Chapter 8
Social: Social Cognition and Teamwork

Abstract Most work is carried out by people working as part of a team. Even where work is carried out by one person it is likely to be in connection if not in collaboration with other people. This could be in a formal organization that has standard operating procedures or as part of a larger system, or it could be part of an informal group of loosely organized collaborators. Social processes—how people interact with each other—are important; they affect how systems interfaces are used. Any system that supports more than one person needs to take these phenomena into account along with the various factors that define the social context in which users especially user working in teams will make decisions take actions including extrinsic intrinsic motivation. In this chapter we introduce some concepts that have proven to be important for system adoption use.

8.1 Introduction

Much early work in HCI focused on single users because at that time most tasks were performed by individuals working on independent computers. However, even in the 1970s, as increased computer use came to the workplace, there was recognition that we need to consider social aspects of system use:

> We believe that the engineer who deals with human performance should avoid two faults that have made the "efficiency expert" one of the most hated in industry: (1) the neglect of personal and of social variables, and (2) the use of people as means to ends they do not share and do not determine. If a person is to design tasks for others, he has the responsibility to attempt to see the tasks and their implications in a wider context and to attempt to ensure that they are life-enhancing. This is not easy to do, nor are the criteria clear cut. It requires that the designer himself close feedback loops with reality at several levels, not only at the level of specific performance criteria of the given system or of the human task which are part of it, but also at the level of his own personal values (Sheridan and Ferrell 1974, pp. 18–19).

As distributed, networked computing systems have become the norm, team or group working has become routine, and the importance of social processes has risen (see, for example, Hinds and Kiesler 2002). We now have a much better

understanding of how the context in which the technological system is used significantly affects *how* it is used. Workplace systems are *socio-technical systems* (see Chap. 2); that is, technical systems that are designed for and shaped by people operating in social contexts. This means it is important to consider the interactions and interdependencies between the social and technical aspects of any system that is being developed or modified: How is it being used? How does it affect (transform, facilitate, impede) social processes?

Social psychology and other disciplines draw a distinction between individuals acting alone, dyads (two people interacting), groups, teams, and communities. In the context of work tasks, dyads, groups, and teams tend to share more clearly defined goals. Here we use the term *team* to refer to a particular, formally defined and workplace oriented type of group. Whilst what applies to groups generally applies to teams, what applies to teams does not always apply to groups.

A team comprises two or more individuals who have to carry out work (a set of related tasks) in pursuit of some common (specified) goal. Team performance, like individual performance, is still based on the notion of particular people doing particular tasks in a particular context. It is, however, complicated by the need to communicate and co-ordinate actions and decision making, and by having to consider the effects of the way that the team may be distributed in both space and time.

When thinking about teams, it is important to remember that what counts as a team depends on where you draw the boundaries when conducting your analysis (Hollnagel 2007). In aviation, for example, if you draw your boundary at the aircraft cockpit level you might consider the pilots to be a team. If, however, you extend the boundary to cover the whole of the (interior of the) aircraft, then the team would include the flight attendants. You can keep extending the boundary outwards, which would bring more people into the team: ground crew; air traffic control; and so on.

Social processes related to and mediated by technology also occur in other large systems of systems such as medicine, entertainment, defense, and increasingly in education. For example, in air transportation, many people—passengers, pilots, ground crew, and so on—come together (see Fig. 8.1). Where a number of social groups come together, as in this case, a large socio-technical system—a system of systems—is formed smaller socio-technical systems each of which has their own social rules and regulations, and often includes different technical systems. People frequently end up as the points at which these systems overlap. For example, think about the check-in agent at an airport who has to work with baggage handling systems to ensure your luggage gets on to the right plane. Here, the agent who prints and attaches the tag to your bag is the boundary point between the check-in system and the baggage handling system, and the tag determines how the bag moves into the baggage handling system.

Working as a team can bring problems of co-ordination and communication. The aviation industry recognized this and developed the concept of cockpit resource management (Wiener et al. 1993) as a way of dealing with the issues on

Fig. 8.1 The modern air transportation system includes many kinds of technology, including computer systems, and many types of users, ranging from passengers to pilots to support staff and including air traffic control

the flight deck. The concept was subsequently extended to cover the whole of the on-board flight crew, and was renamed crew resource management (Kanki et al. 2010). When teams are in the same location, or *co-located* a great advantage is overhearing what others are doing, even if they are not collaborating actively at that moment. This allows people to be aware of where others are in a task. There is a body of work looking at what happens in control rooms, for example, where teams of operators work together (e.g., Heath and Luff 2000).

Although teams may be co-located, teams nowadays are often distributed in space and time, even when working for the same organization. Teams may also be spread across different time zones and across different cultures. A lot of work has been done to understand the benefits and problems of distributed work and tele-commuting (see, for example, Hinds and Kiesler 2002; Ellison 2004). Research has also focused on the ways in which different technologies affect communication and coordination. Technologies that mediate communication between people in different locations are differentially suited to different kinds of tasks (Churchill and Bly 2000). Teams can also change dynamically, as they adapt to the situation at hand. In hospitals, for example, there is often a doctor that is on call. These doctors are usually only called up when the local team cannot resolve the case they are currently dealing with. This may result in the doctor acting as a remote team member to help diagnose and fix the situation, or it may result in the doctor physically attending in order to provide expertise and advice in situ.

In the rest of this chapter we look at the impact of social factors on performance. We begin by examining at the impact of the social context on decision making. We then go on to consider the factors that define the social context in which teams operate. It is worth noting at this juncture that team performance involves more than just the sum of the performances of the individual team members.

8.2 Social Effects on Decision Making

8.2.1 Introduction

Social psychology suggests that sometimes groups do not make better decisions than individuals. It is certainly true that groups often come to different decisions than individuals, and that groups are influenced by social factors. This section looks at some of the social influences on decision making, including the diffusion of social responsibility, the attribution of effects, and how groups make decisions differently.

8.2.2 Social Responsibility Effects

There are two effects related to decision making in social settings. The first of these is called *diffusion of social responsibility*. If a request for assistance is directed at a single person, that person must choose whether to respond or not. When many people are held jointly responsible for dealing with a situation, however, the responsibility diffuses across people: one person may choose not to do anything in the belief that someone else will. Figure 8.2 illustrates a version of this. It shows a fairly obvious typographical error in a local paper. While it can be argued that it is not the readers' responsibility to report typos to a newspaper, many readers take great delight in doing so. In this case, both the paper and the fans ignored this glaring mistake for weeks.

The second effect is *pluralistic ignorance*. When you are in a situation, you will often base your interpretation of the situation on how other people interpret it. Is that person ill or just acting strangely? Are they sleeping by the side of the road or have they had a heart attack? As Darley and Latané (reported in Abelson et al. 2004, p. 224) noted, "emergencies do not come with signs on them saying that they are emergencies." The observer has to interpret the event before responding. If others are ignoring the apparently anomalous behavior or interpreting it in one way, then it provides evidence to suggest that you should too.

Both of these effects apply in an early study designed to investigate how people choose to help. Darley and Batson (1973) had theological seminary (i.e., religious professional) students prepare a talk and then walk individually to the next building where they were supposed to give their talk to a panel. Some students prepared a talk on the tale of the Good Samaritan (a biblical story about a man who stopped and helped an injured man) and some prepared a talk on a topic that did not involve helping others. Some of the students were told to hurry to the next building because they were late, some were told they were somewhat late, and some had more time to make the trip. On the way to the next building each student passed a person slumped in a doorway. Unknown to the students, this person was a confederate of the experimenter. Data was collected on who stopped to help this person, and how much help they offered.

Fig. 8.2 This figure, which appeared in a pre-game (American football) newspaper program, ran for 3 weeks (with different opponents appropriately inserted), with the labels "When Penn State has the Ball" for its defensive team *and* for its offensive team
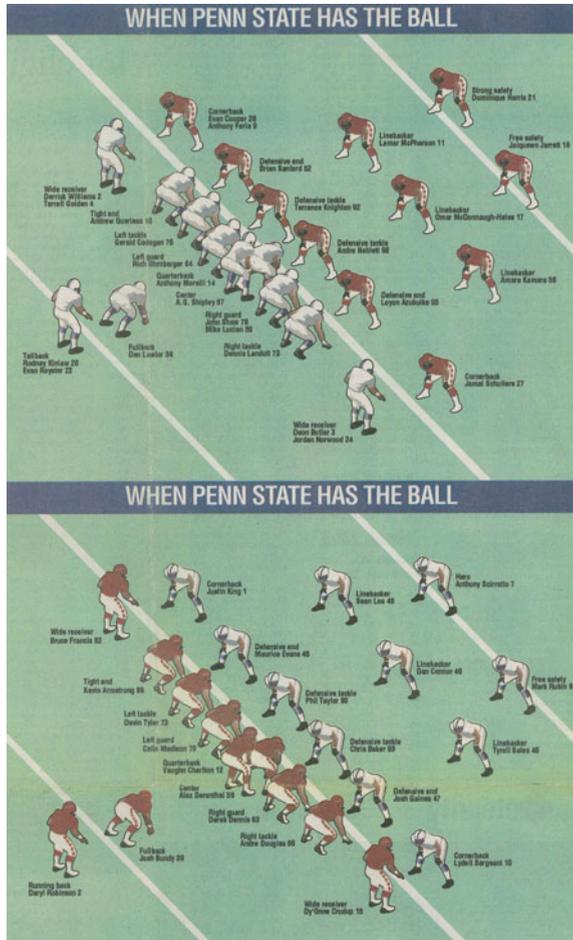
The students who had the most time to get to the next building helped the most (63%); those in the greatest hurry helped the least (10%). The students who were somewhat late helped 45% of the time. Ironically, the amount of help they gave was not influenced by whether the student was going to give a talk on the Good Samaritan or not. This work starts to examine who chooses to participate, and shows that it not only depends on the individual, but also on the context.

You can often see these effects in email. Some time ago we saw an email that was sent out about the potential closing down of an academic society. "Unless this vote [to amend the constitution] is successful, the committee will [have] no alternative [sic] to dismantling the Society, prior to closing it down." The email called upon the members of the society to vote for a new set of bylaws. It was targeted at the group (of society members) as a whole rather than individuals within the group. (The society continued, but it took several more emails.)

Remember that the diffusion of social responsibility requires that others are involved—a person is less likely to take responsibility for action or inaction when they think someone else will take the action. Size of the group is critical, and it must be the case that no one person is singled out as responsible. So, not all situations involving many participants will result in social responsibility diffusion. For such diffusion to occur, the relationship of the individuals in the group to the requestor—whether they are individually likely to be held accountable or not—is key. Your supervisor asking you to put information on a web site to help others is more compelling than a company president asking everyone to participate in a knowledge repository.

You do not always get diffusion of social responsibility. In a demo run as part of an HCI class we have repeatedly failed to achieve this effect. In this demo the class teaching assistant emails the students (some individually, and some in groups of 2, 4, 8, 16, or 32 students) asking them to bring along an example book to the next class. The numbers of students who bring in a book is about the same for those students who are emailed individually as it is for those who are emailed in groups. If there was diffusion of responsibility, there would be more books brought along by those who received the individual email than those who received a group email, Subsequent class discussions usually note that most of the students feel that this request is not individual, that the teaching assistant will know them individually, and that the lecturer will be able to tell whether or not they brought along a book. Sometimes students also report that the bland wording in the request is somewhat unusual, which leads them to suspect that there is an ulterior motive behind the request.

If you want to avoid diffusion of social responsibility, you should target particular individuals. It helps to use first names in emails, use individual communication, and to clearly note any possible consequences. In the case of bulletin boards and online forums, people asking for help have to be specific (which is possible with technical problems) and have to address individuals if possible. In the case of online forums this is difficult and thus it may be better in many cases to find help locally.

Note that diffusion of responsibility and pluralistic ignorance are not inevitable, and can be avoided or prevented. Keltner and Marsh (2006–2007) suggest making the need clear, so that there is no pluralistic ignorance about the need for help, and to direct the request at specific individuals, so that the responsibility does not get diffused.

8.2.3 Attributions and Attributional Style

Understanding why other people do things is called attribution. Attribution is central to how we understand social situations. When we examine how people make these attributions, we can start to identify some regularities:

- Self versus others: attributions about ourselves are usually different from our attributions about others behaving in exactly the same way. We give ourselves credit for success based on our internal capabilities, but blame the environment or others for our failures. On the other hand, when making attributions about others, we are more likely to attribute their success to their environment, and their failures to their personal deficiencies. Even university presidents do this (Birnbaum 1988, p. 215), attributing their own successes to hard work and their failures to outside events.
- If something bad occurs to someone else, we will seek explanations that attribute cause to a circumstance that creates the most distance from our own circumstances. The explanation is simple: we like to distance ourselves from the thought that the same thing could happen to us.

Attribution theory is an important area of research in social psychology. Jones et al. (1972) noted the tendency of people to attribute their actions to external situational causes, whilst external observers attributed the same actions to causes that were internal to the person carrying out the actions (the actor). They called this tendency the *actor-observer divergence*. The term *fundamental attribution error* was later introduced to describe how observers underestimate the impact of situational forces and overestimate the importance of internal dispositional factors (Ross et al. 1977).

One of the fundamental errors in design is for the designer to attribute their own feelings, needs, knowledge, goals, and so on, to users. In other words, for the designers to believe that other people, including their potential users, are exactly like them, and behave in exactly the same way. Good designers differentiate what they want, need, and can do from what their users want, need, and can do. From the user's perspective, the technology may not always behave as expected. In these situations, systems need to be designed to be transparent, to be effectively debugged, and thus to help the users make the appropriate attributions: *is this an issue with the system or the device or did I do something wrong*? Error messages should not be worded ambiguously, but should allow the user to attribute causes appropriately and learn from the error.

Related to the notion of attribution is the concept of *cognitivedissonance*. Cognitive dissonance occurs when a person holds two or more beliefs that are in conflict at one time as in when people do not get what they want. People will rationalize their choice by devaluing the one that is not chosen or that becomes unavailable. It is similar to the moral in Aesop's fable about the fox and the sour grapes. The fox reasoned that the grapes that he could not reach were sour, and hence not worth getting. People sometimes adopt a similar line of reasoning when they do not get the rewards they were expecting (such as a promotion to a new post) by convincing themselves that they are currently in the best position. Similarly, when people do things for little reward, when they explain why they did that activity, it can increase their perceived value of it. This explains why it can be better to give small rewards where the impact can last longer.

8.2.3.1 Breakout Box: Ways Email Has Gone Awry

How can we apply attribution theory to system design? Email is an example where most people are using the same type of system, but other people appear to behave differently from us and differently from how we would like them to.

Ritter has personally seen the following ways that email has been lost, misfiled, misdirected, or lost. Are these errors? In some ways they are. Are they the fault of the user or of the system or the system designer? It seems to vary. In all cases, the sender might want a response.

This list (selected from more) can also be explained with reference to attribution. Do the reasons you do not reply to email vary from why you think others do not reply (starting with whether they got the email!)? Many users assume that email is perfect, that the receiver received it, and that lack of response is due to the receiver not being willing to respond. This list illustrates that this is not always the case. Further discussion is available in the chapter on errors.

1. Date is off on the sending computer (by up to 5 years), so does not appear with today's email (mail to Ritter).
2. Simple typo in "To" address (mail to Saor-bugs, not Soar-bugs).
3. Extra letter(s) typed as an answer to another application, e.g., mail to "yesyen" instead of to "yen" (Ritter).
4. Complex typo, e.g., in "To" address, mail sent to research group's name, not to research group's email alias (Ritter).
5. "From" country (!) was on spam list (so not read by recipient) and not read by cc person (Ritter was cc).
6. Typo in domain (Ritter).
7. Local (university, government, hotel) mail server ate it and left no residue (Ritter, Spink).
8. No known reason, found months later where it should be (Ritter).
9. Reader meant to respond, but never got back to it or was waiting for 'the right time to send a really good and clear reply' (Ritter, too many times).
10. Admin assistant reading manager's email deleted it accidentally (multi-readers of account, anonymous).
11. Admin assistant reading manager's email deleted it, perhaps on purpose (multi-readers of account, anonymous).
12. Email came in batch of 500 messages after a break (Ritter, others).
13. Reader or mailer accidentally deleted incoming mailbox (anonymous!).
14. Filter misfiled it (Schooler, Ritter).
15. Email sent to Ritter (and from Ritter, more recently) where sender's machine filled in remainder as @<localhost>. Ritter replied with ritter@<localhost>. Both bounced.
16. RAID disk failure takes out department for 3 days (anonymous in UK).
17. "When I can't give someone the answer I want to give them, I don't give them an answer" (a publisher).

18. User was going through a life-changing event, such as moving, pneumonia, their own death, having a baby, losing a baby, loss of a relative, or several of these at the same time.
19. User wrote email and, instead of sending it, filed it as if it was the email being replied to. (Ritter, September 2006; to Ritter, 2009).
20. Print out of email was printed and deleted, and was then stapled to the back of another document printed before it. (Ritter, multiple times).
21. Auto expansion from first name (e.g., Jacob) instead of from last name (e.g., Jacob).
22. Email sent from local conference hotel run by major research university never arrived or bounced.
23. Emails included as attachments in the middle of the body of a message (rather than in the header or at the end of the body).
24. Email software and anything in between (e.g., router, ISP, recipient) changes security level. (Ritter, Feb. 2009, and earlier).
25. Students told/reminded to read their student email account (with clunky interface) by an email sent to that address.
26. User replied to questions by answering them on the same line, not a separate line as the quoted questions. The reader only saw their original questions.
27. Migration to MS Outlook server did not migrate all emails.

8.2.4 Majority and Minority Effects

The way that individuals behave when they are part of a group usually differs from how they would behave on their own. There is a strong tendency to be influenced by what the group says or does. If the majority of members of a group express a single opinion, it is much less likely that one individual will hold onto a different opinion, even if they know that they are correct. This effect derives from the desire in a group to maintain harmony or conformity, and minimizes conflict. This can result in incorrect or deviant decision making. This has been raised as a concern for juries, for example, where what is called *group think* can occur (McCauley 1989).

These issues have been studied with experiments using a group where some of the group members were confederates of the experimenter, that is, people who were not really subjects in the study. With a stooge majority (i.e., in a room full of experimenters pretending to be other subjects in the study), individuals readily capitulated to the majority view, even when they were fully aware of the right answer. With a stooge minority, where the group in the experiment had a minority of confederates who held an incorrect opinion, many individuals do capitulate occasionally to their view.

Another way in which this can play out is with what is called *choice shift*. Two good examples of this are the *risky shift*, where a group makes a riskier decision than an individual. Wallach et al. (1964) proposed that greater risk-taking results

from diffusion of responsibility. Here, emotional bonds decrease anxiety and the risk is perceived as shared. Collins and Guetzkow (1964) suggested that high-risk-takers are more confident and hence may persuade others to take greater risks. This can result in those who tend toward less risky behavior becoming more risky; social pressure (I do not want to let my colleagues down) translates to moving to a riskier position. Familiarity and increased knowledge of a situation also leads people to feel that situations are less risky; more people may equate to more knowledge and deeper exploration of the issues, so perceived risk is diminished (Bateson 1966).

However, sometimes the opposite can occur; this is called *cautious shift* (Stoner 1968). Here the group moves to a more conservative, less risky position.

8.2.5 Summary

The effects of the social context on decisions are strong in situations that have social components. These effects arise when there are other parties to the decision and when there are other parties making the decision.

Social effects occur in individuals when they are part of a team but also occur in individuals in social situations where there are no organized teams such as chat rooms and forums. Some of these effects can be anticipated and can be marshaled to help systems, and some can be avoided with forethought.

There are further influences of decision making that arise from social effects. It is these social effects that keep life interesting. If you are interested, see the section on Other Resources.

8.3 Factors Affecting Team Performance

8.3.1 Introduction

It is important to understand the factors that underpin good teamwork so that you can facilitate and support teams with any system you design or develop. A team's performance, and whether it achieves its desired goals, will depend on collaboration and communication between the team members. Teamwork is based upon multiple components, including the team's set of competencies—that is, knowledge, skills, and attitudes (or KSAs). The relationship between the KSAs and teamwork is shown in Fig. 8.3.

Your system design should provide the appropriate levels and types of support to encourage team members to participate in team performance. Participation can range from simply making a comment on a bulletin board that can be seen by other members of a group, to interactively working with other people as part of a team to carry out a task. There are several situational factors that affect how users interact socially with others.
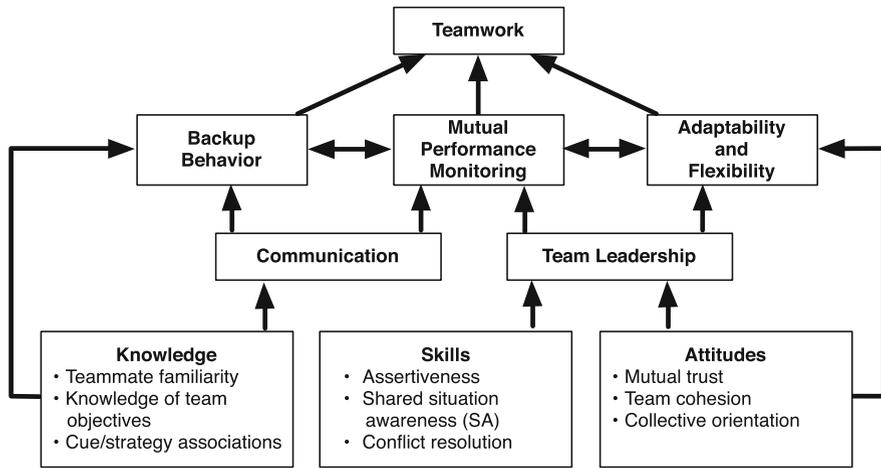
Fig. 8.3   A theory of the components of teamwork (based on a diagram by Salas et al. 2005)

Table 8.1 notes several factors that influence team performance based on a review of modeling teamwork (Morgan et al. 2010). The importance of each of the factors will depend on the task itself, and the context in which it is performed. Note that although we refer to team, these factors also apply to groups.

An example of a team is shown in Fig. 8.4. Much of the research in this area has been carried out in critical dynamic domains, such as aviation or defense, where good teamwork has high payoffs (and, more importantly, poor teamwork can lead to great losses). In addition to the way that teams are made up, and how the individual members work together, team performance is also affected by the availability of resources to carry out the task at hand. These includes physical resources like space, computers, networks, and databases, as well as intellectual and administrative support above and below the team in the organization (see Booher and Minninger 2003; Brooks 1975 for overviews of resourcing issues).

Achieving good teamwork is difficult. The situation is complicated because of the need to consider the interaction of multiple people, each with different backgrounds (knowledge, culture, and so on), which will influence their behavior. It is also important to take appropriate account of task-related factors, because the task structure, for example, may not readily map onto the team's structure. Here we draw on and extend Kozlowski and Ilgen's (2006) review to highlight areas of importance.

8.3.2 Team Size

The size of a team affects performance. If the team is small and its size is constant, it may be possible for communication and collaboration to take place directly between members. The group's size has a strong effect on intra-group interaction, as well as inter-group perceptions. Group size seems not only to influence the

Table 8.1 Factors that influence team performance by defining the social context of the members

Factor	Brief definition
Team size	The number of members in a team
Team competencies	An abstraction of the number of unique qualities possessed by the members of a team
Team structure and composition	The way that the members of the team are structurally organized, e.g., as a hierarchy, and how they relate to one another
Social distance	The perceived distance between the goals and motivations of any two team members
Spatial distance	The geophysical distance between any two members of a team; this also has implications for temporal distance–that is, differences in time zone
Mutual support and surveillance	Mechanisms for maintaining shared norms and coherence by minimizing the expression of the diverse characteristics of team members
Presence or absence of legitimate authority figures	A measure of the perception of a leader's authority and legitimacy by a team member; authority can be leaders or monitors
Task attractiveness	A measure of the alignment of the leader's task with the team members' internal motivations
Team processes and tasks	The relationship between the teams and the tasks that they have to perform

effectiveness of communication between group members (Cartwright 1968; Hare 1952) and its tendency towards hierarchy (Bales et al. 1951) but also the relationship dynamics existing within and between groups (Bales and Borgatta 1955; Benenson et al. 2000; Shalit 1988).

As the size of the team grows, it changes the dynamics of interaction between members, and may make it harder for individual members to participate in team working. In such a situation you need to consider other factors that can be used to facilitate member participation. If the team is too large for effective participation, you may wish to encourage (or even mandate) the use of smaller teams.

8.3.3 Team Competencies

Good teams are usually made up of good team members. If the team members have good levels of KSAs, this will usually be positively reflected in team performance. It also helps if the goals of the team members are aligned with those of the organization in general, and with the task goals in particular. A multidisciplinary team can benefit greatly from skill sharing between different team members, and a team can also be made stronger through appropriate education and training of the team and its members. It is worth noting that there are some tasks where team performance is determined by the performance of the worst team

Fig. 8.4 Teams are important for many processes. Here, two pilots are working together as a team to prepare a plane for flight, and, not shown, interacting with ground control and ATC

member, such as in an obstacle course, and there are other tasks where coordination is far more important than raw speed or talent (e.g., McNeese 2000), and yet other tasks where the best performances of individuals matter (e.g., gymnastics). Industrial and organizational psychology is an area that will provide more knowledge about how to improve teams through selection.

Olson and Olson (2000) suggest that collaboration readiness and technology readiness are also important factors for teams interacting using technology. The former relates to the willingness and ability of team members to collaborate. The latter relates the technological know-how about the tools that will be used, including tools that support synchronous (real-time) and asynchronous communication (and collaboration) such as Skype, Twitter, Instant Messaging, video chat, and text SMS—notably, the suitability of the tool itself, the match of its affordances to the communication needs of the group, and the tasks (Bly and Churchill 1999).

8.3.4 Team Structure and Composition

As the size of the team increases, some sort of structure will be needed to manage communication and collaboration between members. This often takes the form of a

hierarchy. For larger teams (and where the size of the team can increase over time), it may become necessary to provide system support for communication and collaboration. This can be done through facilities for sharing information, or for allowing close grained collaboration with version histories to enable task awareness (e.g., Churchill et al. 2000) or by enabling team members to maintain a more general current awareness of what other team members are doing, as in the example of the control room operators mentioned above (Heath and Luff 2000). This latter kind of awareness is sometimes called shared situation awareness.

The optimal structure will depend on the team members, their relationships, the social context, and the task. In the ideal case, the team is balanced to the task, with appropriate KSAs to perform the task and the team coordination tasks. For complex, unpredictable tasks, or for situations where there is a broad range of tasks, flexible structures are better. For static tasks, static structures can help the teams to be more efficient. Thus in assembly line work, where tasks do not vary, structures tend to be more rigid. In academic research, and in creative pursuits such as design, where the tasks vary quite a bit, teams will have more varied and more variable structures. In Fig. 8.3 this would influence the factors of adaptability and, to a certain extent, the communication and team leadership.

Within the field of system design, Brooks (1975), has famously explored the issue of team structure. He argues that having a single system design architect is the best approach. He also notes that adding more people to a project can slow down development at certain times. There are two main reasons for this: first, you need to spend time and effort bringing the new people up to speed, and second, you often also increase the communication overhead (based on size and structure).

In addition to the structure, the composition of the team is also important: you need to have people who are capable of working together. Several researchers (Kozlowski and Ilgen 2006; Salas et al. 2002) note that teams work better when they leverage the knowledge of the team members, are cohesive and confident, allocate resources appropriately, coordinate well, and learn over time.

There is significant evidence that differences between group members negatively affect group performance (Byrne 1971; McGrath 1984; Newcomb 1961). This literature generally describes the level of group performance as a function of the organization's level of social integration, or the degree to which group members are psychologically linked or attracted towards interacting with one another in pursuit of common objectives (O'Reilly et al. 1989). Social integration constitutes a goal-driven process arising out of the daily interactions of team members, mediated by both the length of contact between members and their respective organizational roles.

Promoting interaction between team members also helps. Birnbaum (1988, p. 94) and others, have noted that people who interact with each other in groups tend to like each other. The interaction and liking are related, in that liking leads to more interaction, which leads to more liking.

The importance of diversity among team members is questioned by some, however. Mannix and Neale (2005), for example, have argued that the effect of diversity of team members is not as clear cut as some people say. They note that

Table 8.2 Social distance measures from Ethington (1997)

Distance	Bogardus (1925) "Would willingly admit members of each race…"	Bogardus (1933–1967)
1.	To close kinship by marriage	Would marry
2.	To my club as personal chums	Would have as regular friends
3.	To my street as neighbors	Would work beside in an office
4.	To employment in my occupation in my country	Would have several families in my neighborhood
5.	To citizenship in my country	Would have merely as speaking acquaintances
6.	As visitors only in my country	Would have live outside my neighborhood
7.	Would exclude from my country	Would have live outside my country

His work looked at race using scales developed by Bogardus (1933) and later works cited by Ethington, but it can also be applied to other social groups

"[s]imilarity on attributes such as attitudes, values, and beliefs will facilitate interpersonal attraction and liking." (p. 31), which will lead to more cohesion and integration within a team and hence to better teamwork performance. They note that diversity can help if it is task relevant, pointing out that "underlying differences, such as differences in functional background, education, or personality, are more often positively related to performance—for example by facilitating creativity or group problem solving—but only when the group process is carefully controlled."

The composition of a team will inevitably change over time as people change positions within the organization, change roles, or even move to other employment. Studies suggest that group performance and cohesiveness correlate more strongly with similarities in attitudes and values than with phenological characteristics (Terborg et al. 1976; Turban and Jones 1988), and that negative outcomes associated with surface-level diversity—ethnicity, social status, and so on—decrease the longer a team remains together (Milliken and Martins 1996).

These findings highlight how important organizational continuity is to organizational functioning. Large turnovers in personnel lead to a drop in overall group functioning as the members of the new team take time to acquire new deep knowledge about one another (Carley 1992; Carley and Hill 2001).

8.3.5 Social Distance

Social distance, a concept introduced by Park (1924), refers to the distance in social terms between two groups or between people. You may find it helpful to think of it in terms of a sense of belonging to a team. The scales for measuring social distance, such as Bogardus' (1933) social distance scale for race, and Westie and Westie's (1956) social distance pyramid for caste and class, are somewhat informal. Table 8.2 shows an example of social distance measures. The table

shows that there are problems in these measures (i.e., units are unclear), that it is not an easy measure to create, and that even discussions about social distance can help us understand ourselves and users better.

More recently, social distance has come to be regarded as a continuum rather than discrete levels, stretching from an in-group bias—people just like me—to an out-group bias—people not at all like me (Eveland et al. 1999; Perloff 1993). Developments in network theory (see Chap. 9) also suggest that social distance is a function of the ties between group members rather than just their individual characteristics (Ethington 1997; Granovetter 1973; Wetherell et al. 1994). Nevertheless, the concept of a social distance continuum is a useful way of capturing the influence of culture, particularly as it relates to the development of out-group biases. It is worth noting that many people draw a distinction between social distance and psychological distance (Ginges and Eyal 2009), arguing that there are salient differences between the interactions of individuals who may belong to particular groups (psychological distance), and group-level interactions, where group identity is primary (social distance).

Smaller social distances are generally preferable because they make it easier for team members to both receive support from, and give support to each other, thereby making participation in the group more likely. Conversely, larger social distances increase the likelihood of team members acting against other team members or other groups.

8.3.6 Spatial Distance

Organizations are increasingly using teams that are distributed geographically and temporally. One part of the team can work on a task and, at the end of their day, pass it to a group in another time zone who are just starting their working day. Getting people to perform successfully in this way requires careful planning, because geographic distances between group members mediate the development of familiarity (Ethington 1997), and thus affect group cohesiveness. Notions of familiarity, in turn, act reciprocally to help create communities of practice (Seely Brown and Duguid 1991). Distortions to the perception of space, however, can also distort both the sense of accountability and attachment to others (Grossman 1996).

Spatial relationships influence decisions to participate. If group members are close to us this encourages participation in local activities. The scale of importance varies by task, but in collaboration by researchers, for example, 30 m is an important distance, above which much less collaboration happens (Kraut et al. 1990). Increasing distance will also decrease participation because increased distance weakens our relationship to others. There are both short distance (10–100 m) and large distance (time zone) effects. This may change as ways of connecting change and network bandwidth increases.

8.3.7 Mutual Support and Mutual Surveillance

In addition to issues of social and spatial distance, the nature of the relationships between team members influences team performance. In particular, peer-to-peer and subordinate–superior relationships, which we discuss here, are important (Harrison et al. 1998; Terborg et al. 1976; Turban and Jones 1988). If these relationships change, this can lead to significant and divergent outcomes in team performance (e.g., Grossman 1996).

Team membership offers several benefits. These include a sense of identity and belonging (group norms), guidelines for dealing with ambiguous situations, structuring of chaotic situations, and helping predict the actions of others (e.g., Chekroun and Brauer 2002; Cialdini et al. 1990; Smith and Mackie 1995). Furthermore, social support can help to moderate the effects of stress by buffering members from negative events (e.g., Caplan 1974; Cobb 1976; Epley 1974). The relationship between social support and stress reduction is complex: Sandler and Lakey (1982) found that the benefits of group support varied across individuals in relation to the coping mechanisms used to deal with adverse situations.

On a peer-to-peer level, teams can help regulate behavior. Viewed through the lens of appraisal theory (e.g., Cannon 1932; Festinger 1954; Lazarus and Folkman 1984), for example, group support facilitates participation. Appraisal theory proposes that you judge a task looking at what resources the task requires and what resources you have. If the task requires more than you have, it is a threatening task. If not, it is a challenging task. If you are part of a team, you have more resources, so being in a team will make the task more likely to be seen as challenging rather than threatening.

Where behavior is deviant, however, Chekroun and Brauer (2002) found that if the deviation could be clearly attributed to particular individuals, other team members offered larger and more rapid responses of disapproval of those acts. Contrary to expectations, larger deviations are typically met first with attempts to mediate actor behavior rather than expulsion (Festinger 1954; Liska 1997), as members try to eliminate the discrepancy. As the discrepancy narrows, the pressure for uniformity appears to increase and becomes even greater when either the relevance or the value of group membership increases (Festinger 1954). Simultaneously, however, the impulse to individuate oneself and, for many people, to increase one's relative status ensures a constant state of comparative surveillance, particularly for groups operating in risky situations for prolonged periods (Dinter 1985).

8.3.8 Authority Figures

Team leaders are often expected to exert authority as part of their role. Leadership, authority, and compliance have been extensively studied, most famously by Stanley Milgram (1963). In Milgram's study, participants gave increasingly

powerful electrical shocks to volunteer learners, based on commands from the experimenter (an authority figure)—notably, shocks were not in fact delivered but study participants believed they were. The power wielded by the experimenter in this study was not physically coercive or economic, but rather symbolic, in that they were an authority figure in a study. Milgram noted that the goal (the advancement of knowledge) and the location (Yale) influenced participants to acquiesce more readily to the experimenter's demands (Milgram 1963, p. 377). In the Milgram study and subsequent obedience studies (e.g., Haney et al. 1973), belief in the legitimacy and power of the leader led to the leader being granted actual power over the participant.

The effects of authority are moderated by other factors, such as physical proximity. If the team leaders are physically located close to the team, they have more influence on team members. Distant leaders have less authority.

Authority can be expressed in several different ways online, for example, by an email address (e.g., president@psu.edu), by having someone send an email on your behalf (e.g., this is an email for a vice president sent by an admin assistant), by privileges or special tools in a game, and by login names (e.g., admin, webmaster, or root@company.com). How authority is implemented, used, and abused online is still not fully understood, however.

8.3.9 Task Attractiveness

The task that a team has to perform and, hence, its goals influence the behavior of the team. Frank's (1944) and Milgram's (1963) studies both note that obedience of authority depends on having legitimate goals that are related to the organization's mission. More legitimate goals lead to greater participation in systems. In addition, people often indicate in interviews and surveys that goals are a motivating factor in their behavior (Collins 2008; Frank 1944). Representing social goals poses a challenge, in that they emerge at the interface between cognitive and social activity, and hence tend to be more abstract. It can therefore be difficult to evaluate how successfully they have been achieved.

Over time, legitimate goals tend to make group members more compliant, whereas illegitimate goals erode the ability of leaders to influence their subordinates. Making the goals clear, and the payoff for achieving them direct and immediate, are just some ways to make tasks more appealing. Online systems, including computer games, can be designed to take advantage of this. Carma (http://www.car.ma), for example, is an online car ride sharing site where the goal is attractive to users for multiple reasons. The Carma app runs on a smartphone and connects to a server. When you want to travel somewhere, you note where you want to be picked up and how much you are willing to pay. As you drive, or before you drive, you check to see if anyone is looking for a ride.

The success of Carma's system appears to be more dependent on social factors than on technology. If there are not enough drivers and passengers, there will not

be enough matches to make its use worthwhile for either driver or passenger. In the past, these rides were arranged informally (e.g., by word of mouth) and using bulletin boards. So the group size, location, and destination will all have an effect. Group size is likely to be a negative factor in rural areas where the group and the population density are both likely to be smaller. On the other hand, group cohesiveness may be greater, as the group members may know each other and be headed to the same destinations. The risks in developing this system do not appear to be technological, but more related to social engineering.

8.3.10 Team Processes and Tasks

It is important to understand the tasks the group is trying to perform. There may be different ways to do the task, and there may be different tasks that can be chosen. Within a volunteer organization, for example, some groups will perform better on activism tasks and some groups will perform better on outreach and education tasks.

The way that tasks are divided between the team members and how the team members communicate will affect team performance. Olson and Olson (2000, 2008) note the importance of the coupling of work, that is, how closely team members have to work together. For technical work and in discussions of risk, for example, the collaborators frequently need to be co-located so that they can communicate fully, whereas in other situations, such as open source software development, remote coupling may be possible.

It is therefore important to adapt the processes to the team and to the tasks. Common ground is a shared set of knowledge, expectations, and understanding about the people on the team and the task. Establishing common ground is an important factor in team performance (Clark and Wilkes-Gibbs 1986; Olson and Olson 2000) and should therefore be encouraged by systems and system designers.

You may also need to think about people's motivation for doing the task in the first place. Pink (2009) argues that boring and repetitive work still requires extrinsic motivation (Pink describes this as Motivation 2.0) to get people to do the tasks, and this was covered in Chap. 4. In those situations where people want to do the work, however, Pink argues that they are intrinsically motivated to do the tasks (he calls this Motivation 3.0). Pink suggests that Motivation 3.0 applies to creative work and leisure, most of design (including design of software, systems and interfaces), many engineering tasks, and most knowledge work.

8.3.11 Implications for System Design

These factors make numerous suggestions about how to design systems, and this section can only note a few for some common systems. For distributed users, like those on YouTube, these factors suggest that it is possible to encourage

participation by helping the site seem smaller, perhaps by creating local regions like in Yelp where you search by a town or area. It is directly helpful to have friends identify each other on the site for mutual support; even to make moderate posts might need encouragement, and attempts to provide appropriate distance between people, both increasing it by calling someone Dr. Ritter, and decreasing it by calling him Frank. Allowing people to moderate interaction in online forums (moderators) as legitimate authority figures will help encourage pro-social behavior. Finally, making the goal attractive and noting the goal, payoffs, and value will help people choose to interact.

For collaboration at a distance, as an aspect of system design that will not go away, these factors remain very important too. Each of these factors will help such groups work together. Not directly mentioned, but influenced by all these factors, is trust, and space and time are important factors, being able to meet face to face, in the same place at the same time will, according to these theories, encourage participation, as does the trust across interactions.

8.3.12 Summary

Successful team performance depends on the social context in which the team will operate. This social context is defined by a wide range of factors. The relative weights of these factors and how they should be balanced will vary across systems and settings. Where differences exist between theories in this area they often arise from different assumptions about the teams, their contexts, and the things that can be changed. In general, teams (1) that are more cohesive, (2) who have worked together longer, and (3) who share more values, will perform better and be more likely to achieve their collective goals. When you design your system you should try to support the factors that enable cohesion and the sharing of values. You should also consider whether there are ways in which you can support new team members to bring them up to speed as quickly as possible.

8.4 Factors Affecting Performance in Community Settings

Having considered the factors that affect performance (and behavior) in team settings, it is also important to take a brief look at what happens in less structured settings. There are an increasing number of communities developing (more or less) organically online. Sites such as Yelp, lastminute.com, YouTube, Tripadvisor, and Epicurious now support self-reported consumer ratings, and some comprise only user-generated content. In addition, there is an increasing number of open source communities in a wide range of areas: for software development (e.g., Linux), for knowledge (e.g., Wikipedia), for stock photography (e.g., Open Stock Photography), and for music (e.g., Open Source Music).

Pink (2009) notes that many organizations still use extrinsic motivation theory, and argues that this approach frequently violates what psychological science is telling us. He suggests that what motivates people to participate without payment in these activities and communities is intrinsic motivation, noting that it is more important than extrinsic motivation for many tasks. It is not the perfect panacea, however, and he provides several counter examples of tasks where intrinsic motivation either fails or is not possible.

In community settings, many people get involved in their own time, and without any form of payment. In many ways, although they comprise a community, their motivation is invariably individualistic. These people are intrinsically motivated by the drives of autonomy, mastery, and purpose, as noted in Chap. 4. The tasks that they are doing are intrinsically rewarding, so people should not be given extrinsic rewards for doing them. The intrinsic drives need to be supported through providing feedback (positive and negative to help with mastery), and *now-that* rewards which only occasionally happen. These should not be monetary in order to minimize the likelihood of discouraging or discounting the user's intrinsic motivations to perform the task. The rewards might provide further autonomy, notes, and recognition about mastery, or emphasize the purpose that was served. Alternatively, make any extrinsic rewards a token: many $1 payments for patents get framed and saved, for example, in recognition of a job well done.

8.5 Implications for System Design

Teamwork is highly dependent on communication and collaboration. The team will often need to share information, for example, so that team members can use it to make individual and collective decisions. It is therefore important that your system supports both communication—of both information and outcomes—and collaboration. This may require the use of tools and technologies that are not an inherent part of your designed system, such as video communication. We used Skype as well as email during the writing of this book, for example, to allow the three authors in three different time zones to communicate and share ideas both synchronously and asynchronously.

Group decision making aids typically incorporate features to reduce bad effects and increase good effects of group decision making. These features often include a brain storming session, and anonymizing users counter the effects of hierarchy (organizational power) so that more ideas can be generated without the leader explicitly or implicitly affecting what people are willing to say.

As we have noted throughout the chapters in this book, most systems nowadays are socio-technical systems. In other words, there is a social system that needs to be considered because the technology and the social system will be interdependent and interact. If you do not spend time and effort understanding the existing social system, you run the risk of adversely affecting it. For example, if staff have to spend more time on maintaining and interacting directly with the new technology rather than on

the tasks they need to perform, or on communicating plans and results, this will have a detrimental effect on the work processes and outcomes. Ultimately, staff may simply stop using the new technology because it gets in the way of them doing their job.

You should try to design your system in such a way that it minimizes the possibility of diffusion of social responsibility. Things that enable diffusion include getting aggregate rather than individual inputs, allowing people to be anonymous, and setting goals where no specific person is invited to contribute. Techniques that are widely used to help avoid diffusion of responsibility include providing representations of the people involved that can be seen by other users, by allowing reputations to be built according to system usage and expertise, and by making any requests for assistance appear more directed to individuals than to a group.

The attribution of causality suggests that responsibility can be moderated. Partly this has to be done by the user, but the breakout box on email suggests that email systems might be more apologetic and clear about what went wrong, and email systems are getting better about noting how and why mail was not delivered. This knowledge can help the sender understand why the receiver might or might not receive an email. Similar effects and results can be imagined for phone calls, text messages, and IMs.

If you are designing a very large system, of the scale of Yelp, for example, you may want to encourage participation by helping the users perceive the system as being smaller than it really is. To avoid overwhelming the user, Yelp does this by creating local regions where you search by town or area. It can also be helpful to have friendly faces available in the system to provide mutual support, and to provide moderators (in areas like online forums) as legitimate authority figures to help encourage pro-social behavior. You may also need to think about how you provide the appropriate social distance between people using the system (e.g., increasing it by using formal titles, such as Dr. Smith, or reducing it by using first names such as John, or even nicknames).

You will need to think about how and why people are motivated to use your system to carry out their particular tasks. Do they use it because they have to (are they paid to use it to do their job, for example)? Or do they use it because they want to use it (the classic example here being social networking systems)? Is their motivation *extrinsic* or *intrinsic*? That is, are they self-motivated because of their own interest, or because they will get a reward from an external source for doing it? Even in the case of developing a social networking system, there may be a need for extrinsic motivation to make sure that people keep the system active by providing new content, although the rewards for doing this may not be financial. You could highlight how the system increases their mastery, gives them autonomy, and increases the importance of doing the task. The balance between motivations may not always be clear cut. Some learning tasks, for example, will require a coach who sets tasks (which may be necessary, but are not necessarily intrinsically rewarding) for people to complete as part of their learning experience. Any reward structure for task performance needs to be appropriately aligned to teams and to individuals. If the rewards are targeted at individuals, and individual performance,

for example, then the likelihood is that the team members will behave as individuals.

In addition to the team level issues, you may also need to think about organizational issues (sometimes referred to as the blunt end of a system, as noted in Chap. 10). If an organization has procedures in place for how a particular job has to be done, for example, then you will need to think about whether these procedures will have to be changed. If the procedures are imposed by a regulatory authority (as in nuclear power, for example) then you may not be able to change those procedures, so you will have to design your system to support those procedures. There can also be cultural effects (on several levels), so there may be a tradition for doing a task in a particular way, which is an effect of organizational culture; we cover this in Chap. 9.

8.6 Summary

Social factors are important. They affect the ways that teams operate, and hence affect system performance. If you are designing systems that will be operated by teams of people, you will need to understand that the ways that teams behave cannot simply be described by generalizing from individual behavior. Care needs to be exercised when generalizing from studies of different types of teams, or from teams doing different tasks in different contexts.

You need to use the results from studies of how teams work intelligently. Teams and their tasks will vary widely. The results probably rely on more factors than are reported, and the type of tasks and types of group members will influence the results but are often assumed to apply to all groups or all tasks. So we should be cautious when generalizing or overgeneralizing from existing results. The results about how teams work may only apply to that type of team with that type of task, rather than all teams (larger and smaller, with different types of people) competing or working in different environments and doing more or less similar tasks. This reflects Clark's (1973) concern about overgeneralization in language research. He noted that it was difficult, and even inappropriate to generalize from a few nouns and verbs to all nouns and verbs—they come from different languages, take different parts of speech as helpers, have different frequencies, and can be radically different in many dimensions—as well as for teams and tasks..

In addition to understanding how teams make decisions and take actions, the factors that influence team performance are important. In particular, the social context of the team your system will support needs to be understood. Often this context will not be static, but will change over time, so you need to understand how and when the various factors that define the social context can change.

There are many examples of how a failure to give appropriate consideration to the social aspects of systems has led to accidents. Casey (1998) notes several including disasters with the Space Shuttle program because they ignored social and political aspects (Starbuck and Farjoun 2005; Vaughan 1997).

8.7 Other Resources

There are a number of general texts about social factors in collaboration and teamwork that are worth reading if you wish to know more about this area. We have cited some in the main body of the chapter (e.g., Ellison 2004; Hinds and Kiesler 2002; Olson and Olson 2008) but there are many more. See, for example, *Intellectual teamwork: social and technological foundations of cooperative work* edited by Galegher, Kraut, and Egido (1990, Hillsdale, NJ: Erlbaum).

There is an extensive literature under the titles "computer-supported cooperative work" (CSCW) and "computer mediated communication" (CMC) where many of the topics we have covered are elaborated in more detail. Conference and journal publications in this area will provide more information and more current information. There are also a number of initiatives in trying to build systems that are smart about how people collaborate, employing computational agents to broker work task accomplishment in teams. See, for example, chapters in Ye and Churchill (eds.) (2003). *Agent supported cooperative work*. Boston, MA: Kluwer.

If you are interested in how to design teams, rather than just how to design systems to support team performance, Vicente (1999) presents a useful approach. He argues for laying out all the tasks that the team will do, effectively a task analysis writ large. Then you group the tasks so that there are natural breaks between sets of tasks, taking into account communication and how tasks interact. He argues that this leads to better team performance because the tasks are more naturally divided.

Work by Judy and Gary Olson are particularly relevant here. They have studied how computer-supported communication changes how teams work, and provide some design advice about how to support teams in such projects:

Olson, G. M., & Olson, J. S. (2007). Groupware and computer supported cooperative work. In J. J. Jacko & A. Sears (Eds.), *Handbook of human-computer interaction (2nd Ed.)*. Mahwah, NJ: Erlbaum.

Olson, G. M., & Olson, J. S. (2003). Mitigating the effects of distance on collaborative intellectual work. *Economics of Innovation and New Technologies, 12*, 27–42.

8.8 Exercises

8.1 Look through the list of the ways that email has gone awry, See how many examples you can find of (a) diffusion of social responsibility, (b) pluralistic ignorance, (c) attribution errors, and (d) majority/minority effects.

8.2 Imagine you are working on a project where the team is distributed across three locations, all in different time zones. You have been asked to identify videoconferencing tools that can be used to carry out monthly progress meetings and to select the best one for the job. List the factors that you would use to inform your decision, and explain why they are important.

8.3 You are managing a soccer team, where daily training routines are partly determined by the combination of the players' individual circumstances. The players are asked to record their weight, calorie intake, and exercises each morning using an app on their smartphone. Explain how you would motivate the players to provide this data every day before setting off for the training ground.

8.4 Choose an online, social web site, such as Facebook, YouTube, or Yelp. Sketch several tasks that can be done by users with the site. Describe the intrinsic and extrinsic motivation(s) for users to perform those tasks. Do the same for an online course site, and for an online game. Note at least four insights that arise from doing this analysis.

8.5 Consider the organization where you currently work (or are a student). Try to identify at least two people within that organization who are simultaneously members of several teams, and explain where the boundaries occur that delineate those teams.

8.6 Find a game that is designed to help someone learn a complex skill, such as World of Warcraft. Examine what components of that game are training individual skills and what are training social skills. Also, note if the game has collaborative or competitive or educational elements across learners.

8.7 Consider how forming, storming, norming, and performing can be done without technology and with technology for group class projects. Consider how these processes are done and could be done better in the workplace.

8.8 Generate a job description with at least eight activities for an office job where telecommuting occurs (e.g., sales, professor, management, software engineer, student). Discuss how technology might replace or support doing each task and note how many of these tasks can and cannot be performed remotely and what social activities are included. Using this analysis, provide suggestions for teleworkers.

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