particularly a new technology, which alters the status quo[52]. These factors will alter an individual's perception of how an organization works, or prevent them from actually conceiving a perception in the first place, and an unsuitable reward structure can change views of whether or not an organization is "fair". Employees who view an organization as unfair, and are skeptical about the rewards and punishments of sharing information, generally won't share that information.

Group and organizational gamesmanship. Corruption. Non-transparent. Meetings held in secret. Government contracts and agreements not made public.

Organizations are made up of individuals. Individual information behavior within compartmentalized organizations often leads to "information hoarding". This occurs when individuals in organizations have difficulties sharing information. These difficulties can be the result of organizational policy regarding such matters, but can also be an individual response to the overall organizational culture. Scientists sharing data (9.6.4).

Intentional distortion of information as gamesmanship. There are some common ways information is distorted such as with false rhetoric, invalid logic, and misleading statistics. Hoaxes.

5.3.4. Crime and Cyber-crime

There are many ways that information systems will facilitate criminal activity. Facilitate by mobility and remote interaction. Dark market for exchange of illicitly obtained information. Deviance.

Scams

These are often for financial gain or to facilitate other criminal activity. Attacks executed through the network or on information obtained through the network. Cybercrime and netwar are increasingly intertwined. Cybercrime and spam. Digital forensics (7.10.3). Money laundering.

419 scam. Identity theft. RealID. Advance-fee scam. Stolen credit cards.

Zombies.

Fraud and Fraud Detection

Banking and other financial transactions generate extensive records (4.4.4, 7.4.1). These records need to be managed accurately and efficiently, as mistakes will erode the trust of users. Baking records, combined with data mining techniques, can help to prevent fraud. These records may be mined (9.6.3) to determine, whether a credit card has been stolen and is being used by an unauthorized person. A database containing records of a consumer's purchase history may be analyzed to determine if their buying patterns have changed dramatically. Based on the suspicious pattern, a credit card company might contact the cardholder to inquire whether the purchases shown in Fig. 5.17 should be authorized. Such judgments would be enhanced by rich data about a person's past preferences, in effect creating models of customers; of course, raises privacy concerns (8.3.1). A real system would also consider the individual's history (4.10.2). Indeed, reality is a lot more complex and there may be legitimate but unexpected patterns of use. However, this can also be seen as algorithmic surveillance. Indeed, there are dangers of false accusations from purely automatic methods.

Date	Time	Purchase	Amount	Location
Jan. 1 2007	7 AM	automobile tire	$120	Jacksonville, FL
Jan. 1 2007	6 PM	gasoline	$24	Raleigh, NC
Jan. 1 2007	11 PM	17 hams	$267	Richmond, VA

Figure 5.17: Is this a suspicious pattern of credit card purchases which might indicate fraud? Could a general program be developed to detect such cases?

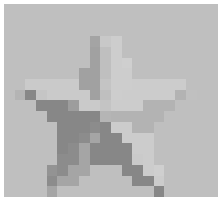

Figure 5.18: Fraudulent will.

Corruption

Corruption is violation of established organizational or government procedures. It is effectively an ad hoc tax on productivity. However, it is difficult to define as it is difficult to agree on what constitutes proper procedures. Cronyism. Strong institutions help to minimize corruption. Free press and a reliable records system (7.4.1), can help fight corruption.

Corruption ends up as a drag on effective functioning on society. It often results from the control of information. Ideally all government information such as budgets, taxes, and regulations would be fully and clearly available for public access. Beneficial effects of freedom of information and transparency in fighting corruption. ipaidbribe Web site.

5.4. Social Data and Computational Sociology

5.4.1. Characterizing the Behavior of People

Human mobility analysis.

Shopping cards.

5.4.2. Social Data and Social Predictions

Social network and social media data.

5.4.3. Social Simulations

Crowds. Individuals may show unpredictable behavior or but the average behavior of a crowd may show typical emergent behavior. There are increasing attempts to simulated the behavior of crowds and of individuals in crowds (Fig. 5.19). Artificial psychology (4.7.0). Agent-based models (-A.10.4).

Figure 5.19: Actual crowd behavior in a panic (left) and a simulation of a crowd (center), and battle scene from *Lord of the Rings* in which the individual characters are algorithmically controlled. (check permission)

5.4.4. Computational Sociology

Multi-agent systems (7.7.8) which explore issues of social organization and interaction. Alife (-A.10.4).

Community behavior modeling.

Figure 5.20: Agent societies.

5.5. Participation in Society

Social practices. Learning as social participation. Socialization.

5.5.1. Self, Roles, and Identity

Self

Individuals in society form a sense of self.“ Self emerges when a child understands that he or she is distinct from their environment. The “self” helps to mediate and internalize the social world[72]. Each of us has an identity that we call “I,” which is separate from the rest of the world. However, visions of the self are often primarily social; that is, we frequently understand ourselves by comparison to others: whereas that person is tall, I am short; whereas that person is selfish, I am generous. Regulation of affect leads to the developed of the self. Self as a narrative (6.3.6), Personal information management (4.11.0).

The self is also constructed and projected into a social environment. We may be concerned with the way others see us — “Do I appear enthusiastic?” or “Do I appear greedy?” — and we adapt ourselves accordingly. “Impression management” describe how we often manage social interactions so that we control people’s impressions of us. “Saving face” is an example of this; doing (or not doing) something that one does not want (or wants) to do simply because the action (or inaction) will help to preserve their image in the eyes of others[49].

People's self-reports are often inaccurate. Self-narratives are the stories people tell themselves. (6.3.6). These is some basis in neuroscience[108]. These stories may be distorted and inaccurate. Indeed, they are greatly affected by our social context. They are interrelated with the stories and impressions we have. Personal narratives.

Identity, space and time and culture. "home".

Roles, Role Playing, and Identity

Identity and roles. Role-playing games (11.7.0). A variety of types of roles. Brain science and identity [43]. Roles versus constraints. Self-presentation.

Virtual identities are personae a user may adopt in a virtual environment (Fig. 5.21); these roles can be adopted in much the same way that an actor adopts characters. In a sense, these non-task-oriented sessions may allow participants to role play; in many cases, an assumed identity may have nothing to do with a person's true identity[100]. This practice has been seen to have both positive and negative aspects. On the one hand, it allows people the freedom to experiment as different characters. Many people have advocated this as an opportunity for individuals to become comfortable with an identity in an anonymous environment before expressing it in the real world, or that once expressed in this "safe" environment, they may no longer feel a desire to act on that personality in the real world. However, critics have pointed out that no environment is truly "safe," and actions taken can have real-world implications. The adoption of various roles can be deceptive, and violates certain innately held social beliefs that we have regarding accountability for action. Spatial aspect of virtual worlds. Guided tours through virtual space.

Figure 5.21: Options for selecting characters for Second Life. (check permission)

Taller avatars and players reaction to them.

Constructing meaning. Culture as framing identity. Narrative and life story[71].

Extended sense of self to include attachment to a constellation of objects [**?**]. Evocative objects. Affect (4.6.2).

Actors mimicking the identity of the people they are portraying.

5.5.2. Social Perception and Social Impression Formation: Attribution of Intention and Responsibility

Social Categorization and Perception

Categorization (2.1.1). [28] Social categorization. Pros and cons. Making generalizations based on just a few attributes. Stereotypes. Traits. Affective input as groups. Emotion and attribution. Inevitable but many consequences. Many examples: Disciplines. Reclassification can be a way to redefine social practice. Boundary objects and communities of practice.

Difficulties of validity in applying any stereotypes.

Kinship (5.1.1).

Attribution

People are highly tuned to what other people are doing. We naturally make attributions about the causes and reasons for that other person's actions. Indeed, people are highly tuned to other people's behavior and are continually looking for the causes of that behavior. Empathy (5.5.3). What is a person doing and why are they doing it.

Stereotypes. Plan recognition (3.7.2). Theory of mind/behavior ((sec:theorymind)). Modeling attributions. Mental models applied to social interaction.

Expression recognition.

Earlier we considered perceived causation for physical objects (4.4.2). Analysis of "what is going on here". We are finely tuned to what people typically do in given situations. We have strong expectations about what is reasonable and we make judgments about them based on those expectations.

The causation of social activities is particularly complex. As highly social beings people almost continually evaluate what other people are doing. When we see another person, we tend to form an impression of what they are trying to do — their intention. Suppose we saw a person breaking into a car: is that person trying to steal the car or just getting at keys that are locked inside? There are many cues we may use. Our analysis of another person's intentions depends on our estimates of the probability of certain actions. These probabilities are affected by factors such as our understanding of social norms and how much is known about the person in question across a number of situations. Attributions and models of others. Attributions are often based on little evidence. This is part of what draws people into con-jobs.

Causation (4.4.2). Attribution and credit assignment. Self-attribution[77]. Cognitive factors in attribution. Is a payment reasonable for an activity? If not then the payment may not be perceived as an appropriate reward. Legal concept of proximate cause.

When we see unexpected behaviors, we look for explanations for them. Thus, if we see a person giving money to a shop keeper to pay for an item, we do not think much about it. However, we may be surprised if we see a person intentionally flinging money into the street. Such expectations help us determine whether a person is responsible for an action. Judgments of normative behavior is a type of plan recognition (3.7.2). Narrative explanations (6.3.6) and circumstantial evidence. One common type of attribution is judge responsibility.

5.5.3. Social Motivation: Binding and Cohesion

Earlier we considered motivation (4.6.0) but didn't focus on the social dimension. Of course, there are many types of social motivation:

Approval. Affection. Traditions, memorials. Breaking bread. Gossip. Malicious gossip. Information sharing. Nuanced information sharing. Selective disclosure of information to other people. Affect (4.6.2).

Empathy is feeling emotions similar to those felt by another person. Mirror neurons. Social brain (-A.12.2). Empathy from maternal care. Artificial empathy (Fig. 5.22). Horror movies. Empathy and a close community.

5.5.4. Social Learning and Imitation

When we interact with other people we learn about them and we also learn more about how to act in social situations – known as social learning (-A.12.2). A lot of social learning is simply watching to see how other people do things. Looking up because other people are looking up. In some cases, the learning seems to be more directly wired in. This may include important skills such as self-regulation, delay of gratification[73], arousal management (4.6.2), culture learning (5.8.2).

Social learning takes place in many ways; the experience we gain from interacting with others individ-

Figure 5.22: Instilling empathy. (check permission)

ually, as groups, observing others and the images, facts, and values that we are exposed to from the media and society as a whole all contribute to our social learning. We will discuss different aspects of social learning and how each may add to our individual understanding of our environment. Vicarious learning and imitation. One way we learn about how to behave in society is by observing and then imitating other people[26]. Children learn by imitating their parents. Imitation serves both learning and social bonding. By observation, individuals begin to understand what is allowed in society and what is deemed improper — imitation is the enactment of these understandings. Thus initiation contributes to fads, and hysterias.

Even adults may imitate what they see on TV, read about in magazines, or experience in media games. Indeed, people sometimes treat computers as though they were social actors. Modeling behavior.

Figure 5.23: Imitation and social learning. (check permission)

5.5.5. Social Navigation, and Social Filtering: Recommender Systems

A recommender system makes suggestions about content that may be of interest to a user.

Public Recommendations

Like button. Used in social search (10.11.1).

Information Referrals

One type of recommendation is interpersonal and is based on the knowledge of preferences or role of colleagues. A set of colleagues can be a type of social network. This is a type of collaborative information retrieval. [50] (Fig. 5.24). "Hey look at this." Re-tweets.

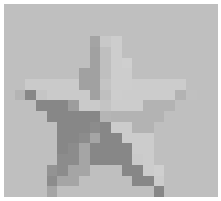

Figure 5.24: Collegial referral.

Anonymous Recommendations

The suggestions are often based on ratings and usage by others. Recommender systems may also be used to generate personalized advertisements targeted to specific individuals or groups. Relevance and

recommendation system. People like you. How friendship networks behave. Usage information is now widely incorporated in many services.

In a second type of recommender system, the data is anonymous. Typically, these are ratings that other people make about it. Indeed, these rating are a type of representation. People's use of particular materials or particular types of materials is measured, and that measure is used to determine likely preferences for additional materials. In most cases, retrieval and filtering are based on matching attributes of the documents. By measuring the preferences for a particular class of documents (say movies, for example) of a large number of people across wide segments of a community, patterns of preference are able to be determined. If you and I consistently like the same kinds of movies, and I like a new movie, there is a good chance that you also will like that new movie. This approach work for multimedia documents from which it is difficult to extract matchable symbols. This is the most useful method for retrieving aesthetic content preferences in formats such as entertainment videos[56] and music[91]. There are also obvious applications for this technology in targeted advertising.

Predicting hidden interests.

Behavior modification through gamification.

This is a type of social medium for social metadata. To make accurate preference assessments, however, it is necessary to collect data from many people; unfortunately, the collection process may be intrusive. In the video example, individuals need to rate a large number of videos for the system to be effective. This type of data may be collected directly (explicitly) or indirectly (implicitly). Fig. 5.25 shows hypothetical preference ratings on seven items (columns) by four users (rows). In addition, three of the four users have rated the hypothetical target item. If we want to predict user 4's rating of the target item, we could look at which of the other user's ratings for the other items were most similar to user 4's. When we do this, we can see that the ratings of User 1 are similar; thus, we might expect that User 4's rating of the target item would also be comparable to that of User 1.

		Video						
		1	**2**	**3**	**4**	**5**	**6**	**Target**
Person	**1**	9	1	4	8	3	0	2
	2	3	0	9	2	3	8	1
	3	2	8	7	9	3	1	7
	4	8	3	3	7	8	2	?

Figure 5.25: Hypothetical ratings of seven items by four users. What is the prediction of the preferences of Person 4 on the target video?

Correlations are a particularly effective method for calculating recommendations across registered users. Fig. 5.26 shows the pair-wise correlations for all the users. Correlations range from -1.0 (perfectly uncorrelated) to $+1.0$ (perfectly correlated). We can confirm our impression about users 1 and 4 by noting that the correlation between their scores is $+0.74$.

		User			
		1	**2**	**3**	**4**
User	**1**	-			
	2	-0.14	-		
	3	+0.10	-0.40	-	
	4	+0.74	-0.49	-0.11	-

Figure 5.26: Correlations between the user ratings in Fig. 5.25. The large correlations suggest strong similarity (or dissimilarity) which can be useful for making preference predictions?

While the correlation between Users 1 and 4 is the strongest, some of the other correlations are also substantial, albeit negative. User 3 tends to predict the opposite of User 4 (correlation of -0.49). Thus,

we might also expect that these two would also differ on the target. While User 3's rating for the target is high, we would expect User 4 to be low. However, the ratings of User 2 and User 4 were also negatively correlated, but User 2's rating of the target was low, which appears inconsistent with the predictions about the target obtained from Users 1 and 3. For much larger problems such as the Netflix prize; apply methods such as those used for text processing.

Although recommender systems focus on comparisons across people, they can also be used to examine comparisons across documents (such as books or videos) when linked by individual preference. Fig. 5.27 shows a map generated by individual selection of two books — "an individual who bought book 'X' also bought book 'Y.' The dots on the map represent book 'Y.' Notice that two clear groups of books emerge, representing a user (buyer) purchase pattern. Presumably, this reflects belief systems (4.5.0). More complex recommendations[12]. Filter bubble. Implications of recommendations for ecommerce.

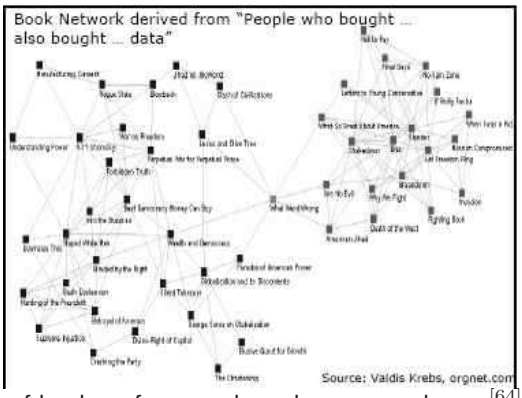

Figure 5.27: A 2-D visualization of book preferences based on co-purchases[64]. There is a clear separation of books by political orientation. (check permission)

Online ratings. Tend to be positive. Self-selecting population of raters. Product rating site.

Dimensionality reduction applied to preferences. Reference citation (10.10.2) networks can also be used as recommender systems; by charting the patterns of who cites whom, it is possible to determine areas of interest between different researchers. The same is true of Web sites.

Serendipity. Diversity of recommendations is desirable.

5.6. Small Groups and Computer-Supported Collaborative Work

People are social creatures — we bond, interact, and compete. From these interactions, we form groups, organizations, cultures, and societies. All of these shared endeavors involve the exchange of information in some form, often with other members of a group. People often form groups to complete tasks. Some groups, like military patrols, are highly organized and regimented. Others, like a group of friends who meet for lunch, are informal. Because some groups adopt formal structures, we can examine how well different structures affect the completion of different tasks, and we can look at the processes these groups adopt. Some social structures more suited to accomplishing certain types of tasks. Sometimes, groups are a part of larger social units such as organizations (5.7.0) or communities (5.8.2). This can also affect how a group is organized and how well it functions. Find levels of continuity in task-oriented group activities. Groups co-constructing knowledge. Shared resources. Computer-supported cooperative work (CSCW). Affective feeling of working with the group and separating affect from the groups needs. Individual approaches and group composition. Development of a group culture which includes ways of speaking and interacting. Ultimately, this leads to the development of communities of practice (5.8.2).

Conformity. Group-think.

Meeting > Task > Project > Organization

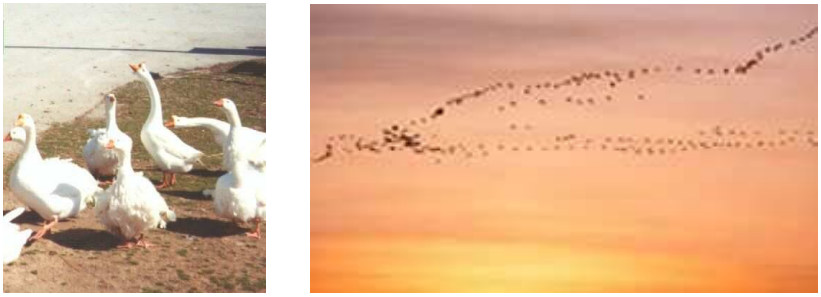

Figure 5.28: A flock of geese on land (left) are less structured but some groups have a clear structure like the geese in flight (right) (check permission)(get new photos).

5.6.1. Group Structure: Roles and Rules

When groups of people work together in teams they develop different roles. These are not unlike broader social roles but they are more focused on the activities at hand. These roles affect the communication and interaction patterns which are inter-related with the group structure. Fig. **??** displays two extremes of group structure. On the left, all the interaction is mediated by the person in the center. On the right there is no such centralized organization, and interaction is possible at all levels. Group communication structure helps to determine the information flow and decision processes. However, the composition of the group is also a factor. This is an example of structuration (5.1.2).

Structuration. Creating groups which can effectively solve problems.

Roles may be formal (explicit) or informal (implicit). Formal roles are generally well-established and are associated with specific responsibilities for supporting the organization's goals (5.7.2). There may also be informal roles in unstructured social interaction. Some people may be the "sounding-board" or the "clown". The leader, or in some cases the group as a whole, ensures that the desired goals are being accomplished. Managers are often leaders, but "leadership" is distinct from management. In a formal setting, this specialization is a clearly defined role. Groups often have a task leader who moves the group toward its goal, and a social leader who facilitates relationships within the group. We will revisit several of these issues later when considering organizations (5.7.2). However, in small informal groups, the roles are fluid. Role-playing games (11.7.0).

Group Processes and Decision Making

The group dynamics of juries are legendary. Jury deliberation is perhaps the most distilled and prototypical example of group decision making. This is one example of social decision making. In a jury room, a small group of people has a pool of shared knowledge, and they must analyze that knowledge and reach a consensus. Groups differ in the ease with which they reach consensus. Group opinions interact with group tasks. Building shared understanding among group members. Indeed, the procedures and artifacts of the group themselves channel effective outcomes. This is often referred to as distributed cognition. Interpersonal persuasion within the group.

When groups are engaged in a task, the members of the group bring different background but the group requires coordination to function effectively. like individuals they generally follow a *Look→Decide→Do* process. That process might be modified or expanded slightly to accommodate the group dynamic (Fig. 5.30). Problem solving (3.7.1). Following this model, the jury would analyze the task before them (to reach a decision), collect the information (the evidence presented to them), formulate resolutions (state their opinions and the reasons for them), and vote. This process may be more or less regimented for different groups and situations, but the process is very thorough and decisions made by small groups can be better than decisions made by individuals. This may be attributed to the mixing of decision-making processes (3.4.1) with social dynamics, which forces individuals to formulate their rationales in different ways, thus allowing them to more closely analyze their own position. Structured discussions can help a group to complete tasks (3.4.3) by helping the group to navigate effectively the steps of the

Figure 5.29: Group decision processes are evident in jury deliberations as has been illustrated by many movies. Here is a frame from the film classic *12 Angry Men*. In this movie, one juror gradually persuades the others to his point of view. (different picture) (check permission)

mental model. There has to be some commonality and overlap of concepts between members of the group. This allows individuals to better understand their own role within the group by understanding the roles of others. Collaborative information retrieval (10.3.2).

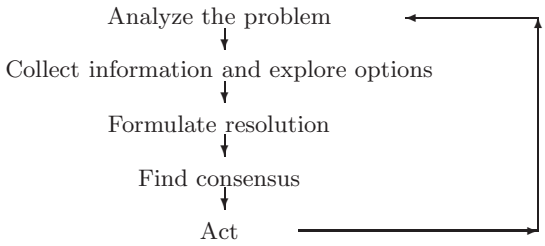

Figure 5.30: Stages in group problem solving. Note the similarity to the $Look \rightarrow Decide \rightarrow Do$ process.

Changing Group Opinions

The opinions of the group evolve through interaction. Indeed, the tendency is for groups to shift their opinions over the course of discussion to more extreme positions compared to the original average of the group; this is known as the "risky shift" or "group polarization" phenomenon[97]. When an individual attempts to highlight the differences between their position and a different, perhaps competing position, they are likely to phrase their argument in an extreme, polarized way. Having committed to the argument, however, an individual is loath to modify it while a part of the group, even though individually they may think it is a little extreme. This overlaps with the models of attitude change we have discussed for individuals (4.5.2). This may make it difficult to develop a consensus within a group. There are developed techniques that may make it easier to do this, however. Taking an initial survey participant's positions helps to prevent the adoption of more extreme views, and fostering constructive, structured dialog helps to maintain group focus on the task at hand.

Shared Representations and Shared Knowledge

Shared knowledge also includes shared procedures. Distributed cognition. Instantiation of shared knowledge in artifacts with varying degrees of formality. Conceptual models (4.4.1)and shared conceptual models.

Individual with knowledge: One or more individuals know the answer to a question.
Interlocking knowledge: Different people in the group have different parts of the answer.
Group has effective processes: The group can find or derive the answer.

Suppose we ask a group or organization to answer a question. Even if no one person knows the entire answer, the group may be able to synthesize the answer, or the group may have procedures that allow it to develop an answer. Just because one person in the group has a good answer, it does not mean

that the group as a whole will come up with the right answer. That is, there is shared knowledge across members of the group. Indeed, there are several senses in which knowledge can be shared. The group may develop common procedures for accomplishing tasks. Or, they may have common records.

5.6.2. CSCW, Collaborative Task Environments and Socialble Systems

Information systems can enhance group interaction. Small group interaction is supported by CSCW systems. Organizational interaction is, typically, supported by knowledge management systems (7.3.1). Using various information systems, collaboration between individuals can be distributed in both space and time[2]. Because the cost and effort of travel can be substantial, collaborative systems, sometimes called "groupware," can be extremely cost effective. Email can facilitate discussion between participants spread over the entire world at different times of the day. Other collaborative software aims to facilitate knowledge building by maintaining a record or log of conversations or work performed on an internet portal. This is termed computer-supported cooperative work (CSCW).

Collaborative information seeking.

Defining how work can be accomplished, especially distributed work. Articulation work[46]. Artifacts and environments. Group interaction can be nuanced and shift rapidly. Collaboration in science (9.2.3). Co-evolution from synergies among participants.

Work practices describe what people actually do to accomplish tasks. This is often rather different from the formal specification of the work (3.5.1). Generally should match work practice to computer support. Co-evolution of work practices and system capabilities. Moreover, the both the work and the system capabilities will change and the other components need to adapt.

Figure 5.31: Coordinating the activities of a medical team in a hospital emergency room is so complex and has so many exceptions that it is not yet able to be automated very well. (check permission)

Collaborative Information Behavior. Building shared understandings. Collaborative simulation.

CSCW (5.6.2). Collaboration. Remote collaboration and social interaction. The technology allows this, but is it a good idea?

Collaborative environments. Collaboration platform. This environment uses a desktop as a spatial metaphor for the interface; participants can collaborate, documents can be shared, and *ad hoc* work groups can be constructed. Sharing resources.

Sharepoint. Telework.

Creating awareness of co-workers. Collaborative operating picture.

Interfaces for collaborative design (5.6.2).

Collaborative information environments (10.3.2).

Design for group interaction is a natural extension of the issues here but before we return to this (7.9.6) we consider various models of social interaction in the next chapter. Designing social interaction patterns and roles while also designing the information system.

Participants need mental models of the tasks and of the other players. Versus office automation.

Information management for many types of collaboration.

Problem of groupthink.

Includes coordination among players.

Spontaneous distributed coordination for awareness of what other team members are doing.

Social interaction can be affected by the technologies mediating it. On one hand, technology can limit the richness of the interaction. On the other hand, the human activity will often adapt to constraints take advantages of opportunities.

Structuration and the organization of meetings.

Collaborative task analysis.

5.6.3. Supporting Face-to-Face Meetings and Co-located Collaboration

Information systems can facilitate many aspects of group interaction, including meetings. The purpose of meetings is to accomplish goals. Often, the goal of a meeting may be to determine a strategy to accomplish a larger goal. Managing a discussion and keeping a civil discourse. Nonetheless, information systems can help. Determining the tasks. Structured, possibly task-oriented, discussion A little later, we will consider distributed meetings (5.6.6).

Supporting the dynamics of face-to-face, small-group interaction can be invaluable in the articulation of the group's shared work objects, the accomplishment of its tasks, and in facilitating the group process itself. They allow people to sit together and collectively work to get something done. Face-to-face meetings, however, go beyond mere verbal communication. Body language and eye contact can be just as communicative as words, often unconsciously so. Observing eye gaze can be useful in judging an individual's interest during a meeting, especially as the thread of conversation shifts quickly across individuals and topics. Analyzing participant attention using information recording devices can help to determine what portions of a meeting are effective. One way to increase attention is to use wall-size displays or white-board displays around which people gather for demonstrations or collaboration (Fig. 5.32). Collaborative interfaces. Awareness of what other team members and what they are doing. Collaborative work spaces. Awareness of co-workers. Facilitating the cohesion and functioning of a group.

Meeting structure agendas, minutes, civil discourse. Verbal interaction (6.4.0).

Figure 5.32: Group interaction can be based around artifacts such as a computer.

5.6.4. Recording Meetings

Suppose that a complicated design problem is discussed at a meeting; later, one of the participants wants to review what was said. The records of individual meetings are called "meeting archives" or "meeting memories". This could be an entire multimedia recording or it could focus on the organizational business conducted at the meeting. Typically these are ad hoc and relate to organizational knowledge management (7.3.1) more than to formal archives (7.5.1). Continuum from personal information management (4.11.0). to larger and more organized groups and all of these access and create information resources. Much less than meeting minutes.

These tools provide continuity across sessions. More than just meeting support but part of broader activities. Recording decisions so that the issues don't have to be revisited and re-opened. These provide continuity across time. However, the minutes of a meeting are often brief and reflect more organizational politics than an accurate rendering of a discussion.

The discussion of the meeting could be covered by an argumentation systems (6.3.5) or for the records of a design group, there could be a design rationale (3.8.7). Having a recording of the meeting can be helpful for determining conversational dynamics; not just what was said, but how it was said. That it, indexing the meaning is crucial and can be very difficult. This can be important for meetings regarding policy issues, as a person's body language or tone might say more than their words. Meeting archives can also be useful for explaining the role of one domain within a large organization. Representation is a major consideration for records of meetings. The representation affects the ease with which information about the meeting can be retrieved later. A meeting archive system should facilitate finding events in the record of that meeting (e.g.,[48]). Difficulty with the representation of representational gestures which are used in the meeting.

5.6.5. Effects of Modalities for Remote Interaction and Developing Social Presence

A technology-mediated conversation will be different from a face-to-face conversation. Connectivity (5.1.5). Members of a group are often geographically dispersed, and this alters some of the fundamental aspects of interaction. In many distance communication environments, participants are unable to see one another, which limits the unspoken communication that normally takes place in conversation (6.4.0). When a group is interacting together through a technology-mediated interface, it can become difficult to realize different elements of the group dynamic, and people might not be able to grasp the roles that come naturally to them in an actual face-to-face meeting. Even text messaging can be considered as a medium. The more complex the message, the richer the communication medium needed. Deception.

Face-to-face interaction is the gold standard for communication[41]. It is the ideal to which all communication mediation technology aspires, and much effort has been, and will continue to be, spent developing different interfaces that not only reach that ideal, but augment it. It is frequently claimed that it is difficult to establish a relationship solely by electronic means; at this point in time, that does seem to be the case. However, it is often possible to produce productive electronic interaction once the dynamics of the group have been established face-to-face. Apparently, there is a greater tendency to lie by email than in other more direct communication modalities [?]. Artifact exchange for remote work.

Social Presence

Social presence is the awareness of other people[92]. Individuals increase their activity or improve their performance due to the presence of others. Social facilitation. Even avatars can create a sense of social presence in some situations[85]. In face-to-face interaction, gaze is one indication of social attention. Fig. 5.33 shows an automatic system to track gaze. It is an element used in the judging of emotion and in the attribution on intention; it is a clue used when watching others and when tracking the conversation. Mutual gaze, that is, eye contact between two people, is a sign that the other person is paying attention. Simulated gaze is a factor giving conversational agents natural interaction Curiously, while video does not provide significant additional information for completing most tasks over audio channels, it is often preferred. This is the case even though some tasks can actually be completed best with audio. From this, preference appears to be a function of the richness of the medium[35] Perhaps

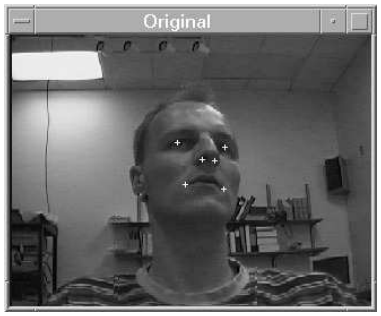

Figure 5.33: Gaze can indicate points of attention in a meeting. Gaze can be assessed by reference points on the face[96]. (check permission)

suprisingly, flattery by a computer agent can be very effective for motivating people [**?**].

Some effects of communication modalities are best explained by the salience of cues, or the obviousness of the interaction. When meeting with a group of people face-to-face, one cannot help but realize that there exists an interaction situation; when being spoken to, it is understood that the person speaking should be the focus of the listener's attention. Similarly, technology used to mediate communication, particularly communication between people in different locations, should not allow the modality itself to draw the participant's attention. We may listen more intently to an audio-only presentation than to a mixed-media interaction. This is because in a mixed-media interaction, a portion of our attention is diverted toward the images rather than the substance of what is being said.

New communications technologies and devices provide new modes of social interaction.

Social presence from interactive robots.P This could be helpful for autistic children.

Shared Artifacts and Augmented Spaces

Many meetings and discussions are based around documents, diagrams, or other artifacts, some of which may be electronic. In virtual meetings where not all the participants are located in the same place, conversational anchors allow for group interaction centered on particular objects.

Some allow for interactive sketching on a shared object, such as "live boards," which let participants interact directly with each other on shared writing spaces. A live board or an electronic marker board can also create a long-term record of the information that has appeared on it.

Other shared objects may include organization and/or meeting support documentation that structures the flow or agenda of the collaboration. And, just as in the real-world, coordination is necessary to manage people who may be involved at different stages of project development — notes of previous meetings can be part of the shared object collection.

Figure 5.34: Shared information resources often provide support for distributed cognition. Here's a tracking slip user by air traffic controllers as a record for a flight. The highly structured slips provide a quick overview of the flight and can be easily transferred across shift changes. Recognizing how the are used can be helpful for developing computerized air traffic control tools. (check permission)

Shared artifacts for completing tasks. Shared understanding of the group activities by its members. Procedures affect human interaction. Fig. 5.35.

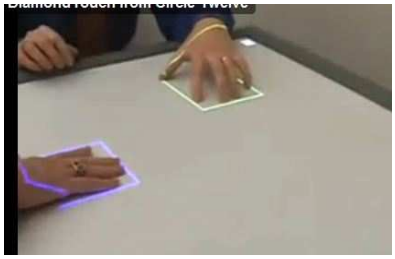

Figure 5.35: Multi-user touch surface (DiamondTouch). This could be used for local or remote manipulation of virtual objects. (check permission)

5.6.6. Shared Virtual Spaces and Media Spaces

Information systems can support virtual teams. Information systems can provide a portal between two physical spaces These portals are called "media spaces," and they become a part of the working environment. Remote perception

Media spaces can be social environments with a conceptual space for people and resources. Media spaces range from telephone calls to inter-office video links and video conferencing. A virtual media space is very similar to a real shared space, and common norms apply: there must be a mutual awareness that everybody is sharing the medium, and appropriate (5.3.1) behavior should be established to accommodate everyone's needs. Media spaces allow participants to meet and discuss common items as if they shared the same office.

When several people work together in virtual spaces, these spaces are called Collaborative Virtual Environments (CVEs). A CVE can provide a neutral, focused, and dedicated meeting ground for participants. CVEs aim to ensure that all participants are aware of the same things (11.10.3). In this environment, documents can be shared among the participants; video and audio communication channels can also be coordinated. Avatars and conversational agents.

Roles in a community of inquiry: initiator, facilitator, contributor, knowledge-elecitator, vicarious-acknowledger, complicator, closer, passive-learner. [103]

Socio-technical discussions. In other cases, a number of researchers may share research instruments such as a large telescope. Such shared resources and the social structure around them are called a "collaboratory" (5.6.6). These collaborations become part of a full-scale interaction environment that allows groups to pool resources, data, and knowledge. Simplicity is often with regard to CVEs. It is difficult to beat email as a flexible medium for collaboration over distance. While it may not provide all the bells and whistles of other technologically advanced collaborative environments, it is direct and easy to use. Conference review systems.

5.6.7. From Meetings to Teams and Projects

Teams are more stable than groups A team, especially a team engaged in highly technical activities, needs members who specialize. Moreover, to support complex collaborative tasks such as design, we need a collection of specialized, interlocking tools. Rather than developing generic environments for collaboration, it is better to consider collaboration on specific activities. To do so, we must ask what tools are required in particular collaborative environments, and then apply those considerations to design. Many technologies have evolved since conference calls were first introduced: virtual meetings (5.6.6), video conferencing, shared visual spaces (e.g., information spaces such as white boards), and shared window systems. There is, a need to information coordination in projects and, ultimately, organizations. New information environments are evolving quickly, like team rooms[18], threaded email discussions (10.3.2), distance education, group decision support systems (GDSS) (3.4.3), and software development environments (7.9.3).

Team formation.

Collective reasoning. Structured analysis system. Issue-based information system (IBIS).

Hybrid local-remote teams. Group and project records.

Team members sharing expertise. Intranets (7.3.6). From teams to task-oriented online communities such at the editing of Wikipedia (5.8.2).

Formal meetings and side channels.

Some teams never meet in person; they are virtual teams. Information technology allows work teams to be distributed. Get groups to work and learn together. These are notable in restricted modalities of interaction. Communication modalities and social presence (5.6.5). Collaboration in distance education. Virtual math teams[95]. CVEs. When the teams are part of a long term, for instance, when they are part of virtual organizations (5.7.3) there needs to be significant sharing and trust so that each member will make appropriate contributions.

5.7. Organizations

Organizations are social systems formed of individual units working together for a common goal; that is, they are task oriented and have a relatively formal structure. Organizations need to balance flexibility and efficient processing to adapt to change. Organizations face the additional challenge of balancing individual needs with organizational goals. In any event, information the glue that keeps the organization functioning. Knowledge management (7.3.1), Sharing information in organizations can be difficult. Organizations are dynamic and often have changes of personnel and mission. First, we consider organizational structure and then organizational processes. From mission, to goals, to structure. Information ties the organization together.

5.7.1. Organizational Structure

Organizational structure is formalized in the units in an organization and the lines of management for them. It also reflects the lines of formal information flow and control. Some organizations are structured, while others are adaptive and flexible. Control in a traditional organization is generally hierarchically structured (Fig. 5.36). General policies are articulated at the top level and they are implemented at the lower levels. Other organizational types are more loosely structured, with control and decision making spread out over a larger area. Organizations like this may include universities, or more broadly, a federation of states. The management structure of an organization depends on the level of control required for the tasks to be completed. Information exists at all levels of an organization, as does interaction. Even in traditional organizations, in addition to the formal lines of communication, there are usually many dynamic work relationships and informal channels of communication. This structure is particularly effective for traditional manufacturing organizations. However, it assumes different levels of information at different levels of the organization so it is less effective for information-intensive organizations. Organizational behavior. Hierarchies facilitate coordination, motivation, and training[34]. Organizations have clear boundaries. The organizational structure usually describes paths of both information flow and control.

5.7.2. Organizational Processes: Workflow and Control

Organizational structure is interwoven with workflow. Roles within an organization specify activities associated with completing tasks. Typically, these roles are formally specified. A university has roles such as Professor and Dean; each occupies a different level of authority and has different work to perform. In society at large, social organization is facilitated by the "division of labor"[42]; rather than having every individual do everything to complete an activity, individuals specialize, and become an expert at particular activities. UML (3.10.2) can be applied to the description of organizational information flow. Structure and roles are intertwined with processes. Organizational control has previously been described as the flow of resources (people and money). In a highly structured organization, individuals are often assigned roles. Roles are formed from groups of activities required by organizational tasks. These roles may include "foreman" or "programmer". Organizations are structured groups that have

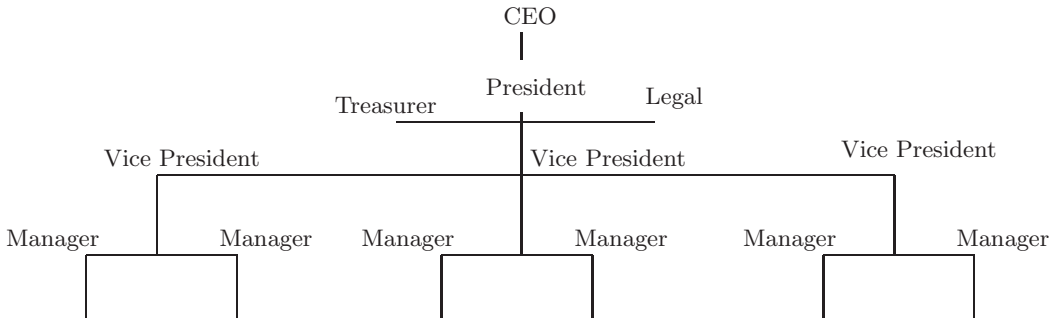

Figure 5.36: Traditional hierarchical management structure for an organization. Decision control flows from the top and information relevant to making those decisions flows up from the bottom.

cohesion and continuity. They generally work together toward a common goal within a framework. Though, of course, split loyal is often a major issue. Formal descriptions of processes.

Information is essential for the management of complex organizations. Control[27]. Not every organizational activity can be formalized. These are organizational practices rather than organizational rules. Office workers often spend more time handling exceptions rather than routine matters. Such tacit knowledge is particularly important in changing environments in which new paradigms are emerging [98]. Silos.

As we shall see in (8.11.2), this generally makes organizations smaller and the boundaries and interfaces between organizations more important.

Office work as practical action in which decision making and problem solving are critical.

Multitasking and interrupt-driven task activities.

Measuring productivity in office work.

Information Flow and Workflow in Organizations

Consistent with business process specification (8.11.2) and object-oriented design (3.9.3). Prescriptive work control systems. Workflow specification is a type of situated planning. Roles must be matched to the capabilities and the schedule of the individuals which fill them. Traditionally, those at the top of the organizational ladder determine for the organization to function smoothly. Organizational decisions should come as a result of an analysis of the desired goals and the existing procedures. The framing of organizational decision needs affect information needs and information seeking. In traditional organizations, there are usually formal processes. However, in real life, organizations don't always follow those processes. For instance, organizational activities may also include less formally defined procedures known as shadow functions. Worklfow leading to preservation (7.5.3). There can be too much emphasis on process.

Information may be viewed as the glue which holds an organization together. Control from one part of an organization to another. Parts of an organization must communicate to focus activities, such as scheduling meetings or designing new products. Thus, an organization is likely to have an information infrastructure that includes libraries, intranets, training, and databases. Some information systems control and track the flow of a product through manufacturing (production). Other systems control communication and information itself. These systems and roles are focused on the management of information within a group or organization. "Gatekeepers" are those members of a group or organization who mediate between the outside environment and the group[20]. They do a type of information filtering (3.2.3); that is, they systematically collect information from the external environment and forward it to individuals inside the organization. While this sounds nefarious, it often consists of identifying trends, marketplace indicators, or other beneficial information to those who can use it. In addition to the

formal chain of command in an organization, there is also interaction in work teams and simply from friendships (5.1.0, -A.3.5).

Information may flow smoothly within an organization but introducing information systems may not always be successful. Like the theory of structuration and the socio-technical model, it is best for an organization to use an emergent model in the adoption of information systems and new technology (7.9.6). This allows the development of structures, processes and systems to fit the overall task.

Representing information flow in organizations. Managing incentives.

5.7.3. Individuals in Organizations

Organizations should be designed to effectively process information, as it is one of the most integral elements of an organization. Clearly, information is critical in an organization and there are specific positions within a company designed to manage it. We focus on social interaction within organizations and basic organizational structures and processes. Later, we will examine variations of these basic models. Stories and the organizational culture. Individuals often do not fully share the goals of an organization. Rather, those individuals' involvement may be based on other incentives.

Sociability and social networks in organizational environments. When does an individual decide to share information in an organization?

Individuals in organizations may ask the question of what is going on here? This is organizational "sense-making" [105] (3.1.1). This emphasizes the ambiguity of social constructs. A committee, cuts across functional areas. Organizations are made up of individuals so it is worth considering the organization from the perspective of the individual. We might ask how individuals react in the context of organizations [104]. Critical thinking as sense-making. Organizational narratives versus reality. Internal logic for organizational decision making.

Socio-technical interaction networks.

5.7.4. Politics and Power in Organizations

5.8. Institutions and Communities

5.8.1. Institutions

Institutions maintain society's values and, thus, the coherence of society. Some institutions, such as marriage, family and religion, are broad social conventions which are related to norms. Other institutions such as the judiciary are related to the government. Still other institutions such as universities, museums, and libraries. Establishing socially desirable behavior [40]. But, other institutions involves financial institutions are also information intensive.

Institutions have momentum and are difficult to change. Information is essential for most institutions but some are information institutions (7.1.0). Management in institutions. Institutions are, of course, social creations.

Institutions are often resistance to adapt to changing situations. At times, this can be of value. At other times it can be frustrating.

Mission creep.

5.8.2. Communities

A community, loosely defined, is a group of people with a sense of coherence and interdependence. This coherence can be the result of geography and government — the most traditional sense of community — or it can be the result of a shared identifying characteristic, interest, or profession. A community can usually be characterized as a particularly closely interconnected social network often with significant social capital between the members.

Unlike most organizations, communities rarely have a formal structure or roles. Members may act

under shared values, which might lend cohesion to the group and lead to the development of a network of commitments, but communities generally do not have a defined structure such as is common in organizations. Community members can also offer each other mutual support and sometimes effective conflict resolution. Information is interwoven with communities. indeed, virtual communities are entirely mediated by information services. Beyond simple task completion, communities facilitate sociability (5.1.1). Scholarly community (9.0.0). Communities are often based around information and information exchange.

Traditionally, a community is composed of people who live near each other, and they generally have a common a government, economy, and ecology. Some characteristics of communities are shown in Fig. 5.38.

Type	Description
Proximity	Community by virtue of spatial proximity.
Practice	Share knowledge and responsibilities.
Interest	Shared non-task oriented activities.

Figure 5.37: Some types of communities. (merge into text)

Aspect	Description
Cohesion	The sense of there being a group identity.
Effectiveness	The community gets things done.
Help	The ability of members to ask for and receive help from other members.
Relationships	The likelihood that members will interact individually.
Language	The use of a specialized language.
Self-Regulation	The ability of the group to police itself.

Figure 5.38: Some attributes of communities (adapted from[87]).

Figure 5.39: Communities may form clusters in social networks.

Community Dynamics

Legitimacy of community membership and respect for opinions. Regulating behavior or members. Common bonds and empathy with other community members. Becoming parts of a group. Socialization.

Community Information Practice

Members of a community share many information needs. Newspapers (8.13.7). Radio stations. Citizen journalism. Wikdelphia. Geographic factors in topic models. Communities maintain knowledge. Community archive. Community Repositories.

Digital inclusion.

As communities develop, recording their interactions and history becomes more important, and various types of information systems may be developed for the purpose. In towns, for example, information systems such as a newspaper or radio station may inform people of community activities, and keep them abreast of news, events, and history. These records can become a "community memory," which documents important events or just tracks the development of the community and its progress. In the area of information systems and community memory, communities of practice are the most developed

and contribute the most to our understanding of the relationship between information science and systems and varying ideas of community. Community informatics. Making information available for a community. This could be a government information service or it could be related to records.

Community Models

Can include data about infrastructure.

Communities of Practice

People who work together because there are synergies in their skills and knowledge. Membership provides a type of social capital. Facilitates information sharing among members. Discussing work practices. Situated learning such as apprenticeships. Practice leads to action. Communities of practice often support knowledge collection and dissemination related to their field. Peripheral learning of tacit information by observation of the group. Professional practice (5.12.4). In-group and out-group.

Professions and Professional Communities

Professions have a specialized body of expertise. They generally involve extensive training and upholding professional values. Professions and institutions (5.8.1).

Groups of professional in a given area may form professional associations. There is also a down-side in that they can also exclude outsiders. Guilds. Professional association.

Members of professions as law, journalism, and medicine as well as craftspeople such as plumbers and electricians, form communities of practice. Sharing knowledge with stories. Communities and social networks.

Professional associations. These are learned societies (9.1.1). usually set ethical standards and disseminate technical information of relevance to their members. Craftspeople and their information needs. The activities of a community of practice include some explicit procedures and some which are tacit and almost impossible to articulate. However, like all organizations these can also be reactionary and membership may be excluded. Jargon. A professional association is different from a trade association which is generally composed of companies which produce similar products.

Apprentices. We will discus communities of practice in the context of knowledge management (7.3.1).

Jargon.

Discourse and Document Communities

One example of discourse communities is scholarly literature (9.1.1).

They use language to create boundaries. Discourse communities own genres. Sets of organizational documents can reinforce the organizational boundaries. Print culture (8.13.6)and bibliophiles (8.13.6).

Online Groups and Communities

Differences in being remotely located as affected by communication modality (5.6.5). Member-mediated online communities such as wikis (10.3.2). Game communities. Clubs. Fan communities. Motivating contributions by (a) emphasizing uniqueness of goals and (b) given challenging goals [?]. Sociability and friendship in these online communities. Social presence can strengthen commitments to an online community. Online communities as an information resource for instance by learning what other people in a similar situation have encountered. Community structure and norms.

Increasingly, there are ad hoc online groups to which individuals contribute. Managing online groups and other services.

Designing online communities. Typically, communities should provide both information and emotional support.

Games (11.7.2). Massively multiplayer games (MMOGs) and massively multiplayer role-playing games

(MMORPGs). Opposing factions. Different types of play. Data collection from the game players. Game-centered face-to-face social interaction.

5.9. Culture

5.9.1. What is Culture

Culture is the amalgam of the norms, beliefs, rules, traditions, art, history, and myths of a society. Culture as what peoples actually do. They can also be interpreted as providing a shared meaning. culture is based on shared assumptions. Culture is a set of beliefs which maintain the values and cohesion of a social group as it is learned and transmitted across generations. Presumably, successful cultures have a survival advantage for the group.

Culture depends on information transmission and it is greatly affected by communication media and records. Translating words is a fairly simple matter; it is more difficult to make clear the cultural meaning they may carry. Information artifacts, such as books, stories, and sculptures can provide a record of a culture, and hence can help to preserve it (7.5.4). Information systems are artifacts of our culture. Their organization and structures reflect different values, preferences, and abilities that a group may display. While the relationship between culture and information science and systems may seem tenuous, it can be quite important, particularly when designing a system for use by people of another culture.

Figure 5.40: Balinese water temples and the rituals associated with them support an elaborate system for managing irrigation[66]. (check permission)

Fragmented culture. Culture in modern society. Culture and family size.

Culture and the tribal level of social organization. Cultural niches. Kinship (5.1.1). Modern society includes many cross currents, counter culture. Education and culture. Culture and information behavior. Willingness to ask questions. Culture and dangerous knowledge. Ritual. Culture as an adapted set of constraints for meeting a human group's needs in a given environment. Other cultures might have developed to meet those constraints and some of those solutions may be more effective than others and some may be more adaptable if the environment changes.

Dimensions of culture. Homogeneity of culture. Power distance, individualism. National culture [?]. Oral cultures. Cultural assumptions and indexing.

Culture helps to structure human activities[68]. Culture helps to define norms (5.3.1). Culture helps to shape belief systems (4.5.0). Ecology of norms. Tradition. Ritual and creating meaning. Establishing a shared narrative.

Cultures are not monolithic. Sub-cultures. Fandom as a sub-culture. This is often associated with social-network.

Cultural learning. Cultural tradition as a learned representation. Culture often helps a social group cohere and survive. Though, in many cases the reasons the cultural traditions are not apparent. In some cases, the traditions help the culture manage resources (Fig. 5.40). Other traditions such as those

surrounding weddings and funerals provide stability and continuity of the culture itself. Culture and narratives (6.3.6). Cultural modeling.

Culture in relation to modern society.

Participatory culture.

Cultural Management of Knowledge. Traditions about treating knowledge. Cultural traditions about culture. Applying cultural dimensions. Cultural property as a form of intellectual property.

Among the differences in cultures are the differences in category systems across cultures. Culture and categorization[68]. Ethno-classification.

Culture and language (6.1.2). (Fig. 5.41) Patterns in search terms (10.11.2).

Months	J
Example	x

Figure 5.41: The frequency of postings about a given topic are a function of two factors.

Cultural models[36]. Cultural traditions need continuity. Cultures are adaptations to one set of conditions and are not necessarily well adapted when those conditions change. Indeed, cultures can sometimes be harmful and out of sync with their environment.

5.9.2. Cross-Cultural Communications and Interaction

The ambiguity of language can be amplified as people different cultures try to communicate.

Effect of disruptive media on culture.

Challenges of moving across cultures.

Ability to interact across cultures. "intercultural competence".

Cultural Change

On one hand culture is continually evolving across people. On the other hand, for a given person, culture can be difficult to change since it deals with solutions for basic human needs and generally has social reinforcement for beliefs.

Culture versus technology[3] and external forces for change.

Cultural change and adaptation.

Mixed Cultures and Cultural Transitions

In the modern world, culture is continually changing.

Change is an issue for archival description (7.5.4).

5.9.3. Cultural Heritage and Memory Institutions

The relationship between these institutions and political constraints. In our complex, industrialized society culture is maintained in part by large institutions such as libraries and museums. A slightly different view of institutions frameworks for social interaction. Relationship between cultural institutions and educational institutions. These "public spaces" exist distinct from commercial organizations [54]. Community memories. Libraries (7.2.1) are cultural institutions. Traditional libraries have served an important social and community role; they provide stability and a standard of open knowledge for the community. Role of small town libraries [**?**]. This is a major benefit of community information services (5.8.2) and supporting collaborations. In many towns and universities, libraries are places where students can gather, have a quiet place to work, and socialize. It is apt that libraries are a place to socialize, as information is inherently social: it is passed from one person to another through books,

conversation, painting, and innumerable other modes, and now through electronic information systems as well. These organizations serve broader educational and knowledge-creation roles as well.

Elgin marbles.

Indigenous Control of Culture

Who owns cultural traditions? Could be related to intellectual property; however, the logic seems to have to do more with respect than with legal control. Perpetual rights to cultural, especially, sacred content.

Respect versus rights. Of course, it is difficult to legislate respect.

5.9.4. Media and Culture

Media dissemination of culture. We cover media more generally in (8.13.7). How should cultural institutions handle complex objects such as mashups.

Does Media Violence Cause Individual Violence?

Does watching violent movie or playing a violent video game make that person more likely to act violently themselves. There is some evidence that media violence causes individual violence. However, there are usually many levels of social constraints on a person. While violent games can sometimes cause a short term physiological arousal, they are generally not as strong as social norms. Mass culture. Catharsis.

There is a vigorous debate about the relationship between viewing violence in the media and the occurrence of violence in society. One view suggests that people imitate violence such as that on television, movies, music, or video games, and that these negative images contribute to the violence that occurs in society. Other theories suggest that these media merely reflect the violence that is already inherent in society, and that the violence itself is primarily due to other social factors. In addition, they may be harmful to young people with mental health problems [**?**].

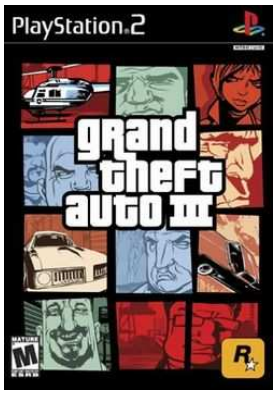

Figure 5.42: Do violent video games increase violence in the players of those games? (check permission)

[22] Does viewing smoking cause an increase in smoking? Generally attitudes and habits are slow to change, but there are situations where that happens. Social roles are those identities that are found throughout society, such as man, woman, parent, child, boss, and employee. Beyond violence within a society, individuals may also infer norms of behavior for social roles from media input and social learning. For example, media may present extreme characterization of social roles.

5.9.5. Institutions and Organizational Culture

Globalization and cultural transitions.

Information Culture

Cultural factors in information behavior [**?**].

5.10. Living Analytics

5.10.1. Everyday Life and Living Analytics

Data sets about everyday behavior.

How do people actually live? How much television, etc. How do people spend leisure time. Patterns of consumption.

Behavioral economics and everyday decision making.

5.10.2. Technologies and Social Interaction

Big data.

Transportation tracking . optimizing travel based on where people want to go

5.11. Education

Education involves both social and cognitive processes. Education and information are intertwined. Education may mean learning a complex interlocking information structure rather than individual facts, and should focus on acquisition of complex new skills or new points of view. Education, knowledge, and information are rarely used in a vacuum. Education has it has both cognitive and social dimensions[88]. It is one thing to learn a new skill set, but it is another to know or learn how to apply it in the world or to communicate it to others. Also, the process of learning itself is often interactive: discussions, explanations, persuasion. Education helps to make individuals effective members of a society or culture. It also helps to perpetuate that culture. The ultimate goal of learning is changing an individual's behavior; for instance, the student can speak to someone else in a foreign language whereas before they would have been silent. However, because changes in cognition seem to be necessary for changes in behavior, learning sometimes focuses on cognitive changes. This highlights the natural connection between education and information resources. The balance between them recalls the discussion at the beginning of this chapter about the relationship between society and individuals. Ultimately, we would like to determine the conditions for the most effective learning.

Learning sciences.

5.11.1. Instructional Objectives

Education is an essential function of society. Schools and universities are social institutions which are important for transmitting social conduct; but in a complex and diverse society, this often means there are many different goals often contradictory, of what those goals are. Among these are the importance of socialization, of care-giving, of learning independence and creativity, and of abstract thinking skills. Are some more important than others? Is it important to learn how to do arithmetic? What is the role of the parent versus educational institutions. Systematic education for young people for making them productive members of society. Education of young people also depends on physiological and social maturation.

Providing both content and processes (5.12.2). People are adaptive, but not infinitely so. Forming habits and providing a base of knowledge for future effective action. Most would agree that a worthy goal is the mastery of a skill required to complete a job; this would allow the individual to be a productive member of society. But what job? Some people value home schooling, while others point to the benefits of "living learning" (e.g., how to get along in a dormitory). Ultimately, the point of education is to change behavior and not just provide information. Presumable, the same skills that a student learns when studying arithmetic are used in their career.

Avoiding commercial and political influence in education.

5.11.2. Theories for Learning and Education

A wide variety of learning theories have been proposed over the years. Rather than trying to compare them, we can examine them from the perspective of the two main approaches to education that we

have adopted: cognition and social interaction. We have briefly discussed detailed cognitive learning phenomena (4.3.5), and later we will consider machine learning (-A.11.0). As we noted at the beginning of this chapter, in education, as in all of human activities, there is a mix of social and cognitive perspectives. Evaluation of educational widgets.

Cognitive Perspective on Education

Cognitive theories of education focus on the development and modification of cognitive representations (4.3.0, -A.11.0). Education may be viewed as a process of re-structuring a student's concepts. Here we consider two types of cognitive theories: information processing theories and constructivist learning theories. When presented with a new experience or piece of information, we contextualize it based on many factors: the experience of acquiring the piece of information, the expectations we have for it, and previous related information or experiences, to name a few. It is then incorporated into our understanding or mental model using a grouping strategy. Thus, information processing theories of education focus on the external presentation of facts, figures, and theories in a way that allows students to easily include them in their pre-existing mental model. This is the classical model of education; teachers present information and students memorize it.

By comparison, "constructivist" focuses on the construction of meaning from fragments of information. This is related to sense-making. It includes discursive, adaptive, interactive, and reflective components. In essence, students build, or "construct" their own meaning of data, events, or observations. After the learning exercise, students need time to reflect on the educational experience and to consolidate their interpretation of it. Learning about processes rather than facts[29]. Gleaning information from the world. Web of concepts. Developing conceptual models. Learning by Doing: Dewey.

Social Perspective on Education

Learning is social in many senses (e.g.,[88]). Cognitive aspects are often dominated by the social lives of the students, their peers, their families, and the broader social context. In a narrow viewpoint, students often learn procedures by talking with other students. We have already noted imitation (5.5.4). Even constructivist approaches to learning often emphasize the importance of social interaction[102]. Even the content and concepts of learning may be viewed from a social perspective; for instance, we can say that learning happens as one negotiates or pulls meaning from the output of external sources[67][106]. The social is internalized to the cognitive through time[102].

Training versus education. Credentialing.

5.11.3. Instructional Strategies

A teacher needs to decide how to implement an instructional strategies. Pedagogy is the approach selected for teaching. The pedagogical model is a description of how that pedagogical approach works. Pedagogic models, domain models, student models.

Pedagogical Models and Instructional System Design (ISD)

Fig. 5.43 illustrates the typical stages for developing a strategy for instruction. Developing critical thinking by comparing information resources[76]. Inquiry-based learning. Reflection. Instructional system design (ISD). Critical thinking[45].

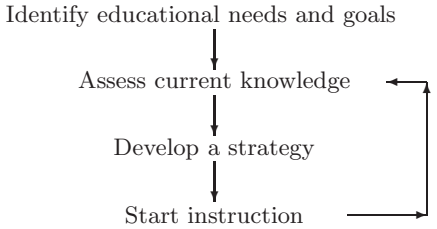

Figure 5.43: Outcome-based learning. Stages in planning for instruction (adapted from[65]). As the instruction proceeds, there may be additional assessment and refinement of the instructional strategy.

The "pedagogical model" is the strategy for teaching; it may be used to provide heuristics of when to intervene in a student activity. Teachers need to tailor content to the capabilities and interests of a group of students. The strategy must go beyond single applications to enable the development of an integrated curriculum. This is an authoring task; educational objectives need to be integrated with available content. A number of learning strategies have been proposed (Fig. 5.44). These go beyond lecturing in traditional classrooms.

Instructional Strategy	**Description or Example**
Rote	Learning by memorization.
Resource-based	Learning by using information resources
Problem-based	Learning by working on (and solving) a problem.
Project-based	Learning by working on a project. This is related to problem-based learning.
Experience-based	Learning byu doing, Apprenticeship, Field trips.
Inquiry-based	Learning by exploring complex questions.

Figure 5.44: Several common pedagogical strategies.

Inquiry-based learning is one way to implement constructive learning. This approach suggests that learning is best supported by questions that students generate themselves. A student might collect evidence and then make generalizations from it. These processes are best implemented by a five-stage learning model[15] that is similar to the stages of information for developers of scientific theories.

Projects can help a student understand the interaction of aspects of a complex task. Project-based learning can be done, in part, with simulations and reasoning support. Reasoning support can help to illustrate patterns or relationships that it is necessary for a student to understand for the completion of a project. Simulations can allow students to control an environment; a model of physical effects can be used for teaching the laws of physics. A simulation might be used by a student to learn the equations necessary for launching a satellite into space. Simulations approximate behavior, but often with less-than-realistic displays; they may include virtual reality. Simulations can be particularly useful for allowing students to experience environments that are inaccessible or conditions that occur very infrequently, such as the ocean floor or outer space. More general implementation of simulations will be considered later (9.5.0). Training simulators. Medicine.

"OK, here's the deal." The gruff inspector snarled as he spoke to your team of detectives. "For a long time people have been blamin' things on the moon! People claim to be crazy because of it, lovers claim to be under its spell, and even hospitals blame the full moon for loaded emergency rooms." "Yeah!", one of the newer members of your team replied flippantly, "So what's new?" The rest of your team let out a low sigh. Now the whole team was in for it! "I'll tell you what's new, Mr. Smartypants," the inspector glowered at each of you slowly, "Now some nutcase has brought charges against the moon for causing the tides! And, its your job to bring me proof one way or another!" The inspector turned back toward his desk and we thought he was through. He wasn't! He turned back to your team, pointed his finger at you and said, "And you only have two weeks to solve the case. Now get started!"

Questions: Can you find a pattern that will convince the jury that the moon is responsible for the tides? If the moon is guilty, does it have an accomplice which contributes to causing the tides?

Figure 5.45: Web Quests challenge students to use Web pages for resource-based learning. (check permission)

Learning requires not only cognitive processing but also motivation. Student engagement — that is attention to the task — is essential to learning by getting the student to synthesize and reflect. It is helpful to engage the student as opposed to using passive listening or reading, and to use "learner-centered design"[93]. Other examples and techniques of constructivist-like learning include: experience-based learning[39], such as field trips and experiments; allowing students to put something into their own words rather than memorizing the words of another; encouraging the deep processing of concepts by forcing students to build their own knowledge while working on a complex and hopefully motivating question.

Scaffolding provides a framework to help students to learn. Scaffolding may be seen as setting the experience level so students can make their own discoveries. The scaffold can be gradually removed or faded as the student's learning improves. These techniques supports constructivist learning[102] which suggests that students construct knowledge for themselves. A related approach attempts to find the teachable moment.

Teaching and Tutoring

Teaching is a transfer of skills from on person to another. Teachers apply strategies for meeting educational objectives. A teacher creates an environment for learning, usually by developing a curriculum and assembling materials. Teaching in a classroom may be contrasted with one-on-one tutoring. In traditional schools, it may also involve talking with parents and, of course, working directly with students.

Feedback is an integral part of teaching and tutoring. Sometimes, the feedback can be minimal — just showing the student what he/she has done. At other times, the feedback may be tailored. Indeed, there are effective feedback languages to guide students without excessive use of criticism.

Figure 5.46: Tutoring.

Tutoring is personalized adaptive instruction. The tutor determines what pedagogical strategy to apply for a particular student: how and when to intervene, either to explain material or to redirect the student's attention, and when to encourage reflection. Language, of course, is essential for this. To understand what makes for effective human tutoring we can examine transcripts of tutoring sessions (Fig. 5.47).

Tutoring discourse such as explanations (6.3.2). Fig. 5.47. Dialog management for tutoring (6.4.0). Note that in the example the teacher does not contradict the student, but poses a question which may help the student identify an inconsistency. This is an example of the "Socratic method" which is based on challenging students with questions and discussion. This is a type of discourse specific to education (6.3.2). Tutoring and question answering (10.12.0). Accountable talk gets students to articulate complex concepts.

Actor	Statement
Tutor	Do you know why it rains a lot in Oregon and Washington?
Student	There is a warm current passing over cool land.
Tutor	Do the Cascade Mountains there affect the amount of rainfall?
Student	No, no, no.
Tutor	How can the Andes affect the amount of rain in the Amazon and the Cascades not affect the rain in Oregon?

Figure 5.47: A tutoring dialog[51]: Note how the tutor highlights the conflicting answers of the student to have the student better understand the underlying processes.

Intelligent Tutoring Systems (ITS) can adapt to individual students. Even if the entire process of tutoring cannot be automated, perhaps some aspects of it can be. For instance, agents might simply coach students, rather than attempt to manage complex interaction[99]. "A teacher for every student." Tutoring vs learning Logo. It is a small step from tutoring systems to serious games. Training with games (11.7.2). Gamification.

Student-to-student computer-supported peer review.

Educational Assessment

Assessment determines progress toward an objective. Presumably, for education we are concerned with functioning in real-world tasks The knowledge of students needs to be assessed at different stages in the educational process. There are two functions of student assessment: assessment for the purpose of evaluating the student and assessment for understand the impact of the supporting information system. Assessment ascertains what a student knows and can help determine what should, or needs, to be taught. For skills training, a "skill gap analysis" could be conducted to determine what the difference is between the skills a person has and the skills they need to complete a task. Validate assessment tool against outcomes. Outcome-based assessment. Criteria for assessment tools.

Embedded assessment can be part of the interaction such as part of an online tutoring session

Typical quizzes ask for a single factual answer to questions. This is known as "item-response testing". This method may be contrasted with testing that involves more complex responses, such as answering essay questions. It is important to find the set of test questions for systematic assessment; educators must be aware that the interpretation of questions on a test may be subjective. In traditional testing, the same questions are given to all students. However, with interactive systems it is possible to tailor questions to a student's knowledge. Moreover, adaptive testing adjusts the questions to the level of knowledge of the student. Data collection about what works in the curriculum [**?**]. Modeling affective state of students.

Representing Student Knowledge with Student Models

If we have a model of the learning process and of the student's knowledge, we should be able to be more effective at tutoring. There are several aspects of a student's knowledge that can be modeled and several ways to represent these concepts. Developing a model of a student's knowledge within a particular domain is a useful step in developing a learning system. Models of for how a task should be solved. Models of the student's general knowledge and state.

A tutoring system may employ a student model, which is similar to a user model but a student model attempts to capture the level of the student's knowledge. Interaction between students and teachers is a specialized type of discourse (6.3.2). Modeling a student's knowledge from just a few observations is treacherous. Suppose a student was trying to do a fractions problem, such as Eq. 5.2. What would you conclude if the student gave the answers in Eq. 5.3 or Eq. 5.4? Rather than treating the symptoms of knowledge deficiency, such as an incorrect answer, it is helpful to identify the "root cause" of any problems, such as the process by which a student arrives at an incorrect answer. However, this can be difficult to sort out especially if the student has multiple sources of confusion. The behavior event stream in very limited is understanding the detail of what the student is thinking. A more subtle representation would show student goals and activities. Indeed, student performance can be predicted with data about the student's activities at the university. Knowledge representation (2.2.2)for the user model.

$$\frac{1}{2}+\frac{1}{2} = \frac{2}{2}=1 \tag{5.2}$$

$$\frac{1}{2}+\frac{1}{2} = \frac{1}{4}\ (incorrect) \tag{5.3}$$

$$\frac{1}{3}+\frac{1}{3} = \frac{1}{6}\ (incorrect) \tag{5.4}$$

Implementing Computer-Based Tutoring

Behavior graph. Conversational agents. Providing feedback.

5.11.4. Instructional Design

Many educational technologies have failed by teaching skills outside of a broader curriculum. Effective instruction needs to be built on more than learning isolated, individual concepts. Design (3.8.0). Rather,

a coherent set of concepts needs to be woven together to form lessons, courses, and ultimately an entire curriculum. Instructional planning should specify desired outcomes (Fig. 5.49). That is, educational goals can be identified and components could be designed to contribute to those goals. At a second level, however, we can identify underlying concepts that cut across several content areas. These underlying concepts can be applied to many areas of education and not, say, just arithmetic.

Dimension	Description or Example
Domain knowledge	Knowing about a specific content area.
Knowledge of the learning environment	Knowing what aids are available and how to use them.
Self-management	Monitoring oneself while learning.

Figure 5.48: In addition to domain knowledge, a student in a learning environment needs knowledge of the learning environment and self-management skills.

Knowledge Skill	Example
Remember	Have heard of SQL.
Understand	Know what SQL is good for.
Apply	Could decide when SQL should be used.
Analyze	Can determine what might be wrong with an SQL statement.
Evaluate	Could decide whether an SQL statement is doing what needs to be done.
Create	Could create new SQL statements.

Figure 5.49: Hierarchy of knowledge skills[23] for a domain and an example using the Structured Query Language (SQL). Instructional system design might specify the level of knowledge expected of students.

These are both cognitive factors and affective factors.

Incentives are a way to implement a design for a social activity. Creating habits with incentive structures [9].

Learning involves much more than simply acquiring facts about a particular domain (Fig. 5.48). A student should learn not only the content of the domain, but also the process of learning. Understanding the process of learning involves "meta-cognition," which is the awareness of one's own thought processes. Help-seeking. This is related to information seeking. Being trained in this awareness can help a student to self-manage the learning process in all other educational domains. Several factors determine the selection of teaching methods from the real world: Theory, cost, and social priorities must all be balanced.

There are several different levels of knowledge skills (Fig. 5.49); they reflects the depth of understanding and the degree to which that understanding can be applied. Remembering knowledge is viewed as more basic than being able to evaluate that knowledge or to create it. It is one thing for a student to memorize facts, but it is quite another to relate facts to each other and absorb their unified significance. Simple memory is, of course, essential to learning. But, this broader perspective suggests that learning that consists of a range of techniques, from memorization to concept integration to application. Language and education (5.11.5).

5.11.5. Educational Informatics

Technology is most effective when it is woven into an educational plan; that is, there should be an emphasis on education rather than technology. As noted earlier, this is a mixed blessing. Pros and cons of technology in the classroom [81]. Evaluation of information technology for education. such as the value of cellphones for classroom use. Supporting collaborative learning and learning communities. Supporting task interaction with shared artifacts. Information environments should be able to stimulate learning. How the use of information resources affects learning.

Serious games (11.7.2) for education. Fun can increase motivation and engagement. Multimedia interactivity may increase attention. However, immediacy of games may reduce reflection. Measuring the

pedagogical value of games. Assessment via learning games. Pointification.

Teaching social skills.

Science, Math, and Computing Education

Many concepts is science and math are abstract; however, they can be illustrated with models. Virtual manipulatives (Fig. 5.50). Visual and/or conceptual demonstrations, like those provided by simulations and reasoning support, generally help a learner to develop a greater, and deeper, understanding of a topic than a simple recitation of definitions or facts[30] (Fig. 5.51).

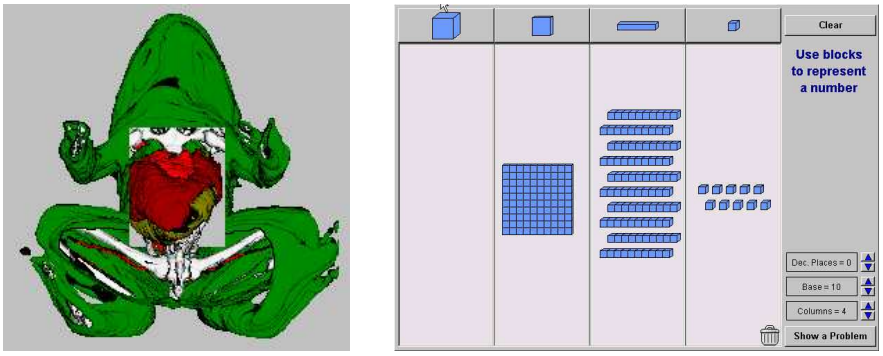

Figure 5.50: Virtual manipulatives allow students to explore principles.[101]. Here are two examples: A virtual frog (left) can help students learn anatomy and a math manipulative (right) teaches the concept of multiples of 10. (check permission)

> The concept of prime numbers appears to be readily grasped when the child, through construction, discovers that certain handfuls of beans cannot be laid out in completed rows and columns. Such quantities have either to be laid out in a single file or in an incomplete row-column design in which there is always one extra or one too few to fill the pattern. These quantities, the child learns, happen to be called prime numbers.

Figure 5.51: Visualization can be useful to help young students understand prime numbers[30].

Personalization of math problems with natural language technology. Collaborative problem solving. Mixed-initiative dialogs for collaborative problem solving.

Learning to solve complex science problems. Medical simulations for training (9.9.1).

Constructionist Learning Technologies Computer programs specify processes (6.5.2). programming, or instructing a computer to perform a series of commands. It is helpful to be able to visualize, the effect different programming actions have on the output of a computer. Logo, for example, is a simple programming language that is suited to this purpose[79]. Using it, a student can explore the effect different commands on a graphical display. It makes the student articulate the assumptions behind the graphical procedures. It also introduces programming basics to the students.

Algorithmic thinking. There have been claims that learning to program leads to better problem solving [79]. However, the empirical evidence does not support this[82]. Alice is an object-oriented programming language (3.9.3) which manipulates graphical objects (Fig. 5.52)[59]. Object-oriented programming is a good way to implement businesses processes. Scaffolding can help transitions among programming languages[53]. Another view is that programming languages should be easy to acquire. Alice for telling stories. Everyone a programmer. Scratch. Squeak. Difficulties of thinking about classes and objects.

Science education and explanations (6.3.4). Scientific inference and reasoning can be supported with argumentation systems (6.3.5). Learning about argumentation. Discourse (6.3.2).

bunny.move(up, 0.15)
bunny.drum.move(up, 0.15)

Figure 5.52: Alice world and Alice program. In the first lines, the whole bunny moves. In the second line, the drum moves. (new photo)

Learning to Read and Write

We examine cognitive issues in reading later, but here we consider technologies for the support of reading. Human language technologies can help to develop tutors for reading. We will examine cognitive processes and social implications of reading later (10.2.0). Reading without formal instruction.

There are many skills involved in reading[75], ranging from correct pronunciation of words to understanding the meaning of words in a given context. One information system strategy presents sentences on a screen; the student reads them aloud, and a speech recognition system processes what the student has said and provides feedback (Fig. 5.53). A student's cognition in reading, literacy, and writing is the result of several factors, several of which include: (a) that they use reading to obtain meaning from print; (b) have frequent and intensive opportunities to read; (c) be exposed to frequent, regular spelling-sound relationships; (d) learn about the nature of the alphabetic writing system; and (e) understand the structure of spoken words. A lack of any of these experiences can lead to difficulty in reading and writing[14]. Children's literature.

Computer assisted language learning us speech recognition technologies (Fig. 5.53). Computer assisted language learning (CALL). Summary Street project.

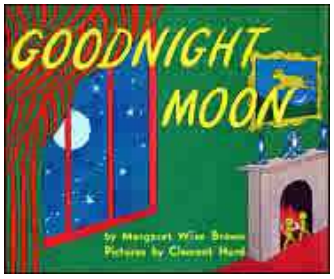

Figure 5.53: Learning to read is facilitated with a multimodal presentation. Illustration in a children's book *Goodnight Moon* (left). Bedtime stories provide parental bonding. Perhaps students can be taught to read by using speech recognition technology to listen to them reading out loud[74] (right). (check permission)

Phonics is a system of teaching reading by identifying constituent sounds of words and the letters that compose them, thereby allowing students to work out and construct the meaning and sound of written words by themselves, rather than memorizing lists of words and their spellings (10.2.4). This is a constructivist approach to teaching reading.

When teaching a foreign language, it is particularly important to engage the student's active participation, as opposed to using passive listening or reading techniques. This can be accomplished with networked distribution and multimedia immersion and is another area where information systems are

revolutionizing education. Information systems have made a much wider array of foreign language materials available to schools and individuals than had previously been the case. Moreover, automatic speech recognition means that the student can be given interactive exercises.

Spontaneous reading with OLPC.

Educational discourse. Feedback on student essays can be provided by text-analysis (10.4.0). A text summarization tool may be used to provide feedback on a student's writing by determining how closely a student's composition corresponds with a pre-determined level of topic coverage[62]. Similarly, collaboration can be used when learning to write.

Information Resources and Education

Many of the systems we have described are active and try to anticipate students' needs, using information system technology to supplement traditional learning techniques. Another educational approach, however, is to have students seek to discover answers (education) for themselves. This system encourages students to investigate questions by accessing rich content. Libraries — can be viewed as complex information systems — play a key role in this aspect of education. Generally, information systems allow students to explore and acquire information. Understanding and using structured information[58].

Libraries (7.2.1). Resource-based learning allows students to build their own knowledge and meaning from various artifacts, or resources (5.11.3). Although it is difficult for some readers to integrate and synthesize information from several different perspectives presented in various resources, extracting significant concepts from an information resource is a skill that students can learn.

5.11.6. Effectively Presenting Information

Managing attention with multimedia.

Learning Objects and Educational Metadata A library provides a range of facts and viewpoints. These facts and viewpoints, scattered among such disparate items as books, microfilm, computer programs, and artwork, support "resource-based learning" by providing "learning objects". A learning object, as discussed above, is simply a resource that supports learning. Within any teaching system — be it an individual classroom or an entire university — the selection and presentation of learning objects are clearly vital to successful education. However, it is unrealistic for an individual teacher to search through and evaluate every possible learning object on a particular topic without having some knowledge of what the objects contain; in this regard, educational metadata becomes very important. One possible solution to this problem is the Dublin Core Metadata Initiative (2.4.4) which has been extended to include educational resources (Fig. 5.54). Open-access educational materials.

Attribute	Description
Audience	For whom is the material intended?
Duration	How long does the material play?
Standards	What educational standards does it support?
Quality	Quality ratings.

Figure 5.54: Elements added to the Dublin Core standard for describing educational materials[8].

Learning objects need to be interoperable with other educational environments. Object-oriented design (3.9.3) facilitates the re-use of modules (7.9.3). It is possible that educational learning objects can be reused much the way that software modules are reused[4]. Synchronous versus asynchronous delivery.

Learning management systems can facilitate many aspects of education beyond simple content. They can help teachers to understand each individual student's performance, and note signs of grade improvement or degradation. These systems can also help to assess what teaching methods are producing the effects, both individually and collectively. Learning Management Systems (LMS) use databases to keep track of student activities. These activities may include class registration, grades, quiz results,

and digital library use. Certain elements of student information need to be secured, but with simple measures this is not difficult.

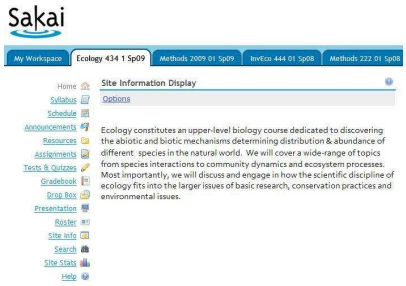

Figure 5.55: Sakai Collaboration is an open-source learning management system. LMSs typically incorporate resources and assessment modules. (check permission)

5.11.7. Learning Environments and Learning Communities

A learning environment is the entire context in which the learning occurs. Traditionally, the context of education is a quiet classroom; teachers often lecture, but lectures do not facilitate constructivist learning. Alternatively, teachers can be the "guide on the side," allowing students to develop their individual intellectual abilities. Information resources can support different learning environments. School libraries can support inquiry-based learning.

There are modality effects in different learning environments. For instance, traditional classrooms do not encourage collaborative discussions. Intelligent tutoring systems (5.11.3).

Communities (5.8.2).

Educational System, Classrooms, and Schools

In the apprenticeship system, education was in is in the context where it is applied. However, much education has moved to classrooms. Lesson plans are goals and strategies for coordinating class presentation and interaction. A classroom teacher should facilitate effective interaction. Supporting classroom discourse. Feedback languages. Instructor facilitates discussions.

Traditional classrooms are sometimes described as being like a factory; students are treated all the same – almost as if on an assembly line. Teachers generally pace their presentations in the classroom and engage the majority of the students. However, lectures are often presented orally and unless a student kept very good notes there was no way for her to reclaim that information. However, classroom presentations could be videotaped and those tapes could be digitized, as meeting archives often are (5.6.4).

Multimedia instruction can be seamlessly applied to a traditional classroom setting. Different images, figures, or videos can illustrate how to parse the material presented in a lecture (Fig. 5.56). Information from many sources can be combined to demonstrate cross-disciplinary techniques such as gesture recognition (11.4.1) that might be helpful in processing the content.

There are many ways to learn. Learning in a studio or a master class is often vicarious learning (5.5.4) (Fig. 5.57). Apprenticeship model of learning. Innovative classrooms.

Groups of students, like other groups learn by working together. A small group of students working on a project is a community within the larger community of the school, which exists within the larger community of society. The community brings social interaction to education at all levels, and provides tools to support that interaction [57]. This in turn gives students a supportive group that facilitates their exploration and development. They can then build further on the social foundations of learning. Individuals may play several different within a learning community.

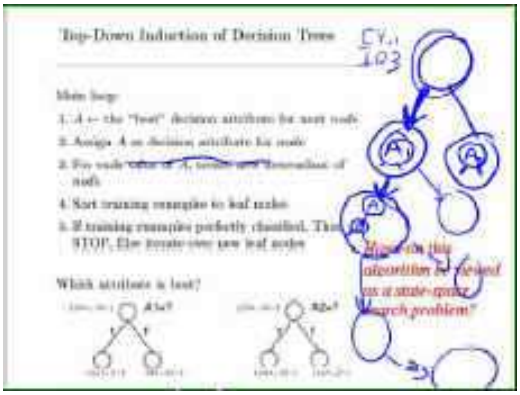

Figure 5.56: Annotations and highlights on the presentation by an instructor during a lecture[24]. (check permission)

Figure 5.57: Learning in a studio may include viewing the work of other students and listening to feedback given to them about their work[17]. (check permission)

Computer supported collaborative-learning.

Distributed and Distance Education

Increasingly, information systems are being used to facilitate distance learning. It is not always practical for teachers and students to get together at the same place at the same time; for example, working students may find it difficult to schedule classes due to the demands of their jobs, or rural students may not have the time and/or means to travel to a university campus several times a week. Information systems are helping to create situations in which the teacher and students are able to be separated from each other, across both space and time.

Distance education may simply involve students using audio or video to attend classes from remote locations, however, new technologies allow multiple means of communication including discussion forums, video-conferencing, online access to lecture transcripts, and online study groups. Modalities of interaction (5.6.5). This is sometimes called "distributed education". Technologies developed for distributed education can also provide support for people with disabilities, for whom it may be difficult to physically attend a class or to keep up with its pace. Teaching presence.

Pros and cons of distance education. Distance education and threaded discussions. It is very convenient. However, social presence and engagement with other students sometimes stimulates involvement. Engagement seems to be essential for learning (5.6.5).

There are many forms that distributed education may take. It could include interaction through the Web for the entire educational experience, as in a typical lecture experience, or an interactive web portal could just be used for discussion forums, while the bulk of a student's time is spent in

individual study. A compromise, which could perhaps retain the benefits of both distance and face-to-face education is blended education. Increasingly, distance education is provided by integrated systems such as Instruction Management Systems (IMS).

Effective practices for distance education.

Mass-course ware. MOOCs. Massive online courses. Learning management systems. Several variations. Quality control. Generally works best for courses where little discussion is required. The difficulty of online credentialing across different universities.

Learning Beyond the Classroom

While some types of learning may be facilitated by the quiet and orderly experience of classrooms, a lot of learning occurs outside of classrooms. Indeed, learning is often most effective if it occurs in the environment and context when it is to be applied[38]. Pervasive and context-aware environments. Learning by doing and learning in everyday situations may be more effective than more traditional classroom-oriented approaches[5].

When using inquiry-based learning students may be thought of as "personal scientists" [60]. That is, students actively construct theories about their world based on their observations of it. The process of manipulating and organizing information modifies students' conceptual structures. Education involves more than just subject-oriented learning; it also includes a social dimension, such as making friends and living with fellow students. There are important aspects of student life, and should not be taken lightly. In this regard, distance or distributed education may never fully replace traditional in-class, on-campus learning environments, but it does provide options for students and teachers to take advantage of educational opportunities and to more fluidly incorporate them into their lives. There is also a lot of learning outside of schools and universities. Some that is supported by public knowledge and cultural institutions such as libraries and museums (Fig. **??**). Because of their educational missions, museum exhibits are sometimes designed to present an interpretation[25]. Docents.

Learning Communities

Because education is often a social activity involving discussion, interpretation, and negotiation, we use — and even attempt to design — effective social environments for learning. Learning often occurs in the context of collaborative problem solving[63]; groups of individuals working together to answer a question, or seek information. Such groups are often called learning communities though, in some cases, the group may be more transient than what we would think of as a community. People generally like to work with other people; those other people can provide both feedback and motivation.

Information systems are well-suited to facilitate these tasks. Commonplace systems, such as Email, allow learners to communicate ideas with ease. More advanced systems are designed to facilitate collaborative discussion and knowledge building using text strings, voting systems, and communal perspectives. These technologies allow students to find a community of interest despite their actual location, enabling them to seek out and find a venue for the discussion of their ideas.

The measure of educational outcome in collaborative activities is determined by the performance of a group as a whole and not the individual members. Group discussions support the development of a shared understanding among the members of the group, as do group learning objects or artifacts. Sharing and discussing an object, such as a document or a simulation, in the group environment can allow knowledge spaces to open so that there is expertise in at least some elements of the group.

Because learning is often social action, communities are an integral part of education. A learning community is any community that supports and facilitates learning. They exist on a continuum of size, ranging from large, diverse, integrated societies to small, distinct groups of learners. Fig. 5.58 illustrates two levels of a learning community. The math forum itself is a relatively small, distinct group of learners, while the submitted post points to the fact that this student is situated within a much larger, more diverse community composed of family, school, and peers [**?**, **?**]. This can also be

supported with a type of virtual reference (3.3.2). Computer-supported collaborative learning (CSCL).

> My father says that a radius is not what i think it is... I think that in a circle half of it is the radius. (Like center to edge) My father says that it has to do with the curve of the circle... I was looking over my pretest for Math and i seemed to have gotten a similar question wrong.. My 13yr old sister says itz right though... My teacher obviously believes that the radius is the diameter... Am I the one who is right?

Figure 5.58: Question submitted to "Dr. Math" in Math Forum, an online math help service. Note the apparent family involvement. (check permission)

This example emphasizes the social aspects of education and how the small group level of interaction exists as an integrated part of a larger community. The act of group formation itself is an act of social learning, in that an individual must not only learn what it is that they are seeking in a group, but also whom else among the larger community shares that idea.

5.12. Everyday Information Skills and Critical Thinking

Many situations are complex and not necessarily what they seem. This can be particularly for some social and information-related activities. Thus, people need a frame of expectations for how to interpret claims. This is often framed as a need to have literacy about those activities.

The ability to prioritize observations is essential to addressing complex problems. This is essentially the same as the goal of supporting unbiased decisions for organizational information systems (3.4.2).

Minimize emotional and attentional bias. Degrees of critical thinking. Due process in legal proceedings (8.5.4) minimizes the effect of emotion.

We have seen many instances including decision support systems (3.4.2). Critical thinking depends on more than just understanding the observations, but understanding the ways such observations may be biased. Argumentation (6.3.5). People also need to detect obfuscation and deception.

Minimize emotional and attentional bias. Degrees of critical thinking. Due process in legal proceedings (8.5.4) minimizes the effect of emotion.

5.12.1. Getting and Evaluating Useful Information

Being an informed citizen. Critical thinking involves weighting the evidence before making a decision. Specific examples include: everyday inference (4.3.4), everyday information seeking ((sec:everdayinformation)), interaction in the social milieu (5.1.1), and making social decisions (8.4.3).

Information resources are not always what they seem. Students should learn about interacting with information systems. They should learn responsibility and caution in handling information. Two related ideas and sets of skills: information literacy and media literacy. Although the skills are necessary for all decision making, Information literacy and media literacy are often considered as training for students. There are many activities which are not well characterized as tasks.

Nonsense detectors. Realizing that people are likely to be biased in their answers. This often violates conversational norms. However, they convey some information. Dubious advertising and freedom of information.

Personal information management (4.11.0).

Learning how to organize and access information. This includes, learning about information structures such as book indexes and library catalogs. Information finding is often difficult. The ability to use indexes needs to be taught. As does the ability to find trustworthy experts when that expertise is needed.

5.12.2. Literacies

Members of our complex society need basic skills to function effectively. These skills are often termed literacies.

Knowing how to find and access information as well as how to evaluate information. There is an expectation in our society that people generally accept responsibility for their own actions. Reading literacy (10.2.2). These skills include economic literacy (e.g., "let the buyer beware"), consumer education, health literacy, media literacies. "Archival intelligence". game literacy, science literacies (9.4.3). Data-analysis literacy. Expectations on information literacy in developing economies. Visual literacies.

While we think of these are the necessities of good citizenship, they can also be seen as cultural expectations.

Information Literacy

Information literacy in an era when ever more of the information is opinion based. Information literacy is needed at many levels such as in the ways that Wikipedia might be biased. Causes of information il-literacy.

Here, we focus on information literacy which teaches people to interact efficiently with information.

Here we consider aspects information literacy. From literacies to expert knowledge. Just as reading is considered an essential skill (10.2.2).

Deception intentionally creates false impressions. Deception may create incorrect beliefs. Deception is common in human endeavors (5.3.3). Truth bias. Intentional misuse of categories. Cues for deception. Cross-cultural dimensions of deception. Levels of distortion in organizations[21]. Impostor. While almost everyone has an instict for self-preservation, there's is a great variety in the degree to which people will take advantage of situations for personal gain versus being altruistic and cooperative. However, it's always the case the eventually somebody come along to turn a situation to peronsal advantage. It may fulfill an economic or political agenda. This is rather the opposite of the conversational norms (6.3.1) or the standards of information professionals ((sec:infoprofessionals)).

Pervasive, consistent and systematic distortion of information.

Internet Literacy

The broad connectivity of the Internet creates many challenges. Awareness of attempts to obtain personal information. Phishing. Privacy literacy. For instance, people should be aware how broadly personal information they post on the Internet may be seen. Students also need to be aware of the nature of information resources. These skills are often termed information literacy and "media literacy".

Judging the Quality of Information

Perceptions of quality versus actual quality. Given the vast amounts of dubious information on the Web, it is essential for users to assess the quality of information. There may be clues about the quality embedded in the information resource. Information finding (3.0.0). Trust (5.2.3). Publishers provide reviews and branding. In other words, they give authority. A user can learn to pay attention to clues that indicate the quality of information. Need to have background knowledge about a resource. Crap detection.

People are frequently uncritical of the reliability of information from sources such as the Web (4.5.1). It is often helpful to focus on materials from reliable sources such as experts and high-quality publishers. Nonetheless, we then have the question of how to identify those reliable sources. Cross comparing information across several sources. See what other people are saying about a claim. Awareness by the reader of the motives behind writing. This can be due to one-sided information or outright deception (5.3.3). More subtly, can we trust Wikipedia articles (10.3.2)? The nature of scholarly authority.

Being able to judge the credibility of an information resource is[10]. More systematically, both information literacy and media literacy encourage students to be aware of the social context of information and media content. A number of factors such as internally consistent, discussion of contrary opinions, and organizational affiliation of the author are clues to information quality.

Figure 5.59: Propaganda posters[11]. Media literacy suggests that the students should be aware of how attitudes can be manipulated.

Beyond analyzing individual information resources, we can also consider entire collections. There are clues which suggest, though certainly don't guarantee accuracy. These include not having any broken links.

An agent provocateur is intentionally disruptive.

Teaching and Learning Search

Teaching young people how to use search engines effectively. Ability to extract and integrate information for several different search pages. Reading (10.2.0).

Judging the Motivation Behind a Communication

Many communications are not trustworthy. This is applied to the influence the television commercials have on children. Media literacy is the ability to judge the intention behind a message. Some presentations take care to present a variety of viewpoints; others may give only one.

As notes above, we expect citizens to be literate about advertising. This is reflected in the statement "Let the buyer beware."

Motivation of advertising. Persuasion gamesmanship. (4.5.2). Media and advertising. Aware of the biases due to attentional processing. Sometimes these assumptions are built into the culture. Recognizing that news reporting might be biased.

Clues about what we can trust in communication. News (8.13.7) (Fig. **??**). Political persuasiveness of content. Gaming the system.

Recognizing that processes association with communication also controls people.

Weighing evidence. Detecting persuasion.

Social Mechanisms for Ensuring the Quality of Information

Due process. Civil debate. Neutral white papers and pundits. Knowledge institutions. Reference. Furthermore, due process should be transparent to encourage people to believe in the system and should build trust. Information professionals (5.12.4). Consent, privacy, and forgetting.

5.12.3. Information Ethics

Ethics analyzes situations in a way that encourages moral actions[33]; thus, critical thinking is essential to ethics. Ethics in the use and management of information. Many organizations have ethical standards. Professional ethics concerning information. Journalistic ethics (8.13.7). Scholarly ethics (9.1.1).

Photo journalism and the difficulty of selecting a single image to show.

Ethical issues in mining large public data sets.

Collective benefits versus individual harm. and some people may be hurt by making information public. It may be legal but could still be harmful.

Individuals should give credit and cite the sources of material they use. Not doing so is known as plagiarism. Plagiarism is related to the violation of copyright but is not the same. Copyright is a law concerning the use of information, while plagiarism in based on social norms. "Plagiarism" is the use of someone else's works without giving attribution of their source. Failure to do so is unethical, and can lead to claims of plagiarism. In some cases, authors re-use their own writing. This is known as self-plagiarism" [89]. This is related to academic honesty (9.1.1).

There are several applications of technology for detecting intellectual fraud. Copy-detection software (8.2.5) can also be used to detect plagiarism.

5.12.4. Information Professionals

Professional are parts of information institutions. Minimize specific agendas. Professions (5.8.2). Codes of conduct. Professional integrity. Information professions depend on a high level of professional integrity. For instance, we expect journalists, archivists, and notaries to be trustworth in handling information.

This is not to say that human information professionals always follow their responsibilities. Journalists and distorted information. Another example is the Heiner case in Australia which involved the destruction of archival records. Police may lie to secure an arrest or conviction.

5.13. History

We have noted that human behavior even in contemporary society are difficult to decipher. This is even more true of history. Informal explanations and the narrative of history. Like lessons learned from organizational reflection, history can provide a reflection of society's decisions. History as collective memory.

Local history.

Social uses of history.

It is very difficult to trace historical evidence.

History data sets civic records, newspapers, archives. (Fig. **??**). Memory studies.

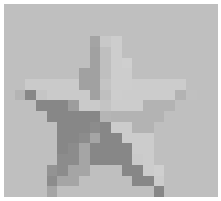

Figure 5.60: Digital history

5.13.1. What is History?

History tries to systematize explanations of past human activities (6.3.4). History as change through time. However, history doesn't directly capture the past. History as description of events (chronologies) versus history are interpretation causes. History as interpretation and narrative (6.3.6).

Generalization about history.

Popular history may represent an idealized version of cultural values. Historiography Causation is interpreted. This is inlike science, where the constraints on inference come from physical processes,

In history the interesting effects are often the decisions made by people. Because it is difficult to interpret people's motives, the key constraints for history are provided by memories and records. The saying "History belongs to the winner" has considerable truth to it, but at least rigorous historical investigation needs to contend with some evidence.

Types of history. Intellectual history. History of technology. Social history. History of art. Public history explores public interaction with history. This can be simplified as idealized versions of history.

History and events. Writing history. Historical argumentation (6.3.5). Historical explanations as distinct from scientific explanations (9.2.2). History is not grounded in replicability as science is. Difficulty of reasoning about counterfactuals.

How people learn about the past. On one hand, the past is a foreign country, but some conception of the past is essential. Another viewpoint is that while cultures and time perids differ those differences may not be so great that they can't be covered understood back on the commonality of human experience and basic empaty.

From history to sociology.

Digital history.

Doing history as a process of conceptualization. Can have accurate facts but still not convey and valid historical account.

5.13.2. Evidence about Historical Events and Social Memory

Event Streams and Historical Concepts

History as a way of organizing knowledge. Notions of historical periods and historial figures. Colligatory concepts.

Social history, economic history.

Historical Evidence

There is a tendency to revise history. Difficulty of history is that there are many possible explanations and too little evidence.

Adequate evidence for claims about history. Historical explanations.

Documents as providing evidence (2.3.1), records (7.4.1), and archival materials (7.5.1). Also, other sources such as architecture and archeology. There is a real chance of fraud with digital objects. Evaluating the legitimacy of records. Some kept in archives has some level of confidence but what to make of records that gave not been in a systematic archive.

Primary sources. Archaeological evidence is often based on the context from which an artifact was obtained. Physical evidence from museums.

Figure 5.61: Political cartoons can be useful as primary sources as evidence of perspectives on social issues.

Oral histories (Fig. 5.62).

The presentation of history in movies is often controversial. Oliver Stone. Docudrama. Immersive historical games.

Figure 5.62: One of the video oral histories from the HistoryMakers collection. (check permission)

During a court trial, the jury may be presented with a reconstruction of an accident or a crime. If a video of the events were available, the jury would want to see it. While such a video is usually not available, an animation of the events can be made. Note, however, that there are many ways to shade the veracity of an animation, and so it might give a distorted impression to a jury. Fig. 5.63 shows animation from two perspectives. By comparison, interactive animation allows for a full view of actions; hence, interactive animations can facilitate better exploration of all perspectives on an event. Digital evidence.

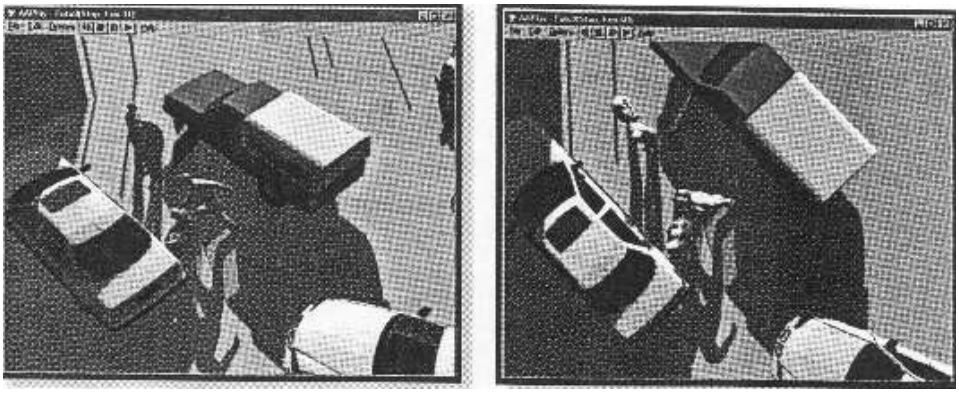

Figure 5.63: Two perspectives on an event may lead to different interpretations. In the view on the left, the person in the center appears to be striking a victim. However in the view on the right, the same person is seen to be running past the victim[1]. (redraw-K) (check permission)

Systematic Attacks on History

Swaying popular opinion by creating an alternative historical narrative. Changing the language to eliminate collective memories. In many cases, this is relatively easy because the institutions which provide evidence are relatively weak. Corrupting historical evidence for instance by creating inauthentic records.

Representations of History

Civic data sets (8.1.1).

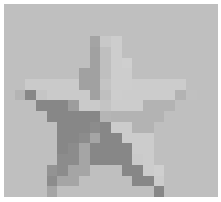

Figure 5.64: Historicans workstation.

Mass digitization (10.1.6), massive amounts of data (9.6.0), and understanding history. Analysis of historical texts. Automated text analysis. History serious games.

Figure 5.65: Historical reenactors.

5.13.3. Social and Personal Memory

Cultural memory institutions (5.9.3). History (5.13.0). Biography, Biopic, Autobiography. Theory of biography. Digital lives (10.3.1). Expectations (4.4.3). Archival appraisal (7.5.3) and forensics. Personal information management (4.11.0).

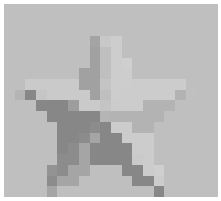

Figure 5.66: Personal letter. (check permission)

Eye-witness testimony in a trial may sometimes be doubted, especially if it is based on leading questions or other concept map-like preparations. There are many errors in convictions for serious crimes based on eyewitness testimony. Many types of memory biases (4.3.2).

We can find similar efforts in eye-witness testimony [6]. This is also sometimes called "gist memory" since the person tends to remember the main points – the gist – but not the details. The inaccuracy and susceptibility of human memory can create biases in eyewitness testimony. People recall of events was able to be manipulated [70] to create false memories. Certainty is based on many factors. Face recognition.

Exercises

Short Definitions:

Action research
Assessment
Attribution
Co-browsing
Cooperation
Constructivist learning
Coordination
Culture
Distributed cognition
Division of labor
Domain model
Early adopter
Information literacy
Intelligent tutoring systems (ITS)
Instructional system design
Knowledge skill
Learning community
Learning management system
Learning object
Learning outcome
Manipulative
Media literacy
Media space
Meta-cognition
Norm
Pedagogy
Phonics
Plagiarism
Professional development(teachers)
Recommender system
Reputation
Role (group)
Scaffolding (learning)
Shadow function
Social brain
Social capital
Social contract
Social network analysis
Social presence
Sociability
Structuration
Student model
Task group

Review Questions:

1. Develop a simple fraud detection model you might apply to credit card purchase data. (5.3.4)

2. Describe some of the examples of social learning. How is it similar to or different from other types of learning? (5.5.4)
3. What are the different types of systematic information flow through an organization? (5.7.0)
4. Describe examples of three types of communities. Explain how they meet the definition of communities. (5.8.2)
5. How might information systems decrease the sense of community? How might information systems increase the sense of community? (5.8.2)
6. Identify the level of knowledge skills required for: (a) Determining that a car is broken, (b) Explaining to a mechanic what is wrong, and (c) Fixing the car. (5.11.4)

Short-Essays and Hand-Worked Problems:

1. Explain how online tools could support the development of social capital. (5.2.1)
2. Why do you trust your bank to take good care of your money? (5.2.1, 8.7.3)
3. What is the likely target value for user 4 in the table? Justify your answer. (5.5.5).

		Video						
		1	**2**	**3**	**4**	**5**	**6**	**Target**
User	**1**	4	8	2	7	1	9	2
	2	3	0	9	2	3	8	1
	3	2	8	7	9	3	1	7
	4	2	6	1	9	4	7	?

4. Listen to a meeting and characterize the types of social interaction that takes place. How might that social interaction be modified with additional information systems? (5.6.3)
5. Observe a meeting and, if possible, videotape it. Describe how you would annotate the events in the meeting to make it accessible for use later. (5.6.3)
6. What are some of the barriers to communications for organizational components in remote locations? (5.6.6)
7. What are some of the difficulties of virtual organizations compared to organizations in which there is face-to-face interaction among the participants. (5.7.1, 5.7.3)
8. How does information technology amplify the division of labor? (5.7.2)
9. Briefly describe an electronic community to which you belong. If you do not belong to any electronic communities, describe one you have heard about. Why you do you consider it an electronic community? In what way could the community interaction be strengthened? (5.8.2)
10. Give examples of the way a community is defined by language. (5.8.2)
11. A community creates coherence among its members but such coherence in an organization can result in silos. Do communities develop silos? (5.8.2, 7.3.6)
12. Describe the design for an electronic book interface which would support reflective thinking. (5.11.2)
13. What is the difficulty of building student models for activities such as writing an essay? (5.11.3)
14. Propose how you might develop a curriculum for a high-school information science class. (5.11.3)
15. Describe how the hierarchy of knowledge skills (Fig. 5.49) would be applied by a student learning about (a) chemistry, (b) history. (5.11.4)
16. Describe some ways in which non-traditional information systems could be used by students in pre-schools and kindergartens to improve learning. (4.9.2, 5.11.5)
17. At one extreme, libraries may be seen as passive repositories where people can search for information. At the other extreme, education attempts to be proactive and give people an understanding of basic principles before the students need them. In the future, will libraries and educational computing completely merge? Explain. (4.10.2, 5.11.5)
18. What education model do you think is best used to teach science education. (5.11.5)
19. Describe the online materials you should collect for a digital library designed for fifth graders. (5.11.5, 7.1.2)
20. Compared to Eq. 5.2, what cause would you infer for each of the following *incorrect* answers? What are some possible alternate explanations? (5.11.7)

$$\frac{1}{2}+\frac{1}{2} = \frac{2}{4} \tag{5.5}$$

$$\frac{1}{2}+\frac{1}{4}=\frac{2}{6} = \frac{1}{3} \tag{5.6}$$

$$\frac{1}{2}+\frac{1}{2} = \frac{1}{17} \tag{5.7}$$

21. Project what you think the mix of technology will be in the classroom in 20 years. Will there be classrooms? (5.11.7)

22. How might you teach students to evaluate the accuracy and truthfulness of information resources? (5.12.0)

Practicum:

1. Evaluate the information needs of an organization. Describe the ways that organization deals with these information needs. (5.7.0)

Going Beyond:

1. Is there always wisdom of crowds? (5.0.0)
2. We have emphasized the synergy of social forces but other sociological theories focus on "power" and "class". What are the advantages and disadvantages of employing those notions. (5.0.0)
3. Do television and Internet access provide the same level of social isolation? (5.1.1)
4. How might we quantify social capital is there in an organization? (5.2.1, 5.5.5)
5. How does information technology affect the optimal structure for task groups? (5.6.1)
6. Give some examples of how family life was or will be changed because of information technology.
7. Create a taxonomy of types of organizations. (2.2.2, 5.7.0)
8. Describe information flow in an organization with which you are familiar. (5.7.0)
9. What is the relationship between culture and technology? How easy is it for technology to change culture? (5.8.2)
10. Does a complex industrial society have culture? (5.8.2)
11. Describe the information systems available to members of your community in public schools, in libraries, and in community centers, such as the YMCA. (5.8.2)
12. How important is access to information to reduce poverty? What are some specific steps that you feel could be effective? (5.8.2)
13. List some ideas of how to encourage people to participate online communities. (5.8.2)
14. Give examples and discuss best practices for each dimension of S.O.A.P. (5.11.0)
15. What is the role of entertainment in education? (1.6.1, 5.11.0)
16. It is possible to synthesize both cognitive and social perspectives on education into a framework? (5.11.2)
17. How important is the acquisition of facts for students versus learning analytical skills? (5.11.2)
18. Compare the similarities of use-case analysis and instructional system design? (3.10.2, 5.11.3)
19. How should cognitive processing models impact to instructional system design? (4.3.0, 5.11.3)
20. Develop a model of the rules students need to learn to do fractions problems. (5.11.3)
21. What kind of knowledge does a multiple-choice question test evaluate as compared to an open-ended question test? (5.11.3)
22. Explain how an adaptive testing program would be implemented. (5.11.3)
23. Collect a tutoring dialog. Annotate the dialog with notes about the state of understanding of the student and the strategies of the tutor. (5.11.3)
24. How can a tutor increase student engagement in a dialog? (4.2.2, 4.6.0, 5.11.4)
25. Develop a lesson plan for (a) a fifth grade science teacher and (b) a tenth grade history teacher using digital resources. (5.11.5)
26. In what sense are public schools learning communities? How could the community aspects be enhanced? (5.11.7)
27. How important is face-to-face interaction for education? (5.11.7, 6.1.2)
28. To what extent should an information science course teach values about the use of information? (5.12.3)
29. Do you agree with the statement: "The winner writes history"? (5.13.0)

Teaching Notes

Objectives and Skills: Group dynamics, Instructional system design.

Instructor Strategies: This chapter introduces fundamental principles of social processes. It then combines these social approaches with cognitive issues for education. The two main sections, social issues and education, could be considered separately.

Related Books

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- National Research Council. *How People Learn: Brain, Mind, Experience, and School.* National Academy Press, Washington DC, 1999.
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- Robbins, S.P. *Organizational Behavior.* Prentice-Hall, Englewood-Cliffs NJ, 2003.
- Shirky, C. *Here Comes Everybody: The Power of Organizing without Organizations.* Penguin Press, New York, 2008.
- Watts, D.J. *Six Degrees: The Science of a Connected Age.* Norton, New York, 2003.