How Companies Can Leverage Crowdsourcing

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Submitted to the System Design and Management Program
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ABSTRACT

Crowdsourcing is an increasingly popular phenomenon where companies solicit the help of the public in helping accomplish some of the activities commonly performed by employees or contractors. These activities can range from solving scientific problems that baffle the in-house experts to repetitive and boring tasks that are deemed too mundane for the employees. Other activities include content generation, product design, idea generation, and product reviews.

The explosive growth of the internet has made the world a more connected place. One consequence of that is that crowdsourcing can now be carried out efficiently and inexpensively through websites. This thesis presents a survey of activities commonly crowdsourced and examines some popular websites that exemplify these types of crowdsourcing.

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1 Introduction

1.1 Research Motivation

Crowdsourcing is an increasingly popular phenomenon where companies solicit the help of the public in helping accomplish some of the activities commonly performed by employees or contractors. These activities can range from solving scientific problems that baffle the in-house experts to repetitive and boring tasks that are deemed too mundane for the employees. Although there are many criticisms that crowdsourcing is just a way for companies to squeeze more profits by paying the crowd (public) much less for what their work is worth, it can also be argued that the crowd can sometimes achieve superior results that the employees cannot match in quality or quantity. Crowdsourcing can thus provide multiple benefits, if successfully leveraged. It's thus crucial to gain a better understanding of it by examining the typical activities where companies have leveraged it and achieved success.

1.2 Research Objective

The crowd has many advantages over the employees that make the crowd more suitable for certain activities. The main research objective is to identify the activities where companies have leveraged crowdsourcing and achieved success. Furthermore, this thesis will analyze the reasons why the crowd can perform the activity better or cheaper, and what companies should do to more successfully lead the crowd in each case.

This thesis explores how companies leverage the latest internet technologies to build websites or other systems that will attract the attention of the crowd, help the crowd identify tasks they are most suitable for accomplishing, and facilitate communications among the crowd or communicating the results back to the sponsoring companies.

This thesis also explores the motivation behind crowdsourcing, both from the company's and the crowd's perspectives. While cost can explain why companies might want to adopt crowdsourcing, it certainly cannot explain why so many people are willing to spend their time on activities that they will receive low (or even no) compensation for. Understanding the crowd's motivation for performing different activities thus has its significance in management theory, just like companies gradually realize they cannot always rely on money alone to motivate their employees.

The research will consist of studying existing literature on crowdsourcing, including books, papers, articles and blogs. It will also involve first-hand interactions with various crowdsourcing websites and identifying the underlying mechanisms and technologies that help contribute to their success.

1.3 Thesis Structure

Chapter 2 gives an overview of crowdsourcing and explains what the advantages are from the company's perspective and what are some common motivations that drive the crowd to perform the tasks. Chapters 3 to 9 each presents a task that's often crowdsourced. Each chapter will begin by describing the task. Then it will examine one or two representative examples of how companies have leveraged crowdsourcing for that task. It will describe the crowd's motivations as well as identify what the company has done to take advantage of those motivations. Chapter 10 will give a conclusion of the findings.

1.4 Task Contrast

The following is the list of tasks covered by this thesis.

1. Content Generation
2. Product Design
3. Problem Solving
4. Ratings and Reviews
5. Idea Generation
6. Performing Tasks
7. Professional Service

Since they all seem related one way or the other, it's worthwhile to point out their differences from the perspective of this thesis. First of all, content generation appears to encompass all other categories, because the purpose of these other tasks is actually to produce some specific content. However, in content generation, the content itself is often the end product, while in other categories the content merely serves as input to some other process. For instance, unlike a YouTube video whose consumption is its own sake for existence, a t-shirt design has no value until it's printed on the t-shirts by the manufacturer. The distinction between the content generation and reviews tasks is also subtle. The difference is that the content generation task strives to extract original content from the users while the ratings and reviews task tries to solicit their opinions of some product or service.

In problem solving, the goal is to identify a feasible solution to the stated problem. Unlike product design, where it's usually easy to meet all the requirements and that it's the subjective factors that matter, problem solving is all about fulfilling the requirements only. So product design involves picking the best candidate from a set of appropriate submissions, while problem solving is concerned with generating just one valid solution. While both activities involve evaluating the submissions, the same isn't true for ratings

and reviews. It's easy to find polarized ratings and reviews for the same movie or book on websites such as IMDB and Amazon. So while ratings and reviews are also highly subjective, they differ from product design because the main goal is for people to express their opinion, rather than identify or predict what might please a large number of people. Ratings and reviews also usually apply to finalized products in order to affect consumption decisions, whereas product design and problem solving are usually still at the concept stage.

Idea generation is very similar to product design as well, in that both involve meeting some minimal requirements and that the goal is to select the best submission. The difference however, is that product design is geared towards the customers or end users, while idea generation is geared towards the company that initiates this call for ideas. For instance, a t-shirt design has the end users in mind, while an idea about how a company can advertise a new beverage would fall into the idea generation category.

The next category, performing tasks, is specifically concerned with accomplishing the mundane and boring tasks that companies often want to outsource to achieve cost savings. These tasks resemble the work at factory manufacturing lines, and have the characteristic of being very routine yet difficult to automate. The skills required are so low that almost anyone with basic literacy or computer skills can complete them. Generally the requirements are so minimal that almost all the submissions would pass the criteria, so sometimes the activity initiator doesn't even bother to review the quality of the submissions. Also, once the task has been assigned, it's generally not available to others because there's really no need to select the best submission for such simple tasks.

Finally, the tasks in the "Professional Service" category are generally those that require much more skills than the routine ones mentioned previously. There are more requirements and so it's also much harder to complete them. Despite the additional complexity, they are nonetheless very achievable, unlike the problems in problem solving that baffle even the highly trained experts. Sometimes there are also quality differences among the tasks, prompting the activity initiator to evaluate all the submissions to pick the best one. Alternatively the initiator may receive multiple offers and decide to give the work to the most experienced or cheapest one.

2 Crowdsourcing Overview

2.1 Term Coinage

The term crowdsourcing was first coined by Jeff Howe (and the Wired editor Mark Robinson) in a Wired Magazine article in June 2006 [1]. The article describes an emerging trend where companies start engaging the public in helping perform activities

such as content creation and problem solving. The term was intended to be a wordplay on outsourcing and so it wasn't defined in the article. As people started referring to this term in a loosely defined way, Howe decided to offer a formal definition on his blog. In this thesis, the usage of this term will be consistent with Howe's definition: "Crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call" [2].

It furthers the understanding of crowdsourcing by seeing how this definition distinguishes crowdsourcing from open-source, outsourcing, user-generated content (UGC), and collective intelligence. Crowdsourcing differs from open-source because it is a deliberate act by a company (or organization) to outsource a function, whereas open-source involves individuals who organize themselves towards the attainment of a goal, typically in software. Put in another way, the company would own the software that is produced as a result of crowdsourcing, but no individual (or company) would own the software that has been open-sourced. As for why crowdsourcing is different from outsourcing, the difference lies in how crowdsourcing recruits through an open call. An analogy will help illustrate this difference. If a person loses his dog, and posts a bunch of "missing" fliers, then that's asking for help in the form of open call, because the dog owner doesn't know in advance who will see those fliers and help find the dog. On the other hand, if the dog owner hires a "lost and found" specialist to help him find the missing dog, then that's like outsourcing because in this case he's specifically delegating the task to an individual.

Crowdsourcing is different from UGC because a lot of user-generated content are personal and so their creation wouldn't have been once performed by employees. For instance, it's inconceivable to imagine that all the personal data uploaded to social networking sites such as Facebook could have been once performed by employees. That's because no employee of any company would have access to these data in the first place. On the other hand, Britannica and Microsoft recruited experts to write all the encyclopedia articles, so it's consistent with the definition to say that Wikipedia crowdsources the article entry. Note that the employees mentioned in the definition need not be the company's own employees. The fact that some companies like Citysearch hire contractors to write editorial reviews of local businesses long before the existence of Yelp also suggests that Yelp is crowdsourcing the reviews. It must be emphasized that crowdsourcing isn't merely limited to content creation. It can apply to a range of activities such as product design and problem solving as well. Finally, collective intelligence is concerned with organizing "groups of individuals doing things collectively that seem intelligent" [42]. In their paper, Malone and his colleagues came up with a framework for comparing the various types of tasks involving collective intelligence. The comparison examines 4 factors, namely, (1) what is being accomplished, (2) who is performing the task, (3) why are they doing it, and (4) how is it being done. Since one of

the possibilities for the "who" part is the crowd, some tasks requiring collective intelligence would thus also fall under crowdsourcing. However, crowdsourcing is concerned with the ownership of the output and how the tasks are traditionally performed, which collective intelligence pays no attention to.

2.2 Advantages of Crowdsourcing

Many people have criticized crowdsourcing as just a way for companies to maximize their profit by outsourcing functions traditionally performed by employees to the public, thus achieving possibly huge cost savings. While that may be the main reason for crowdsourcing in some cases, there are many other scenarios and occasions where it's beneficial and even critical for companies to solicit help from the crowd. The advantages of crowdsourcing will be briefly explored below.

First of all, the sheer size of the crowd is a huge advantage already. It's reasonable to claim that most companies have fewer than 10,000 employees. In fact, less than a thousand US firms have that many employees in 2008, according to US Census Bureau [3]. In contrast, the potential size of the crowd, which depends on the nature of the activity being crowdsourced, is often much larger than 10,000. For instance, 65,000 new videos were being uploaded on YouTube at the time of its acquisition by Google in 2006 [4]. If it weren't for the crowd, in this case the millions of YouTube users, it would be hard to imagine how YouTube's 50 employees could create or find that many videos to upload every day.

The second advantage is that the crowd is typically distributed geographically. DARPA (Defense Advanced Research Projects Agency) held a competition in 2009. "The challenge is to be the first to submit the locations of 10 moored, 8-foot, red, weather balloons at 10 fixed locations in the continental United States. The balloons will be in readily accessible locations and visible from nearby roads" [5]. The participating teams employed various strategies, but almost all of them engaged the crowd to either help locate the balloons or verify reported sightings [6]. This was expected because rather than hiring a group of people to wander around United States in search of the balloons, it's much more efficient to ask internet users throughout US to simply look up the sky and report any balloon they found instead. Although this competition was an experiment by a government agency, it's not hard to imagine that one day a company might have similar needs of locating objects dispersed in a vast region.

The third advantage is the diversity of the crowd. In his book "The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies", Scott Page explains how a diverse group, under certain conditions, can often outperform a group of experts in solving problems that belong to the realm of these experts. He cites the

example that during World War 2, the British gathered twelve thousand people to help solve the Nazi Enigma code. Many of them were cryptographers and mathematicians as one would expect. The rest were linguists, philosophers, historians, classicists, and even crossword puzzle experts. Although these people weren't trained in cryptography, Page believes that the British's success in solving the Enigma twice had a lot to do with the diversity of expertise in this group. As another example, some large companies nowadays would cast the scientific problems that even their R&D cannot solve to a website called InnoCentive. So far the users on InnoCentive have successfully solved about half of these challenging problems [7]. A later section in this thesis will explore in more details how these InnoCentive users, which consist of mostly amateurs, are able to solve problems that baffle the professional scientists that comprise corporate R&D.

The fourth advantage is the drastically reduced cost of tapping the crowd to perform the work. Sometimes the activity being crowdsourced can be performed by an employee or a professional at a higher quality. For instance, stock photos by professional photographers often cost more than $100 each. Technological advances have drastically reduced the cost of photography equipment in recent years that now amateurs can easily afford the same equipment that the professionals are using. Although their skills may not be on par with the professionals, the quality of their photographs is often high enough for companies looking for stock photos. Also, unlike the professionals who expect to earn six-figures, these amateurs shoot photos mostly for entertainment and so are willing to sell their photos for couple dollars through sites like iStockphoto. The act of taking stock photos has now been indirectly crowdsourced under the inevitable influence of technological advances.

There will be more examples of these advantages in later sections of the thesis. Also, there may be other advantages as well, but these are some of the common reasons why companies consider crowdsourcing as an attractive alternative.

2.3 Challenges of Crowdsourcing

If crowdsourcing offers so many benefits, then why hasn't it been more widely adopted? First of all, one of the main disadvantages of crowdsourcing is the quality of the work in general. The skill-level of the crowd is expectedly lower than that of the professionals and employees traditionally dedicated to the task. Also, unlike supervised employees, the crowd usually experiences less pressure to perform high quality work. The company may thus either receive low quality results or have to spend time reviewing the work. For instance, Frito-Lay invited internet users to help craft its new advertisement through Yahoo. The winning submission was eventually shown during the 2007 super-bowl. Although the crowdsourcing was considered successful and resulted in an acceptable

submission, it's hard to estimate the extra time and effort spent by the company in reviewing all these submissions. On the other hand, if Frito-Lay outsourced the task to an advertising agency, then it might have more control over the process and more confidence that an acceptable advertisement would be produced at the end.

Note that companies need not always review the work produced by the crowd themselves. Nowadays companies often ask the crowd to review the quality of their peers' work as well, and then only review the highly rated ones at the end. This is indeed much more efficient but then again the company faces the same issue of whether it can trust the crowd in helping it perform the task, in this case reviewing the quality of the work rather than producing the work itself.

The second challenge is given the relatively low monetary rewards, how can companies encourage the crowd to help out. To overcome this challenge, companies often tap into the crowd's internal motivations instead, like their craving for attention and entertainment. Companies often accomplish this by carefully building a community for the intended crowd. The community not only helps retain the crowd, but also serves as a platform whereby the crowd can satisfy their desires for attention and appreciation. However, with all the social networking and community sites out there, competing for the crowd's attention is increasingly harder. The company thus may have to invest extra resources and efforts to build the community beforehand while not being able to reap any results immediately.

The third challenge is that while the crowd may perform quick, short-term tasks effectively, they simply cannot be depended on for long-term projects. There are several reasons. First of all, the crowd typically has no obligation to the company, and so are free to perform as much work as they please. It's rather infeasible to hope that the same person would be motivated to work for an extended period of time unless the reward for the task is extremely appealing. Secondly, while a long-term project can be broken down into multiple smaller tasks to make it easier to assign to the crowd, often times there are dependencies or common components to the tasks. The company may face difficulty in coordinating the crowd in such cases. Thirdly, tasks are rarely isolated but often related to the existing systems or require some internal knowledge. Not only will training the crowd present a difficulty, but any knowledge and skill increase acquired from the task will be lost afterwards. Fourthly, while employees are expected to be present at work or at least easy to contact, the same isn't true for the crowd at all. All these reasons impose limits on the sort of activities that can be effectively crowdsourced.

3 Content Creation

3.1 Task Description

With the widespread adoption of the internet, many websites now attract millions of unique visitors on a daily basis. According to comScore, in May 2011 each of the top 50 web properties in US has at least 20 million unique visitors [24]:

comScore Top 50 Properties (U.S.)
May 2011
Total U.S. – Home, Work and University Locations
Source: comScore Media Metrix

Rank	Property	Unique Visitors (000)		Rank	Property	Unique Visitors (000)
	Total Internet : Total Audience	*216,250*				
1	Yahoo! Sites	188,763		26	ESPN	38,141
2	Google Sites	179,989		27	NetShelter Technology Media	37,836
3	Microsoft Sites	179,762		28	Tribune Interactive	36,367
4	Facebook.com	157,219		29	Wal-Mart	33,558
5	AOL, Inc.	114,901		30	LinkedIn.com	33,383
6	Turner Digital	102,549		31	Adobe Sites	32,617
7	Amazon Sites	94,923		32	AT&T Interactive Network	31,682
8	Glam Media	93,995		33	NBC Universal	31,384
9	Ask Network	92,026		34	Break Media Network	31,158
10	Viacom Digital	84,143		35	Yelp.com	30,105
11	CBS Interactive	79,048		36	WordPress	29,953
12	Wikimedia Foundation Sites	73,302		37	Fox News Digital	29,858
13	Apple Inc.	70,336		38	Netflix.com	29,543
14	eBay	67,241		39	Superpages.com Network	29,497
15	New York Times Digital	66,694		40	Disney Online	29,250
16	Demand Media	64,795		41	The Washington Post Company	29,086
17	VEVO	63,166		42	iVillage.com: The Womens Network	28,760
18	Fox Interactive Media	54,162		43	ABCNews Digital	27,444
19	Answers.com Sites	53,515		44	WeatherBug Property	27,411
20	craigslist, Inc.	51,790		45	Scripps Networks Interactive Inc	27,274
21	Comcast Corporation	51,323		46	Twitter.com	26,997
22	Gannett Sites	43,535		47	Everyday Health	26,263
23	Weather Channel, The	41,616		48	Discovery Digital Media Sites	26,223
24	Federated Media Publishing	41,083		49	WebMD Health	24,961
25	Technorati Media	38,404		50	Time Warner (Excl. Turner/WB)	24,610

Figure 3-1: Top 50 US Web Properties

However, just like business isn't guaranteed for a brick-and-mortar business, traffic also isn't guaranteed for a website. There were about 130 million websites in the world as of June 2011 [25]. How users determine which websites to visit depend largely on what value these websites can offer. The top websites usually provide some valuable service to the users. For instance, Google offers an unparalleled search engine that captured 65% of the market share in US, serving more than 11 billion queries in May 2011 alone [26]. Facebook on the other hand, allows its users to interact with their acquaintances online, thus forming a social network that consists of 600 million people [27]. Another effective way to attract users is by providing valuable content such as articles, reviews, and videos, which explain the popularity of websites like Wikipedia, Yelp, and YouTube. Prior to the web 2.0 era, the standard interaction between users and websites was that the employees of these websites would provide the content while the users would merely consume them.

Advancement in internet technologies such as Javascript and AJAX, however, helped enable the interactions to be more interactive. Around the same time websites have recognized the desires and needs for users to create and upload their own content. The result was a gradual shift in responsibilities for content creation, and the proliferation of user-generated content. This allowed internet companies, especially startups, to own a massive amount of content without having to invest heavily to acquire them. Many websites also experienced an upward spiral, where more users meant more content and more content again led to more users.

3.1.1 The 89:10:1 Ratio

Not all users were as interested in creating content as consuming them, however. In fact, empirical observations suggested that typically only 1% of the users in a virtual community actually create new content, 10% would modify that content, while the remaining 89% would view the content without contributing at all [28]. While the actual percentages may vary depending on the user demographics and content type, these estimates nonetheless provide valuable insights regarding user participations. Although this "89:10:1 ratio" seems utterly unfavorable to websites that depend on user-generated content, that 1% is often a large number already for high-traffic websites with millions of visitors.

3.1.2 Tragedy of the Digital Commons

The fact that the majority of users don't contribute shouldn't be surprising. After all, contribution is purely voluntary, often with no material rewards from the companies. Websites also usually don't grant different levels of access to content based on the amounts of contribution. As a result, users have no real incentives to contribute content and so are happy to free ride on those by others instead. However, if every user adopts this line of thinking, then no one would contribute content, and so the user community as a whole would be worse off as well. This is an example of the more general scenario "tragedy of the commons", whereby a group of people fail to provide a common good among themselves due to the reasoning above. In this case, the common good is the digital content. What's interesting, however, is that the "tragedy of the digital commons" doesn't always occur even though the logic seems sound. The following example of content creation crowdsourcing shall illustrate what motivates these users to contribute at the absence of material rewards [11, 12]. As it turns out, money isn't the only motivator. Love, whether for the activity itself or towards the people who would benefit from the activity, as well as glory (i.e. recognition) can also be effective motivators sometimes [42].

3.2 Example (YouTube)

3.2.1 About the Website

Launched in February 2005 and acquired in November 2006 for a hefty $1.65 billion, YouTube is one of the fastest growing websites. According to comScore, it captured 43% of the video market share in US with its 14 billion video views in May 2010 [29]. Also, in June 2010, YouTube queries accounted for more than 25% of the total queries conducted on the various Google websites, putting YouTube even slightly ahead of Yahoo in terms of search volumes [43]. Although Google doesn't disclose any revenue data for YouTube, a Citi analyst estimates that YouTube's net revenue (after accounting for revenue share) will surpass $1 billion by 2012 [44]. Users can watch a variety of videos for free, including movie and TV clips, music videos, tutorial videos, blogging videos where users express their viewpoints, and amateurish videos that capture exciting moments. With the exception of some copyrighted materials from the partners, almost all the videos were uploaded by the users. Although it's fair to say that YouTube owes its success to the video uploaders, it's crucial to understand why so many users are willing to upload their videos on YouTube for free, and what YouTube does to help make that happen.

Prior to the birth of YouTube, there was no easy way for people to share videos online. Therefore, many people rejoiced when they stumbled onto YouTube, which provided them a simple interface to upload videos in various formats. Their desire to upload videos was so natural that they didn't perceive it as a task that YouTube has crowdsourced. It's a true win-win situation, not just for the company itself and the users who can now upload videos, but the rest of the users who watch these videos as well. YouTube doesn't charge users for uploading or viewing videos, even though they consume computer and network resources that YouTube has to pay for. From YouTube's perspective, these videos and users are the company's biggest assets, and so it's better to make money from other means such as advertising and affiliate programs than to charge these users and drive them away. Below is a screenshot showing an American Express advertisement and some affiliate links to iTunes and AmazonMP3.

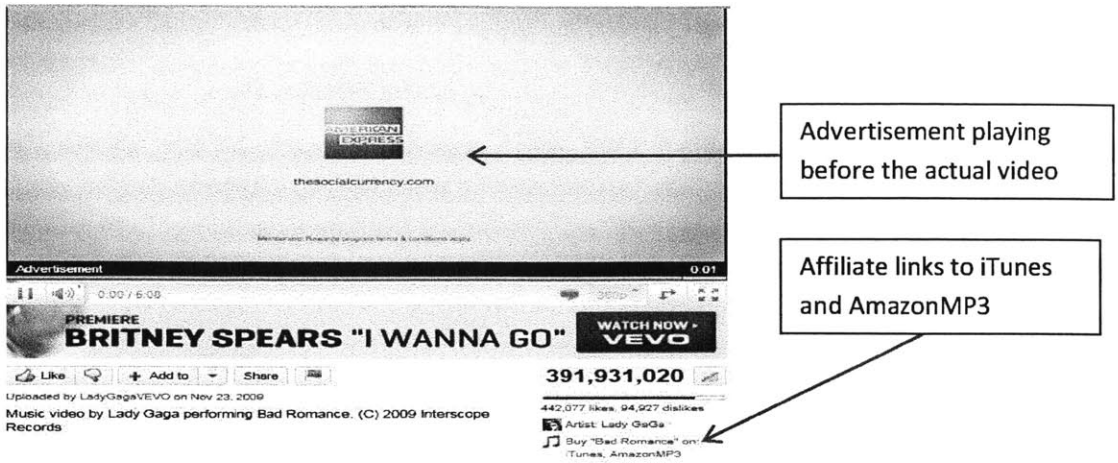


Figure 3-2: Advertisement and Affiliate Links on YouTube

Video uploading isn't the only activity that's being crowdsourced. For instance, some videos may not meet YouTube's guidelines. Rather than having the employees screen each uploaded video, YouTube gives users the ability to flag a video as inappropriate instead. The employees can then concentrate on reviewing the ones that have been flagged. Or YouTube can take down a video automatically when enough people have flagged it. The video ratings, comments, and comment ratings are all user generated as well. The comments help bind the users together and so are extremely important for the sake of community building. If the community is weak, and that users never interact or acknowledge the achievement of each other, then the attention received by the uploaders will have a diminished value to them. To encourage users to write useful or insightful comments, YouTube thus features the top comments based on how many positive votes they receive. Just like it feels good to upload a popular video, it feels good to write a comment that's read and well received by many as well.

3.2.2 Motivations of the Crowd

While it's clear how YouTube stands to benefit from these video uploads, it's less obvious what motivates these users to upload videos. In other words, why has the "tragedy of the digital commons" not occurred on YouTube. One explanation is that these contributors intend to share their videos with their acquaintances only, and so are using YouTube merely as a video storage platform. Another explanation is that these videos serve a marketing purpose. A third explanation is that the uploader wants to promote certain things, either something he really likes or a cause he really believes in. While arguments like these are all valid, they each seem applicable to only a small subset of the uploaded videos. None of these is general enough to explain the uploading of the vast majority of videos.

3.2.2.1 Crowd's Desire for Attention

An alternative explanation is that the videos can satisfy the uploaders' desires for attention [30]. For instance, people in academia value attention so much that they are often willing to give up financial gain for it [13]. Also, status and recognition prove to be extremely important motivations for people to contribute within an online community [14]. In order to verify his conjecture about the role attention plays, Huberman and his colleagues collected data such as "upload date" and "view count" from almost 10 million YouTube videos uploaded by 600,000 users. What they found was that the productivity in crowdsourcing, in this case the amount of video uploads, exhibits a strong positive dependency on attention. On the other hand, a decline in attention leads to a decline in the number of video uploads as well. Furthermore, uploaders like to compare with others when they have low productivity whereas they like to compare with themselves otherwise. The implication of these observations is that YouTube, and other companies that crowdsource content creation, should leverage people's desire for attention, especially when there's no material compensation.

3.2.2.2 YouTube's Treatment of View Count

As shown in the figure below, YouTube shows the view count very prominently below each video, much more prominently than the upload date, number of likes and dislikes, and number of comments, all of which are very important information about the video as well.

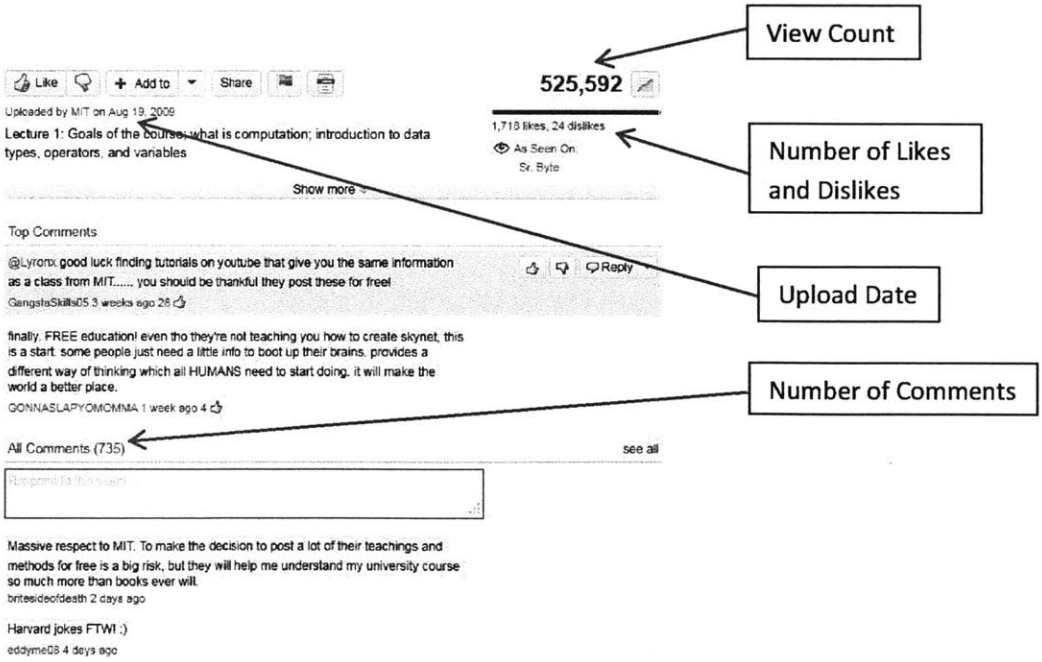


Figure 3-3: Prominence of View Count on YouTube

The author believes that YouTube chooses to feature the view count in order to hint at the users that the view count is the most important piece of information about each video. There are several reasons why YouTube might want to give that hint. First of all, a high view count suggests that the video is popular and implies that it's probably worth watching. Another reason is that the view count allows a simple comparison with other videos. Let's consider some alternative ways to compare videos. There's the number of comments, which by itself doesn't mean much because the comments can either be positive or negative, not to mention a lot of the comments aren't even related to the video in the first place. The number of likes and dislikes are YouTube's way of rating a video, but it's cumbersome to compare two videos based on the number and proportion of likes and dislikes. So while the view count doesn't indicate how good the video is, at least it allows easy comparison with other videos. By featuring the view count, YouTube indirectly encourages its community to focus more on it than the other pieces of information about the video. It's not clear whether that's the cause of positive correlation between productivity and view count that Huberman and his colleagues observed, or whether YouTube is aware of that correlation and so is leveraging it by magnifying the significance of the view count.

Regardless, the author believes it's indeed better to focus on the view count for the purpose of crowdsourcing. First of all, the view count can only make the contributor feel better as the number increases, whereas a video that receives more and more dislikes can discourage the contributor from uploading again. It's also better than the number of comments, because having more comments can also be discouraging if most of them happen to be negative. Also, while a view count of several thousand is considered low on YouTube, it might still make the uploader feel good because in reality we rarely have a thousand audience.

3.2.2.3 Partner Revenue Sharing

Since YouTube doesn't charge the users, it needs to effectively monetize the videos, especially the most popular ones because 30 percent of videos actually account for 99 percent of views on the site [15]. One way is by placing advertisements in these videos. However, while users may voluntarily submit their videos without any monetary compensation, they often don't like to perceive themselves as revenue vehicles for the companies. So rather than forcing advertisements on the videos, and thus upsetting the uploaders and their audience, YouTube allows uploaders of popular videos to sign up for these revenue sharing opportunities themselves. While some users don't care for the extra cash they may earn through showing advertisements on their videos, these revenue sharing opportunities can encourage video uploading for another set of users. After all, not every user has the same craving for attention, and so the monetary compensation is

often a practical incentive. Furthermore, sometimes a video requires some budget to create, and so the potential revenue can help justify the production.

3.3 Conclusion

Companies should try to leverage the users' desire for attention if they want to crowdsource content creation at the absence of monetary rewards. It's thus crucial to feature the top contributors as well as making them aware of how much attention their content are receiving. Of course companies should also consider monetary rewards whenever possible, especially when the content production may incur some costs. That way those who previously only vie for attention now have more motivations while those who are motivated primarily by money are expected to start contributing as well.

4 Product Design

4.1 Task Description

For content creation, crowdsourcing is considered successful if the crowd ends up contributing a lot of content. While the quality of the content matters, the focus is usually on the quantity. However, it's the opposite for product design. Whereas unpopular content merely waste some computer resources, a bad product can waste the company a lot more money depending on the type of the product. Furthermore, to achieve economies of scale, a successful design should appeal to a large number of people. All these mean that for product design, quality is the most important. The quantity doesn't really matter because at the end, the company will only select a few designs for manufacturing anyways. Sometimes all a company needs to succeed is just a handful of successful products, like Apple with its iPods and iPhones.

While this strategy is more prevalent with startups where crowdsourcing the designs is at the heart of their business plans, some large companies have also tapped into the collective wisdom of the crowd. For instance, Fiat is Brazil's most famous automobile brand. It runs a project called Fiat Mio, which involves a website where the crowd can contribute ideas and suggestions to help the company build a new car. So far the website has received over 10,000 suggestions from over 160 countries. The suggestions represented what these people want most, such as size and entertainment options. In a way the project resembled a product survey, and it worked partly because Fiat is a brand with a lot of loyal fans [32].

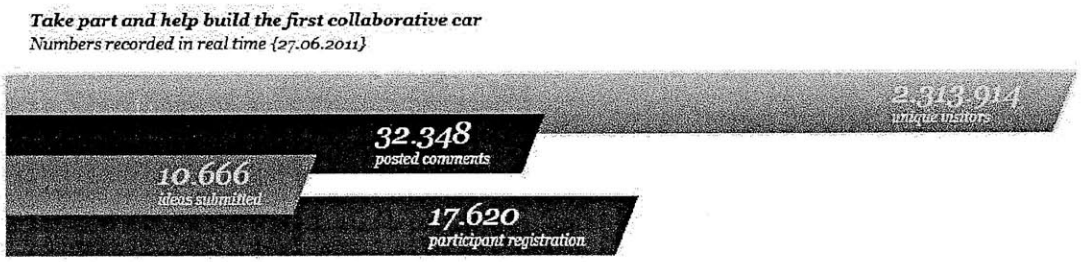


Figure 4-1: Fiat Mio Project Statistics

One of the characteristics of companies that crowdsource product designs is that they usually try to sell the products to the same group of people that helped design them. For instance, Quirky is a website that allows inventors to focus on the designing without having to worry about the business and legal aspects. After an inventor submitted an idea to Quirky, anyone in the Quirky community may "influence" the idea by commenting on it. The comments can be on the design itself, as well as other related aspects such as the

name, tagline, and logo etc. The best design, rated by the community, will then become the "product of the week". Only if enough people in the community commit to buying it will Quirky actually produce it though. This allows the company to not take any risk towards investing in these designs. At the end, the idea originator and everyone who have contributed to the design will get to share most of the profits. Each person receives a proportion based on the amount of influence he has on the design, as determined by his contributions and quality of his comments. This monetary incentive is what encourages active participation in the Quirky community. As of November 2010, 80 products have already been manufactured as a result of the community's efforts. Of those, 28 are also available at retail stores worldwide [32]. Figure 4-2 shows a screenshot of a product designed by the Quirky community. In this case, 727 people have contributed.

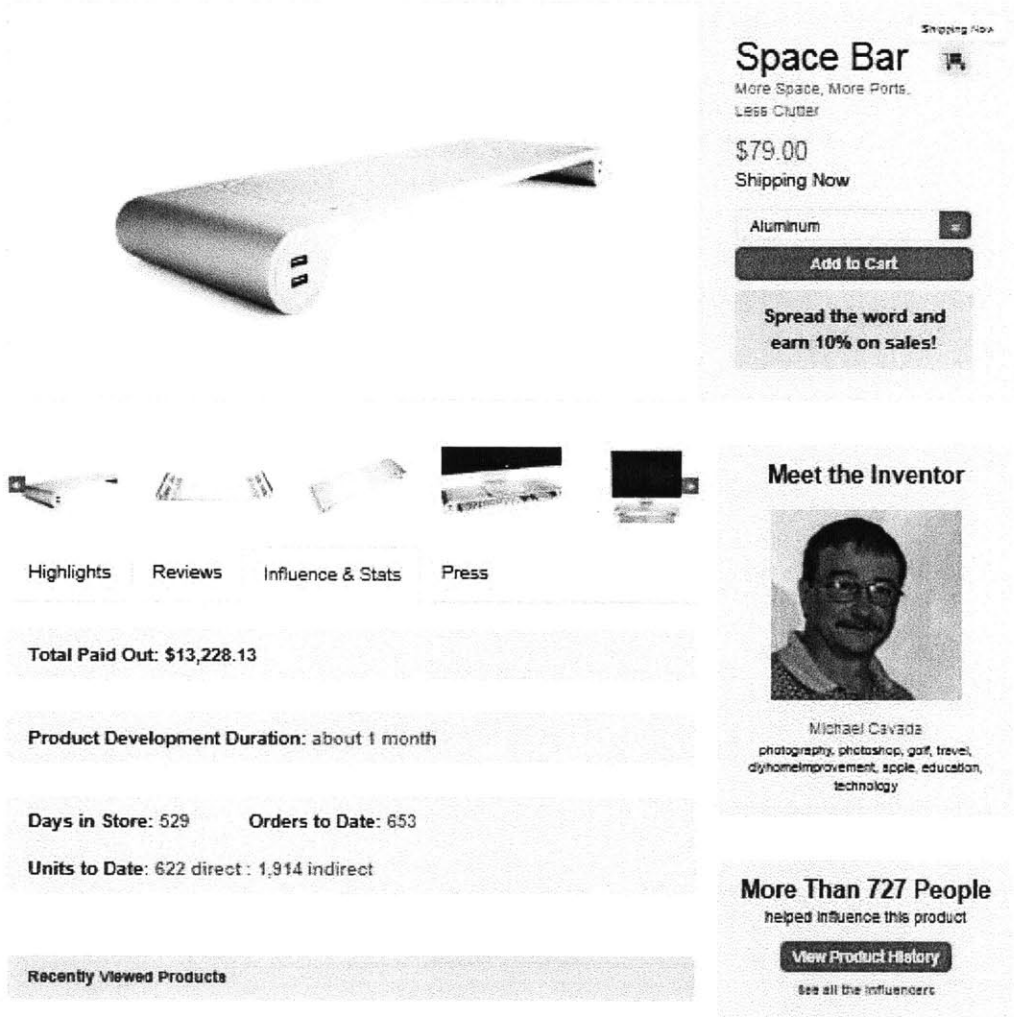


Figure 4-2: A Product Developed on Quirky

4.2 Example (Threadless)

4.2.1 About the Website

Threadless operates on a simple idea: crowdsource the product design of t-shirts. With only a 50-person staff, the company has generated $30 million of revenue in 2009 [45]. In fact, the company was founded in 2000 after the founders themselves won an internet t-shirt design contest [33]. The designers first upload their t-shirt designs to the website. Then they are rated by the visitors and members of the Threadless community. The winning designs from each week will then be selected by the staff for printing and the designer will then receive a cash prize or store credits. Figure 4-3 summarizes this process.

Figure 4-3: Design Process on Threadless

For each design, users can submit a score from 0 to 5. They can also leave comments and suggestions for the designers. Note that one must submit a score before he can see the average score. While this encourages users to submit a score, it has an undesirable consequence of receiving scores from people who don't really want to evaluate the design but just want to see the average score. Figure 4-4 shows a page featuring a t-shirt design, where users can vote on the right.

Figure 4-4: A T-Shirt Designed on Threadless

There's an additional benefit of having a winning design, because there's a separate product line for designs that are submitted by designers who have previously won the main competition at least four times. These designs can bypass the usual voting system. In addition to this weekly process, occasionally there will also be special contests sponsored by some partners. Known as the "design challenges", these contests all have a theme for the designs. Figure 4-5 shows some of these contests.

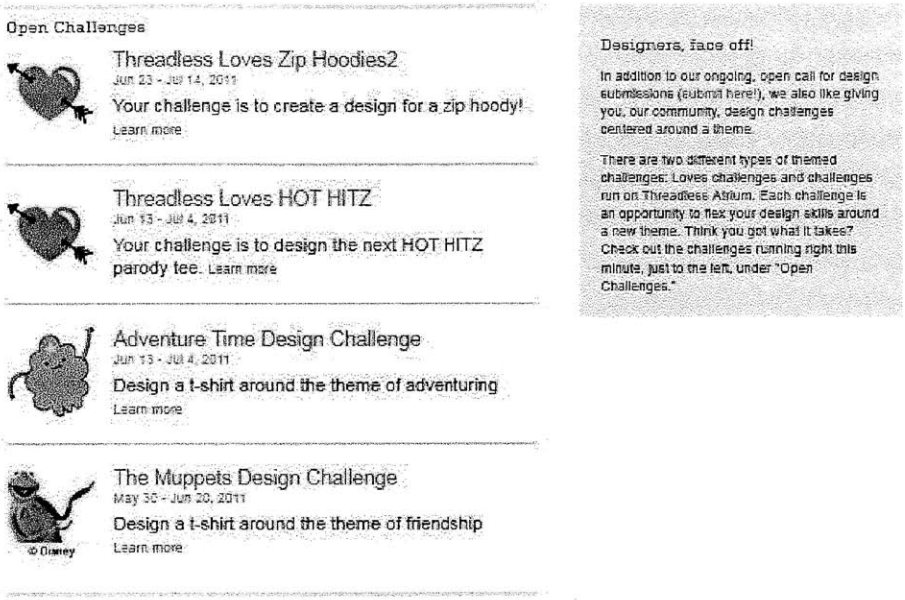


Figure 4-5: Design Challenges on Threadless

Just like on Quirky, users will be able to purchase the printed designs on the website as well, in addition to a retail store that was opened in Chicago, near the company's headquarter. If a design is sold out, the company will print it only if enough people request a reprint.

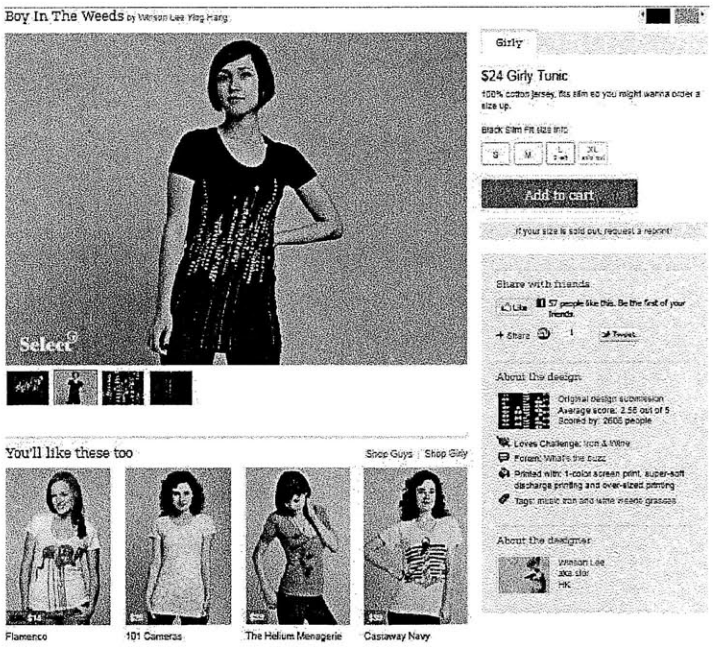


Figure 4-6: Product for Sale on Threadless

4.2.2 Motivations of the Crowd

The previous section gives an overview of Threadless' design process and business model. This section discusses the main motivations behind the crowd's active participations, based on Daren Brabham's findings [34]. Brabham interviewed 17 people in the Threadless community who have either submitted a design, actively rated designs, or routinely shopped there. Out of the interviews conducted through IM, Brabham identified five major reasons for their participations:

1. Making money
2. Improving creative skills
3. Freelance opportunities
4. Love of community
5. Addiction

Making money

Being able to make money seems to be the common motivator behind the design submissions. After all, money is one of the most reliable motivators. Also, the crowd doesn't want to perceive themselves as being used by the company. While a worthy and noble cause can often move the crowd to work for free, a commercial entity usually will have a much harder time doing so. When the purpose is making profits, the crowd needs to be financially rewarded in order to not feel exploited.

Improving creative skills

In contrast to making money, being able to improve creative skills is an intrinsic motivation. According to Dan Pink, intrinsic motivation is often more effective when the task requires creativity, and one of them is "mastery" [17].

Freelance opportunities

The third motivation is related to career advancement. By competing and hopefully winning a competition, the designer not only has one more award-winning design in his portfolio, but also receives more exposure as well. Some participants revealed that they have been contacted by other companies as a result of their participations on Threadless. Furthermore, some successful ones even form their own design companies.

Love of community

Another motivation seems to be their love of the Threadless community. The website provides a platform for these designers to network and interact. In fact, it's the vibrant culture of the community that keeps some of these participants from leaving.

Addiction

The final motivation is sheer addiction. According to Brabham, "11 of the 17 participants interviewed used language relating to addiction to describe their love of Threadless and their behavior on the site." Although the participants can't clearly identify the reasons for their addictions, it seems that having fun and feeling belonged to the community are the underlying reasons. Many of them see themselves as active participants of the community, and feel a constant need to monitor activities and keep themselves informed of the latest events at Threadless. They perceive themselves as active participants in the Threadless business process, instead of just designers or customers. The possibility of chatting with other users and thus forming friendships also contributes to their affinity to the website.

4.3 Conclusion

Threadless has a successful business model. Through its website, it's able to acquire popular designs at almost no cost, while guaranteeing a certain demand before printing each design. Although the t-shirt designs are submitted by individuals, the community plays a very important role as well. Threadless is known for its extremely loyal and vibrant user community. Without the community, the designers have less motivations. Furthermore, their designs may also be less successful without the community's feedbacks. It's thus crucial for companies to not only understand how to tap the creativity of the crowd, but how to build a tight and fun community around it as well.

5 Problem Solving

5.1 Task Description

Leaving problems to the crowd that even employees with ample qualifications and skills can't solve may seem counter-intuitive. After all, the crowd is best known for their sheer size, willingness to perform tasks at low costs, and their occasional creativity. However, problem solving, especially scientific ones, require specific skills, knowledge and certain amounts of dedications and patience. It seems unreasonable to expect laymen to be able to solve problems that even baffle corporate R&D scientists. Yet there are several flaws with this thinking. First of all, the crowd consists of a huge variety of people. While it includes teenagers, college dropouts, and unemployed ones, it also includes professionals with various kinds of trainings. Simply stated, the crowd can include anyone, so it's just a matter of targeting the appropriate ones. Secondly, problem solving is increasingly interdisciplinary in nature. As Scott Page described in his book "The Difference" [9], a problem may appear very difficult from one perspective yet very easy from another. Since people with different trainings tend to develop different perspectives, it's beneficial to open up the problems to more people in the hopes that one of them can look at it from an entirely new perspective. That fresh angle may sometimes prove to be the turning point in taming the problem. Even if no one in the crowd can single-handedly solve the problem, the crowd may still be able to improve each other's solution until this iterative process leads to the answer at the end. Thirdly, while the difficulty of these problems may daunt a lot of people, it not only excites the experts among the crowd, but also rekindles the passion in those amateurs who have received formal training in a scientific discipline but ended up working in other fields instead. To these people, giving them a hard problem to solve is like giving them a new found hobby, and this intrinsic motivation can sometimes be very effective. As Dan Pink shows in his book "Drive" [13], monetary rewards can actually reduce the ability of workers to produce creative solutions to problems. The intrinsic motivation that these people have may thus be an additional advantage to the employees who are paid to solve these problems.

5.2 Example (InnoCentive)

5.2.1 About the Website

InnoCentive was founded in 2001 by Eli Lilly as a platform to tap external talent for tasks related to drug developments. Since the beginning, the platform has been available to other companies eager to leverage this pool of expertise as well, such as Proctor & Gamble and Boeing. These companies, known as "seekers" on InnoCentive, post some of their most difficult problems on the InnoCentive website. The solvers then receive a reward that typically falls between $10,000 to $100,000 for their successful solutions.

Over $28 million in awards have been given to solvers since the company was founded. Figure 5-1 shows some other statistics of InnoCentive as of June 2011.

Since 2001, InnoCentive has been making a positive impact on the world, one organization at a time. Take a look at some of our numbers. (Current as of Q2 2011)

Total Registered Solvers: Approximately 250,000 from nearly 200 countries

Total Solver Reach: More than 12 million through our strategic partners

Total Challenges Posted to InnoCentive.com: > 1,300

Project Rooms Opened to Date: 339,726

Total Solution Submissions: 24,256

Total Awards Given: 866

Total Award Dollars Posted: > $28 million

Range of awards: $5,000 to $1 million based on the complexity of the problem

Average Success Rate: 50%

Figure 5-1: Statistics of InnoCentive

The "challenges" (problems) come in all sorts of disciplines such as chemistry, life sciences and computer science. Figure 5-2 shows some of some of these challenges.

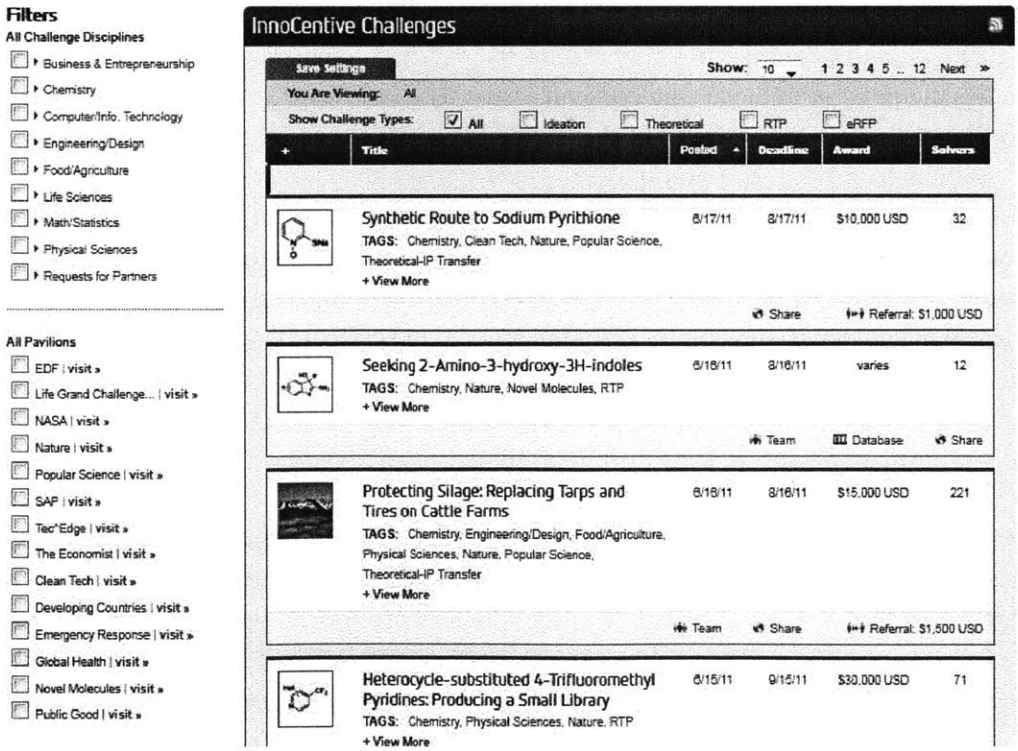
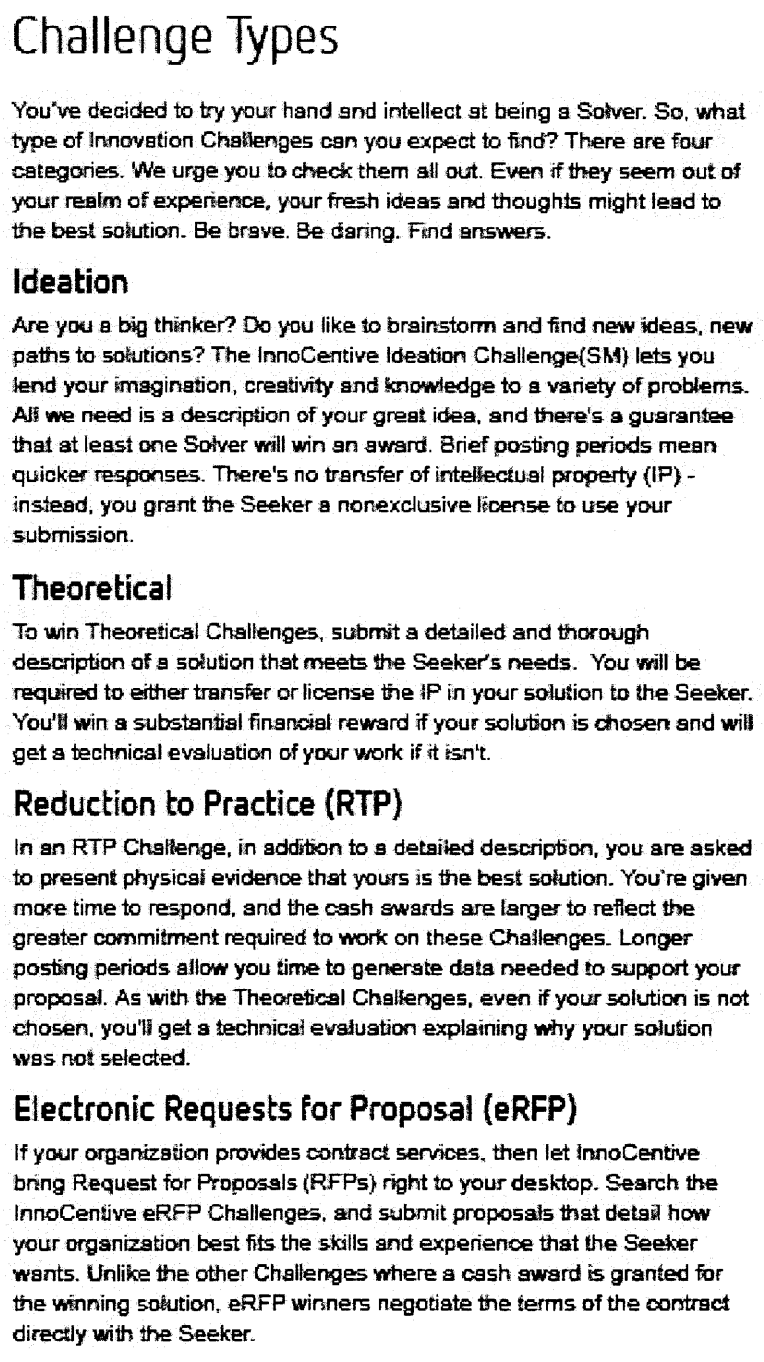


Figure 5-2: Challenges on InnoCentive

The challenges also range from theoretical to practical. The theoretical ones usually just require papers detailing the solution, while the practical ones require lab results. Figure 5-3 presents the different types of challenge on InnoCentive.



Challenge Types

You've decided to try your hand and intellect at being a Solver. So, what type of Innovation Challenges can you expect to find? There are four categories. We urge you to check them all out. Even if they seem out of your realm of experience, your fresh ideas and thoughts might lead to the best solution. Be brave. Be daring. Find answers.

Ideation

Are you a big thinker? Do you like to brainstorm and find new ideas, new paths to solutions? The InnoCentive Ideation Challenge(SM) lets you lend your imagination, creativity and knowledge to a variety of problems. All we need is a description of your great idea, and there's a guarantee that at least one Solver will win an award. Brief posting periods mean quicker responses. There's no transfer of intellectual property (IP) - instead, you grant the Seeker a nonexclusive license to use your submission.

Theoretical

To win Theoretical Challenges, submit a detailed and thorough description of a solution that meets the Seeker's needs. You will be required to either transfer or license the IP in your solution to the Seeker. You'll win a substantial financial reward if your solution is chosen and will get a technical evaluation of your work if it isn't.

Reduction to Practice (RTP)

In an RTP Challenge, in addition to a detailed description, you are asked to present physical evidence that yours is the best solution. You're given more time to respond, and the cash awards are larger to reflect the greater commitment required to work on these Challenges. Longer posting periods allow you time to generate data needed to support your proposal. As with the Theoretical Challenges, even if your solution is not chosen, you'll get a technical evaluation explaining why your solution was not selected.

Electronic Requests for Proposal (eRFP)

If your organization provides contract services, then let InnoCentive bring Request for Proposals (RFPs) right to your desktop. Search the InnoCentive eRFP Challenges, and submit proposals that detail how your organization best fits the skills and experience that the Seeker wants. Unlike the other Challenges where a cash award is granted for the winning solution, eRFP winners negotiate the terms of the contract directly with the Seeker.

Figure 5-3: Types of Challenges on InnoCentive

5.2.2 Crowd's Advantage

In the overview section, diversity has been hailed as an advantage possessed by the crowd for problem solving. This is confirmed by Karim Lakhani and his colleagues, who did a survey on 166 problems posted to InnoCentive by 26 different companies. About 30% of these problems were solved. Although this success ratio seems low, it's important to keep in mind that these are challenging problems that even large corporate R&Ds have troubles with. Perhaps the most interesting and unexpected discovery in their study was that the solver had a higher chance of solving problems in fields where they had little expertise [18]. When a difficult problem cannot be solved by an expert, the typical thinking is to seek the help from an even more skilled and knowledgeable expert. Yet this survey shows there's another route, which is to consult people who aren't even experts in this field. This might make sense because an outsider can often view the problem from a fresh perspective that actually makes the problem easier to solve. For instance, Page offers the following problem in his book "The Difference" [9]:

SUM TO FIFTEEN

> **Setup**: Nine cards numbered 1 through 9 are laid out on a table face up.
>
> **Order of Play**: one player is randomly chosen to go first and then players alternate taking cards.
>
> **Object**: To collect three cards that sum to 15.

At first glance, this is an optimization problem where each player wants to collect cards that sum to 15 while preventing the other player from doing the same. It's not obvious what the winning strategy is for the first player and how the second player should respond to each move. It might even be tempting to write a computer program to simulate all the scenarios. However, an ingenious middle school student may be able to recognize the similarity between this problem and the famous magic square, where each column, row, and diagonal sums up to 15 in a 3x3 square. It then becomes clear that the strategy for both players is actually equivalent to that of the tic-tac-toe game, which even most children can handle comfortably.

InnoCentive recognizes the fact that a team with diverse expertise is more likely to find better solutions than a smart individual working alone. It gives the example of James Watson and Francis Crick identifying the double-helix structure of DNA, when neither of them was an expert in biology. To foster collaborations among the crowd, InnoCentive provides "team project rooms" on the website, which are basically workspaces for teams to share notes and discuss results privately. While this increases collaborations within a

team, Lakhani's study shows that the teams work independently and rarely share their knowledge or results [18]. This actually reflects the same lack of openness observed in problem solving within the scientific community.

Sometimes the crowd can also help by simply referring the right expert. InnoCentive recognizes this and so have established a referral program for some of the challenges, where a member can earn up to $10,000 if the solver is someone he refers. This has multiple benefits. First of all, it helps grow the community by incentivizing the members to tell others about InnoCentive. Secondly, in addition to leveraging the crowd's knowledge, it actually leverages their social networks as well. In addition, a person whose expertise is in one field is no longer limited to challenges residing in that field, because he might happen to know someone who can solve challenges in other fields. Figure 5-3 shows a screenshot of the referral program.

Figure 5-4: Challenge Referral Program

5.2.3 Motivations of the Crowd

There are many motivations that drive these solvers. While the monetary compensation is obviously attractive, other concerns such as reputation and recognition are very important as well. Figure 5-4 shows a webpage where InnoCentive features the top solvers.

Figure 5-5: Top Solvers on InnoCentive

Another set of motivations is purely intrinsic. Solvers often indulge in the sheer joy of problem solving. The process of tackling a challenge is itself rewarding already, and being able to actually solve the challenge is more like a bonus. Also, some solvers are retired scientists who are just happy to be able to apply their skills and knowledge again. Lakhani's study shows intrinsic motivation like these actually has a stronger effect on actually solving the problem. On the other hand, participations out of career and social concerns, or for competition's sake, all tend to lower the probability of solving the challenges.

5.3 Conclusion

InnoCentive is a marketplace, where companies can tap the global pool of scientific talent among the crowd. Figure 5-6 shows all the countries where the solves reside.

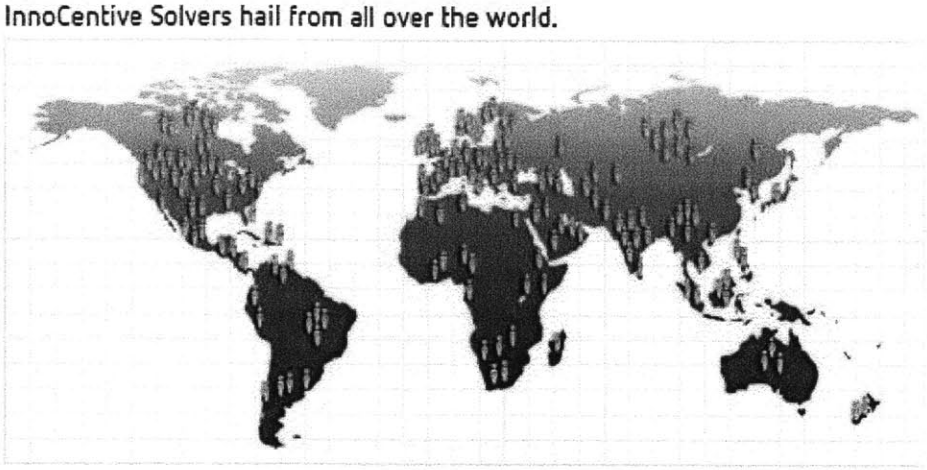


Figure 5-6 Locations of Solvers

It's enabled by the uprising propensity of companies to crowdsource tasks, and the empirical observation that diversity is extremely beneficial for solving hard problems. Through InnoCentive, companies are able to solve some of their most difficult R&D problems, and often at a much lower cost than if the solution is produced in-house. On the other hand, the crowd not only receives monetary awards for successfully solving the challenges, but also gets to satisfy their appetite for problem solving.

The crowd has been relatively successful in solving these challenges, considering the difficulty of these problems. Their broad range of expertise is something that the R&D labs admires. Although the crowd occasionally forms teams, the lack of collaborations among the teams makes the crowd less effective as a whole. Companies that want to leverage the crowd for problem solving should try to promote the openness of the problems by designing appropriate incentives and removing relevant barriers.

6 Ratings and Reviews

6.1 Task Description

Information explosion and technological advances give the society much more information and products than they can consume. Ratings and product reviews are thus helpful in filtering out the low quality ones. Nowadays these are typically crowdsourced to the users. For instance, it's the users, not the company, who rate all the videos and comments on YouTube. The ratings for the t-shirt designs on Threadless are also entirely determined by visitors and members of the Threadless community. While these content are user created as well in the first place, it's noteworthy that the book ratings and reviews on Amazon are also generated by the users, even though the books certainly are not. Figure 6-1 shows some user-generated book ratings and reviews on Amazon.

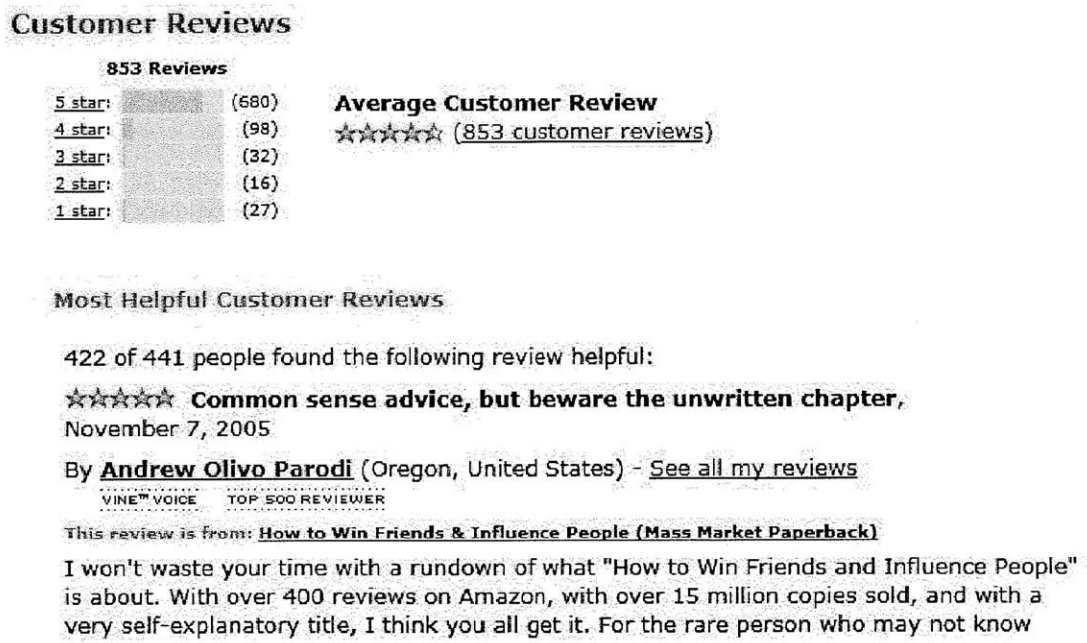


Figure 6-1: Book Ratings and Reviews on Amazon

Another famous example is IMDB, which stands for Internet Movie Database. User ratings there are regarded very highly. Figure 6-2 shows the ratings of a movie on IMDB.

Figure 6-2: Movie Ratings on IMDB

There are numerous reasons why it's beneficial to crowdsource the ratings. First of all, the proliferation of content makes it almost impossible for companies to keep track and catch up with all the new content every day. It's also not uncommon nowadays for startups to have millions of users with only a handful of staff. It's thus unrealistic for each employee to rate the content submitted by hundreds of thousands of users. Secondly, users often value each other's opinions and ratings more than the editorial ones, partly because the editorial ratings might be biased in the company's interest. For instance, the ratings might be inflated and the reviews only mention the positive aspects. The company might also temporarily improve the rating of an item in order to boost its sale. Thirdly, a rating by fewer reviewers is often viewed as less authoritative than one with more reviewers. For instance, when users consider book ratings on Amazon, they not only consider the rating itself but the number of reviewers as well. An easy way to get more ratings is by delegating it to the crowd. The collective opinion from hundreds or even thousands of users may thus be more persuasive than a single editorial one.

6.2 Example (Digg)

6.2.1 About the Website

Digg is a social news website where it's the crowd who decides which articles deserve more attention. Google was once interested in acquiring Digg for about $200 million, at the time when Digg was generating less than $10 million of revenue [19]. Users can "digg" an article to increase its popularity and bring it to the top of the page. Alternatively they can also "bury" it to achieve the opposite effect. The number of "digg" subtracted by the number of "bury" is then the final popularity rating, or the "diggs", for this article. Although other factors such as article freshness, number of comments, and the digging trend may matter, generally the higher the diggs the higher this article will appear. Users can also comment on each article. Just like they can "digg" or "bury" an

article, they can likewise either "digg" or "bury" a comment as well. Each comment thus has a diggs rating as well.

Figure 6-3 shows some news articles on Digg while figure 6-4 shows some comments. Note that the diggs isn't the only factor affecting the final position of the articles.

Figure 6-3: News Articles on Digg

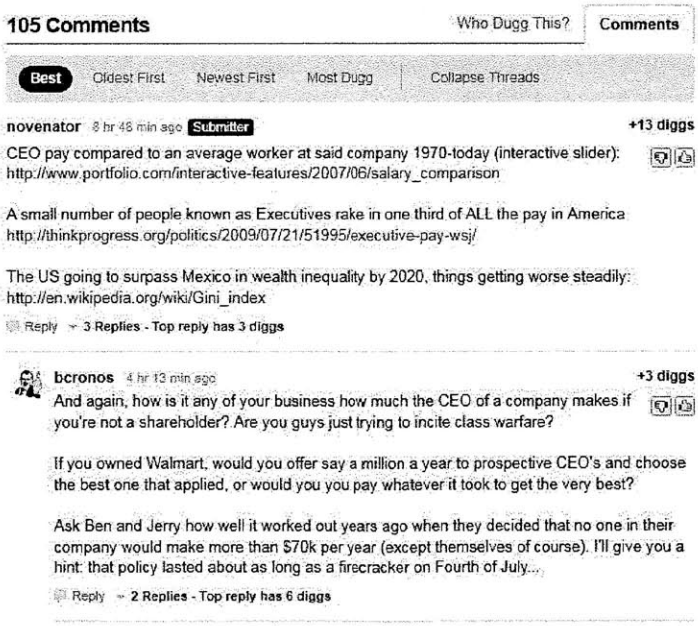


Figure 6-4: Comments on Digg

Digg has millions of visitors, and so sometimes an article that has been "dugg" many times will bring a lot of traffic to the corresponding website. This becomes known as the "digg effect". In fact, many are willing to pay for these traffic and so users often get paid for blindly digging certain articles. In fact, some even attempt to do so through crowdsourcing platform Mechanical Turk, which will be discussed in a later section of the thesis. Many startups have also been created to profit from this opportunity and so Digg needs to continuously revise their algorithm to prevent people, including some of its top users, from gaming the system to draw traffic. This issue is explicitly addressed in their terms of service: "[Y]ou agree not to use the Services with the intention of artificially inflating or altering the 'digg count', comments, or any other Digg service, including by way of creating separate user accounts for the purpose of artificially altering Digg's services; giving or receiving money or other remuneration in exchange for votes; or participating in any other organized effort that in any way artificially alters the results of Digg's services" [36,37].

Since all the links to the news articles are user generated as well, Digg actually crowdsources the content generation as well just like YouTube does. However, whereas the main value for YouTube lies in the content, the main value for Digg lies in the user opinions of the articles. After all, these articles already exist on other websites and so simply aggregating them haphazardly won't provide much additional value.

6.2.2 Motivations of the Crowd

From the crowd's point of view, they typically won't benefit from promoting or demoting a product, video, comment or news article. While some of them try to game the system as mentioned previously, the majority of them are regular users with no such intention. Given the lack of extrinsic motivations, there are several explanations for their continued contributions. First of all, when a user comes across an interesting article, he might want to see how his view compare to the rest of the users [37]. He can achieve that by submitting the article to Digg and seeing how the other users react to it. Secondly, the article invites comments and discussions on the Digg website. So the submitter can find out more about the story in his article by listening to different perspectives [37]. Finally, contributing an article that rises to the top of the Digg homepage can satisfy the submitter's desire for attention and recognition by the community.

Since the size and adhesiveness of the community are crucial factors in determining the quantity and quality of user contributions, it's important to understand why users like to visit Digg as opposed to the more established news sites such as Reuters or Yahoo News. One reason is that the user comments and discussions often make the story much more interesting and engaging. The reader can also view the story from different perspectives.

Another reason that readers enjoy browsing the Digg website is that they won't know what weird and obscure articles they may come across. That element of surprise can be addictive. Finally, the stream of news content can change every minute. That level of freshness attracts a lot of repeat visits from users who want to stay on top of what's happening in the world.

6.2.3 Challenges

The premise of Digg's success is that the crowd gets to determine which articles should surface to the top. While this kind of democracy is welcomed by the users, it can also mean potential dangers to the company itself. For instance, an article containing the AACS encryption key for protecting HD DVD and Blu-ray Disc appeared on Digg's homepage in May 2007. Digg subsequently removed it after receiving a cease-and-desist letter from AACS. However, most of the Digg community disagreed with the decision and reacted strongly by posting numerous articles and comments containing that encryption key and expressing their negative sentiments towards Digg. Figure 6-5 shows the Digg homepage when it was inundated with these articles at one point [38].

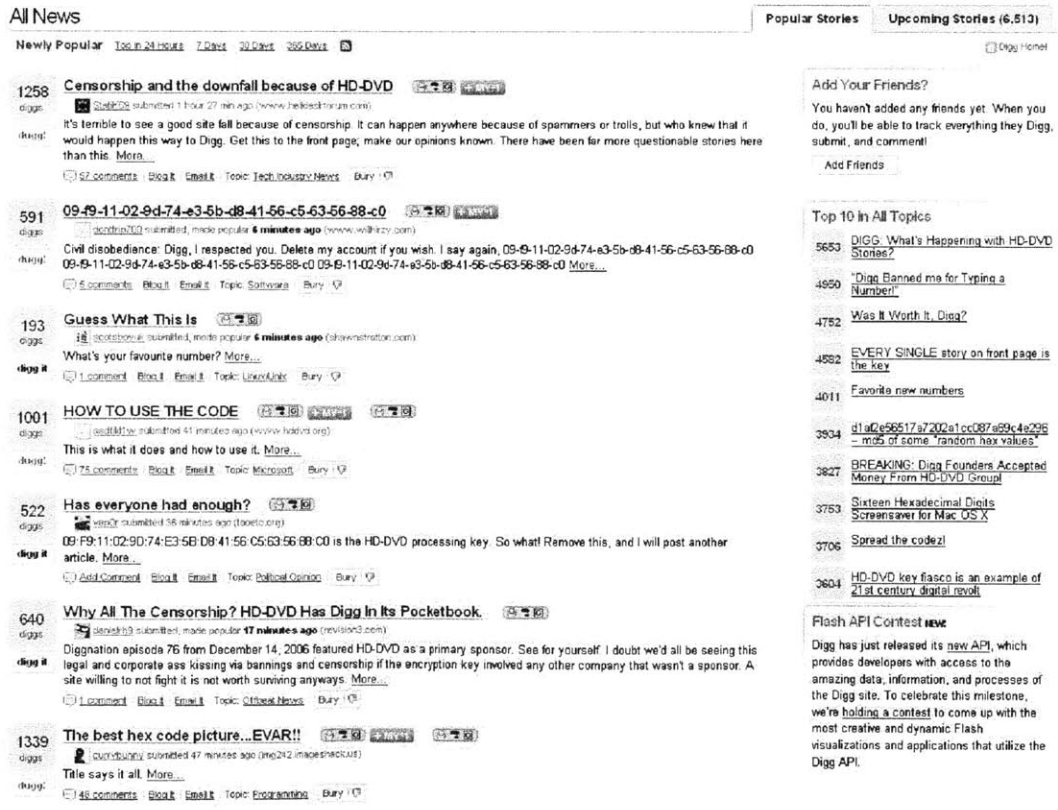


Figure 6-5: Digg's Homepage Covered with AACS-Related Articles

Another challenge is to prevent the so-called "groupthink", where the crowd thoughtlessly follow the decision and repeat the action of the majority. The wisdom of the crowd is based on its diversity, and so it's important to maintain the independence of thought and opinion among them. For instance, Threadless requires users to vote before they can see the current rating. On the other hand, users can see the ratings before they cast their votes on YouTube, and that can sometimes bias their votes if the ratings happen to be lopsided. The same is true for Digg, but fortunately Digg only reveals the identities of those who digg an article and not those who bury it, so there's less pressure to express a different opinion. Figure 6-6 shows a screenshot of Digg featuring the people who dugg an article, the purpose of which is to allow users to "follow" each other and be notified of each other's latest posts. Note that there's no such as page as "Who Buried This?" though.

Figure 6-6: Digg Showing Users Who Dugg an Article

6.3 Conclusion

Crowdsourcing the reviews and ratings has many benefits. It not only spares the company from having to review thousands (and sometimes millions) of pieces of content, but also make the reviews and ratings more trustworthy. In addition, it also has a side benefit of fostering the community because each user is influenced by the community's opinions and the user's own opinion in turn influences the rest of the community. So asking users for their opinions not only helps generate the ratings themselves but also increases their affinity to the community, which in turn will encourage them to contribute more.

Although there are many benefits of democratizing the voting, care must be given to preserve the independent opinions of the crowd. Otherwise it can lead to groupthink, which will cause the results to be severely biased. The company also needs to put in mechanisms to make sure that their rating system can't be abused by people wishing to promote or demote a piece of content. Unfortunately the rise of crowdsourcing marketplaces have made such activities much easier and cheaper to perform than in the past. So crowdsourcing can be a double-edged sword that can potentially bring significant benefits to a company yet also wreaks havoc to another.

7 Idea Generation

7.1 Task Description

There are two types of idea generations. One of them seeks suggestions from the crowd on how to improve products or service etc. The other one gives an assignment to the crowd and then picks the best idea among them. In other words, the company is asking the crowd to brainstorm.

7.1.1 Suggesting Improvements

The first type is actually pretty prevalent. Restaurants and other stores often provide a suggestion box for customers to express their feedbacks. Many websites also have a webpage with a textbox for users to submit their suggestions. In fact, research done by Eric von Hippel shows that great innovations often come from the lead users [39]. However, crowdsourcing the product suggestions involves some difficulties that are also encountered when crowdsourcing content generation. First of all, most of the suggestions won't be that helpful or might have already been considered by the company, just like most of the content on YouTube are low quality videos that few people watch. Furthermore, these low quality suggestions can clutter up the mailbox or interface. They also take up company resources to process. At the end, only a few percentage of the submissions might actually be useful, and the challenge is to identify this valuable small batch without having to sift through the rest. Fortunately, the crowd can again come to the rescue here. Just like the crowd can be delegated to rate content such as videos or news articles, they can also rate product suggestions. That way the most useful ones can stand out from the rest and be more noticeable to the company, just like the news articles that have been dugg most would surface to the top of the Digg homepage.

7.1.2 Brainstorming

The second type is less commonplace and sometimes gives the impression that the purpose is marketing rather than really trying to seek out ideas. For instance, several companies such as L'Oreal, Pepsi and Frito-Lay have asked their crowds to design an advertisement or a slogan for their new marketing campaigns. In this case, the company faces the same challenge mentioned previously, namely that most of the submissions might be low-quality ones. Furthermore, the company often holds this as a contest, and so would have to review all the submissions in a more compressed timeframe. Although it can again leverage the crowd to do the initial screening and only review the more promising ones, the decision here is harder because in this case, the company has to

choose the best submission, while in the previous case it only has to decide whether to follow up or act on each submission.

7.2 Example (Dell's IdeaStorm)

7.2.1 About the Website

IdeaStorm is a website that Dell built in 2007 to allow Dell to help determine what are the most important and relevant ideas to the customers. Users can post their ideas on how to improve Dell products and services, and each idea will fall into a certain category. They can also comment on the ideas that have been posted. Although the ability to comment on user-generated content is very commonplace, it's particularly important here because many new ideas are actually spawned from these user comments. Users can also vote to promote or demote ideas to make them more visible on the Popular Ideas page, which make them more prominent to both the other users and the company. Figure 7-1 shows an idea submission and its current status, along with the voting buttons. Note the similarity between the promote/demote mechanism and the digg/bury one on Digg.

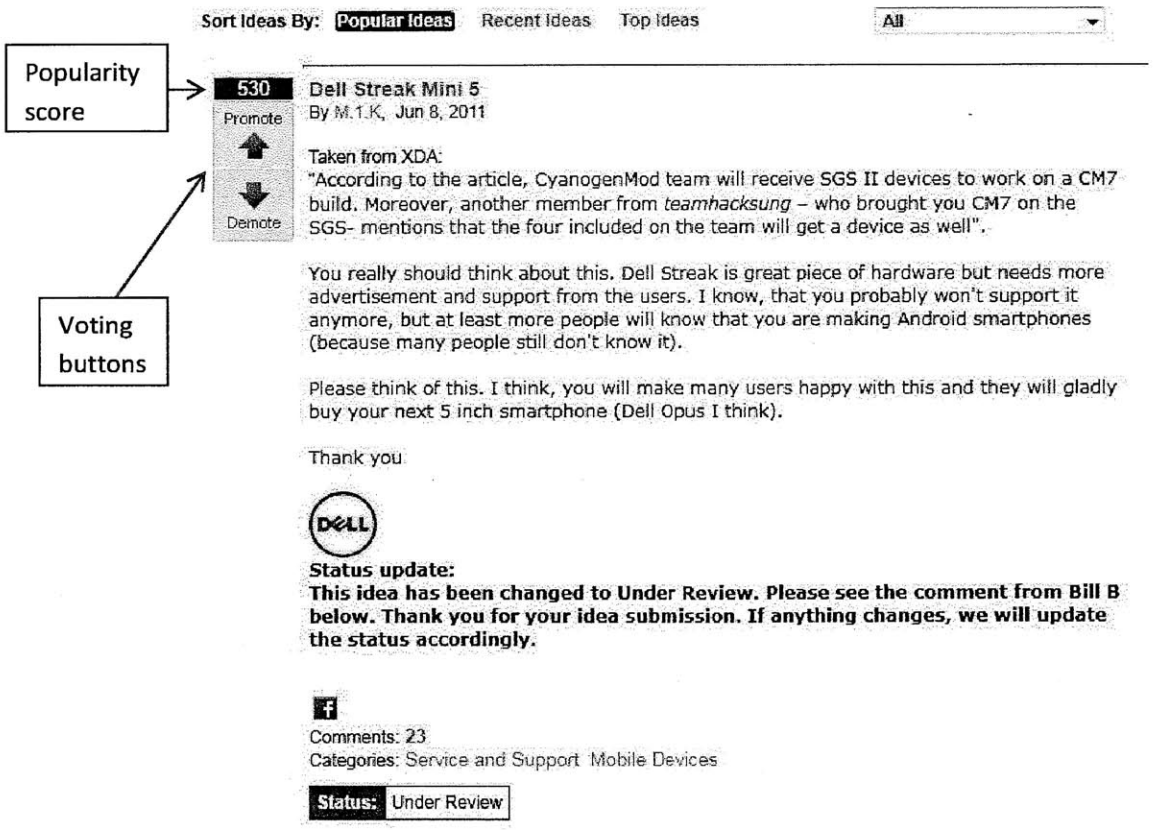


Figure 7-1: An Idea Submission on IdeaStorm

However, IdeaStorm also adopts a so-called "vote half-life" system to take the date of the vote into accounts. First of all, each promotion or demotion is initially worth +10 and -10 points, respectively. The popularity score is then determined by the total number of promotions and demotions on it. For instance, a score of 530 means that there are 53 more promotions than demotions. Secondly, each vote has a half-life of 4 days. That means every 4 days the vote will be worth half its original points. In other words, a demotion will only be worth -2.5 points after 8 days. However, the effect is internal and won't change the popularity score that's displayed, and that's why some ideas with lower popularity scores can appear above the high ones.

One problem that IdeaStorm is facing is that some members vote with multiple accounts. Although this problem can also occur on other websites with user voting, it's more serious on IdeaStorm because the consequence of the voting is no longer just about expressing preferences but can actually affect whether Dell might implement the idea or not. In other words, more is at stake in this case and so there's more motivation for dishonest voting behaviors.

To satisfy the contributors' craving for attention, there's a "Top Contributors" page. It lists the top contributors and include information such as their total number of ideas, votes and comments. In fact Dell even assigns each user a score based of how many of these activities he performed. Figure 7-2 shows a screenshot of them.

Rank	Username	Points	Votes Cast	Ideas Submitted	Comments
1	jervis961	36482	15273	180	5541
2	dhart	24101	111	7	39
3	badblood	23230	5055	221	2435
4	phubert	16592	6554	359	5738
5	jmxz	14512	1848	277	2656
6	ootleman	11820	2	2	0
7	robinjfisher	11638	1	1	0
8	agreer	9571	4	2	9
9	gergnz	9279	6	1	0
10	jorge	8775	8223	182	4239
11	yesmathew	8609	208	12	160
12	winoffice	8544	2710	107	2386
13	reg	7582	1239	73	1500
14	thebittersea	7015	5903	16	237
15	ergo	6279	25	1	11
16	benjesuit	5568	589	63	890
17	aikiwolfie	5296	2873	96	4578
18	pawprintz	5059	2	2	0
19	helmecj01	5012	9980	89	289
20	mistern	4934	524	67	616

Figure 7-2: Top Contributors on IdeaStorm

In addition, Dell also occasionally hosts some "Storm Sessions" where users can submit ideas for the topics that Dell designated. After a certain time the sessions will close and the Dell representatives will then share how Dell plans to implement the ideas. Figure 7-3 shows an explanation of these "Storm Sessions".

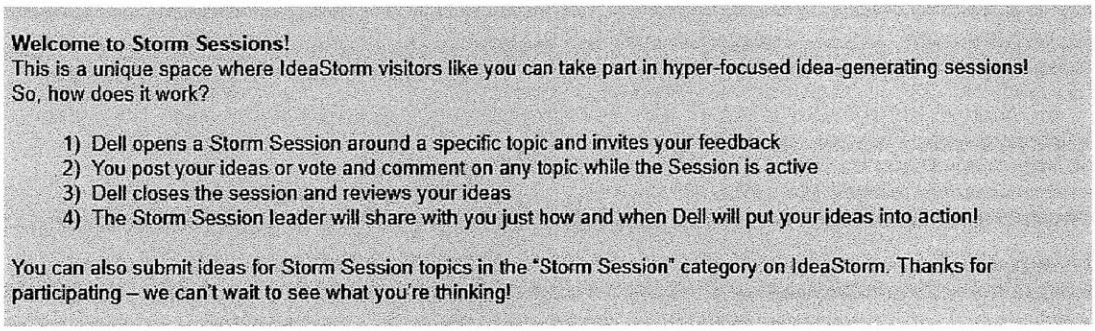


Figure 7-3: Storm Sessions on IdeaStorm

7.2.2 Motivations of the Crowd

Just like on many websites that crowdsource content creation, there's no financial rewards for contributing ideas on IdeaStorm. There are several reasons why these users suggest ideas. First one is that they are loyal to the brand and want to help it succeed. Second one is that they are frustrated with one of the products or services. The last one is that they really desire some features themselves and want to see Dell implement them. For instance, one of the most high-profile actions that Dell took as a result of these ideas was supporting Linux distributions. After numerous Linux fans voiced their discontent with Dell for failing to include support for Linux, Dell started selling several computer systems with a Linux distribution preinstalled. Dell also implemented some other popular requests such as setting up some technical support phone lines in the US and hiring fluent English speakers to operate them, allowing preinstalled software to be optional, and providing reinstallation CDs for free.

7.3 Example (Get a Slogan)

7.3.1 About the Website

Get a Slogan is a website dedicated to brainstorming, which is the second type of idea generation discussed previously. Clients can pay a fixed amount to have the crowd design the best slogan that accommodates its needs. Figure 7-4 shows some of the client requests, including one that's submitted by the Get a Slogan itself, while figure 7-5 shows some slogan submissions for it.

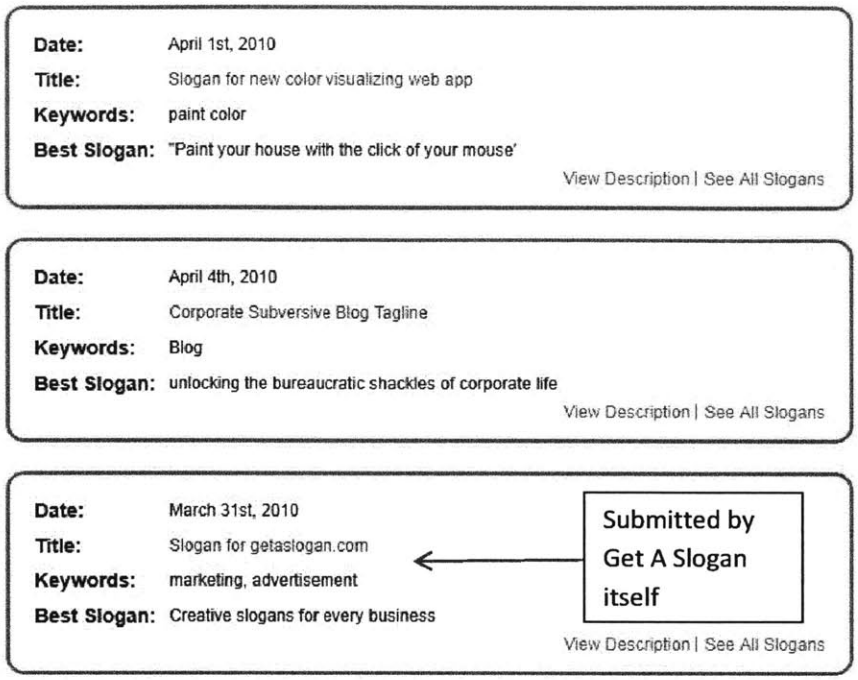


Figure 7-4: Client Requests on Get A Slogan

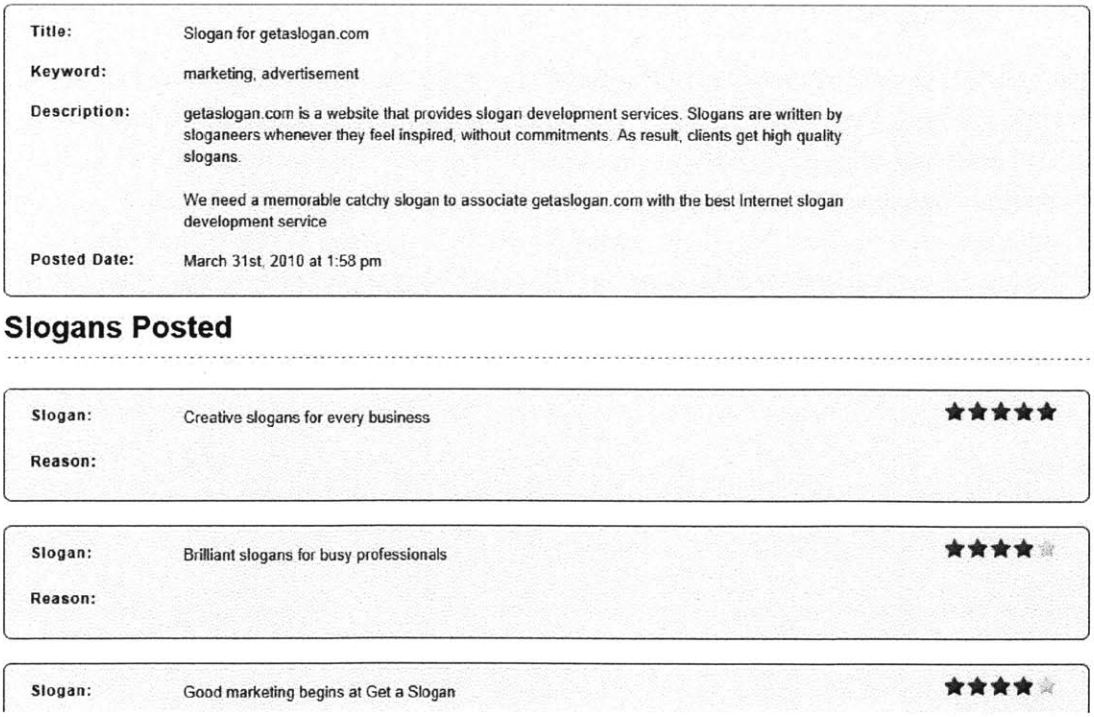


Figure 7-5: Slogan Submissions on Get A Slogan

When the client pays $50 for a slogan, the website guarantees that he will receive at least 50 slogan suggestions. Furthermore, the clients can also pay $100 to restrict the participants to only those who have won at least one slogan contest. This is similar to how Threadless operates a separate product lines for those designers who have won at least three t-shirt design contests. However, the difference between Get a Slogan and Threadless is that on Threadless the designs are judged by the crowd alone whereas on Get A Slogan they are judged by the client. Furthermore, the clients can provide feedbacks on the slogan submissions and ask the submitters to tweak them.

7.3.2 Motivations of the Crowd

Since participants receive cash rewards for submitting winning slogans, financial incentives is one of their motivations. It also gives users an opportunity to flex their creativity muscles, which can be an intrinsic reward for many. On the other hand, since the slogan submissions are not revealed until the winning entry is chosen, the crowd doesn't get to review and comment on each other's work. The lack of user interactions means there's no user community at all. Motivations such as desire for attention and recognition within the community are thus not applicable on this website.

7.4 Conclusion

Through the IdeaStorm website, Dell gathers suggestions from the customers in all areas of their business. On the other hand, Get a Slogan is a marketing platform for clients to submit their slogan requests and the crowd to fulfill these requests. There's a strong user community attracted by the Dell brand on the IdeaStorm website, while no user community at all on Get a Slogan. Fortunately, the activity itself is fun, requires very little time, and can be performed anywhere. These reasons, coupled with the financial incentives, help the crowd stay active even without a supporting user community.

8 Performing Tasks

8.1 Task Description

From playing chess to identifying relevant webpages for a query, computers have repeatedly amazed humans with their "intelligence". However, computers only excel at tasks that involve following a fixed set of heuristics. There are many other tasks, such as image recognition, that computers perform poorly on. When companies are faced with these tasks that really can't be automated, they typically delegate them to their employees. If the tasks happen to be very simple and routine in nature, not only will the employees be unsatisfied, but the companies will also incur extra costs by assigning them to their employees, who might be overqualified for these tasks. Since these tasks are so simple, they can be performed by almost anyone with normal intelligence. Therefore, it makes sense to outsource them to a cheaper labor pool.

However, although the crowd can perform a task cheaply, it may be troublesome to reach out to them and manage their results. Although the internet has already made it much easier for people and companies to stay connected, usually companies still don't crowdsource directly. Instead, they put their requirements on popular crowdsourcing marketplaces, where the users (i.e. crowd) can see them and choose the tasks they want to work on. It's similar to how companies put their job descriptions on job hunting websites, where applicants can see them and apply to the ones they are interested in.

There are several advantages of crowdsourcing for this kind of simple task. First of all, which is also the most controversial, is that the task can be performed at a much cheaper cost. Secondly, since the size of the crowd is large and that the task is simple, a lot of people can be working on the task, which means it can finish much sooner than if delegated to some employees. Thirdly, employees usually work during office hours, but the crowd knows no such limits since they can come from anywhere in the world. On the other hand, some of the advantages possessed by the crowd are usually not present for these tasks. For instance, their diversity is no longer an asset and may sometimes make them harder to train for the tasks. Furthermore, it's also not useful anymore for them to comment on each other's work and come up with a creative solution. The companies typically want things done a certain way and do not appreciate creativity. In other words, they much prefer factory workers over knowledge workers in this case.

8.2 Example (Mechanical Turk)

8.2.1 About the Website

Amazon's Mechanical Turk service, launched publicly in 2005, is a crowdsourcing marketplace for this kind of task. The buyers of the service, known as Requesters, would pose tasks that require human intelligence to perform, yet are often simple enough for just about anyone to perform. Known as HITs (Human Intelligence Tasks), they include searching for missing persons, tagging images, comparing photographs, and writing product descriptions. Figure 8-1 shows some of these tasks on the website.

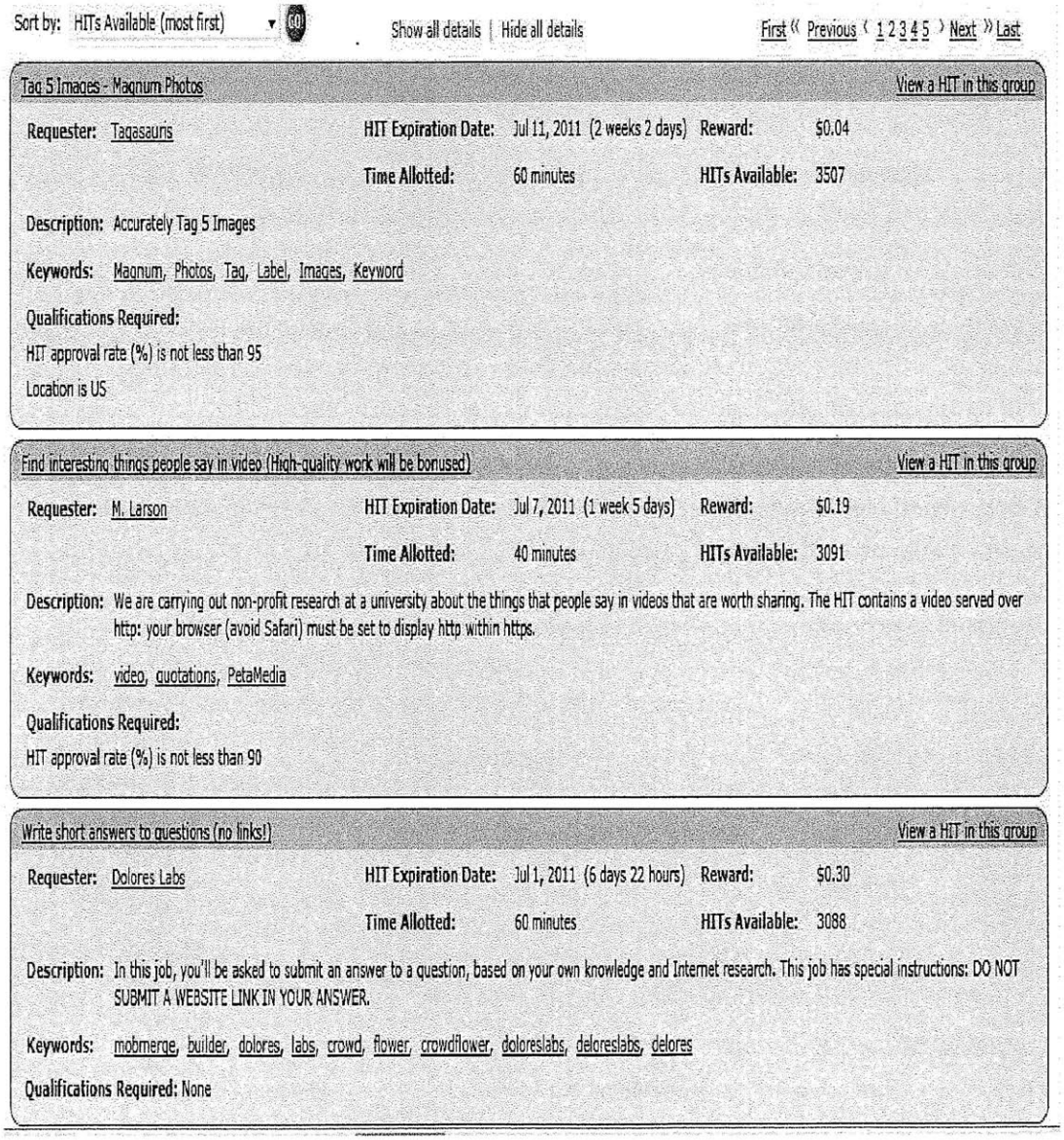
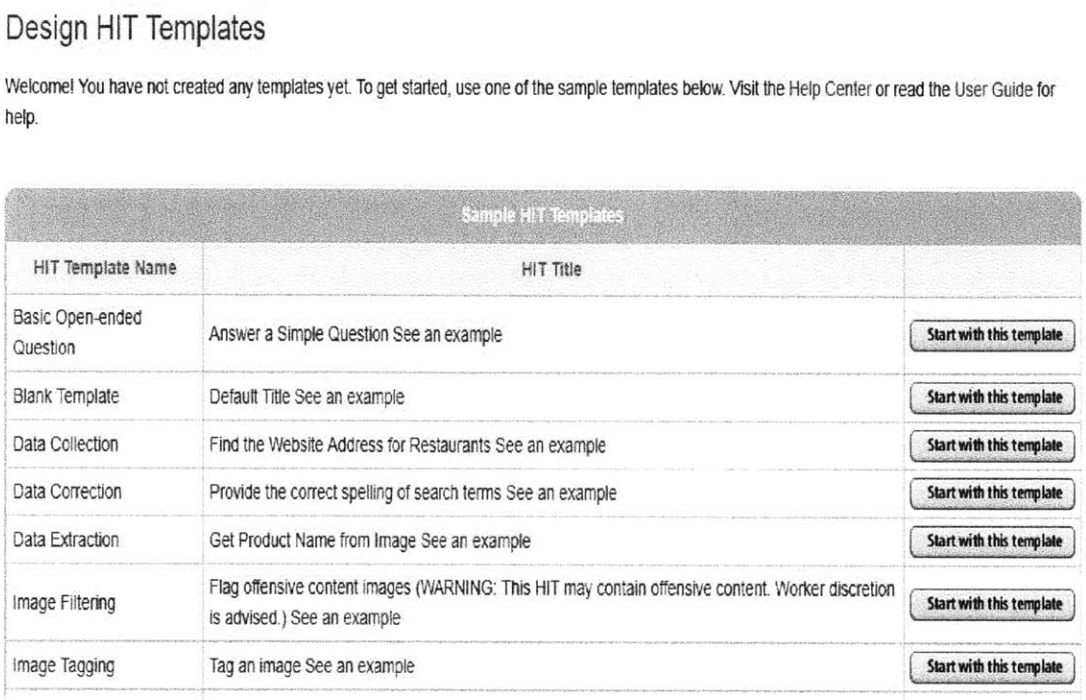


Figure 8-1: Some tasks posted on Mechanical Turk

To facilitate the creation of HITs, Mechanical Turk offers a set of HIT templates. Figure 8-2 shows some of these templates.



Design HIT Templates

Welcome! You have not created any templates yet. To get started, use one of the sample templates below. Visit the Help Center or read the User Guide for help.

Sample HIT Templates

HIT Template Name	HIT Title	
Basic Open-ended Question	Answer a Simple Question See an example	Start with this template
Blank Template	Default Title See an example	Start with this template
Data Collection	Find the Website Address for Restaurants See an example	Start with this template
Data Correction	Provide the correct spelling of search terms See an example	Start with this template
Data Extraction	Get Product Name from Image See an example	Start with this template
Image Filtering	Flag offensive content images (WARNING: This HIT may contain offensive content. Worker discretion is advised.) See an example	Start with this template
Image Tagging	Tag an image See an example	Start with this template

Figure 8-2: HITs Templates on Mechanical Turk

On the other hand, the sellers, known as Providers, can browse the website for tasks that they are interested in performing based on the payment amount and task description. Figure 8-3 shows a summary of the Requesters and Providers.

Figure 8-3: Summary of Requesters and Providers on Mechanical Turk

As shown in figure 8-1, some HITs have qualification restrictions, such as living in a certain country or having completed a certain number of HITs. The qualifications may also be based on possessing certain skills or knowledge, and these can be obtained only after passing the corresponding tests that the Requesters have posted. Figure 8-4 shows some of these qualifications, along with the number of qualified users and the Requester who originally created the qualification test.

Figure 8-4: Qualifications on Mechanical Turk

In addition, the Requesters can also reject the results submitted by the Providers, which will affect the approval rate of the Providers. The approval rates are important because some Requesters set a minimum approval rate as one of the qualifications as well. On the other hand, after successfully completing the tasks, the Providers will then receive payments from the Requesters. The tasks typically take very little time, and so the accompanying compensations are very low as well, from couple cents to couple dollars each. At the end, the Requesters will also have to pay a commission fee to Amazon that's worth 10 percent of the total payments to the Providers.

Since the service was originally launched in 2005 to help identify duplicate webpages for Amazon, most of the early HITs were also uploaded by Amazon itself. The most common HITs involve transcribing and rating podcasts, tagging images, writing articles, and commenting on blogs, all of which only require basic literacy and internet navigation skills. In addition to these, the service was also occasionally used to help search for prominent missing persons. For instance, the famous computer scientist Jim Gray disappeared on his yacht in 2007. His friend then asked DigitalGlobe, which provides satellite data for Google, to upload some relevant photos to Mechanical Turk so that volunteers can search for clues of his whereabouts. By the eighth day after Gray was found missing, the 12,000 volunteers have scrutinized images covering 30,000 square miles of water. About 20 images were tagged as "likely", with another one tagged as "highly likely". Drift experts were then consulted to estimate the possible locations of his yacht after eight days of drifting. Unfortunately, rescue planes were further delayed by several more days due to bad weather. At the end, none of the rescue planes came back with good news [46].

Since most of the tasks paid as little as a few cents, the service has been criticized by some as a "virtual sweatshop". Critics cite the facts that the regulations regarding minimum wage and overtime etc. are not applicable, and that while the employers do not have to pay payroll tax, the workers do have to pay self-employment tax. It appears to be nothing but a massive cost-saving scheme for the companies. Despite the criticism, there are indeed some middle class workers who are doing the more technical tasks for fun. Howe's article describes a case where a bunch of qualified Providers performed tasks that require specific software skills. At the end, the company paid $5 instead of $2,000 for the same task. On the other hand, the workers in this case who might had previously earned six figures, were content to be able to apply their skills again.

8.2.2 Motivations of the Crowd

To understand the demographics and motivations of the workers on Mechanical Turk, Panagiotis Ipeirotis conducted a survey in 2010 [40]. His first finding was that 47% of the

workers are from US while 34% are from India. Since the workers from these two countries represent the majority of the workers, he then focused on comparing the responses from these two groups. He prepared the questions in Figure 8-5 to understand their motivations. Figure 8-6 shows the survey responses.

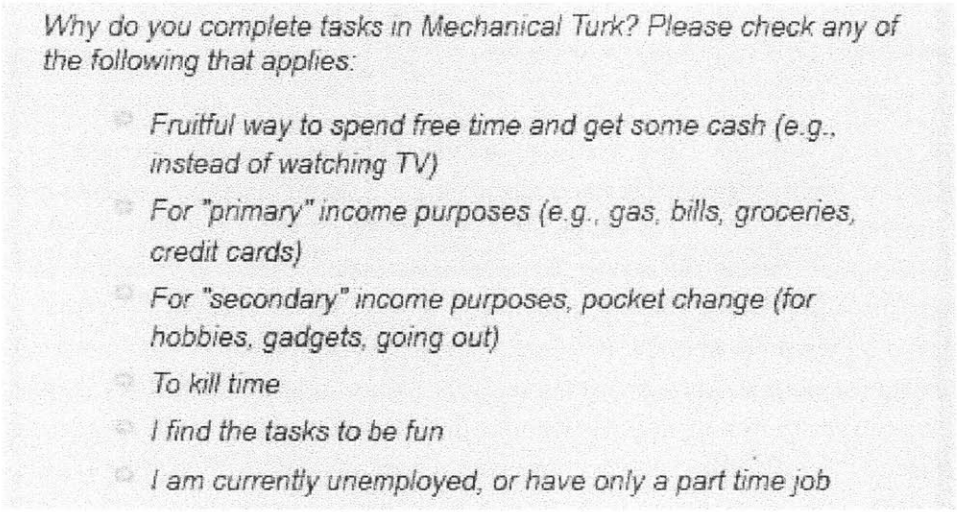


Figure 8-5: Survey Questions on Motivations

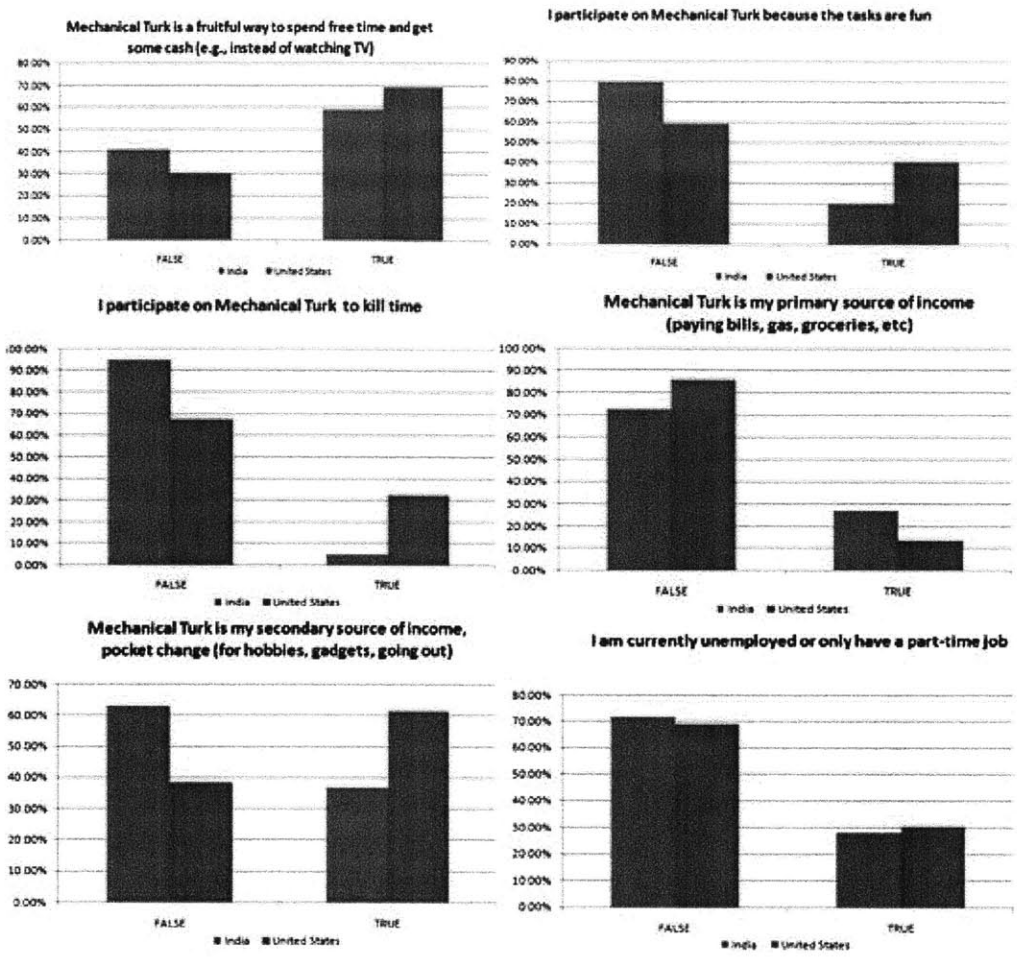


Figure 8-6: Survey Responses on Motivations

As shown in figure 8-6, the motivations vary between US and Indian workers. The primary reason is the difference in their household income, as shown in figure 8-7.

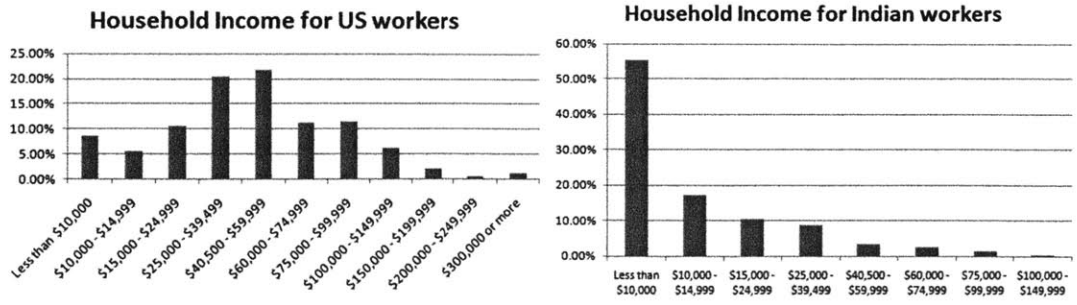


Figure 8-7: Household Income of US and Indian Workers

The Indian workers have a much lower income than their US counterparts. So while many more US workers see Mechanical Turk as a secondary source of income or simply a productive way to kill time or apply their skills, many Indian workers see it as their primary or significant source of income. The motivations of the crowd thus can depend heavily on their locations and so sometimes the crowd cannot be analyzed as a whole.

8.3 Conclusion

There are many tasks that cannot be automated and must instead by performed by humans. These tasks are often simple enough for anyone with reasonable intelligence and computer skills to perform. Rather than crowdsourcing these tasks themselves, it's a lot less troublesome for companies to tap the crowd through marketplaces such as Mechanical Turk. On the other hand, although the payments are often very tiny with regards to the standards of livings in US, they represent a respectable income in poorer countries such as India. Since these marketplaces can serve both parties well, they are very successful. However, their usefulness is limited by the skills of the workers the marketplace can attract. For more complicated tasks that require more skills or knowledge, specialized marketplaces are needed. These marketplaces for professional services will be examined in the next chapter.

9 Professional Service

9.1 Task Description

The previous chapter discusses the crowdsourcing of simple tasks that almost anyone can perform. This chapter will explore the crowdsourcing of more technical tasks that require professional experience or qualifications, for instance software development and testing. Prior to crowdsourcing, many companies have already started outsourcing their IT and software related operations to countries such as India and China, because these countries have a lot of skilled and relatively inexpensive labor. However, outsourcing often requires some time and efforts to set up and maintain. This overhead makes crowdsourcing a more ideal alternative when the tasks are relatively short-termed and don't require much maintenance. Since these tasks require more skills, the companies pay a lot more for them than the routine tasks mentioned in the previous chapter. As a result, the companies are also more selective on qualifications and previous experience. In fact, not only do the workers have to compete on qualifications and experience, they often have to compete on price as well. For instance, on vWorker (formerly Rent a Coder), companies would hold virtual auctions to decide which of the many freelance programmers it should assign the task to. In addition, since many programmers come from countries with lower standards of living, and thus are willing to accept lower payment, competition is very fierce. However, the competition is still probably not as intense as on TopCoder.

9.2 Example (TopCoder)

9.2.1 About the Website

Founded in 2001, TopCoder is a company that specializes in holding programming competitions. Every couple weeks, young talented programmers in the world would compete in TopCoder's SRM (single round match), a 2-hour competition that tests the programming and debugging skills of the contestants, as well as their knowledge of algorithms. There are other types of competitions as well, all related to software development and testing. By holding these competitions, TopCoder is able to build a community consisting of 300,000 members [41], and generating $19 million of revenue by 2007 [23]

TopCoder has several ways to make money with this community. One of them is by helping companies exploit this pool of talent through crowdsourcing their projects. For instance, when a 3rd party wants to crowdsource a software component, TopCoder can first hold a design competition for that component. Contestants can then submit their entries and the best submission will be selected and the winner will be rewarded. Then

there might be a separate development competition to implement the chosen design. Again, the best submission will be selected. There are other types of competitions as well, including software specification, architecture, assembly and testing. Since these competitions actually represent different stages of software development, TopCoder can help a company crowdsource a project phase simply by holding a corresponding competition for it. By breaking up a task into smaller pieces, the crowdsourcing can be carried out much more effectively by allowing the contestants to perform what they are best at. For instance, the best design might be implemented by someone else, whose implementation will be tested by yet another person. Figure 9-1 shows some active contests on TopCoder.

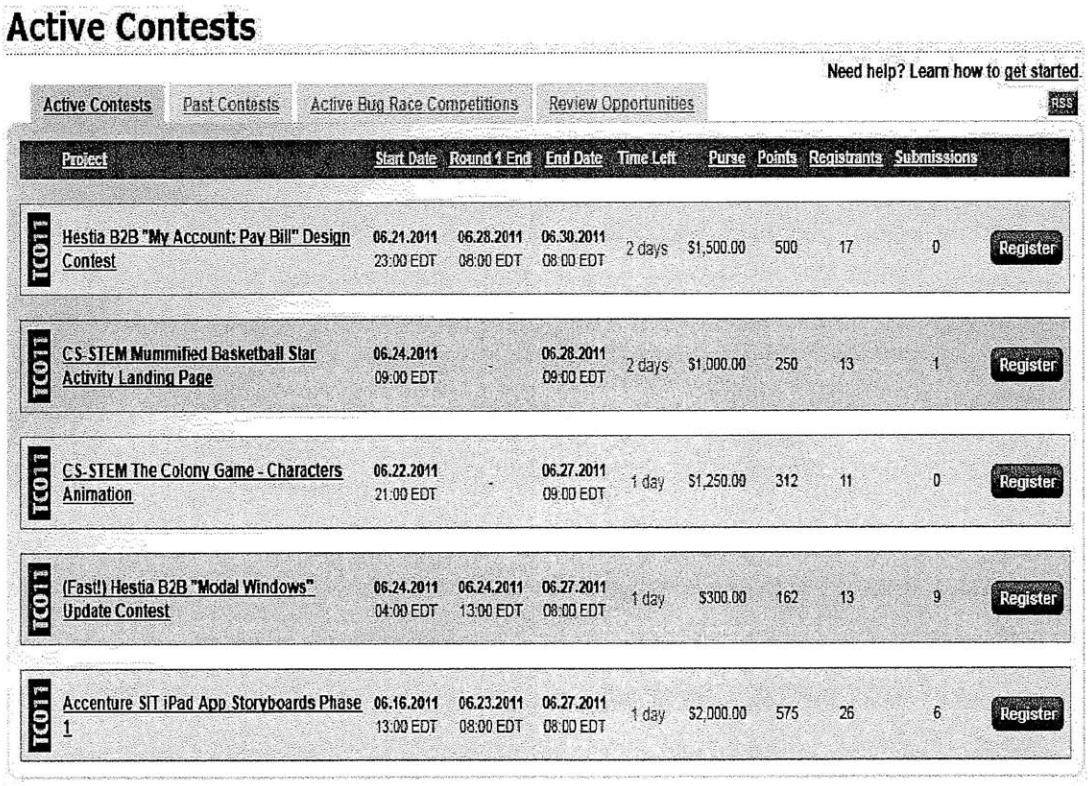
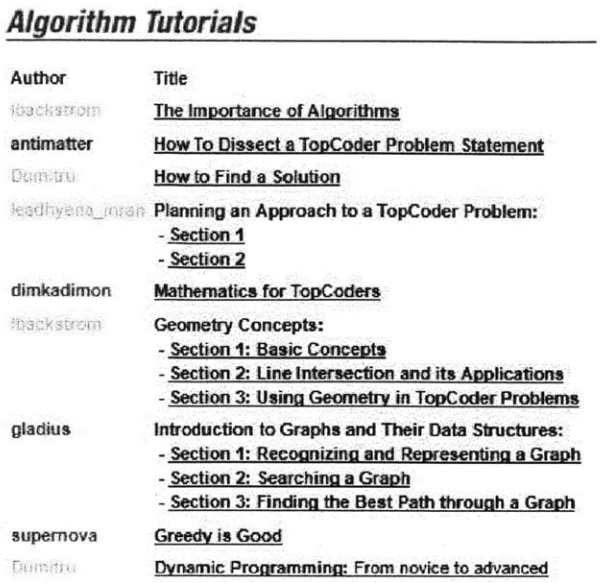


Figure 9-1: List of Contests on TopCoder

To make the website both a fun place to compete and learn, TopCoder also pays members to write various programming articles so that members can learn from each other. The reward is typically less than $500 for each article, which is a decent amount considering that many members are still college students. The articles are also a great way for members to establish their status and gain recognition in the community. Figure 9-2 shows some algorithm tutorials submitted by the members.



Algorithm Tutorials

Author	Title
lbackstrom	The Importance of Algorithms
antimatter	How To Dissect a TopCoder Problem Statement
Dumitru	How to Find a Solution
leadhyena_iran	Planning an Approach to a TopCoder Problem: - Section 1 - Section 2
dimkadimon	Mathematics for TopCoders
lbackstrom	Geometry Concepts: - Section 1: Basic Concepts - Section 2: Line Intersection and its Applications - Section 3: Using Geometry in TopCoder Problems
gladius	Introduction to Graphs and Their Data Structures: - Section 1: Recognizing and Representing a Graph - Section 2: Searching a Graph - Section 3: Finding the Best Path through a Graph
supernova	Greedy is Good
Dumitru	Dynamic Programming: From novice to advanced

Figure 9-2: Algorithm Tutorials Submitted by Members

9.2.2 Motivations of the Crowd

Since only the winners of the competitions are rewarded, the contestants often receive nothing for their hard labor. However, since the work is treated as a competition, these contestants often find the activities exciting and so the actual rewards are only secondary. Instead, winning the competitions and being acknowledged are often their primary concerns, because that can potentially brighten their career prospects and also given them recognition in the community. Their motivations are thus very similar to those on Threadless.

To satisfy their desire for recognition, TopCoder would feature the top contestants prominently. For instance, figure 9-3 shows a section featuring the top 10 contestants in design contests and another section showing the "Coder of the Month". TopCoder would also archive these achievements. Figure 9-4 shows the recent members selected as "Coder of the Month".

Figure 9-3: Top 10 in Design Contests & "Coder of the Month" on TopCoder

Design Coder of the Month	
Handle	**Month**
argolite	05/2011
saarixx	04/2011
BLE	03/2011
MiG-29	01/2011
Mozgastik	11/2010
gevak	10/2010
tomaM	09/2010
caru	08/2010
mekanizumu	07/2010
AleaActaEst	06/2010
Standlove	05/2010
saarixx	04/2010
argolite	03/2010
moonli	02/2010
flying2hk	01/2010

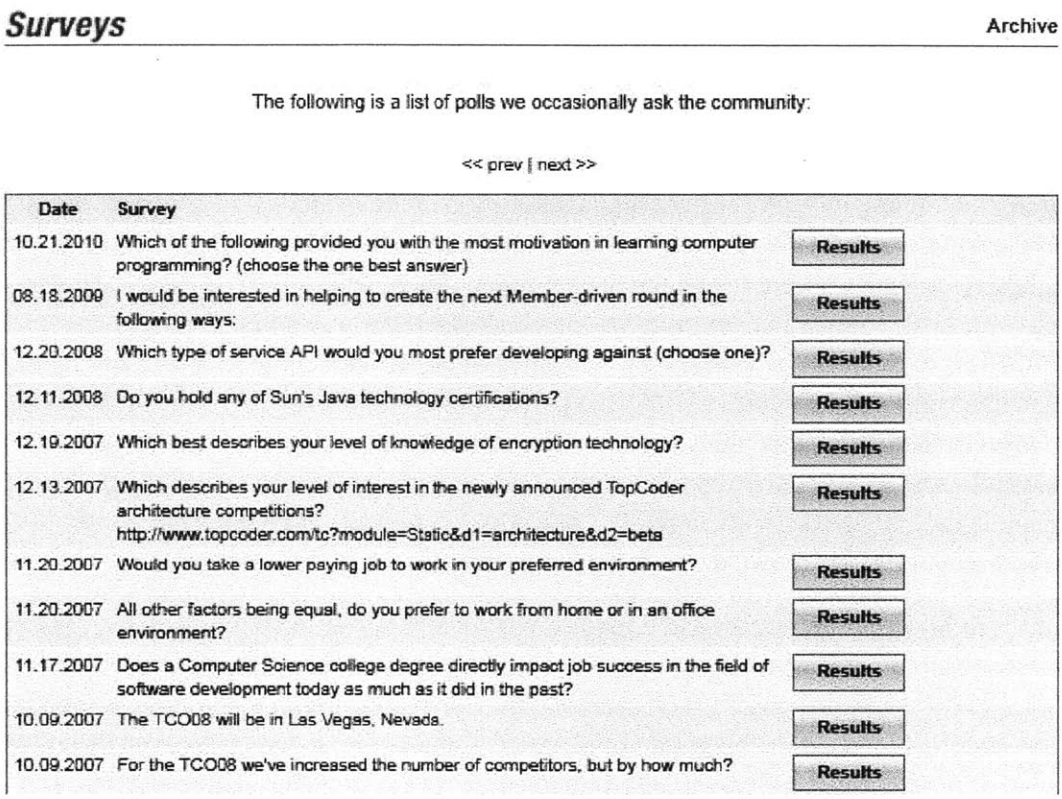
Design Coder of the Month

TopCoder reserves the title of Coder of the Month for any member who has had an outstanding month of competition. These members may have had an exceptionally high rating increase for the month, earned a large amount of winnings, or has had an impressive winning streak.

View the Classic Coder of the Month Archive

Figure 9-4: Recent Members Selected as "Coder of the Month"

TopCoder understands that its core asset is the strong community of programmers that it has built. To better understand and serve the members, TopCoder frequently polls the members. Figure 9-5 shows some recent surveys conducted by TopCoder.



Surveys Archive

The following is a list of polls we occasionally ask the community:

<< prev | next >>

Date	Survey	
10.21.2010	Which of the following provided you with the most motivation in learning computer programming? (choose the one best answer)	Results
08.18.2009	I would be interested in helping to create the next Member-driven round in the following ways:	Results
12.20.2008	Which type of service API would you most prefer developing against (choose one)?	Results
12.11.2008	Do you hold any of Sun's Java technology certifications?	Results
12.19.2007	Which best describes your level of knowledge of encryption technology?	Results
12.13.2007	Which describes your level of interest in the newly announced TopCoder architecture competitions? http://www.topcoder.com/tc?module=Static&d1=architecture&d2=beta	Results
11.20.2007	Would you take a lower paying job to work in your preferred environment?	Results
11.20.2007	All other factors being equal, do you prefer to work from home or in an office environment?	Results
11.17.2007	Does a Computer Science college degree directly impact job success in the field of software development today as much as it did in the past?	Results
10.09.2007	The TCO08 will be in Las Vegas, Nevada.	Results
10.09.2007	For the TCO08 we've increased the number of competitors, but by how much?	Results

Figure 9-5: Some Recent Surveys on TopCoder

9.3 Conclusion

TopCoder has built a community of talented programmers by hosting competitions. Furthermore, it's able to help clients crowdsource their projects by encapsulating the requirements in some of the competitions. The result is that the clients can pay significantly much less, while the workers have fun in the process in addition to earning some cash. This crowdsourcing model is very similar to the idea generation one that Get a Slogan implemented. However, the tasks on TopCoder require much more time and skills, and so the penalty of having a submission that isn't selected is also much greater. Fortunately, TopCoder treats these tasks as contests, and so the contestants would only feel that they have lost a contest rather than being unpaid for work they have done. Companies that try to leverage crowdsourcing might thus find it helpful to masquerade the tasks as competitions or other fun activities so that the crowd would perform the work out of intrinsic motivation.

10 Conclusion

This paper explores some tasks commonly crowdsourced through the help of the internet, and some representative websites that facilitate these types of crowdsourcing. The tasks have different characteristics, and so the crowd that are attracted to them also have different demographics. For instance, a large portion of the content generators are teens, while a significant number of problem solvers are experts and PhD holders. The tasks themselves cannot account for all the demographic differences, however, because the motivations for completing the tasks are also important. For example, given the routineness of the tasks available on Mechanical Turk, workers who perform them tend to be unemployed people who are willing to perform these tasks even for a tiny amount of money. On the other hand, many users on Threadless are potential art designers who cherish the site for the opportunity to express themselves and be recognized for their artistic talent. Similarly, many users on TopCoder are students and young computer professionals who are drawn to the website for the opportunity to compete and win.

Human motivations are varied and complex. However, as examined in this thesis, they generally fall into one of these categories: (1) monetary incentive (2) love of the activity (3) desire for recognition and (4) closeness to the community. Which one is the dominant motivation will depend on the nature of the task. For instance, money is usually the main incentive for tasks that are boring and uninteresting. For tasks that require creativity or are truly engaging, love of the activity is already a significant motivation already. On the other hand, tasks that are challenging or require a lot of skills will attract the crowd with strong desire for recognition. Finally, a vibrant and supportive community can serve as a magnet for continuous contributions. It's very important to identify the characteristics of the task being crowdsourced and the associated crowd in order to design the most relevant incentives.

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