# Encouraging contribution to online communities

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## 1. Problems of Contribution

Many hands make light work, goes the proverb. But only if all those hands actually do some work. To be successful, online communities need the people who participate in them to contribute the resources on which the group's existence is built. The types of resource contributions needed differ widely across different types of groups. Volunteers in NASA's clickworker community (http://clickworkers.arc.nasa.gov/), for example, help space scientists analyze data by clicking on Mars photographs to trace the outline of craters. In social media communities, like YouTube, where users upload videos, or Gnutella, where participants share their music collections, the contributed resources are the digital artifacts that users share with each other. In communities such as Wikipedia or the Apache OSS project, which produce a product for external consumption, the contributions consist of the direct production work that creates the artifacts (e.g., editing articles or source code), the coordination work done behind the scenes to plan the artifacts, and the production process and the managerial and administrative work that sustains the community as a whole. In many discussion communities, it is the conversations that participants exchange with each other that provide benefits to others in the community. In a technical support group, for example, participants provide answers to others' questions, while in health support groups they also provide emotional support and tell personal stories that engage the interests of others.

In almost every online community, there are important contributions not being made. For example, consider Gnome, the open-source software graphical user interface for Unix-like operating systems. As of April, 2010, the 15 most important modules in this open-source desktop project had a total of 13,028 open bugs (see **Error! Reference source not found.**). Of these, the developers working on the project classified 9.4% of them as either critical or major. Under-contribution can be a problem even in highly successful communities, like Wikipedia. As part of its plans to publish an offline version of the encyclopedia, Wikipedia created a quality assessment project to evaluate which articles are ready for external publication. In this assessment, a stub is the lowest quality Wikipedia article, "containing only a few sentences of text which is too short to provide encyclopedic coverage of a subject, but not so short as to provide no useful information." Of the roughly 900,000 articles evaluated in the English Wikipedia, two-thirds were classified as stubs as of March 2010 [http://en.wikipedia.org/wiki/Wikipedia:Version_1.0_Editorial_Team/Index]. Although the Wikipedia encyclopedia is among the top ten most visited websites and provides reference information for both professionals and the general public, this level of under-contribution means that users are confronted with stubs when they search for many articles.

| Product | Open bugs | Opened in last 7 days | Closed in last 7 days |
|---|---|---|---|
| Evolution | 2738 | +55 | -43 |
| gtk+ | 2392 | +36 | -23 |
| nautilus | 1609 | +17 | -15 |
| doxygen | 868 | +10 | -0 |
| rhythmbox | 741 | +21 | -16 |
| gnome-panel | 604 | +13 | -15 |
| glib | 560 | +23 | -12 |
| banshee | 531 | +40 | -28 |
| GStreamer | 512 | +41 | -40 |
| epiphany | 485 | +16 | -10 |
| GnuCash | 481 | +22 | -9 |
| metacity | 432 | +3 | -1 |
| f-spot | 413 | +4 | -0 |
| l10n | 336 | +3 | -9 |
| vala | 326 | +20 | -14 |

*Table 0-1. Open Gnome bugs (3/10/2010)*

Sometimes the contribution gap occurs because there is simply too much work to do compared to the number of hands available. This seems to be the case with the backlog for fixing bug requests in the Gnome project and with stubs in Wikipedia.

Sometimes, however, hands are available but idle. One reason is that people don't know what to do. It may be possible to increase contributions just by directing people to useful tasks. Since not everyone can do the same things, the chapter begins, in section 2, by exploring the coordination effects of requests that ask people to do specific tasks.

Sometimes the needs are clear but volunteers don't find the tasks appealing. For example, most writers of software code don't have the same enthusiasm for writing documentation or translating it into a wide range of languages. Similarly, the core developers may not want to create drivers for specialized peripherals unless they happen to be using these devices. In addition, volunteers often think that providing user support is less attractive than creating new software or even fixing bugs. One of the reasons that high-technology companies like IBM, Sun, Nokia and Redhat have paid employees working on volunteer-initiated, open source software development projects is that the volunteer workforce didn't spontaneously do some of the work needed to make the software successful or to adapt it to commercial uses.

The remainder of the chapter explores ways to increase people's motivation. We use theories from psychology and economics to identify techniques that can increase resource contributions from members, and also to identify common ways to go wrong. Figure 1 summarizes the causal pathways that theory and empirical evidence suggest lead to increased motivation to contribute, labeled by the sections in this chapter where they are discussed. Many of the pathways derive from an expected utility framework that is common in both economics and psychology. For example, classic Expectancy-Value models in organizational behavior hold that people will work hard if they think that doing so will lead to outcomes they value (VH Vroom, 1995; V. Vroom, Porter, & Lawler, 2005). Motivation is a multiplicative function of *expectancy* (i.e., their beliefs about the probability that their action will lead to the outcome) and *value* (i.e., the value of the outcome or satisfaction they will receive if they achieve the outcome). Where utility is derived from outcomes of the actions, psychological theories often posit a two-stage process, where individual effort has some impact on performance, and performance has some impact on outcomes. For example, in a running race, increased effort in the form of training might lead to completing the race faster (performance), which might lead to winning the race and collecting a trophy (outcome). In the online community setting, exerting effort may lead to the creation of a new video (performance) which, upon upload, may lead to positive comments or status in the community (outcomes).

Satisfaction or utility need not come only from external outcomes such as comments from other people. It may also come directly from the actions that people pursue or the performance level they achieve. Since at least the time of Aristotle (Aristotle, 1953/originally 330 BCE), philosophers and psychologists have distinguished between intrinsic motives, where the performance of some activity is an end in its own right, and extrinsic motives, where the activity is a means to achieve some other outcome. For example, people may slay monsters in World of Warcraft for intrinsic motives (i.e., because they enjoy the task itself or the camaraderie that develops among players who work together to fight difficult monsters), while others may do so for extrinsic motives, because they enjoy the status that comes from achieving a high level in the game. Some people edit many articles in Wikipedia because of the intrinsic pleasure they derive from writing about topics they care about (Burke & Kraut, 2008). Sections 3 and 4 explore intrinsic motivations that are tied to effort or performance, rather than extrinsic motivations tied to outcomes.

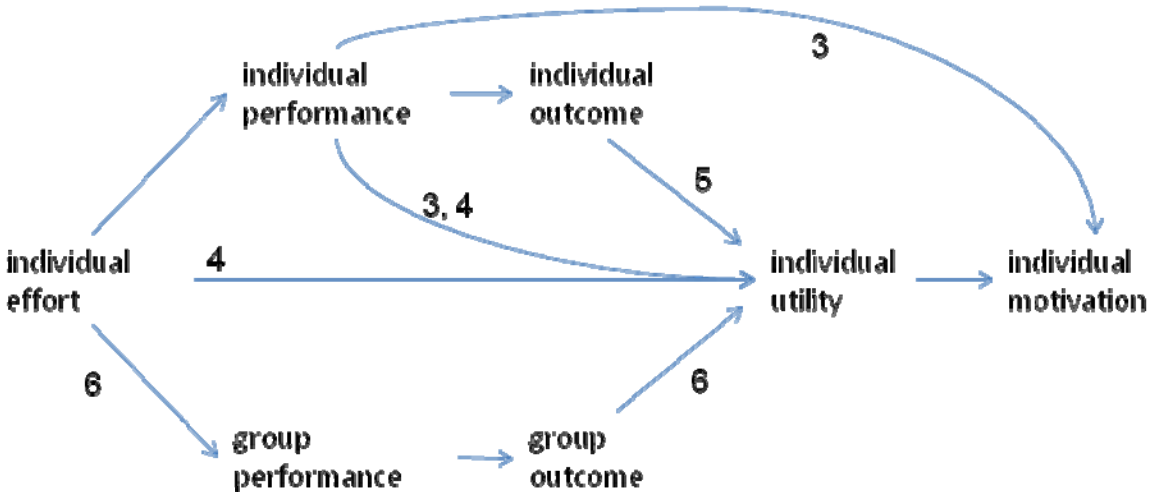


*Figure 1: Motivators of individual effort and the sections of the chapter where they are explored.*

Section 3 continues the exploration of requests, begun in Section 2 with a focus on their coordination effects, but focuses on a variety of persuasive techniques that may motivate people to comply with the requests. For example, people may be more motivated to complete tasks when asked by friends or people with high status. Since people seem to respond to many persuasive techniques by following heuristics rather than carefully assessing the utility they might gain, we can think of these techniques as creating direct links from individual performance (task completion) to motivation. People are also motivated to achieve challenging goals, so that completion enhances self-efficacy. Thus, we can think of persuasive techniques that establish goals and provide feedback as enhancing a direct link between task performance and utility, not requiring the mediation of externally visible outcomes.

Section 4 describes ways to enhance intrinsic motivators, things that make tasks fun or interesting irrespective of the outcomes of that effort. For example, effort on the task may be more rewarding if it is undertaken as part of a social experience, if it is immersive, or if it affords a sense of control and mastery. Providing feedback about performance is one of the central design levers explored in this section.

Section 5 explores the design space of external rewards that can be offered for individual performance, as a way to increase the expected utility of individual effort and thus enhance extrinsic motivations. Performance can lead to status rewards, privileges within the community or more tangible rewards such as money or prizes. For example, while building up a public reputation is not the primary motivator for most contributors to open source projects, it is one of the factors that makes a difference for many (Roberts, Hann, & Slaughter, 2006). Similarly, some Wikipedia participants are motivated to edit, in part, because they hope to get promoted to an administrator role (Burke & Kraut, 2008).

Section 6 addresses ways to increase the expectancy-value from group effort and outcomes. In

online communities, many of the benefits created by a member's contributions are realized by other members, or even by the general public, and coordinated contributions of many people may be required to produce an outcome that is valued by all of them. We draw heavily from Karau and Williams' *collective effort model* (S. J. Karau & K. D. Williams, 1993). The group context may affect *expectancies*, beliefs about the marginal impact of the user's behavior on group performance. Thus, for example, professors may decline to correct errors in Wikipedia articles where they have expertise because they believe that many other contributors could easily do the work (i.e., they have a low expectation that their edits will improve the article over what it would be without their contribution). The group context may also influence the value an individual will receive from the outcome of the effort, should the effort succeed in producing the group outcome. First, people may vary in how much they value the group outcome. For example, members of WikiProjects, groups of people who curate collections of articles on defined topics, may vary in how much they like the group and thus the degree that they active satisfaction when the group achieves some goal, like increasing the number of high quality articles in its domain. This liking of the group affects their willingness to contribute effort to group goals. Second, people may not value group success because they may not get a fair share of credit for it. Thus, for example, professors may decline to correct errors in Wikipedia articles where they have expertise because they get fewer reputational benefits from anonymously editing in Wikipedia compared to writing a short note in a professional journal.

**2. Ask and Ye Shall Receive**

It is axiomatic that people won't be able to contribute what a community needs unless they are aware of those needs and have the skills and resources to contribute them. For this reason many production-oriented online communities publicize lists of needed contributions. As discussed previous, the Gnome open source development project has many open bugs. To let the developers know what work the project needs, it maintains reports like the one in **Error! Reference source not found.**, listing the bugs in each of the modules, classified by severity and priority. As of April, 2010, the most important15 modules in the Gnome open-source desktop project had a total of 13,028 open bugs. Of these, developers working on the project classified 9.4% or over 1,200 of them as either critical or major.

Similarly, the community portal in Wikipedia contains numerous lists of actions one can take to improve the encyclopedia. Among other action items requiring attention from the community, as of May 2008, these included providing citations for the over 125,000 articles missing sources, providing citations for over 107,000 quotes, contributing photographs or drawings for specified articles, creating requested articles, filling in useful content on stubs, or otherwise 'wikifying' (i.e., improving the formatting) of any of the more than 2,000,000 articles that had not reached at least good-quality articles and giving feedback to editors explicitly seeking feedback about their editing.

Broadcasting a description of the work may by itself elicit contributions from the volunteers who frequent an online community, assuming appropriate community members who have the motivation, knowledge or skill and available time to notice and respond to the request. In many discussion sites, for example, community members see requests for information or other support as a part of monitoring the message boards for other purposes. In the Apache server community, system administrators who run Apache servers often monitor discussion posts, because the posts

can provide background information about problems and solutions relevant to the administrators' paid jobs. If they see a request they can answer without much effort while monitoring the sites, they do answer, because the costs of monitoring and responding were low (Lakhani & von Hippel, 2003).

Design claim 1: Making the list of needed contributions easily visible increases the likelihood that the community will provide them.

Some communities provide tools that reduce the burden on volunteers for monitoring the tasks that they are both motivated and competent to do. The "watchlist" in Wikipedia is such a monitoring tool, which allows a registered editor to be alerted whenever anyone changes or comments on a set of pages the editor has designated (http://en.wikipedia.org/wiki/Help:Watching_pages). In other online communities, it is often possible for a community member to monitor certain types of content using a combination of simple filters and email, RSS feeds or similar alerting mechanisms. The Bugzilla software, used as a bug tracking system for many open source development projects, offers advanced search and alerting features that allow developers to "get an email about any change made in Bugzilla, and which notifications you get on … bugs is fully controlled by your personal user preferences." (http://www.bugzilla.org/features/#searchpage.) Similarly, Facebook provides awareness features that show members changes in information generated by other people in their social networks and allows them to be notified of these changes by electronic mail, if they are not frequent visitors. These awareness features in turn lead to increased communication among Facebook friends. A number of products exist to make programming an RSS filter easier, by helping people match changed content with keywords they care about (e.g., feedrinse.com; filtemyrss.com). However, even with these tools, programming filters is effortful and may require skill and foresight, which deters most community members from using these features.

Design claim 2: Easy to use tools for finding and tracking work that needs to be done will increase the amount that gets done.

If designers have information about community participants' interests and behavior, this can be used to direct them to appropriate tasks in the site. Research on off-line volunteerism shows that when potential volunteers are recruited through appeals that match their motivations, the appeals were more persuasive and led to stronger intentions to volunteer. For example, appeals that focus on the career benefits of volunteering are most persuasive to those who volunteer for careerist reasons (Clary, et al., 1998). This principle of creating requests that match the interests of potential contributors works in online settings as well. For example, consider the case of a designer trying to increase conversation on a movie discussion forum. Asking people to respond to posts mentioning movies they had rated in the movie review portion of the site increased their likelihood of reading and responding to those posts compared to asking them to reply to random posts (Harper, et al., 2007). Cosley (Cosley, Frankowski, Terveen, & Riedl, 2007) developed such an application, called SuggestBot, for Wikipedia. Wikipedia editors were four times more likely to complete a backlogged task if Suggestbot directed them towards work that matched their interests and competence, determined from their prior editing in Wikipedia, instead of directing them to a random page. While Cosley was able to direct Wikipedians to particular articles, it might be possible to use similar techniques to identify roles for which members of the community are well suited. For example, machine learning techniques can identify people who

are suited to be administrators in Wikipedia (Collier, Burke, Kittur, & Kraut, 2008) and one could use these techniques to recruit volunteers to become administrators.

Design claim 3: Asking people to perform tasks that interest them and they are able to perform will increase contributions compared to asking people at random.

**3. Structuring Requests to Enhance Motivation**

How one asks for contributions makes a difference. When trying to elicit information or some other contribution in an online community, for example, asking a specific question rather than making a statement or asking an open-ended question increases the likelihood of getting a response by fifty percent(Burke, Kraut, & Joyce, 2010). Over a half century of research on attitude change and persuasion provides some guidance about how to make requests work. Although we will no\t review all the conclusions from that literature here, we identify some important lessons. Cialdini and his colleagues provide useful reviews of the literature. (Robert B. Cialdini, 2001; R. B. Cialdini & Goldstein, 2004)

In many cases, it is better to identify particular people, and personally ask them to contribute. For example, in an online chatroom, requests for help are answered up to 50% faster when a recipient is addressed by name than when the request is broadcast to everyone present in the chatroom, and the speedup increases with the number of people present (P.M Markey, 2000), The recommendation to ask a particular person is consistent with decades of research on conformity (Milgram, 1963) , get out the vote campaigns (Green & Gerber, 2008) and helping in emergencies (Darley & Latane, 1968) (Darley & Latané, 1968). For example, research on get out the vote campaigns show that door-to-door canvassing and phone calls, in which the canvasser makes a request to a particular voter, are much more cost efficient in increasing the total vote than are campaigns using email or paper leafleting, even though email and leafleting can target a wide audience at low cost. Research on bystander interventions in emergencies show that bystanders are much more likely to help if they are singled out and given a specific request than if the help request is broadcast to a group as a whole. More generally, Latané's social impact model of persuasion (1981) holds that the power of a persuasive attempt increases with the number and immediacy of the people making the attempt and decreases with the number of people whom the persuaders are attempting to influence.

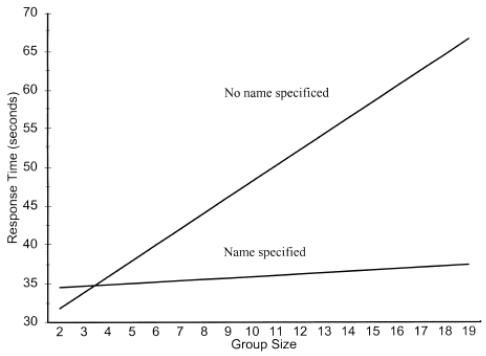


*Figure 2: Group size & directing the request to a particular person (P.M Markey, 2000).*

Design claim 4: Compared to broadcasting requirements for contribution to all community members, asking specific people to make contributions increases the likelihood that they will.

Researchers who have examined persuasive communication note two separate processes in responding to a persuasion attempt (Chaiken, Liberman, & Eagly, 1989). People sometimes systematically process messages that concern issues that they care strongly about, evaluating the evidence mostly in a rational way. Such deep processing is likely to occur, for example, when people are making an expensive purchase, like a car, or deciding on a potentially dangerous medical procedure. For these types of decisions, they might run though an informal cost-benefit analysis, comparing the cost of performing an action against the benefits they will receive. In processing messages about these types of decisions, they will be strongly influenced by the quality of evidence and the reasoning presented. For example, they might analyze how a purchase or medical decision will influence outcomes they value. However, for persuasion attempts surrounding many routine decisions that people do not care strongly about, they use more superficial or heuristic processing (Chaiken, et al., 1989). When deciding whether to jaywalk at the intersection, what to eat for lunch or whether to answer a question in an online group, they are less likely to do a rational analysis of the decision and the information presented to them and are more likely to be influenced by superficial cues and to use rules of thumb to help them make their decision. For example, when choosing what to order in a fast-food restaurant, they are unlikely to conduct a analysis of salt and fat contained in an entrée, even though this information is available to them (Krukowski, Harvey-Berino, Kolodinsky, Narsana, & DeSisto, 2006). On the other hand, they are likely be influenced by irrelevant factors such as the choice they made in this type of restaurant in the past, the order made by the person ahead of them in line, the combinations that the chain has pre-organized for them or advertising showing the choices made by good-looking consumers. These cues play into heuristics that often lead to a satisfactory decision while minimizing decision costs. It is as if the consumer is reasoning, “If I liked it in the past, I will probably like it now” or “If others like it, it is probably good for me, too.”

It is likely that many of the requests members receive in online communities involve actions and decisions that they don’t care strongly about and are therefore unlikely to evoke deep processing. This will be especially true for newcomers in an online community who haven’t yet become committed to it or care about its welfare. Therefore, when asking for small contributions, requests without elaborate justification may be successful for the casual visitor to a site. Wikipedia, for example, asks for financial contributions with the simple phrase, “You can support Wikipedia by making a tax-deductible donation” on its home page, without elaborate rationale for why the donation is needed or how the money would be used to benefit either Wikipedia or the reader.

Elaborating these simple requests with messages that emphasize the benefits that people will receive is unlikely to help much. Prior experimental research shows that while a short rationale may help in increasing compliance with the request, the quality of the rationale doesn’t matter for small requests, because they are likely to evoke heuristic processing, while the quality does matter for large contributions, which are likely to evoke deep processing (Langer, Blank, & Chanowitz, 1978). Providing a rationale may even hurt. For example, Beenen et al., 2006, experiment 1 showed that sending an email message emphasizing the benefits to the recipient and the community of making contributions in the MovieLens movie recommendation site actually decreased contributions. (Beenen, et al., 2004) Participants may have seen these

messages as manipulative and acted opposite to their recommendations simply to preserve their autonomy.

Design claim 5: Simple requests will lead to more compliance than lengthy and complex ones for decisions about which members do not care strongly.

The depth of processing theory indicates that people will be more willing to go through an informal cost-benefit analysis in making a decision the more they care about the decision domain. Managers of online communities can use pre-existing differences among visitors to their site to differentiate more involved people from less involved ones and develop different appeals for those with high and low involvement. For example, they can use participation logs to provide some estimate of involvement and then display different requests to those who are long-term, actively involved members versus those who are first-time or casual visitors.

Design claim 6: Messages stressing the benefits of contribution will have a larger effect on people who care about the domain of the contribution.

Alternatively, managers can use the nature of the request itself to increase people's involvement in decision-making. In general, messages with strong fear appeal are compelling (Witte & Allen, 2000). In addition, because they cause people to take the decision process more seriously, they cause them to be especially sensitive to the evidence and rationale for the decision. Public broadcasting stations routinely resort to these types of fear appeals, warning that the station might be shut down without sufficient member support. One public radio station in Pittsburgh had its most successful fund raising campaign in history, raising more than half a million dollars in ten days, when it announced that its license for sale, raising fears of its commercialization. One can imagine that an appeal that emphasized that Wikipedia would need to shut down if it did not raise additional money would be effective at increasing contributions among committed Wikipedians, for whom the message conveys a strong threat against an institution they value, even though the same message might have no effect or even turn off casual visitors to the site.

Design claim 7: Fear campaigns lead members to increase contributions in response to persuasive appeals.

Design claim 8: Fear campaigns cause people to evaluate the quality of persuasive appeals.

When creating persuasive messages to appeal to causal visitors, it makes sense to rely upon heuristics that influence people who will not think deeply about the decision or the persuasive appeal. Among the heuristics that Cialdini (2004) identifies, we concentrate here on authority, liking, social proof, commitment, and reciprocity as ones that are especially applicable to online communities.(R. B. Cialdini & Goldstein, 2004)

People are persuaded by others with status and authority. As Milgram (1963) showed in his famous obedience experiment, people will agree to requests from an authority figure even if they

think they are killing someone by doing so. (Milgram, 1963)These authority and status effects occur even if the source of the status and authority is irrelevant to the persuasion attempt. While expertise, a legitimate source of authority, increases persuasion and compliance with requests (Wilson & Sherrell, 1993), non-relevant sources of authority do so as well. For example, pedestrians are over three times more likely to jaywalk behind a man dressed in a business suit than one dressed in workers' clothes (Lefkowitz, Blake, & Mouton, 1955). Online, when students were asked to comply with a request to fill out a questionnaire, they were 50% more likely to do so if the request comes from a professor than from another student, even if the requester was not from their university (Guadagno & Cialdini, 2005). In Wikipedia, pronouncements and recommendations from Jimmy Wales, the co-founder, have much more weight than those from other editors. For example, his quote that becoming a system operator or administration in Wikipedia is "not a big deal" [1] is still quoted as part of the rationale in elections to administratorship or in policies, seven years after he made it. While not all requests in online communities need come from the founder, contribution requests that come from others with formal roles (e.g., administrators in Wikipedia) or from frequent posters are more likely to be acted upon than non-identified requests or requests from people with little visibility in the site.

Design claim 9: Requests from high-status people in the community lead to more contribution than anonymous requests or requests from low-status members.

As Dale Carnegie argued in his self-help classic *How to Win Friends and Influence People* (1936), getting people to like you increases your ability to persuade them, sell to them and get them to comply with your requests.(Carnegie, 1936) This principle works online. In a phishing attack, perpetrators try to get a victim to reveal confidential information by sending them email as if it came from a legitimate site. People are 4.5 times more likely to fall for a phishing attack when the email appears to come from one of their friends, whose name was extracted from the victim's online social network, than when it comes from a stranger (Jagatic, Johnson, Jakobsson, & Menczer, 2007).

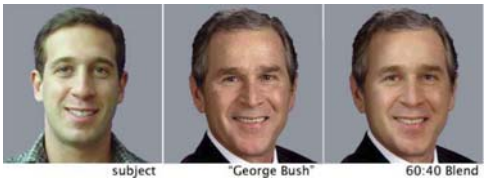

Figure 3. Facial similarity leads to political influence (Bailson & Yee, 2005)

Psychologists have long studied the factors that lead to liking (Berscheid & Reis, 1998) and have shown that most of the factors that lead one person to like another also increase their ability to persuade each other. For example, we tend to like others if they are more similar to us on any number of dimensions, from social class, to attitudes, behavioral mimicry, and physical appearance (Byrne, 1997) and these factors all influence persuasion as well. In some clever experiments, Bailenson and his colleagues morphed photographs of research participants with those of political candidates and demonstrated that voters are more willing to vote for candidates the more they liked the subject with whom the politician's photo was morphed (Bailenson, Iyengar, Yee, & Collins, 2009) The effect was stronger for less partisan participants and for unfamiliar candidates. In another experiment, research participants conversed with a digital avatar delivering a persuasive message, that college students must always carry their identity

[1] http://en.wikipedia.org/wiki/Wikipedia:Administrators

cards as a security measure (Bailenson, et al., 2009). Participants were more persuaded by the avatar when it mimicked their head movements. The online retailer threadless.com uses this similarity effect when it posts pictures of customers, not professional models, wearing its customer-designed t-shirts on its homepage (see Figure 4).

We also like others who are more physically attractive or have other desirable traits (Eagly, Ashmore, Makhijni, & Longo, 1991). The physical attractiveness increases persuasion and compliance (Eagly & Chaiken, 1975). It is for this reason that so many advertisements in print, TV and the Web use images of attractive people to sell their products (Baker & Churchill, 1977). There are many other sources of liking besides physical attractiveness and similarity. For example, we also tend to like others we have often seen in the past or who are friends of our friends. All of these sources of liking could be used to increase compliance to requests in online communities.

Design claim 10: People are more likely to comply with requests the more they like the requester.

Design claim 11: Because the following factors influence liking, people will be more likely to comply with requests if they come from others who are similar to them, are attractive, are of high status, or have other noticeable socially desirable characteristics.

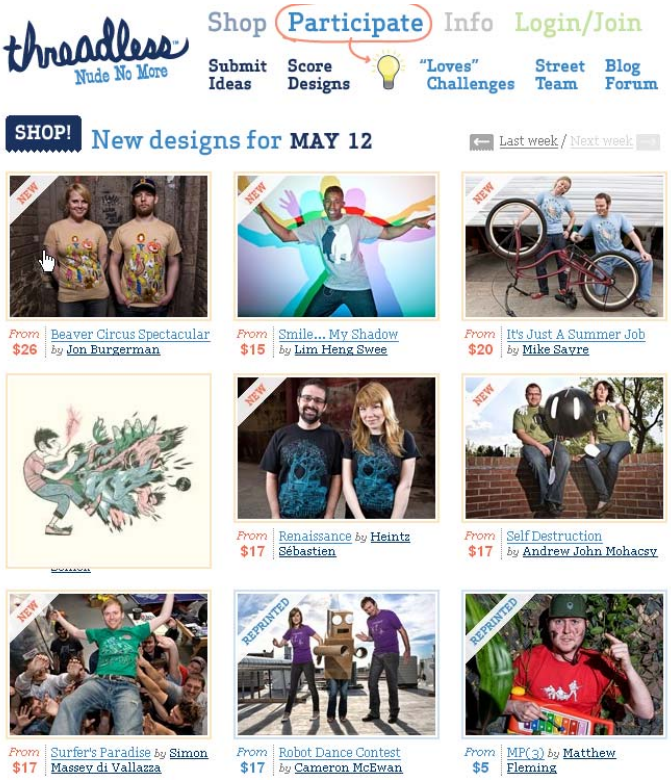


*Figure 4. Customers as models in threadless.com*

Designers can also use the group context to directly increase peoples' perceptions of the value of an activity, through various conformity and compliance techniques (Robert B. Cialdini, 2001). One of the most powerful techniques to change attitudes is what Cialdini (2001) terms "social proof," whereby people come to believe that an action or outcome is valuable when they are led to believe that other people performing the actions or espousing a belief. For example, hotel patrons are more like to reuse their towels when their hotel bathroom includes a sign saying "Join your fellow guests in helping to save the environment. Almost 75% of guests … [use] their towels more than once" than when the sign used the standard environmental pitch "Help save the environment. … show your respect for nature …," and the effect was even stronger when guest were told that 75% of those who had previously stayed in their room had reused a towel.

Indeed, social proof partially accounts for the preferential attachment that characterizes so much of the online world (Barabási & Albert, 1999), where more people connect to sites, objects and other people who already have many people connected to them. Salganik and his colleagues demonstrated this effect experimentally when they created several different markets for music downloads, each with the same music, but different consumers (Salganik, Dodds, & Watts, 2006). Versions of the market that showed the numbers of people who previously downloaded each song exhibited much more inequality in music popularity than did versions where the previous downloads were hidden, and this social influence effect was strongest when the songs were displayed in a list with the most popular songs on top. In addition, the experiment showed that this social influence led to unpredictability about popularity, with the songs that were downloaded first getting a boost, even holding constant their overall quality. Social proof is one reason that a small number of the articles in Wikipedia have a disproportionate number of people editing them (Capocci, et al., 2006), and why a small number of people have very large social networks on social networking sites (Backstrom, Huttenlocher, Kleinberg, & Lan, 2006).

While social proof and preferential attachment will often lead to an oversupply of some contributions and an undersupply of others, these principles can be leveraged to convince people to contribute in cases where they otherwise would not. For example, the homepage of the ESP Game site (espgame.org) announces that it has already labeled over a million images on the web and has been "seen on CNN and newspapers around the world." In this case, social proof is used to convince latecomers to play the game, and the game distributes them evenly to the images that need to be labeled.

Design claim 12: People are more likely to comply with a request when they see that other people have also complied.

Decades of research in psychology and organizational behavior indicate that goals and goal-setting strongly motivate people. Goals are objects or conditions that one seeks to obtain (Edwin A. Locke & Kristof, 1996). They can be long term (e.g., create the world's best web server) or short term (e.g., fix all bugs by the February software release); vague (e.g., "work on the article today") or specific (e.g., "write 500 words"); easy (e.g., "fix 10 typos") or challenging (e.g., "restructure the argument"). Hundreds of studies have shown that people work harder when they adopt concrete goals as an objective than when they have no goal or only vague goals. Specific, challenging and immediate goals stimulate higher achievement than do easy goals, vague, "do your best" goals or long-term goals with few milestones.

Assigning high-challenge goals energizes performance in four ways. First, these external goals lead people to set higher personal goals, in turn increasing their effort. Second, goals cause people to persist at tasks longer than they would otherwise. Third, goals cause people to pay attention to and expend their effort toward thoughts and behavior that are relevant to the achievement of the goals and away from irrelevant or distracting ones. Fourth, achieving an assigned goal leads to task satisfaction, which enhances both self-efficacy (i.e., belief in one's own ability to complete a task; (Bandura, 1993)) and commitment to future goals, resulting in an upward performance spiral. Both personal goals (e.g., to run an 8-minute mile) and organizational goals (e.g., President Kennedy's goal for NASA to send people to the moon) can increase motivation and performance.

Goal-setting can be used strategically to increase contributions. For example, the membership campaigns conducted by public radio and television stations effectively create concrete and challenging goals. Not only do these stations identify major goals for their listeners ("We need $250,000 during the Fall pledge campaign to keep this station on the air"), but they create a cascade of sub-goals, such as meeting a challenge grant of raising $500 in the next hour, to motivate listeners. Fund raisers are explicit when describing to potential sponsors their goal-setting strategies, "Challenge grants are a great way to support [the station]. When you designate your [gift] … to be used as an on-air challenge, then other listeners are inspired to help us make the goal of the challenge (http://kjzz.org/support/challengegrants)."

Beenen et al. (2004) demonstrated experimentally the power of goals in the Movielens community. Movielens is a movie recommender site, whose members evaluate movies on the basis of which they and other members receive recommendations. Members rated more movies when they were sent an email asking them to rate a specific number of movies in the next week than when the message asked them to "do your best" (DYB) to rate more movies. For example, when asked to rate 16, 32 or 64 movies, they provided more than 13 on average; when asked to rate as many as they could, they provided only 5 (Figure 5). It seems likely that goals that are so challenging as to be obviously out of reach may be demotivating. Both theory and experiments, however, suggest that, within reason, the more challenging they are the more effort they motivate. While it's possible that asking members to rate 1000 movies in the next week would have yielded fewer ratings, a request for 64 did not produce a statistically significant dropoff in contributions as compared to a request for 32.

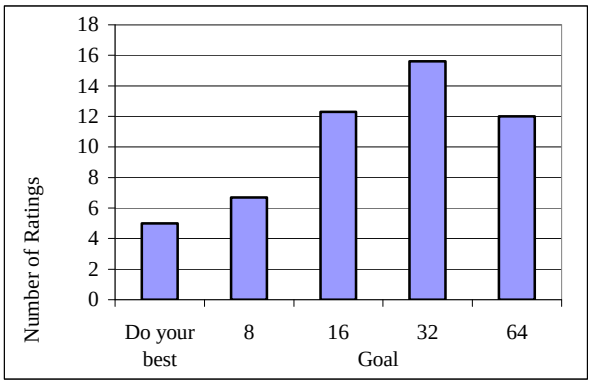


*Figure 5: Ratings/person in the week following a request to rate as many movies*

While many people use self-imposed goals as a source of self-regulation, research has shown that the goals people develop for themselves are not necessarily more powerful than goals assigned to them by an outside agent. As long as people think the goals are important and have committed themselves to the goals, whether the goals were self-generated or imposed by an outsider has little impact on its effectiveness at shaping behavior. Designers and managers of online communities, like managers in conventional organizations, have multiple ways of convincing a community that certain goals are indeed important. One can increase the importance that most people will attribute to a goal if leaders communicate an inspiring vision for the community. The vision statement for the Encyclopedia of Life is to create an ecosystem of websites that makes all key information about all life on Earth accessible to anyone, anywhere in the world to transform the science of biology, engage a broad audience of schoolchildren, educators and academics and to increase our collective understanding of life on earth: (www.eol.org). Biologist EO Wilson's communication of this vision

(http://www.ted.com/index.php/talks/view/id/83) serves to motivate the contributions of both professional scientists and amateurs. Wikipedia's goal of creating the world's most comprehensive encyclopedia is enhanced by co-founder Jimmy Wales's vision "Imagine a world in which every single person on the planet is given free access to the sum of all human knowledge. That's what we're doing (http://en.wikipedia.org/wiki/Jimmy_Wales)" and the extensive effort he put into being a spokesman for Wikipedia as an institution and as an ideal. Designers and managers can also increase the importance of a goal by providing external incentives such as money, privilege or reputation for achieving the goal. We discuss these mechanisms below in section6.

Design claim 13: Providing members with specific and highly challenging goals will increase their contributions.

Some online communities routinely make effective use of group goal-setting. For example, editors in Wikipedia use the challenge of applying for Featured Article status, where the article they are tending is eligible to appear on Wikipedia's front page, as a self-management technique, motivating themselves to do the necessary work to improve their article enough to clear this hurdle. shows the number of edits on article pages and the talk pages associated with articles in the months surrounding their move to Featured Article status. On average, the amount of work the editors contribute in the month prior to the featured article decision is two to fours times as much as they were doing in prior months and over three times as much as they will do after the status shift.

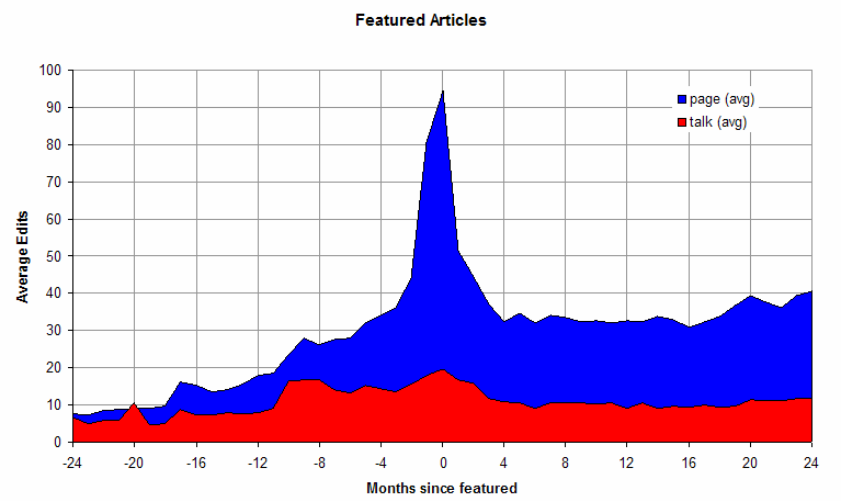


*Figure 6. Wikipedia edits before and after reaching featured status*

Wikiprojects, where groups of editors in Wikipedia organized to improve articles in a defined domain area, use goals organized into what they call "Collaborations of the Week" to encourage project members to work on specific, high priority articles. The project chooses one or two articles under its purview and advertises that editors should improve them during a defined time period (typically a week). These collaborations of the week are highly successful. They cause project members in particular to triple the work they do on the designated articles during the collaboration period (see Figure 7). The motivational effects of these goals also spill over, causing project members to do more project-related work generally, editing articles beyond those listed in the collaboration of the week goals. In particular, people who have participated in collaborations of the week then go on to engaging in what organizational scholars call

"organizational citizenship behavior," those behaviors vital to group functioning that aren't explicit part of one's job description. For example, in Wikipedia, in contrast with tasks like editing main body of the articles, citizenship behaviors include fighting vandalism, maintenance work and clean-up work. (Zhu, Kraut, & Kittur, Under review).

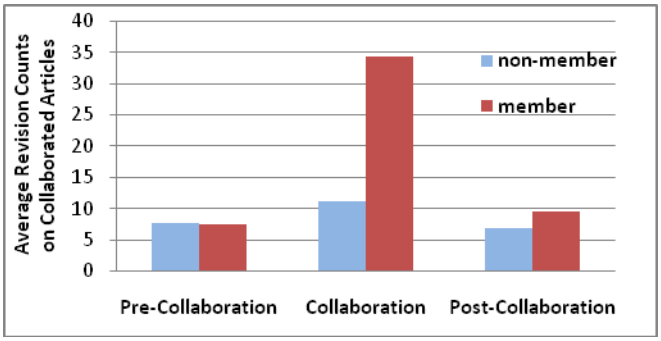


*Figure 7. Revisions made to articles by project members and non-members, before, during and after a Collaboration of the Week.*

Gnome, an open-source development project building a user interface to the Linux operating system, uses six-month release cycles to coordinate work (http://live.gnome.org/ReleasePlanning). Each date is fixed, and the release planning document lists a set of new features and bug fixes. Besides having the effect of coordinating the work, the release schedule helps to motivate developers. As in the case of Wikipedia, a large fraction of all work is done in the month before release or the code freeze preceding the release

As Ducheneaut et al. (2007) note, the multi-player game World of Warcraft (WoW) has an interesting twist on the imposition of goals (Ducheneaut, et al., 2007). As players "level up" in the game (i.e., gain more experience points by completing game-specific tasks) they are given more talents, skills and resources that allow them to complete ever more difficult tasks. The goal structure is arranged so that players gain substantial new talents and skills every 10th level. The amount of time players commit to the game is partially driven by the goals represented by these periodic increments in talents and skills. As shown in Figure 12, the time players spend in the game increases with their level; high-level players spend more time than lower level ones. However, the opportunity to receive qualitative increases in talents, skills and resources at each 10th level serves as a goal for players, and they increase their playing just before every 10th level to achieve the goal and then decrease their time in the game. We will return to this discussion of instituting goals through the use of incentives and reinforcements in the section on rewards below.

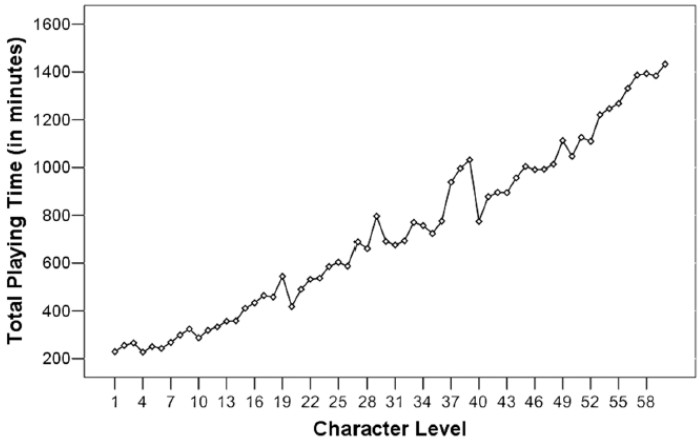


*Figure 8. Weekly minutes playing World of Warcraft, by level (Ducheneaut, Yee, Nickell, & Moore, 2007)*

Design claim 14: Coupling goals with specific deadlines leads to increases in contribution as the deadlines approach.

Goals are more effective when accompanied by frequent feedback about progress. The feedback helps to remind people about the goals and evokes a "high performance cycle" where success enhances self-efficacy (belief in one's ability to accomplish goals) which in turn enhances commitment to goals (E. A Locke & Latham, 2002). Thus, for example, fundraising campaigns commonly display a thermometer to show progress toward a collective goal. Some online communities display progress toward assigned goals such as completing all elements of their user profiles  Performance feedback, not necessarily tied to goal completion, is considered more generally in the section 4 and public display of feedback is considered as a reward in section 5.

Design claim 15: Goals have larger effects when people receive frequent feedback about their performance with respect to the goals.

While many people use self-imposed goals as a source of self-regulation, research has shown that the goals people develop for themselves are not necessarily more powerful than goals assigned to them by an outside agent.  As long as people think the goals are important and have committed themselves to the goals, whether the goals were self-generated or imposed by an outsider has little impact on its effectiveness at shaping behavior.  Designers and managers of online communities, like managers in conventional organizations, have multiple ways of convincing a community that certain goals are indeed important.  One can increase the importance that most people will attribute to a goal if leaders communicate an inspiring vision for the community. The vision statement for the Encyclopedia of Life is to create an ecosystem of websites that makes all key information about all life on Earth accessible to anyone, anywhere in the world to transform the science of biology, engage a broad audience of schoolchildren, educators and academics and to increase our collective understanding of life on earth: (www.eol.org). Biologist EO Wilson's communication of this vision (http://www.ted.com/index.php/talks/view/id/83) serves to motivate the contributions of both professional scientists and amateurs. Wikipedia's goal of creating the world's most comprehensive encyclopedia is enhanced by co-founder Jimmy Wales's vision "Imagine a world in which every single person on the planet is given free access to the sum of all human knowledge. That's what we're doing (http://en.wikipedia.org/wiki/Jimmy_Wales)" and the extensive effort he put into being a spokesman for Wikipedia as an institution and as an ideal. Designers and managers can also increase the importance of a goal by providing external incentives such as money, privilege or reputation for achieving the goal. We discuss these mechanisms below in section 6.

**4. Enhancing Intrinsic Motivations**

Many members of online communities are motivated because either effort on the task or successful completion of the task is intrinsically rewarding, independent of other downstream consequences of performing the task.  Many people derive pleasure from communicating with others in a help support group, solving programming challenges in an open-source community or killing monsters in an online game.

Intrinsically motivated actions are ones that directly fulfill some basic desire.  For example, White identified a basic motivation for mastery that he claimed to be at the root of the intrinsic motivation for curiosity, autonomy and play (1959). Others emphasize hedonic pleasure as the primarily motive(e.g., Mihaly Csikszentmihalyi, 1997).  Others, such as Reis (2004) see the

basic drives as more diverse. He identified 16 of them shown in **Error! Reference source not found.**, arguing that each brings its own unique feeling of joy. Thus satisfying a drive for social contact brings fun, for curiosity brings wonder, and for status brings self-confidence. He holds that people behave as if they are trying to maximize these 16 types of joys. While he holds that these basic motives are universal, different people value the different joys to different levels. For example, intellectuals may especially value the joy of wonder derived from curiosity, athletes may especially value the vitality that comes from physical exercise and extroverts especially

| **Motive name** | **Motive** | **Intrinsic feeling** |
|---|---|---|
| Power | Desire to influence (including leadership; related to mastery) | Efficacy |
| Curiosity | Desire for knowledge | Wonder |
| Independence | Desire to be autonomous | Freedom |
| Status | Desire for social standing (including attention) | Self-importance |
| Social contact | Desire for peer companionship (including play) | Fun |
| Vengeance | Desire to get even (competition & wining) | Vindication |
| Honor | Desire to obey a traditional moral code | Loyalty |
| Idealism | Desire to improve society (including altruism, justice) | Compassion |
| Physical exercise | Desire to exercise muscles | Vitality |
| Romance | Desire for sex (including courting) | Lust |
| Family | Desire to raise own children | Love |
| Order | Desire to organize (including ritual) | Stability |
| Eating | Desire to eat | Satiation lack of hunger) |
| Acceptance | Desire for approval | Self-confidence |
| Tranquility | Desire to avoid anxiety, fear | Safe, relaxed |
| Saving | Desire to collect, value of frugality | Ownership |

*Table 0-1. Reiss's 16 motives (2004)*

value the fun that comes from social contact.

Regardless of whether one believes that there are very few primary motives, like mastery or pleasure, or a more diverse set, designers should be able to design the tasks they ask people to do that better engage these motives and thereby heighten potential contributors' intrinsic motivation. Here we focus on the ways one can design tasks to fulfill four types of motivations – social contact, optimal challenge, mastery, and competition. However, designers should be able to link tasks to other important motivations as well, including romance, idealism, and family for example.

Social contact is a powerful motivator. Studies that correlate the tasks people are engaged in with their moods show that for most people, being engaged socially is associated with positive moods. For example, a national sample shows that the most positive moods of the day occur when teens are talking and doing activities with their best friends, and the lowest moods of the day occur

when they are alone (M Csikszentmihalyi & Hunter, 2003)(Csikszentmihalyi & Hunter, 2003). Studies of the general public find similar results, with the greatest happiness occurring when people are interacting with others (Kubey & Csikszentmihalyi, 1990). It is the intrinsic interest that so many people have in social interaction that makes discussion in many online forums so appealing and that augments the game play in multi-player games.

It is possible to make otherwise tedious tasks more engaging by combining them with social interaction. Traditional American quilting bees, husking bees and barn raisings relied on this principle. Indeed, we believe that the success of question-answering sites, whether implemented as question-answering services, such as yahoo answers (http://answers.yahoo.com/) or as Internet forums, such as those devoted to health problems or technical support, often rely on the social components to increase people's willingness to contribute to these sites. Newcomers to these sites are likely to continue participating when others reply to their initial posts (Burke, et al., 2010). Moreover, people who answer questions in these types of sites participate for longer and answer more questions when the feedback they receive from others is systematic, consisting not only of verbal replies of clarifying questions or thanks, but rating scales that allow the people who asked questions to evaluate the quality of the answers they received.

*Figure 9 Cozard Nebraska corn husking bee, 1943*

Many open-source software development projects surround their development activities with various types of social interaction. Consider the GNOME project, which produces desktop software for the Linux operating system (www.gnome.org). Besides mailing lists and developer and user forums for the sub-projects encompassed by the GNOME umbrella, GNOME also has local developer/users groups, because, as their website says, having a local group "helps a lot in getting local people, in their own language, to know more about getting involved in GNOME." The GNOME foundation also supports at least two conferences a year, one in the United States and one in Europe, to bring developers together. The conference slogan "Meet, Plan, Party" highlights the interplay between work-oriented and social features of these conferences. The conference combines technical talks about GNOME sub-projects, intense coding sessions very similar to husking bees, where developers work simultaneously on the software, and after-hours dining, conversation and drinks sessions.

Design claim 16: Combining contribution with social contact with other contributors will cause members to contribute more.

Both academics who study human play and other positive experiences, and game and other interactions designers who build positive interactive experiences have developed theories and principles to describe some of the features that make activities fun (Blythe, Overbeeke, & Monk, 2003). One of the best known is Csikszentmihalyi's theory of flow (1997). Flow is "the holistic sensation that people feel when they act with total involvement (p36)." It is akin to the Reiss' vitality motive identified previously. Csikszentmihalyi identifies the following characteristics of situations that are likely to lead to the flow state and enjoyment. (Mihaly Csikszentmihalyi & Rathunde, 1993) First, the challenges raised by the activities players are engaged in should match or slightly exceed their skills. As a consequence, the enjoyment they receive from a situation depends not only on situational characteristics but also on their current skill level. In solving a crossword puzzle, for example, ones that are too easy will be boring and ones that are too hard will be frustrating, but some puzzles will be enjoyably challenging. The most enjoyable situations are ones in which people feel barely in control. Of course, what is challenging is likely to change as players' skill increases. A second feature of flow-inducing situations is that they have clear goals and feedback. Competition with an appropriate competitor is a simple way of ensuring an activity has the appropriate challenges, complexity and feedback to be enjoyable, but it is not the only way. People are happier, more satisfied, more creative, more attentive and more satisfied when performing tasks in which the challenges match their skills than when engaged in similar activities in which the challenges and skills aren't well matched.

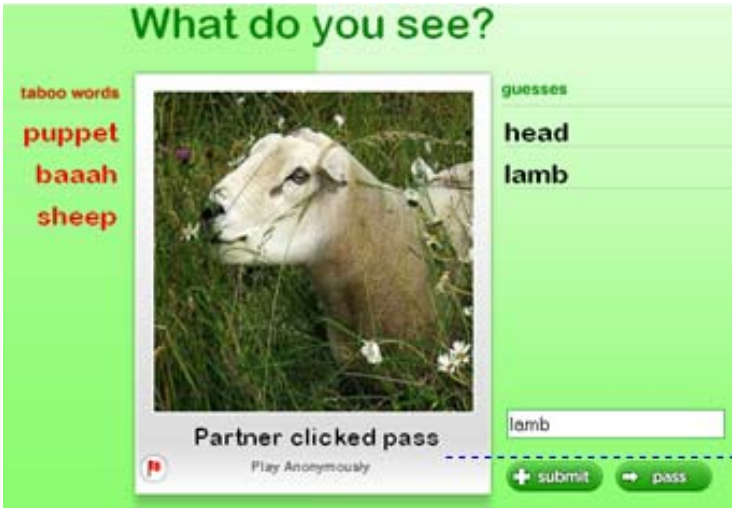

Figure 10. ESP game

Game designers have created a similar set of principles for making computer games enjoyable. **Error! Reference source not found.** is an analysis mapping the principles of flow to the heuristics game designers use to make games engaging (Sweetser & Wyeth, 2005). Although these principles were developed to describe the design of online games, similar principles could be used in the process of making important contributions to online communities more enjoyable and game-like. Consider, for example, the techniques that Von Ahn (2007) has used to design the website "Games with a Purpose (http://www.gwap.com)," which includes the ESP Game we discussed earlier. This is both a social and a competitive game in which players collaborate with a partner and compete against time to guess their partners' names for pictures. As with many games, each round has a clear goal, naming the picture, and players get immediate feedback about whether they have matched their partner's name or not. Pictures differ in difficulty, and "easy names" (i.e., one that others players have picked multiple times) are placed on a list of tabooed words. Although players are randomly matched with other players and are given a random sample of pictures from the inventory, they have some degree of control, because they can cancel a trial and request a

new picture at any time. However, the game could have been made even more engaging if it had followed more of the design principles in **Error! Reference source not found.**. For example, as the game accumulates information about a player's skill level, it could have given him or her progressively more challenging pictures to name, for example, by selecting among pictures with more words on the taboo list. Although opportunities for more extensive social interaction would make the game more fun, this richer social interaction would defeat the purpose of this game by allowing players to collude on naming pictures.

| **Flow Criteria** | **Principles of game design** |
|---|---|
| *Concentration* | *Games should require concentration and the player should be able to concentrate on the game* |
| | Quickly grab the players' attention and maintain their focus throughout the game |
| | Provide a lot of stimuli from different sources that are worth attending to |
| | Don't burden players with unimportant tasks |
| | Have a high workload, while still being appropriate for the players' perceptual, cognitive, and memory limits |
| | Don't distract players from tasks that they want or need to concentrate on |
| *Challenge* | *Be sufficiently challenging and match the player's skill level* |
| | Challenges must match the players' skill levels |
| | Provide different levels of challenge for different players |
| | The level of challenge should increase as players progress through the game and increase their skill level |
| | Provide new challenges at an appropriate pace |
| *Skills* | *Support player skill development and mastery* |
| | Allow players to start playing the game without reading the manual |
| | Learning the game should be part of the fun |
| | Include online help so players don't need to exit the game |
| | Teach the game through tutorials or initial levels that feel like playing the game |
| | Increase players' skills at an appropriate pace as they progress through the game |
| | Reward players appropriately for effort and skill development |
| | Game interfaces and mechanics should be easy to learn and use |
| *Control* | *Support players' sense of control over their actions* |
| | Support players' sense of control over their characters or units and their movements and interactions in the game world |
| | Support players' sense of control over the game interface and input devices |
| | Support players' sense of control over the game shell (starting, stopping, saving, etc.) |
| | Prevent players' from making errors that are detrimental to the game and support recovering from errors |
| | Support players' sense of control and impact onto the game world (like their actions matter and they are shaping the game world) |
| | Support players' sense of control over the actions that they take and the strategies that they use and that they are free to play the game the way that they want (not simply discovering actions and strategies planned by the game developers) |
| *Clear Goals* | *Provide players with clear goals at appropriate times* |
| | Overriding goals should be clear and presented early |
| | Intermediate goals should be clear and presented at appropriate times |
| *Feedback* | *Provide appropriate feedback at appropriate times* |
| | Provide feedback on progress toward their goals |
| | Provide players immediate feedback on their actions |
| | Let players always know their status or score |
| *Immersion* | *Players should experience deep but effortless involvement in the game* |
| | Players should become less aware of their surroundings |
| | Players should become less self-aware and less worried about everyday life or self |
| | Players should experience an altered sense of time |
| | Players should feel emotionally involved in the game |
| | Players should feel viscerally involved in the game |
| *Social Interaction* | *Games should support and create opportunities for social interaction* |
| | Support competition and cooperation between players |
| | Support social interaction between players (chat, etc.) |
| | Support social communities inside and outside the game |

*Table 0-2. Mapping flow to principles of game design (from Sweetser & Wyeth, 2005)*

Design claim 17: Creating immersive experiences with clear goals, feedback and challenge that exercise peoples' skills to the limits but still leave them in control causes the experiences to be intrinsically interesting.

Feedback about one's performance, especially positive feedback, can be quite motivating. Performance feedback, whether positive or negative, can be motivating because of people's desire for self-improvement – to learn and gain competence. Positive feedback may be especially motivating because of people's desire for self-enhancement – to feel good about themselves and maintain positive self-esteem.

Such feedback can be verbal, in the form of comments from other people. This may be part of the explanation for why people are more likely to continue participating in discussion groups when their initial posts get feedback from others, which we discuss in Chapter XXX on newcomers. It can also be non-verbal, in the form of quantitative performance measures. For example, at the site 43things.com, where members post personal goals that they are trying to achieve, other users can click on a "cheer" button to praise someone else's goal. In systems like Slashdot, where members moderate others' comments, achieving a score of 5 on a comment is a form of positive feedback. As shown in Figure 12, the site ccmixter.org provides several forms of positive feedback to authors who post audio clips. Sites with mechanisms for participants to give each other systematic, quantitative feedback also generate more ad hoc, verbal feedback. The systematic feedback also seems to reduce turnover in these sites, at least for people who ask questions (Moon & Sproull, 2008). In the online community context, performance feedback is often given publicly: the praise or gratitude is displayed not only to the recipient but to everyone, and is sometimes used as the basis for awarding privileges in the site. In that case, it can create a more external reward, which will be discussed in Section 5.

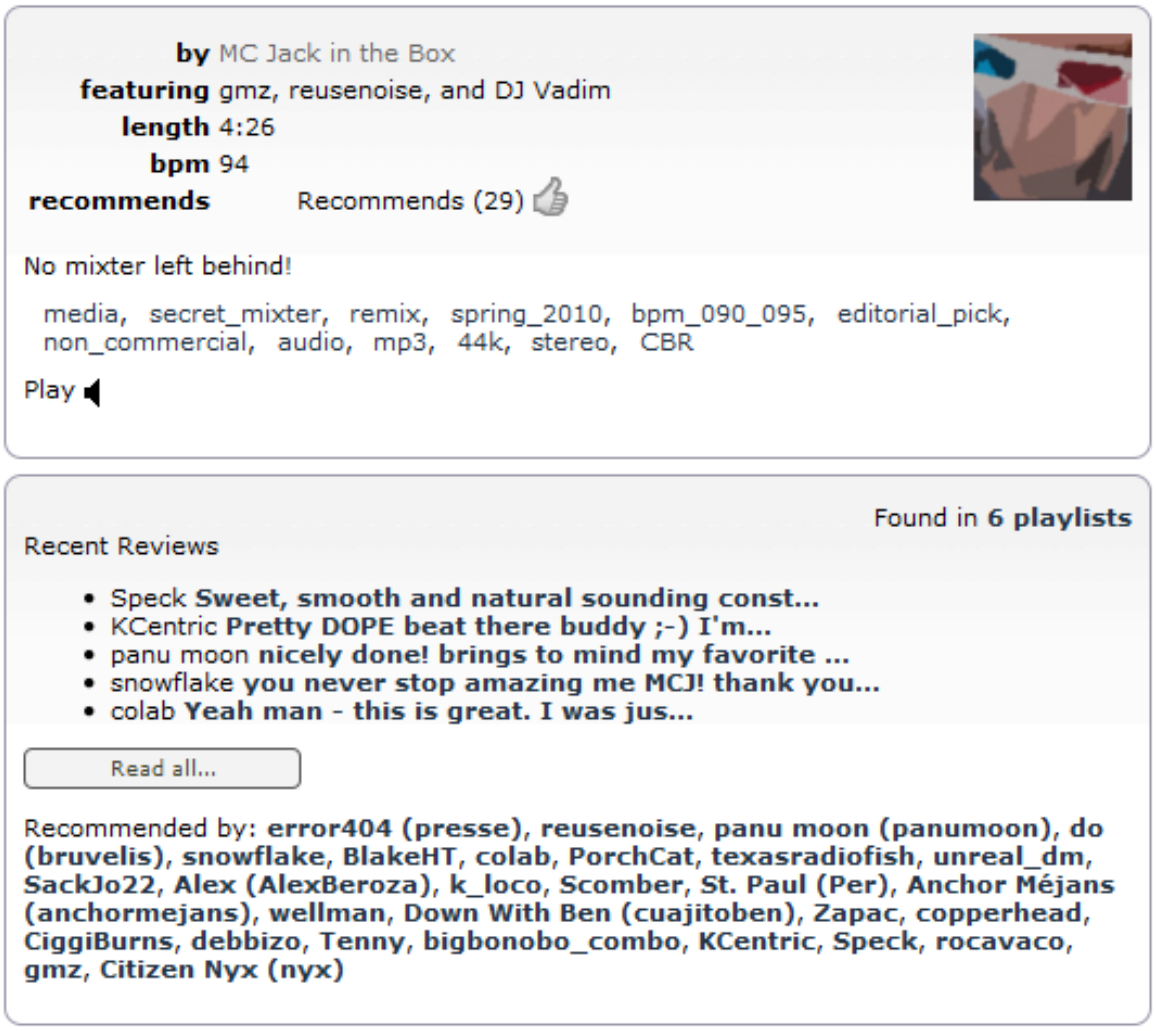


Figure 11: Information displayed on the site ccmixter.org about an audio clip posted by a member. Feedback about who has recommended the clip, and the first lines of recent reviews commenting on the clip are prominently displayed.

Design claim 18: Performance feedback, especially positive feedback, can enhance motivation to perform tasks.

Design claim 19: Site designs that encourage systematic, quantitative feedback generate more verbal feedback as well.

However, as Henderlong and Lepper note in their review of the effects of praise on children's intrinsic motivation (2002), praise enhances intrinsic motivation when it enhances children's sense of competence and autonomy. If the conditions for enhancing competence and autonomy are not right, praise may have no effects on intrinsic motivation or may even undermine it. First, the receivers must think the praise or other feedback is sincere. If not, they will not interpret it as

a reliable signal about competence and may perceive it as controlling.

False praise is frequent enough in real-world settings, where, for example, teachers might praise to manipulate, motivate or protect a particular student. In online settings praise might be judged as insincere or not credible if it is automatically given by a bot or calculated based on an unrealistic or inaccurate formula. Praise or other feedback is likely to be seen as most credible if it is specific, transparent, and reflects the judgment of the entire community. Thus, receiving a score of five on a comment posted to Slashdot should be credible because it is based on the assessments of many independent readers, while receiving a barnstar in Wikipedia is less credible because it is based on the judgment of only a single editor. In Wikipedia, barnstars received for well-defined activities, such as the Graphic Designer's Barnstar awarded to those who work tirelessly to provide Wikipedia with free graphic files, are more likely to be seen as credible than those that reward a diffuse pattern of behavior, such as the Random Acts of Kindness Barnstar, awarded for "going the extra mile to be nice, without being asked" or even the Original barnstar for "particularly fine contributions to Wikipedia."

Design claim 20: Performance feedback enhances motivation only when it is judged as sincere.

Performance feedback that is comparative in nature can be especially motivating. Some people enjoy the thrill of competition and the feeling of beating a competitor. Even those who are not naturally competitive may gain a sense of competence from knowing that their performance was better than that of other people, especially if the other people are known to have tried hard. Many online communities maintain scores or levels for members, based on their cumulative activity, and display the scores prominently enough that members are naturally drawn to compare their own scores or levels with others. World of Warcraft provides a good example, because players are always exposed to their current level, as well as to the levels of other players, as labels attached to their avatars. Sometimes explicit comparisons are made, especially in the form of "leaderboards" or top 10 lists. For example, the "Hall of Fame" at Slashdot.org shows the 10 most active authors and submitters; threadless.com shows the 10 who have earned most points for submitting designs, referring customers, submitting photos or performing other actions the site owners value.


*Figure 12: Outword is an outdoor spelling game that compares a player's scores with other players within a defined radius.*

Comparative performance feedback, however, can also decrease motivation, for several reasons.
First, if people feel ambivalent about their participation in the community or about the desirability of performing the tasks, comparisons showing that they have done more than others may demotivate them. For example, some users of an online gaming site might play less if reminded about how many hours they had "wasted" on the site.
Second, people who are informed that their contributions are unusually high may feel that they have "done enough". For example, in a field experiment,

users of the MovieLens site were told how the number of movies they had rated compared to the median of all users. Those who were below or near the median rated more movies in the subsequent time period than a control group did. However, those who were well above the median did not increase their contributions (Chen, Harper, Konstan, & Li, In press).

Third, if others' performance is seen as unattainably high, people may be discouraged from even trying. This is especially problematic when leaderboards elevate the top10 or 25 participants in populations of tens of thousands. While the leaderboards may be motivating for the participants already on the list or within striking distance, they may be demotivating for the vast majority of members who perceive that they have no chance of making the list. One solution to this problem is to make comparisons based only on recent activity, such as the previous week. Another possibility is to tailor them to the individual, identifying some dimension on which the individual stands at the most motivating level. Amateur sports competitions use this technique when they have separate categories for seniors, for example. An extreme example comes from a location-based game for iPhone, OutWord. It provides feedback that a user has the highest score within a certain radius (e.g., 1.87 miles). The user is always the best, but the radius increases as the user plays more.

Design claim 21: Comparative performance feedback can enhance motivation, as long as high-performance is viewed as desirable and potentially obtainable.

Finally, publicly displayed performance feedback, especially leaderboards, can create a competitive, game-like atmosphere. This may demotivate participation and contribution, especially for non-competitive participants and especially in communities where a supportive atmosphere is desirable. For example, when teaching a course on online communities, one of the authors frequently requires students to engage in online discussion of course materials, and provides students with the ability to "vote up" the comments of their peers that they like. In the initial design of the course, those votes were accumulated into a leaderboard showing the top vote getters for the previous week and cumulatively. However, after a few weeks a competitive atmosphere emerged that led some students to stop participating. In the current version of the course, the leaderboard gets turned on for only a week or two, just to let students experience its impacts.

Design claim 22: Performance feedback, and especially comparative performance feedback, can create a game-like atmosphere that may have undesirable consequences in some communities.

**5 Enhancing Extrinsic Motivations**

In contrast to intrinsic motivations, rewards are extrinsic motivators. There are plenty of reward programs in online communities that appear to have the desired effects. For example, sermo.com, an online community for doctors, introduced a reward of an iPod for any member who brought in at least ten new members. In the first few months of the program, while eleven members referred exactly 10, only four referred exactly 9, and three referred exactly 8, suggesting that the iPod had a motivating effect, at least for those who were close to achieving the reward. But reward programs don't always work, and sometimes they have undesirable side effects, so even if a

community can afford to give out cash rewards, that may not always be the most effective strategy. To guide choices, we start by examining the types of rewards and why they work.

Recipients may value reputation or status markers because these rewards can change how other people interact with them. Many online communities maintain reputation information based on the history of someone's participation in a community and display it next to the person's username wherever it appears in the online community's content, or in the user's profile page. For example, eBay maintains a history of feedback from each member's transaction partners. It displays a composite feedback score in most places in the interface where the member's name is shown; a reader can click on the composite score to see details of the history. A good feedback score earns respect: at an eBay seller's convention one of us attended, people at a public conference session introduced themselves by name and feedback score, with particularly high scores eliciting loud murmurs of approval. Feedback can also affect commercial prospects. One field experiment we conducted showed that an established reputation was worth about 8% in additional revenue (Resnick, Zeckhauser, Swanson, & Lockwood, 2006);

Privileges can also act as a reward. In many online communities, not all the activities in the community are open to everyone. Initially, newcomers may be allowed to read but not post, or their posts may have to be moderated before becoming publicly visible. Eventually, they may earn the privilege of posting without moderation. On Slashdot, users can earn the privilege of moderating others' comments and of posting comments that start with a score of 2 rather than 1. Other online communities require members to earn the privilege of uploading a personal photo to their profile. Members may see privileges as desirable either because they directly value the activity granted to them or because they value it indirectly, for what it symbolizes. For example, privileges can serve as status symbol or a validation of a recipient's competence or sense of belonging.

Last but not least, online communities can provide tangible rewards. Money is the purest form of tangible reward—it can be spent on anything that the recipient chooses. Amazon's Mechanical Turk < https://www.mturk.com/mturk/welcome> uses financial rewards to motivate contribution. It is a marketplace for work, where those with tasks to be done list them to be completed by Turkers, as members of the Mechanical Turn community are known, to complete. Each task has a piece rate wage associated with it. For example, Turkers might be asked to fill out a short survey for ten cents or describe an image for eight cents. On May 20, 2010, Amazon had over 100,000 tasks posted on Mechanical Turk. Often, however, tangible rewards are given in the form of specific prizes, such as an iPod, or points that can be redeemed for a limited set of prizes, or charitable donations to causes that the recipients support.

**Design claim 23:** Rewards, whether in the form of status, privileges, or material benefits, will motivate contributions.

Rewards may be contingent on the quality of the contributions that are made (often called performance-contingent rewards) or may be contingent solely on effort (often called task-contingent rewards). In many online community settings, once people choose to engage in small, discrete tasks, they will perform them to the best of their ability, regardless of the reward level, even if the reward is not performance-contingent. For example, two separate field experiments

conducted by different authors on the now-defunct question answering site Google Answers found that questions accompanied by larger payments were more likely to be answered, but, contingent on being answered there was no difference in answer quality (Jeon, Kim, & Chen, 2010). Similarly, on Amazon Mechanical Turk, higher prices for tasks increased the quantity of tasks but not the quality of work that people did (Mason & Watts, 2009).

Design claim 24: With task-contingent rewards for small, discrete tasks, larger rewards will motivate people to take on tasks, but will not motivate higher effort on accepted tasks.

## Perverse Incentives: Gaming of the System

Although external rewards can encourage contributions, two caveats are in order. The first caveat is that rewards sometimes create the wrong incentives. When the rewarded activities are imperfect proxies for the behaviors the community really wants to encourage, rewards may induce “gaming of the system,” where members take actions that are rewarded but are not actually valuable. If the action to be rewarded is inviting new members, an attacker may invite new members who have no interest in the community, or even invent fictitious entities to invite, and then collect the reward for inviting them. If the action to be rewarded is posting comments or reviews, the attacker can post blank messages, nonsense messages, or copies of text provided by other people. If the action to be rewarded is to rate or vote, an attacker can choose randomly rather than providing a considered opinion. What's worse, computer programs, or bots, can be written to carry out these unhelpful but rewarded actions on a large scale. If that happens, the net effect of the rewards may be detrimental to the online community even if the rewards motivate useful contributions from most members.

**Design claim 25:** Rewards cause some people to "game the system", undertaking "counterfeit actions" that will be rewarded but which do not actually contribute to the community.

Rewards that are contingent solely on task completion, rather than on quality, are especially vulnerable to the counterfeit action of low effort. On Amazon’s Mechanical Turk, where people are paid small amounts of money to complete small tasks, researchers have found it is necessary to include some validation that checks for tasks being completed too fast or comparing results among several people doing the same task, to avoid getting contaminated results from people trying to collect the money without seriously attempting the tasks.(Kittur, Chi, & Suh, 2008)

Another example comes from the site sermo.com, an online community for physicians. The primary interaction is between doctors, sharing case consults, each with a mini-poll asking what other physicians thought of the case as well as an opportunity for free-response comments. The business model for the site, however, is to provide information from doctors to other interested parties such as insurance companies and hedge funds. In order to encourage physicians to respond to polls on the site, some of which came from outside parties, physicians were offered monetary payments for responding to those polls. The rewards seemed to influence a few doctors to game the system in the first few months that it was in operation. For example, a few doctors voted on nearly every item in the system, spending only a couple of seconds on each item, and voting disproportionately for the first option in each poll. The site has since reduced its emphasis on monetary rewards and has taken counter-measures to discourage such gaming.

Rewards for engaging in internal site moderation can create the same perverse incentives. For example, Slashdot awards “karma points” to members for various activities, including voting on the quality of others’ comments. A similar "experience points" system exists at the site everything2.org, with experience points gained for using one's available votes. This naturally leads to "vote dumping," where people vote without thinking very deeply about what they're voting on or whether they're voting up or down. Although such behavior was a negative contribution to the community it still gained points. On everything2, there's even a post, lovingly updated for several years, with suggestions of ideas for where to dump one's votes.

Similar problems can occur in online communities that provide privileges, status cues, or other rewards based on the number of posts made. In an effort to increase post counts, some users contribute many short and not very informative posts. If only status is at stake, the danger may be small, since people may gain official status from having a high post count but members who regularly interact with them will remember them as making low-quality contributions. When the stakes are higher, however, this can be a problem. For example, the product review site epinions.com paid royalties to people who post reviews. Initially, this was paid based on the number of readers of each review, which was affected more by the popularity of the product than the quality of the review. Over time, this shifted to a reward based on the extent to which the information is used by consumers as part of buying decisions, a reward that is arguably more performance-contingent.

**Design claim 26:** Rewards that are task-contingent but not performance-contingent will lead to gaming by performing the tasks with low effort.

If counterfeits can be detected, rewards for counterfeit actions can be withheld. The reward for a real action can then be set sufficiently high to counteract the difference in cost between the high-effort real action and the low-effort counterfeit action. Thus, for example, rather than rewarding people for any post they make, rewards may be offered only for posts that are read or replied to a lot or rated highly. Rewards for bringing in new members can be contingent on the new people sticking around for some time or making contributions themselves. Slashdot introduced a system called "meta-moderation" which eliminates the incentive for vote dumping. Each moderation vote is now examined by five other users, selected at random, who opine on whether the moderation was fair or not. Members whose votes are often marked as unfair lose karma points and may even lose the privilege of moderating. (Of course, if meta-moderation gains karma, then the same problem of vote dumping may occur there.)

Unfortunately, since many genuine contributions involve providing information, in the form of messages, ratings, tags, etc., it is often not possible to tell with certainty whether a contribution is genuine or counterfeit, even in hindsight. For example, a movie rating that disagrees with everyone else's may be a counterfeit, selected at random in order to receive a reward merely for rating, or it may reflect a genuine, though unpopular, opinion about the movie. Thus, a rating that disagrees with the consensus may be a good candidate to be counterfeit, but refusing to reward all such ratings will reduce the rewards that are made to genuine ratings as well.

So long as there is a performance metric that tends to be higher, on average, when people exert higher effort on the task, scores can be assigned in a way that eliminates incentives for gaming. Consider, for example, a simplified situation where there are only two possible performance outcomes, Good and Bad. Suppose that exerting high effort leads to a Good performance measurement 80% of the time, while low effort leads to a Good performance measurement only 10% of the time. If a reward of 10 is given for a Good and 0 for a Bad evaluation, the expected reward for high effort is 8, while the expected reward for a counterfeit, low-effort action, is 1. Thus, even though there is some reward for a low-effort, there is additional expected reward from effort. If the cost of effort is more than 7, the reward can be scaled in order to make the additional expected reward large enough to create an incentive for high effort. Thus, even though there may be benefits from low-effort contributions, the benefits from high-effort contributions are enough better to make that preferable. If we wish to make the expected reward for the counterfeit action 0, we can simply subtract an appropriate amount from everyone's reward. This creates the risk, however, that a genuine action will get a negative reward 20% of the time, which may not be desirable or feasible. This technique can, in principle, be extended to situations where there is no objective way to evaluate task performance, but performance can be compared among a set of contributors (Miller, Resnick, & Zeckhauser, 2005).

**Design claim 27:** Performance-contingent rewards can be set in a way that prevents gaming; this is true even if performance evaluation is imperfect, so long as it is somewhat informative.

While performance-contingent payments may be designed to prevent gaming in principle, in practice it may be difficult to calibrate rewards to produce just the right expected payoffs, and to convince the participants that gaming is not in their interest. Thus, other simpler approaches to rewarding while discouraging gaming will often be appropriate.

People are unlikely to experience positive utility from privately delivered praise and thank yous for counterfeit actions. For example, if someone enters a rating selected at random or a comment with no new information in it, even if praise or thanks are received, the recipient is unlikely to gain utility from it, knowing that the contribution was really a counterfeit. Knowing that praise and gratitude are undeserved destroys their utility. The key insight here is that the same verbal feedback may have different utility to people depending on whether they undertook genuine or counterfeit actions.

The same logic can be applied to differentiate between status and privileges, on one hand, and tangible rewards, on the other. Status and privileges within the community may induce less gaming than rewards that are valuable outside the community, because status and privileges within the community may not be very valuable to people who do not make genuine contributions to the community. In some communities, however, such as Slashdot, even status and privileges within the community were sufficient rewards to engage many people in gaming the system.

**Design claim 28:** Status and privileges are less likely to lead people to game the system than are tangible rewards, among people who are not invested in a community.

An alternative approach tries to limit gaming by making it harder for the attacker to find counterfeit actions, rather than by eliminating incentives for an attacker to choose the counterfeit actions. Imagine that an attacker is trying to get rewards by performing low-cost actions that do not actually contribute to the community. If the eligibility criteria are transparent, it will be easy for the attacker to find actions that will be eligible. Moreover, if the schedule is predictable, the attacker will get immediate feedback about whether a particular action was successful in meeting the eligibility criteria, and can thus learn quickly which actions to keep doing. By contrast, if the criteria are not transparent and the schedule is unpredictable, it will be harder for an attacker to find a set of rewarded actions that he or she can undertake at low cost. Moreover, in a dynamic cat-and-mouse game where the attackers keep finding new attacks and the system designers keep adjusting the eligibility criteria in an attempt to disrupt the attacks, it will take attackers longer to adjust to the counter-measures. Non-transparency and unpredictability do not eliminate the possibility of gaming. But they do make gaming harder, and that may be sufficient in many practical situations, especially if the rewards are only of moderate value.

One online community that has adopted this approach is Slashdot, a news and commentary site. We have already discussed the problem of vote dumping, which Slashdot tried to counteract by evaluating the quality of votes through meta-moderation. Karma points are also awarded for a variety of other actions, including posting comments that are voted up by other people. While this might seem to be a performance-contingent reward, there are well-known tricks for posting comments that will be well-received, even though they contribute little to the conversation, such as reposting popular comments from previous conversations or reciting inside jokes. Such activities earned their own colloquial name, "karma whoring." The site administrators then made the criteria less transparent. Although most of the source code that runs the Slashdot site is made freely available, some key elements that determined point allocations were kept hidden so that karma whores would not be able to inspect the exact rules or know about changes to them. Finally, they made the feedback about karma scores imprecise: instead of displaying an exact numeric score, each user's karma level is now displayed using very course-grained categories ("none," "positive," "good," or "excellent"), so that it is very difficult to track the effect on one's numeric score of a particular action.

Google has adopted a similar strategy of non-transparency with its algorithm for ranking web pages. Google assigns a numeric score to every web page that it indexes. Pages with higher scores are shown higher in search results. The initial algorithm, PageRank, was published as an academic publication. Generally, pages get higher scores (or PageRanks) if they are linked to by other sites with high scores. Since many sites would like to appear higher in search results, there is a large incentive to game the system: indeed, the whole field of search engine optimization (SEO) marketing emerged to help web site operators increase their PageRank. Academic researchers have demonstrated that it is impossible to make any algorithm like PageRank completely immune to gaming and still have some other desirable properties in assigning scores to naturally occurring pages (Altman & Tennenholtz, 2008). It is possible, however, to make it quite difficult. Google has made revisions to the initial PageRank algorithm but has not publicly revealed what they are. Moreover, the exact PageRank for a web page is not publicly available, only an integer score in the range 1-10. Together, these elements of non-transparency make it difficult to develop and test strategies for gaming PageRank. Most SEO marketing firms now

focus on helping their clients make pages that will legitimately earn high PageRanks (e.g., by posting content that is of genuine interest) rather than on gaming the Google algorithm.

**Design claim 29**: Non-transparent eligibility criteria and unpredictable schedules will lead to less "gaming of the system" than predictable rewards.

## Trade-offs between intrinsic and extrinsic motivation

The second caveat concerning external rewards is that while they can increase extrinsic motivation, they may not leave all other costs and benefits unchanged. Both psychologists and economists have argued that one should be careful about providing rewards and other extrinsic motivators for activities that people find intrinsically interesting, because doing so undermines their intrinsic interest in the task. Conceptually, intrinsically motivated activities are ones people are willing to do for their own sake, without an external incentive. Psychologists use the term narrowly to refer to activities that commonsense or empirical data show are fun, interesting or challenging. Economists use a broader definition (Frey & Jegen, 2001), referring to activities people perform without external incentives, whether or not they are fun. For example, economists include as intrinsic motivations an altruistic concern for others' welfare, such as parents' personal bonds with teachers that causes them to retrieve their children from daycare on time, a desire to comply with social norms, or the "civic virtue" that causes some people to pay their taxes without compulsion or fear that their tax-evasion will be uncovered (Casadesus Masanell, 2004; Feld & Frey, 2002; Gneezy & Rustichini, 2000a).

Several meta-analytic reviews (i.e., quantitative reviews) of the experimental literature show that providing rewards for performing behaviors can have a small but reliable and substantively significant effect of undermining the performers' intrinsic motivation (Cameron, et al., 2001); (E. L. Deci, Koestner, & Ryan, 1999). In laboratory experiments, for example, children are less likely to play with art materials that they enjoy if they were first rewarded for playing with them and then the rewards were removed (Lepper & Greene, 1975). Surveys show that political volunteers work fewer hours if they receive some compensation for their voluntary activities than if they get no compensation (Frey & Goette, 1999), and women are less likely to donate blood if they are offered personal compensation for their contribution (Mellström & Johannesson, 2005). Gneezy and Rustichini (2000b) found that laboratory subjects completed fewer IQ test questions when paid a small amount per question than when not paid at all, but completed more when paid a large amount than when not paid at all (Gneezy & Rustichini, 2000b). Thus, we must qualify the initial design claim by adding the condition that the effect of the rewards must outweigh any loss of intrinsic motivation that may occur.

Although the theory is still incomplete, tangible incentives seem to undermine intrinsic motivation in part because they undercut people's feelings of autonomy and competence (E. L. Deci, et al., 1999). In particular, cognitive evaluation theory (E. Deci & Ryan, 1985) and the larger self-determination theory (SDT) of which it is a part hold that people will be more intrinsically interested in tasks under environmental conditions that cause them to feel competent and autonomous when acting. When people perceive rewards as controllers of their behavior, then rewards typically decrease their intrinsic motivation in the task. This principle is consistent with the empirical findings that task-contingent tangible rewards depress intrinsic motivation. These are exactly the types of rewards that people will perceive as likely to control their behaviors. On the other hand, when people see the rewards as positive feedback that they are competent, then the rewards should enhance intrinsic motivation, rather than undermine it. This principle is consistent with empirical findings that both verbal rewards (e.g., "You are doing fine") and tangible rewards received for exceeding others' performance enhance intrinsic motivation, because both give people feedback about how well they are doing.

*Figure 14* from Cameron et al.'s (2001) meta-analysis provides a summary of the experimental evidence from many studies; the findings are largely consistent with the CET theory (Cameron, et al., 2001). First, rewards undermine motivation only when the activities were intrinsically motivating to start with. In contrast, when the activities are initially dull, uninteresting or aversive, extrinsic rewards seem to enhance intrinsic motivation.

The form of tangible rewards may also affect whether they crowd out intrinsic motivations. Monetary rewards frame an interaction as purely a transaction, inviting recipients to assess whether the payment is sufficient compensation for the action. On the other hand, prizes may be viewed as bonus thank-you gifts acknowledging the work, and thus supplement rather than supplant any intrinsic motivations recipients might have had. For example, participants in lab experiments work harder for a 50 cent candy bar, which they perceive as a gift, than for 50 cents in cash, which they perceive as insufficient payment for the work they are doing (Heyman & Ariely, 2004). Similarly, rewards in the form of charitable donations to a cause the

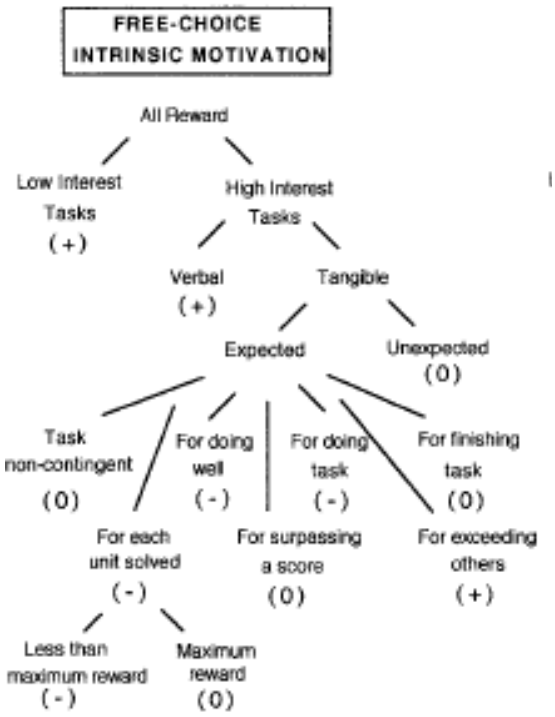


*Figure 13. Summary of the meta-analysis showing when rewards undermine free-choice intrinsic motivation (from Cameron et al., 2001: Need to redraw for better quality)(Cameron, Banko, & Pierce, 2001). 0=no reliable effect; - = statistically significant negative effect of reward; + = statistically significant positive effect of reward.*

recipients like may also avoid framing the interaction as a transaction. Prizes and status rewards may also have an added benefit if they serve as a public signal of a recipient's affiliation or generosity. For example, a mug with an NPR logo may be worth more to an NPR contributor than the cost of providing that mug: a Wikipedia t-shirt may be more valuable as a prize for Wikipedia editors than will a cash prize equal to the cost of the t-shirt.

*Design claim 30: Adding a task-contingent reward (for doing or finishing a task, regardless of performance) to an already interesting task will cause people to be less interested in the task and to perform it less often. The effect will be larger for monetary rewards than for prizes, status rewards, and charitable donations.*

The psychologists who have studied the trade-offs between rewards and intrinsic motivation believe that the preservation of intrinsic motivation for learning is an important goal in its own right. Because many of them are concerned with educational applications of rewards, they want to know whether students will read, write stories, draw, track down information on the Internet or do other fun, educational activities in settings where they are no longer rewarded for them.

However, designers and managers of online communities are less likely to care about intrinsic motivations per se and more likely to care about the combined effect on an ongoing basis of rewards and intrinsic motivation on community members' contributions. They want to know, for example, whether people will write and comment more on Slashdot when doing so earns them Karma points. Will they contribute more t-shirts designs to threadless.com if they are paid for good designs? Will they edit more articles in Wikipedia if doing so earns them barnstars or a promotion to administrator status? The designers and managers don't care if the contributions are the result or intrinsic or extrinsic motivations.

Since both extrinsic and intrinsic motivations can lead people to perform activities, the effects of a reward are likely to depend on how it simultaneously influences extrinsic and intrinsic motivations. In particular, rewards that reduce intrinsic motivation more than they increase extrinsic motivation are likely to have the overall effect of reducing the probability that people will perform the activity. However, even if a reward decreases intrinsic motivation, if it increases extrinsic motivation more, it will have its desired design effect of increasing the probability that people will perform the action. The net effects of a reward will depend upon how it simultaneously influences these two types of motivations. If designers offer a tangible incentive for a contribution, like the money contributors at threadless.com can earn for their t-shirt designs, the incentive is likely to increase their extrinsic motivations. It will also invoke the perception that people contribute *in order to* earn prizes, and thus reduce people's intrinsic motivation to draw and submit design. If the incentive is too small, then the increase in extrinsic motivation will not compensate for the reduction in intrinsic motivation.

This reasoning is consistent with a series of observations and experiments among economists that show that small rewards reduce the probability of people performing an activity compared to either no reward or a large reward. For example, in Switzerland, about 20% of political volunteers receive some financial rewards for their work. Those who receive a small monthly fee for participating (less than $35 USD) volunteered for fewer hours (11.7 hours/months) compared to people who received no fees (14 hours/month) and to those who received higher

fees (greater than $50 USD 21 hours/month), even when controlling for hours the volunteers worked per week and their gender (Frey & Goette, 1999). Two experiments by Gneezy & Rustichini (Gneezy & Rustichini, 2000b) show similar results using more controlled methods. College students who were given 60 New Israeli Shekels (NIS) to participated in an experiment answering IQ test-type question answered fewer of them when they were given an additional .1 NIS for each answer than when they were given no additional money or either 1 or 3 NIS per answer(Gneezy & Rustichini, 2000b). In a related experiment, school children collected one third less money for a charity when they were told that the experimenters would pay them a fee of 1% of the money they collected than when they were not told they would receive fees (36% reduction) or were told that they would get a fee of 10% of the collection (30% reduction).

How small must the incentive be before it fails to compensate for a reduction in intrinsic motivation? As Gneezy & x Rustichini (2000), "the exact determination of this quantity in experimental or real-life situations is likely to be difficult and subtle." (Gneezy & Rustichini, 2000a)The incentives that threadless.com offers its members as a challenge to submit winning t-shirt designs on a theme is probably sufficient: travel, accommodations and 3-day tickets for two to a music festival, along with a $500 gift certificate and $2,000 in cash, and a "commemorative swag bag" for the loot. Had it offered only the swag bag without the other loot, the incentive might have invoked the work-for-reward schema while providing insufficient reward. In other settings, the trade-offs are less clear. If the barnstars in Wikipedia evoke the work-for-reward schema, it is not clear without deep immersion in Wikipedia culture how the relative value of one type of barnstars compares to other types of barnstars and to the fun of editing.

Design claim 31: Small tangible rewards are likely to reduce contributions for intrinsically interesting tasks while larger rewards will increase contributions.

**6 Enhancing Expectancy-Value of Group Outcomes**

While the previous two sections have considered ways to increase the intrinsic and extrinsic benefits that accrue directly to the individual, in this section we consider the indirect benefits that accrue to an individual through the impact of individual effort on a collective outcome. The collective effort model, described in the introduction to this chapter, predicts that people will contribute more in a group setting when they value group outcomes more, and when they expect their own effort to have a greater influence on the group's performance and hence outcomes. We consider each in turn.

Empirical research shows less social loafing in group settings when people like the group more (S. Karau & K. Williams, 1993). More generally, chapter XX explores, in detail, how to enhance individual liking for and commitment to an online community, both by building bonds with particular members and by increasing their attachment to the group as whole.

Design claim 32: People will be more willing to contribute in an online group the more that they are committed to the group.

According to the collective effect model, people will contribute more to a group if they think their contributions make a difference on the group's performance. One way to influence beliefs about the efficacy of individual effort on group performance is to reduce or cap the size of the group (Bibb Latane & Nida, 1981). Markey (2002), for example, showed that people participating in online chat groups were less likely to answer questions posed by newcomers when more people were present(Patrick M. Markey, Wells, & Markey, 2002). Clearly there are trade-offs in online communities between having large numbers of participants, each of whom can provide content or make some other type of contribution, and capping its size, so that each participant contributes more and likes the community better (see Chapter XX on building commitment to online communities). As Kim (2000, chapter 9) suggests, creating sub-communities by partitioning a larger one into interest groups or separate forums helps to solve this dilemma. Thus, both Facebook and Linked-In get the best of both worlds by exploiting a huge membership base, sub-divided into sub-communities based on the college from which members graduated, their prior employers, issues around which they rally or their personal social networks.

Design claim 33: People will be more willing to contribute in an online group when the group is small rather than large.

In addition to capping the size of online groups, one can also exploit the expectancy link in the collective effort model by directly informing people about the uniqueness of their contributions. According to the collective effort model, if people believe that their contributions are redundant with those that others in the group can provide, then there is little reason to contribute because their contributions have little likelihood of influencing group outcomes. Conversely, if they think they are unique, they should be more motivated to contribute, because their contributions are likely to influence the group. Ling et al. (2005) have shown experimentally that this is the case in online communities (Ling, et al., 2005). For example, in one experiment using the MovieLens movie recommendation site as a test bed, they showed that people who had seen art-cinema movies, which few MovieLens members rate, and who were reminded of their unique movie tastes were 40% more likely to rate these movies than a matched sample who had seen similar movies but were reminded of their common movie tastes. That is, they were more likely to contribute ratings when reminded that they had previously rated Das Boot, a 1981 Oscar nominee but not currently popular, than Titanic, the 1997 Hollywood blockbuster. In a related experiment, Ludford et al. (2004) showed that members posted almost twice the number of messages to a movie discussion group and rated more than twice the number of movies when they were reminded of how their movie ratings differed from others in a discussion group vis-à-vis a discussion topic, as compared to participants who did not receive this comparison (Ludford, Cosley, Frankowski, & Terveen, 2004).

The uniqueness principle could have broad utility in improving contributions to online communities. In many online communities, some tasks have many people contributing while a much larger number have very few people contributing. For example, in Wikipedia, both the number of edits and number of editors contributing to an article represent an inverse power law. While 5% of articles in Wikipedia have more than 50 different editors involved over a 3-month period, more than 50% of the articles have fewer than 10. Similarly there are many more copies available of pop songs in peer-to-peer movie sharing sites than of jazz or emerging artists

(Asvanund, Clay, Krishnan, & Smith, 2004). Therefore, according to the collective effort model, one can increase people's likelihood of editing in Wikipedia or contributing a song in a music-sharing site by pointing them to the articles that few others have edited or the songs that few others have contributed, assuming that one can identify people who can indeed make those contributions. Another way to operationalize the uniqueness principle is to constitute teams in task-based communities, such as open source software development communities, so that each member of a work team has unique skills.

Design claim 34: People will be more willing to contribute in an online group when they think that they are unique and others in the group cannot make contributions similar to theirs.

Previously we claimed that people will be more likely to comply with a request when they see that others have also complied. One reason is that seeing others' behavior activates the "social proof" heuristic (Robert B. Cialdini, 2001). There are other reasons, however, why showing that others are contributing can increase contributions beyond the social proof that contributing is appropriate. One is that people do not want to contribute to a lost cause; evidence that others are also contributing increases potential contributors' perception that valuable group outcomes will achieved. For example, many fundraising campaigns are announced to the public only after half of the funds have already been collected in a quiet period. This way, people who are asked to contribute later will think that the fundraising goal is likely to be reached. Similarly, people do not want to be taken advantage of by contributing while others shirk. Third, people's sense of fairness sometimes creates an obligation to contribute when they see that others have done so, as described in Chapter XX on building commitment. Finally, seeing that others have contributed may establish a descriptive norm that people naturally conform to, as will be discussed in greater detail in Chapter XX on regulating behavior.

In many cases there will be a tension between showing that other people are contributing and creating a sense that each individual is needed. One way to resolve that tension is to show complementary contributions rather than substitutes. Thus, in an open source community, the software developers could be shown demonstrations of how much effort the documentation writers have expended and vice versa. Another way to resolve the tension is by informing people of others' commitments to contribute that are contingent on their own contributions. For example, challenge grants are commitments by large donors that are contingent on other donors also contributing. They provide social proof of the value of contributing, while increasing the importance of the additional contributions rather than substituting for them. Similarly, the site PledgeBank.com relies extensively on pledges of contingent contributions, as illustrated in *Figure 15*.

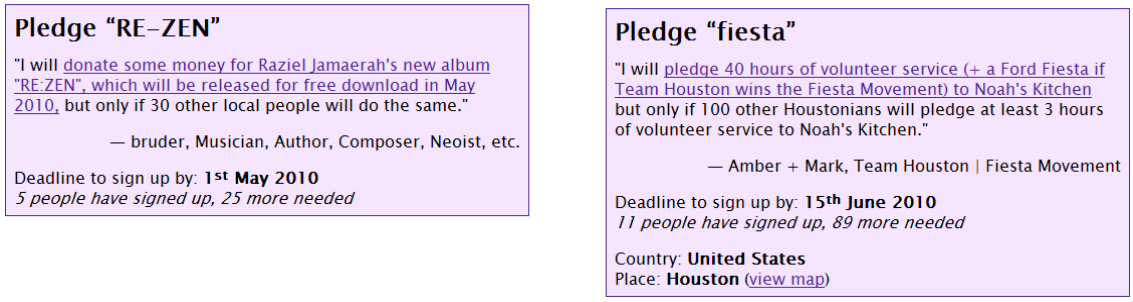


Figure 14: Sample contingent commitments on PledgeBank.org

Design claim 35: People will be more willing to contribute in an online community if they see that others are making complementary or contingent contributions than if they see others making substitute contributions.

## 7 Conclusion and Implications for Contest Design

Online community designers and managers should consider many options for encouraging needed contributions of effort and other resources to their communities. One approach is to make requests. Another is to increase individuals' expected utility of contributing, by enhancing the intrinsic interest of the tasks, by providing extrinsic rewards, or by increasing the expected benefits that will accrue through the individual's contribution to group outcomes. A third approach, based on establishing social norms of contributing effort and other resources, is taken up in Chapter 6 on regulating behavior. For each of our approaches, we have mined prior research in economics and psychology to formulate design claims, and each of the design claims was illustrated with one or more examples from online community settings.

Often, seemingly simple high-level design decisions require a large number of more detailed design decisions, and these may have a variety of impacts on the community's ability to elicit needed work contributions from members. To illustrate, consider contests, whose configurations have implications for many of the motivational pathways discussed in this chapter.

Contests have attracted a lot of attention recently in the online world. For example, the online movie rental company, Netfix.com offered (and eventually awarded) a $1,000,000 prize for any team that could improve the accuracy of predictions about how much consumers would enjoy particular movies based on their prior movie preference. The statistical software development company, Mathworks, holds contests to solve difficult programming challenges (MathWorks, 2010). The Defense Advanced Research Project Agency (DARPA) used an $40,000 online contest to spot 10 red balloons it had positioned across the United States (Markoff, 2009).

Online communities, too, often conduct contests. For example, the site threadless.com is organized around a continuous contest to have submitted T-shirt designs selected for printing and sale. Winners are selected, in part, based on votes and reviews from other members. InnoCentive is a company that connects companies, academic institutions, and government and non-profit organizations, known as Seekers™, with engineers, scientists and business people, known as Solvers™, to solve tough problems posed by the Seekers. Seeker organizations post their

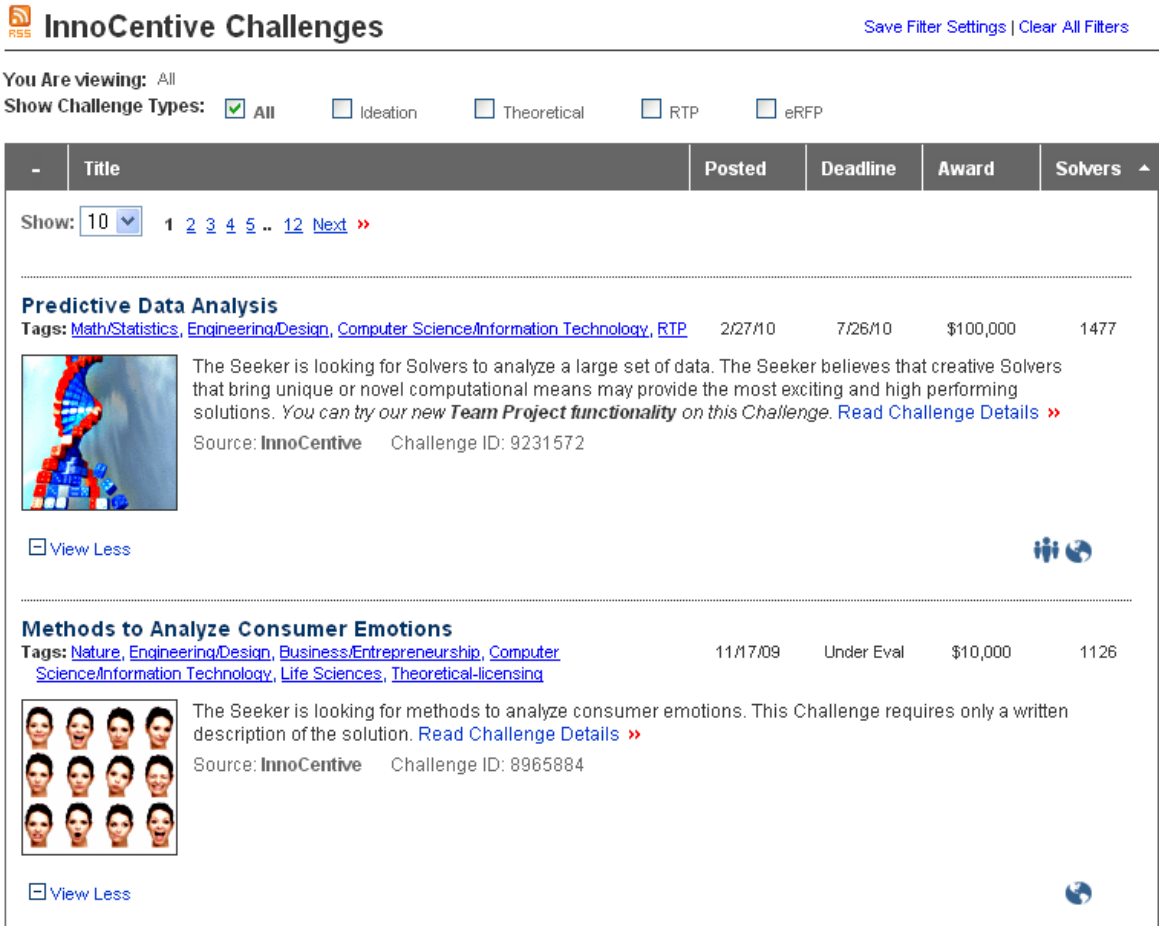


*Figure 15: Sample of InnoCentive Challenges*

challenges on the InnoCentive web site, and offer registered Solvers significant financial awards for the best solutions. *Figure 16* shows a sample of some challenge contests.

A contest is a request for a particular kind of contribution. Thus, the first implication for contest designers is that they think carefully about what tasks they wish to conduct contets around. Contests that are specific and challenging, and provide intermediate feedback on performance, will engage goal setting motivations well. For example, the Netflix prize had a clear performance target (10% improvement in predictions) and clear feedback (an automated site that graded one submission per day). Contests that involve public commentary about work in progress can add the social interaction motivator. A contest also provides comparative feedback: there are winners and losers. So care needs to be taken to avoid demotivating all of the losers. Moreover, contests should be avoided in settings where a competitive atmosphere would poison the community. The rewards of the contest are likely to induce people to "game the contest". For example, if community votes determine winners, there may be efforts to "stuff the ballot box" with shill votes. Counter-measures may be needed to prevent such gaming. A contest may undermine intrinsic motivations to perform tasks: some people may be more attracted to tasks that they or others will attribute to purer motives rather than trying to win the contest. Finally, contests with entries by groups rather than individuals, and thus involving group outcomes, will involve choices about how to make people feel like their contributions are essential to the group outcome.

## 8 Summary of Design Alternatives

Thus far, we have explored the challenge of encouraging contributions largely through the lens of different motivators, identifying design alternatives that might activate each motivator. We conclude by inverting that focus. We reflect on the design space of alternatives and the ways to have impact through different regions of that space.

The first thing we note is the power of the tools that select, sort, and filter the content in the online community. These tools can help to draw people's attention to tasks that are important and that the people are capable of doing. The selective presentation of tasks can create implicit requests for action, and the better targeted are those implicit requests, the more effective they will be.

Next, there are many ways that designers can set the frame through which people will view both implicit and explicit requests, following principles of persuasion. The requests can appear to come from high status people or people that the recipient likes or is similar to. They can be lengthy and appeal to reasoned cost-benefit analysis, such as dangers to the community, inability of anyone else to substitute for the individual's unique contributions, or the presence of others' complementary contributions. The requests can also be brief and rely on a context that conveys social proof that contributing to the community is something that everyone does. Deadlines create a frame of urgency and difficult tasks may challenge people to meet goals in order to maintain self-efficacy.

Third, feedback and record-keeping about contributions that people make can be a powerful motivator. Individual feedback, even provided privately, can act as an informational reward, especially when combined with some kind of goal-setting process. Comparative feedback can evoke social comparisons and a competitive drive for self-enhancement. Making the contribution records public can turn them into a status reward. Performance tracking can also be the basis for privileges or more tangible rewards.

There are two design levers involving the user experience of contributory tasks. Designers can motivate contributions by embedding the contributory acts in a social experience. They can also make the individual experience more immersive. Either will make the tasks more intrinsically rewarding.

The community size is a final design lever. A smaller community reduces the marginal impact of any one member's actions, and thus reduces motivations to contribute. On the other hand, larger groups may be able to accomplish more, and thus generate more commitment and motivation to contribute.

There are many ways, then, to elicit contributions. A few involve changes in the composition or activity of the group. Many involve the addition of record-keeping systems that reflect the contributions of members back to themselves or others. Such record-keeping systems can also be the basis for awarding privileges or more tangible rewards. It is easy to overlook the simplest methods, however. Just asking, either implicitly through selective presentation of tasks or explicitly through requests that are designed around principles of persuasion, may be one of the most effective ways to get things done.

| **Type** | **Design Alternative** | **Claim #** |
|---|---|---|
| Selection, sorting, highlighting | | |
| | Easily visible list of needed contributions | *Design claim 1* |
| | Easy to use tools for finding and tracking work that needs to be done | *Design claim 2* |
| | Target requests to people's interests and capabilities | *Design claim 3* |
| Framing | | |
| | Broadcast requests vs. requests to specific people | *Design claim 4* |
| | Simple requests vs. lengthy, complex requests | *Design claim 5* |
| | Requests that stress the benefits of contribution | *Design claim 6* |
| | Requests that make fear appeals | *Design claim 7*, *Design claim 8* |
| | Requests issued by high status people | *Design claim 9* |
| | Requests from people who are attractive, have high status, or the requestor likes or is similar to | *Design claim 10*, *Design claim 11* |
| | Showing that other people are contributing | *Design claim 12* |
| | Specific and highly challenging requests | *Design claim 13* |
| | Requests with deadlines | *Design claim 14* |
| | Showing the uniqueness of potential contributions | *Design claim 34* |
| | Showing that others have made complementary or contingent contributions | *Design claim 35* |
| Feedback and rewards | | |
| | Performance feedback | *Design claim 15*, *Design claim 17*, *Design claim 18*, Design claim 19, *Design claim 20* |
| | Status, privileges, and tangible rewards | *Design claim 23*, *Design claim 25*, *Design claim 28*, *Design claim 31*, *Design claim 30* |
| | | |
| | | |
| | Comparative performance feedback | *Design claim 21*, *Design claim 22* |
| | Task-contingent rewards | *Design claim 24*, *Design claim 26*, *Design claim 30* |
| | Performance-contingent rewards | *Design claim 26*, *Design claim 27* |

| | | |
|---|---|---|
| | Non-transparent eligibility criteria | *Design claim 29* |
| Content, Tasks, and Activities | | |
| | Combining contribution with social contact with other contributors | *Design claim 16* |
| | Immersive experiences | *Design claim 17* |
| Community Structure | | |
| | Group/community size | *Design claim 32* |

*Table 0-1. Design claims for encouraging contributions*

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