IDEA CONTESTS:

HOW TO DESIGN FEEDBACK FOR AN EFFECTIVE CONTEST

A Dissertation

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By

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Myself when young did eagerly frequent

Doctor and Saint, and heard great Argument

About it and about; but evermore

Come out by the same Door as in I went[1].

- *Omar Khayyám* (1048-1131)

[1] Translated by: *Edward FitzGerald* (1809-1883)

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Abstract

Inviting the public or a targeted group of individuals to submit their ideas or solutions to a specific problem or challenge within a predefined period of time is called an “idea contest.” Idea contests are the straightforward mechanism to solicit and leverage the innovation and the intelligence of thousands of individuals. With the advent of the Internet, companies can easily organize idea contests with an easy access for anyone to participate from anywhere around the world. A contest organizer needs to design a contest so that more individuals are encouraged to participate, generate more innovative ideas/solutions, and to remain active throughout the contest. In my dissertation, I explore the effects of idea contest parameters –such as award size and structure, contest duration, the visibility of submissions, and the feedback- on the participation, motivation, and performance of individuals before and after joining a contest.

Feedback, as the primary focus of my dissertation, is a less studied parameter in the context of idea contests. In my first essay, I investigate the relative importance of each contest design parameter, particularly feedback, with each other in motivating individuals to participate in a contest. In this regard, I both ran a conjoint study among real designers and collected online data from 99designs website. Feedback plays an important role in increasing the likelihood of participation and the participation rate for an idea contest. In the second essay, I explore the effect of two different types of feedback –absolute vs. relative- on the performance of participants during an idea contest. By running a real contest with participants from a major public university, I measured how participants in an idea contest react to different types of feedback. The likelihood of revising ideas as well as the quality of ideas submitted were the primary dependent variables in this field experiment.

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Chapter 1

Idea Contests: Literature review and research gaps

1 Introduction

In order to stay competitive, companies need to find promising new ideas which could be generated inside of a company by its pool of experts, or be found from outside company's boundaries (Chesbrough, 2006). Nowadays, companies no longer rely only on their internal expertise, but rather look into a large and diverse pool of individuals, who might have better ideas, to dig up new opportunities. They integrate customers into the early stages of innovation process, considering them sources of ideas and solutions for new products or even problems a company faces (Leimeister, Huber, Bretschneider, & Krcmar, 2009). Accessing such a large pool of individuals would be less costly than running internal projects by using only company experts (Bockstedt, Mishra, & Druehl, 2011; Yang, Chen, & Pavlou, 2009).

Inviting the general public or a targeted group of individuals to submit their ideas or solutions to a specific problem or challenge within a predefined period of time is called an "idea contest," "idea competition," "innovation contest," or "innovation tournament" (Ebner, Leimeister, & Krcmar, 2009). An idea contest is a well-established mechanism and straightforward way to solicit innovation and leverage the intelligence of thousands of individuals (Boudreau, Lacetera, & Lakhani, 2011; Terwiesch & Ulrich, 2009; Terwiesch & Xu, 2008). In the literature, other similar terms such as "Customer Idea Contests" (CIC) (Mueller, 2006), "research contest" (Taylor, 1995), "broadcast search" (Jeppesen & Lakhani, 2010), or "delegated search" (Erat & Krishnan, 2011) have been used, but in this dissertation I will use "idea contest."

The structure of idea contests is common in practice. The organizer of an idea contest, who could be any individual, firm, public or private organization, or any non-profit (Ebner et al., 2009) specifies a problem that is seeking a solution, and then invites undefined group of individuals to participate and submit their solutions. In most cases a reward is set for the best submission and the winner of a contest. The contest organizer is also called “sponsor,” “seeker,” “problem holder,” or “contest holder.” Likewise, any individual who is willing to enter an idea contest is called “solver,” “searcher,” “contestant,” “participant,” or “worker.”

There are some common stages in most idea contests (Figure 1.1):

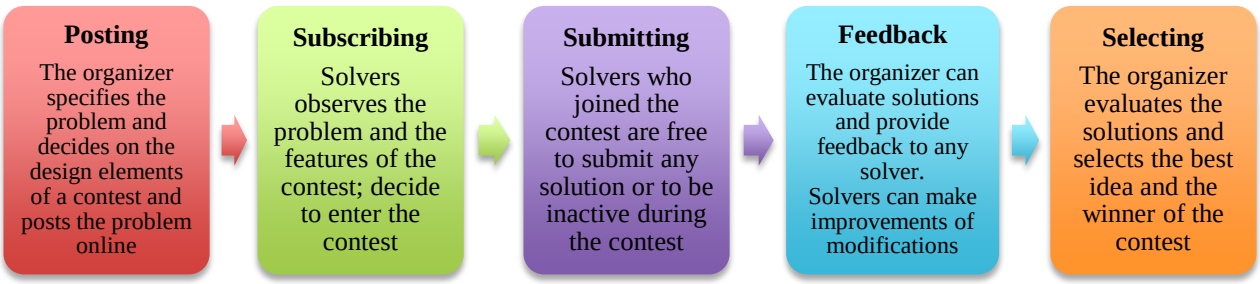
1) *Posting*: A contest organizer decides which problem he is looking for solution; determines an award for the winner, sets the duration of the contest, and defines other details. Then, he posts the problem (typically online) and invites individuals to participate.

2) *Subscribing*: Individuals will receive notification about the contest. They evaluate contest characteristics such as the definition of the problem, award size etc., and decide whether to enter that contest or not.

3) *Submitting*: after joining the contest, individuals can submit their ideas or solutions within the contest period. In practice, participants are free to submit more than one solution during a contest.

4) *Feedback*: the contest organizer can evaluate submissions during a contest and communicate with participants about their submissions. Participants, also, may have an opportunity to make some modifications or improvements to their submissions before the contest ends.

5) *Selecting*: after a contest is over, the contest organizer evaluates and screens all the submissions by her own expertise or by using a panel of experts, based on some defined criteria[1]. Then, submissions are ranked and the best one is selected as the winner of the contest. In practice, selection process could be very time consuming and can take a lot of effort, depending on the number of ideas generated in a contest.



Source: Adapted from Yang et al. (2009)

Figure 1.1: Common stages in idea contests

With the advent of the Internet, companies can easily organize an idea contest with an easy access for individuals to participate from anywhere around the world. By running idea contests, companies can invite a large and diverse group of people with various level of expertise and skills (Chris Zhao & Zhu, 2014). Contests could be held directly by a company itself, or by a third-part provider (Zheng, Li, & Hou, 2011). For instance, an idea contest was held by Netflix[2], in which anyone who could come up with an algorithm to improve Netflix's recommendation system by at least 10 percent could win $1 million dollars (Afuah & Tucci, 2012). InnoCentive[3] is operating as a host and

[1] Various criteria are used to evaluate the quality of ideas, such as originality, novelty, usefulness (Mueller, 2006). Piller & Walcher (2006) define the novelty or originality of a submission, usefulness (expected customer benefits and number of expected beneficiaries of the idea), and the level of elaboration of the submitted idea, as selection criteria.

[2] See www.netflixprize.com

[3] See www.innocentive.com

marketplace of idea contests. It offers any firm having complicated science problems to post their challenges on the platform[4] with a cash prize defined for the best solution (Morgan & Wang, 2010). 99designs[5] provides a platform in which designers can submit their ideas in response to a customer's design request, and winners receive cash prizes (Boudreau & Lakhani, 2013). More than 300,000 design contests have been held on 99designs, in various categories such as logo, website, business card, or book design.

The contest organizer may receive many submissions by the end of a contest. By filtering and screening submissions, the number of submissions will be narrowed down to fewer ones (Figure 1.2). Filtering levels depend on the nature of a contest and a company's decision. The ultimate goal is to find the best solution, which can solve a predefined problem.

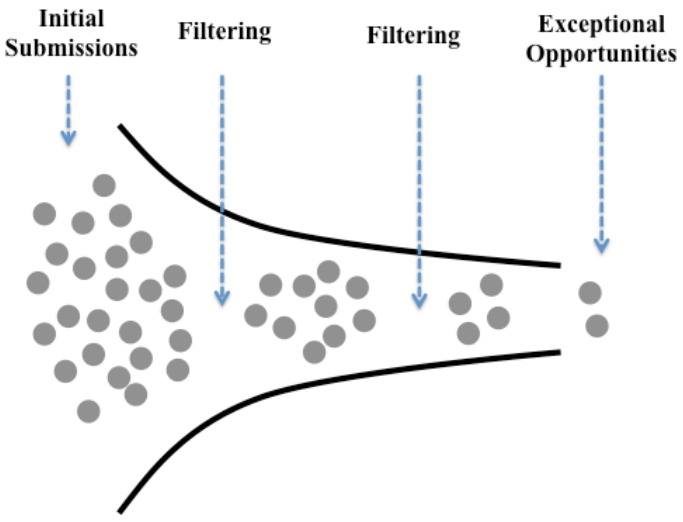


Figure 1.2: Filtering the submissions to find the best solution

[4] "Traditionally, software was developed for specific platforms, such as Windows, Linux, or Mac OS. Today, developers build Web-based applications that run on the Web, that are completely independent of the user's actual computer operating system." A platform is a system which could be programmed and customized by users to target specific needs ("What is web as a platform? Webopedia Definition," n.d.).

[5] See www.99designs.com

Designing an effective idea contest which encourages individuals to participate is very important for researchers (Füller, 2010; Howe, 2008; Leimeister et al., 2009; Morgan & Wang, 2010; Terwiesch & Ulrich, 2009; Zheng et al., 2011; Zwass, 2010). However, an optimal design is "a hard problem in that no solution works over all environments and the particular context needs to be considered" (Boudreau, Lakhani, & Menietti, 2016). To receive adequate and acceptable submissions from individuals, a contest organizer faces some questions with respect to how to design an idea contest (Boudreau & Lakhani, 2013; Wooten & Ulrich, 2013).[6]

Why is designing an idea contest so important to an organizer? First, since typically idea contests are announced in an open call, an organizer needs to have an attractive enough contest to draw the attention of potential participants. Having more participants in a contest increases the quantity and diversity of solutions (Terwiesch & Xu, 2008), which leads to finding better solutions to a problem (Yang et al., 2009), and few exceptional solutions (Terwiesch & Ulrich, 2009). Thus, attracting more participants would be beneficial for a contest organizer and this is only possible by designing a better and more effective contest. Second, the design of an idea contest may impact the performance and behavior of individuals within a contest. The contest organizer must encourage individuals to participate and generate better solutions, and to remain active throughout the contest.

[6] Adamczyk, Bullinger, & Möslein (2012) clustered five research categories that idea contests are studied in the literature: economic perspective, management perspective, education focus, innovation focus, and sustainability focus. In each category, the past research has been shown along with the future paths to investigate more on how to design an effective idea contest.

All in all, the goal in any idea contest is to attract more participants, to motivate them to generate acceptable solutions, and to increase the quality of their submissions (Mueller, 2006). Thus, the success of an idea contests is measured based upon those individuals who join the contest and contribute (Adamczyk, Bullinger, & Möslein, 2012). In order to find out how to design an effective idea contest, we need to fully understand four important questions (Figure 1.3):

1) Why individuals are willing to enter an idea contest? What are their motivations?
2) How does the design of an idea contest influence their decisions to enter?
3) How does the design impact the performance of individuals during a contest?
4) How does the design make individuals behave differently within a contest?

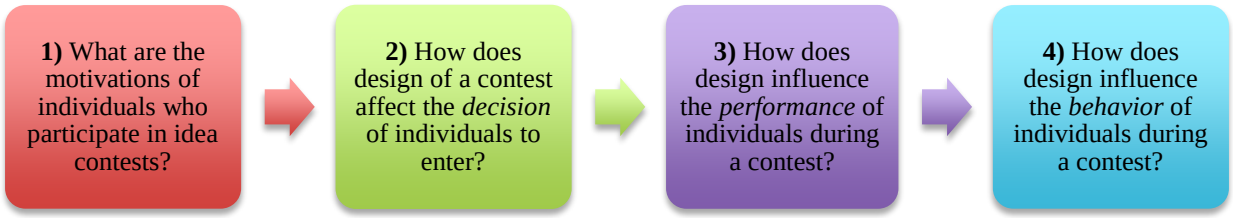


Figure 1.3: Four questions that help to design a better idea contest

To answer the first question, we need to explore motivation theories and find out what motivations would drive individuals to participate in an idea contest.

2 Motivation Theories

Without understanding what motivates individuals to participate in idea contests, it is not possible for companies to design efficient contests (Archak, 2010; Chris Zhao & Zhu, 2014; Ebner et al., 2009). It is a key challenge, specifically, for companies using idea contests to incentivize the crowd to propose and generate creative ideas or solutions (Piller & Walcher, 2006). Individuals who participate in an idea contest have different motivations categorized into intrinsic or extrinsic type. Intrinsic motivation is defined as

performing a task or activity due to its inherent enjoyment and satisfaction, whereas, extrinsic motivation refers to performing an activity for the sake of an external outcome which is set by someone other than the individual who is doing that activity (Deci, Betley, Kahle, Abrams, & Porac, 1981; Deci & Ryan, 1975; Ryan & Deci, 2000).

By surveying real participants in idea contests, research has identified different motivations. For instance, Zwass (2010) named some of these motivations such as "altruistic desire to contribute, passion, enjoyment, self-expression, identity construction, forming personal relationships, competitive spirit, learning, self-esteem and self-efficacy, desire for social standing and recognition, peer recognition, career advancement, signaling to potential employers and investors, financial rewards."

Lakhani, Jeppesen, Lohse, & Panetta (2007) studied problem-solving contests and discovered some important extrinsic and intrinsic motivations such as winning an award money, career and professional reputation concerns, peer and work pressure, enjoyment of solving a problem, being the first to solve a challenge, beating other solvers, or even having a free time or capacity. Leimeister et al. (2009) relating to sport competitions identified some important incentives that individuals have in idea contests such as learning (acquiring knowledge from peers and/or experts), direct compensation (i.e. prize), self-marketing (an incentive that enables individuals to present themselves and their skills/knowledge), and social motives (appreciation by peers and/or the sponsor).

Some research identified different categories for the motivations of individuals. Ke & Zhang (2009) based on the *self-determination theory*, categorized such motivations and put those into four different types: *external motivation* (i.e. extrinsic motivation), *identified extrinsic motivation* (i.e. social identification), *integrated extrinsic motivation*

(i.e. ideology conviction), and *intrinsic motivation*, which affect the effort intensity of individuals, make them reveal their knowledge in an idea contest. Likewise, Chris Zhao & Zhu (2014), introduced the following categorization of motivations: *External motivation*, *Introjected motivation*, *Identified motivation*, *Integrated motivation*, and *Intrinsic motivation*.

Nonetheless, some research has been done to investigate which type of motivation is mostly driving participation in idea contests. For instance, Zheng et al. (2011) empirically studied the role of intrinsic motivation in individuals' participation and found that intrinsic motivation is more important than extrinsic motivation. Contest participants in their study were not driven fully by financial rewards. However, other research shows that winning an award is the most important motivation for solvers to participate in problem-solving contests (Lakhani et al., 2007).

Keeping in mind that individuals have different and distinct types of motivations, companies should have the right mixes of intrinsic and extrinsic motivations in order to increase the participation of individuals (Leimeister et al., 2009). How can companies induce the right mixes of motivations? Designing the features of an idea contest along with the functionality of a platform where the contest could be held, will answer this question. For example, since the extrinsic motivators could be in the form of monetary or non-monetary rewards like valuable goods or services (Boudreau, Lacetera, & Lakhani, 2008; Brabham, 2010; Piller & Walcher, 2006), designing appropriate reward structure is crucial. Moreover, when social and intrinsic motivations could be triggered through interaction of participants in a community of individuals (Bullinger & Moeslein, 2010;

Piller & Walcher, 2006), designing this functionality on an online platform would benefit a contest organizer.

Little research has been done to show that not only the rewarding system is important, the tasks and features of a contest are impactful. Based on the *job design theory*, Zheng et al. (2011) proved a positive association between a contest task design (e.g. autonomy, variety, and analyzability) and participation motivation. In their research, the significant impact of intrinsic motivation on individuals' participation suggests that developing contest tasks and features should be in a way to increase the level of autonomy and competency among individuals. This result would help an organizer to design a contest and a required online platform.

In the next section, I will review common design features of an idea contest and go over the available studies for each one. I show that how different design features of a contest influence the *decision to enter* a contest –also known as *participation intent*- as well as *performance* and *behavior* of contestants within a contest. Further research, yet, needs to be done to find the answers of the following questions:

1) Do the motivations of individuals change over time within an idea contest?

2) Which type of motivation (intrinsic vs. extrinsic) is induced by each design feature? And as a result, does either intrinsic or extrinsic motivation affect each other?

3) How does each design feature influence the effort and performance of individuals within a contest?

3 Idea Contest Design Parameters

"Design parameters," also known as "design measures," "design elements," or "design characteristics," which I will use only design parameters in this dissertation, have

effects on how individuals perceive incentives, and on their decision to participate in idea contests (Leimeister et al., 2009).

Leimeister et al. (2009) describe some common characteristics of idea contests as follows:

1) *Task specificity*: which addresses the scope of a problem that a company is looking for solutions;
2) *Degree of idea elaboration*: which addresses the level of elaboration for participants' ideas;
3) *Organizational appearance*: which displays the way participants can submit their ideas;
4) *Time line*: which shows the start and the end of a contest along with the duration of submission phase;
5) *Incentives*: which is the prize offered to the winner(s);
6) *Target group*: which exhibits participations' qualification.

Bullinger & Moeslein (2010) after analyzing fifty-seven real innovation contests categorized additional elements for idea contests:

1) *Media*: idea contests are run online, offline, or mixed. However, with the help of Internet, online media is the best way to run such contests. Media is also called *nature of competition* (Ebner, Leimeister, Bretschneider, & Krcmar, 2008), in the literature;
2) *Organizer*: which could be any individual, company, public/private organization, or non-profit;

3) *Task/Topic specificity*: the topic of a contest indicates how specific the task is, ranging from low to high specific;
4) *Degree of elaboration*: an organizer can ask only for the rough ideas, sketches, or for full concepts and prototypes;
5) *Target group*: an organizer can call unspecified (open to everyone) or specified (limited to a geographic location or specific age, expertise, etc.) group of individuals to join a contest;
6) *Participation*: which could be individually or in teams;
7) *Contest period*: each contest has a predefined duration which varies from very short term, short term, to long term, or very long term;
8) *Reward system*: which could be fostering extrinsic motivation (in the form of monetary award such as money; or non-monetary award such as valuable goods) or intrinsic motivation (which is social motivation, reputation among peers, and etc.), or mixed;
9) *Community functionality*: which is the community application and tools for the interaction and communication among participants;
10) *Evaluation*: which could be based on self-assessment, peer reviews, by jury of experts, or mixed.

In addition to above design parameters, Adamczyk et al. (2012) introduced some novel elements such as:

1) *Attraction*: which is to notify potential participants to enter a contest, that can be organized online through websites or blogs, or offline using word-of-mouth (or both ways);

2) *Facilitation*: which is encouraging participants to contribute and stay active with the help of moderators, professionals, or even peers;
3) *Sponsorship*: which is getting financial or emotional assistance from outside of a contest;
4) *Contest phases*: which is the number of rounds in a contest. Contests could be run in one or multiple rounds;
5) *Replication*: the same idea contest could be repeated biannually, annually or even less or more frequently.

The research on the effect of each design parameter on the *participation*, *performance*, and *behavior* of participants is growing interest. In the following, I review available research on this topic.

4 Prior Research on Design Parameters in Contests

4.1 Award Size and Structure

A rich body of literature has been developed in social and psychology science investigating the effect of extrinsic motivation, e.g. monetary reward, on the intrinsic motivation of individuals. The same idea has been tested in innovation competition context, where the research shows that higher reward size will attract more individuals (Lee, Chan, Ho, Choy, & Ip, 2015; Yang et al., 2009). Higher rewards not only may increase the number of submissions, submissions with higher quality would increase as well (Archak, 2010; Liu, Yang, Adamic, & Chen, 2014).[7] However, greater amount of award could be detrimental since it induces so much effort that participants must be compensated (Connelly et al. 2014).

[7] Higher reward attracts better and experienced participants (Liu, Yang, Adamic, & Chen, 2014).

DiPalantino & Vojnovic (2009) found that participation rate in idea contests would increase logarithmically as a function of the reward size offering by an organizer. They posit that below a certain amount of reward size, individuals would not participate in contests; high skilled individuals only choose contests with higher award size, while lower skilled ones participate more broadly. Some studies, however, demonstrate that monetary award is not an important incentive for individuals in idea contests and higher award size may not lead to higher number of submissions (Yang, Adamic, & Ackerman, 2008a).

In idea contests[8], when the contestants are risk-neutral, the winner-takes-all award structure would be optimal. This structure encourages contestants with higher level of expertise to exert more effort while multiple-prize structure would attract individuals with lower level of expertise as well (Terwiesch & Xu, 2008).[9] In contests with large number of participants, due to externality effect and diversity, fixed-price award structure is preferable, while in small contests, performance-contingent award[10] would lead an organizer to have better solutions, more profits, and a more efficient contest (Terwiesch & Xu, 2008).

Archak & Sundararajan (2009), based on a game theoretic model, demonstrate that contest organizer depending on the risk aversion of participants should allocate the prize of a contest among winners. For instance, when participants are risk-neutral, the organizer should have a single prize that goes to the top participant. However, while the participants are risk-averse, it is optimal to offer multiple prizes, which "the optimal prize

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[8] In *ideation projects*

[9] In *expertise-based projects*

[10] For *expertise-based projects* performance-contingent award may not work, but for both *ideation* and *trial-and-error* projects, performance-contingent award is efficient.

amounts exhibit the exponentially decreasing marginal utility pattern and each new prize should have approximately twice higher marginal utility than the prize immediately above it."

In a maze-solving experiment, Freeman & Gelber (2010) examine behavior of participants under three different structures of prize in the experiment, when a performance feedback was present (or absent). They used three prize structures as piece rate (independent of participants' performance), single large prize, and multiple differentiated prizes. The output of experiment was lowest under piece rate, higher under single prize, and highest under multiple prizes. When participants found out about how well others and they performed in the first round of experiment, low ability individuals increased effort and performance under multiple-prize condition –than with single prize. Moreover, high ability individuals performed similarly in both prize structure conditions, and in the absence of performance feedback, the output of low and high ability individuals were quite the same in both conditions. Moreover, when performance feedback was not provided low ability individuals did not give up on winning a single prize.

Furthermore, Erat & Krishnan (2011) based upon a theoretical model point out three conditions under which a seeker, in a delegated search, benefits from more approaches that individuals take to solve a problem, and thus, should employ multiple award structure: 1) when the seeker has uncertainty about the quality of solutions, and 2) has moderately specified the problem to solvers (not fully or poorly specified), and 3) the problem allows divergent solution approaches.

In economics literature, the research demonstrates how to design an efficient contest[11] by modifying the prize scheme (Riis, 2010; Sisak, 2009). For instance, single prizes are efficient in contests when individuals are risk-neutral and symmetric, but for risk-averse and asymmetric contestants multiple prizes would be optimal. Furthermore, having more participants in a contest makes the multiple prizes scheme optimal. Fullerton, Linster, McKee, & Slate (2002) studied two types of prize structures in their research: first-price auctions and fixed prizes. They tested that auctions are better than fixed prizes when there are only two competitors and they follow symmetric strategies.

Some research has been done on award size and structure of sales contests (Kalra & Shi, 2001; Lim, Ahearne, & Ham, 2009; Murphy, Dacin, & Ford, 2004). However, there are some differences between sales contests and idea contests. First, the goal in sales contests is to maximize the effort of all salespersons while in idea contests the value of highest performance is supposed to be maximized. Second, participation in sales contest is mandatory but in idea contests individuals voluntarily participate and contribute to a contest. Third, the outcome and effort of individuals in sales contests is measurable whereas in idea contests the quality of submissions is subjective and measured by a jury of experts, and does not depend on how much effort is put (Boudreau et al., 2011; Morgan & Wang, 2010; Terwiesch & Xu, 2008).

Award size and its structure is the most important incentive for individuals in idea contests. However, more research should be done, empirically or theoretically, to investigate:

[11] Small number of economic papers applied the R&D and innovation setting in their studies to find the optimal design of an innovation contest (Che & Gale, 2003; Fullerton & McAfee, 1999).

1) How does the structure of rewarding system (fixed-price, multiple-price, performance-contingent award and etc.) affect the decision of individuals to enter a contest? Which structure attracts more individuals?

2) How does reward structure impact the type of individuals (in terms of experience and skill) who may join a contest? How do more experienced and skilled individuals react to different reward structures before joining a contest?

3) How does the size and structure of a rewarding system influence the effort and performance of individuals (with different level of experience and expertise) during a contest? Do contestants behave differently under different reward systems during a contest?[12]

4) Does the size and structure of reward affect the intrinsic motivation of individuals (with different level of experience and expertise) and how?

4.2 Intensity of Competition

The research has shown that competition triggers the sense of challenge (or excitement) in individuals, promotes their intrinsic motivation, and encourages them to participate (Tauer & Harackiewicz, 2004). On the contrary, competition could undermine the intrinsic motivation and lower the rate of participation (Deci et al., 1981). In practice, sponsors encourage large number of individuals to enter a contest. However, the economic research shows that restricting the entry would be optimal since with greater participation, the likelihood of winning for every individual will be relatively small and the investment of winner will be low (Che & Gale, 2003). Likewise, Taylor (1995) points out that the design of contest would be optimal if the contest organizer offers a proper

[12] I investigate this question based on few research studies in the next section.

prize, limits the number of participants, and charges each individual an entry fee in order to extract all individuals surplus. In a study, Fullerton & McAfee (1999) show that the optimal number of competitor is two.

Nonetheless, Terwiesch & Xu (2008) claim that attracting more participants may lead to more diverse solutions, which mitigates the effect of underinvestment when there is a large group of individuals competing, with the optimal entry fee of zero. Boudreau et al. (2011) posit that greater intensity of competition reduces the motivation of all participants to put effort since winning would be less likely for an individual, but at the same time, adding more participants increases the likelihood of finding at least one extreme-value solution as the "parallel path effect"[13] for a contest organizer. By considering the *uncertainty* of a problem as a moderator, they believe that when the uncertainty of a problem is high, adding more competitors in idea contests increases overall contest performance, and top performers would exert more effort. Uncertainty in idea contests arises from the nature of a problem, which is not clear which approach should be taken to find its solution, the unknown return of each possible approach, and not knowing who would be the winner and how good the solutions of other contestants would be.

Particularly, individuals tend to invest less time and effort as the rivalry increases and consequently their likelihood of winning diminishes (Boudreau et al., 2011; Natalicchio, Messeni Petruzzelli, & Garavelli, 2014; Terwiesch & Xu, 2008). Nonetheless, Boudreau et al. (2016) illustrate that adding more participants in an idea contest has different effects on other participants' level of effort. For instance, since low

[13] Participants in a contest try independent experiments, independent approaches, or "parallel paths" to find the best solution for the contest problem.

ability participants are aware of their low chance of winning, increasing the level of competition has little effect on their likelihood of winning and effort level. However, a high ability participant, in order to maintain her position against other competitors, increases her level of effort when the number of competitors increases.

All in all, more research needs to be done to find:

1) How does the number of individuals already joined a contest (as an indicator of competition intensity) affect the decision of new individuals who may join a contest? How about the type of potential contestants (in terms of experience and expertise) who may join?

2) How does the change in intensity of competition during a contest affect the performance of individuals (with different level of experience and expertise)?

3) How does the change in intensity of competition during a contest make individuals (with different level of experience and expertise) behave differently during a contest?

4) How does the intensity of competition influence the intrinsic motivation of individuals (with different level of experience and expertise) during a contest?

4.3 Complexity

Zheng et al. (2011) define contest complexity as "the degree of difficulty of performing the necessary tasks inherent in a solution to the contest." They consider two dimensions of complexity: *analyzability*, which refers to "the availability of concrete knowledge about task activities and the degree of complexity of the search process in performing the task," and *variability*, which refers to "the frequency of unexpected and novel events and contingencies that may occur when an individual engages in a task."

Complexity at first might affect the intrinsic motivation positively since it increases the level of challenge or activation for individuals. Later on, the higher the complexity is, the higher the cognitive load would be, which makes the individuals lose their interest or enjoyment in doing a task (Morgeson & Humphrey, 2006; Wood, 1986).

Future research should explore the effect of complexity on the decision, performance, and behavior of individuals before and after joining a contest in greater details. Although, a contest organizer cannot change the nature of a problem, he can narrow the focus of a complex problem to reduce the time and effort of participants (MacCormack, Murray, & Wagner, 2013).

4.4 Problem Specification

The lack of adequate specification for a problem in an idea contest, would avoid individuals to participate since it diminishes the likelihood of finding a solution. On the other hand, when a problem is well specified, it is easy for the individuals to participate and find a proper solution, but they do not try other possible approaches to find better solutions. Thus, moderately specifying a problem would be a strategic way for a seeker to make individuals participate and browse more of the solution space to find an acceptable solution (Erat & Krishnan, 2011). Sometimes, companies narrow the focus of the problem in order to reduce the time and effort of the participants to find solutions (MacCormack et al., 2013). Yang et al. (2009) found that contests with shorter description would attract more individuals to participate. More research should investigate how problem specification changes the number of participants and the quality of submissions at the end of a contest.

4.5 Target Group of Potential Contestants

Many idea contests involve an open call to any and all contestants. By inviting a large unstipulated population to participate in a contest, an organizer may receive more solutions with higher diversity, which may bring the organizer better solutions as well. By increasing the number of participants, the possible approaches that they try out to discover a specific solution would increase too. However, which group of solvers could come up with successful solutions? Unlike the common expectation that individuals who are core to a problem are able to find viable solutions, those individuals who are distant in terms of technical expertise or in terms of a professional community, approach a problem with different perspectives (Jeppesen & Lakhani, 2010). Hence, although having a targeted group of individuals in terms of knowledge and expertise seems promising in finding a successful solution, external solvers (i.e., "outsiders") possess alternative approaches that could lead to a better solution.

4.6 Participation

Hutter, Hautz, Füller, Mueller, & Matzler (2011) defined a term "*communition*" as a combination of collaboration and competition for awards in an online community. Based on data from OSRAM LED contest community, they found a positive correlation between collaboration of competing individuals and the quality of submissions. Those ideas submitted through collaboration and competition demonstrated a higher chance of being ranked as better ideas. Bullinger, Neyer, Rass, & Moeslein (2010) by analyzing data from a community-based innovation contest held at a public university in Germany, found that if there is cooperation among participants in an idea contest, the innovativeness of submissions is influenced in a U-shaped form: individuals with very

low and very high “cooperative orientation” can deliver highly innovative solutions. However, future research is needed to demonstrate whether working in teams during an idea contest is better than working individually, and how the performance and outcome of teams vs. individuals differ.

4.7 Contest Duration

Contest period is the time left till the end of a contest. Longer contest duration attracts more solvers (Walter & Back, 2011; Yang et al., 2009) since in short period of time it might be hard for solvers to propose solutions. On the other hand, the longer a period of a contest is, the more likely other participants are able to join a contest. Hence, contest duration may indicate a possible level of competition in a contest. According to the research, solvers prefer contests with fewer participators in order to increase their chance of winning (Yang, Adamic, & Ackerman, 2008b). Therefore, longer duration of a contest could be a negative signal for potential solvers as well.

Future research should address how the duration of a contest influences the decision of individuals to enter a contest, and their performance and strategic behavior during a contest.

4.8 Community Functionality

Community functionality is the application of a platform, where contest is running, that supports communication and interaction among participants, facilitates information exchange, and helps participants to provide feedback and comments on each other submissions (Piller & Walcher, 2006). Ebner et al. (2009) point out that proper communication tools and trust-supporting elements help an organizer to build a

successful idea contest. Feedback mechanism could be set up in order to cultivate an environment that is more favorable to sharing and exchanging information.

Feedback can motivate individuals to contribute more in idea contests (Yang et al., 2009), and lack of such interaction may lead to a lower sense of community among individuals (Djelassi & Decoopman, 2013; Lakhani et al., 2007). However, Leimeister et al. (2009) found that appreciation from other contestants is less significant for individuals in idea contests because it is more important for them to receive appreciation from the "right" persons who could be the judges and/or the contest organizer.

In idea contests, a contest organizer decides whether to provide feedback to any participant during a contest. It is a managerial decision that might affect the participation of individuals as well as their performance of generating innovative ideas (Wooten & Ulrich, 2014). Nonetheless, future research should investigate

1) How does the community functionality affect the decision of individuals to enter a contest?

2) How does feedback (either peer feedback or the judges' feedback) influence the performance of individuals during a contest?

4.9 Evaluation

Evaluation of submissions could be based on self-assessment, peer reviews, or a panel of experts. For instance, Threadless[14], an innovative Chicago-based company, invites designers to create and submit their designs for T-shirts. Hundreds of thousands individuals interested in designing have joined Threadless community. Community members make comments and provide feedback to each other and then,

[14] See www.threadless.com

Threadless, based on the public votes and community feedback, selects best designs, prints on clothing and iPhone cases, and sells them worldwide (Brabham, 2010; Lakhani & Panetta, 2007).

Evaluation is part of idea selection as one of the important stages of an idea contest. For more details, we can refer to Ozer (2005) who reviewed all the idea selection approaches with their benefits and limitations, in different disciplines. Yet, the question of whether type of evaluation in an idea contest could influence the decision, performance, and behavior of individuals needs future research.

4.10 Variety

Variety is defined as the degree to which a contest requires its participants to use different skills and to perform a variety of activities during the contest. If individuals utilize more skills to find a solution in a contest, they feel more challenged and experience more enjoyment during that contest (Zheng et al., 2011). However, Yang et al., (2008a) found that when a contest problem requires a high level of skills and expertise, it negatively affects the number of solvers entering the contest. The variety of skills should be related with the complexity of a problem and needs to be investigated more in details.

4.11 Visibility of Entries

An idea contest could be blind or unblind and a contest organizer, in practice, is able to choose between either type to design a contest. In blind contests, the visibility of any submission is limited only to its owner and the contest organizer. Most of the time, such contests are single entry and no feedback is provided on submission during the contest. On the contrary, in unblind contests, all participants are able to see all the submissions. Individuals can monitor other contestants' solutions and feedback, and use

such information to create new ideas or to revise their own solutions (Bockstedt et al., 2011).

It is argued that greater entry visibility in idea contests (i.e. unblind contests) may result in more participation rates, and hence, more generation of ideas with higher quality (Wooten & Ulrich, 2013). However, Jian, Li, & Liu (2013) by framing an analytical model and testing the results in a lab experiment, demonstrate that blind contests lead to higher quality best solutions than unblind contests, and are more efficient. In addition, they posit that when the number of participants goes up, the efficiency of unblind contests diminishes and participants reduce their performance.

Unblind contests only might have an intellectual property issue in which solvers may perceive that their ideas could be stolen by other participants. Therefore, most solvers may refuse to enter unblind contests. Nonetheless, the research on this topic is scant and needs more investigations in order to see the effect of contest type on the decision of individuals before joining a contest, and their performance and behavior during a contest.

5 Tactical Behavior by Contestants

Individuals with different levels of experience and expertise may behave differently in an idea contest, depending on various design parameters. Bockstedt et al. (2011) define four dimensions that capture the participation strategy of individuals during a contest: *timing of first entry* (i.e., when an individual starts participation in a contest), *number of entries* (i.e., how many submissions the individual submits), *range of entries* (i.e., how long an individual stays active), and *the skewness of entries* (i.e., how entries are distributed throughout individual's active participation). Also, they measured *prior experience* of an individual in an idea contest by the number of contests she participated

(*participation experience*) and the number of contests she won so far (*winning experience*).

Yang et al. (2008b) analyzed participants on two Chinese platforms (Witkeys and Taskcn) and found that only very small core of successful users contributes about 20% of the winning solutions on the platforms. Individuals who win contests tend to participate in less popular tasks over time, select contests with greater winning chance, and submit their solutions later than other contestants (different timing of first entry). Most active solvers on those platforms turn into inactive after performing in different contests. In another study by DiPalantino & Vojnovic (2009) based on real data from Taskcn website and a theoretical model, individuals would not participate in those contests that have a reward below a certain amount of reward size. Furthermore, high skilled individuals only choose contests with higher award size, while lower skilled ones participate in broader contests.

Archak (2010) after crawling TopCoder website found out that the more expertise an individual has, the more challenging contests she selects to join, and they move first in the registration phase of the contest and signing up early for particular projects. Bockstedt et al. (2011) found that individuals, who enter an unblind contest earlier, submit multiple entries, have a greater range of entries, or their submissions are positively skewed in the contest, are more likely to win. Moreover, they observed that even though both participation and winning experience increases the winning likelihood for an individual, winning experience matters more. Their finding is contrary to the research by Bayus (2013) that shows past success hinders the future success in generating innovative ideas.

Liu et al. (2014) with a theoretical study and data from Taskcn observed that experienced users are more likely to choose contests with a higher award than inexperienced ones, and submit their solutions relatively late. Their findings show that higher reward absorbs better workers. However, high-quality users would not enter a contest where a high-quality solution has been submitted, which results in lower quality submissions at the end of the contest. Additionally, experienced users are more likely to choose contests with a higher probability of winning.

6 Discussion

In this chapter, I reviewed the research about the effect of contest design parameters on the participation, performance, and behavior of individuals before and after joining a contest. In addition, I introduced possible research questions not investigated yet for each parameter. The available research and studies were discussed for some design parameters such as award size and structure, intensity of competition, complexity of the task/project, problem specification, target group of participants, type of participation, contest duration, feedback, evaluation, variety of skills, and the visibility of entries.

Understanding the importance of each design parameter would help a contest organizer to design a better and more effective contest, which attracts more participants and motivates them to contribute and generate higher quality of submissions. However, some other parameters such as attraction, facilitation, sponsorship, contest phases, and replication have not yet been studied and need further investigation. As a primary focus of my dissertation, I try to explore the effect of feedback, as one of the design parameters neglected in the research and practice of idea contests, on the likelihood of participating and participation rate as well as the performance of individuals during a contest.

7 Outline of Dissertation

In the essay found in chapter 2, my objective is to find the importance of each design parameter in attracting solvers to participate in an idea contest. Different design parameters of an idea contest such as the award size, contest duration, contest type (blind vs. unblind), and feedback system may be varied to discover their effects on individuals' participation in a contest. Real designers on 99designs website were recruited to participate in an experiment to get insight about how to design each parameter to attract participation in an idea contest. I both ran a conjoint study among real designers and collected online data from 99designs website. Feedback, as one of the design parameters, may affect participation as much as other contest design parameters.

In the essay of chapter 3, I explore the effect of two different types of feedback (absolute vs. relative) on the performance of participants in an idea contest. By running a real idea contest with participants from a major public university, I measured how participants in an idea contest react to different types of feedback. The likelihood of revising ideas as well as the quality of ideas participants submitted were the primary dependent variables in this field experiment.

Chapter 2

How to Attract More Participants in an Idea Contest?

1 Introduction

Idea contests have a long history and been practiced in various real situations. In the days when navigators were facing a big problem of longitude measurement, the British government offered a prize for a practical method to determine the longitude of a ship during a sea voyage. It was one of the very first idea contests of the time. Many ideas were proposed to solve this problem, but eventually, John Harrison –a self-educated English carpenter and clockmaker- won the contest and received £15,315 in 1765.[1] Napoleon Bonaparte, as another example, during his conquests offered a cash prize of 12,000 francs for a new method of preserving foods for his army. Known as the "father of canning," Nicolas Appert was the one who finally solved this problem in 1810.[2]

Emerging technologies, especially the Internet, have facilitated the deployment of idea contests by companies these days. Many companies have embraced such contests to acquire new solutions for their innovation related problems and challenges. The pivotal need of a company is always to find innovative ideas and opportunities to sustain its competitiveness (Chesbrough, 2006). Having been relying merely on internal R&D activities for innovation, companies nowadays are able to access greater external sources of information through idea contests. Running idea contests is an easy way to combine the efforts of a large and diverse pool of individuals and to solicit their knowledge (Boudreau et al., 2011; Boudreau & Lakhani, 2013). Companies have been using idea contests to resolve a variety of problems.

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[1] See en.wikipedia.org/wiki/Longitude_prize

[2] See en.wikipedia.org/wiki/Nicolas_Appert

For instance, Netflix, an online DVD-rental and video streaming company, offered $1 million for the best algorithm to predict user ratings for its online films.[3] NASA has embarked to find "innovative solutions to research and technology problems that impact human health and performance in short and long duration human spaceflight" through idea contests.[4] One of the recent contests is the Google Lunar X Prize. Thirty million dollars is offered as a prize by Google to invite teams from all around the world to 1) land a robot safely on the Moon, 2) move 500 meters on, above, or below the Moon's surface; and 3) send back HDTV Mooncasts for everyone to enjoy.[5] Such contests are sometimes organized by a third party instead of a focal company. For example, InnoCentive, NineSigma, Kaggle, and Yet2.com are online platforms hosting idea contests and allow other companies to post their problems on their websites.

As the focus of my research, 99designs[6] is also an idea contest marketplace that allows users to create contests in which everyone interested in designing can submit design ideas for evaluation. "Design contests are what we're known for –it's that kind of crowd source element: post your job, get sent ideas, and pick the one you like," says Patrick Llewellyn, the CEO and president of 99designs. Contests on 99designs, for instance, are within different design categories such as logo, website, business card, book etc. Over thirty thousand designers are active on 99design platform and also, over three hundred thousand contests have been held, up to now.

But how can a company run such contests to receive remarkable solutions and ideas? Since, in most of the time, an idea contest is in the form of an open call and

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[3] See www.netflixprize.com
[4] See www.nasa.gov/open/plan/open-innovation.html
[5] See lunar.xprize.org
[6] See www.99designs.com

everyone is invited to enter, attracting more individuals should be the first objective for a contest organizer. The research posits that attracting more participants increases the quantity and diversity of solutions (Terwiesch & Xu, 2008), which leads to finding better solutions to a problem (Yang et al., 2009), and to few exceptional solutions (Terwiesch & Ulrich, 2009). The focal point of this chapter is to find out how to increase the participation rate of an idea contest. In this regard, we need to understand *first*, why people participate in idea contests and what their motivations are, and *second*, how to design an idea contest in terms of its design parameters and characteristics.

The motivations of individuals who join idea contests are investigated in the literature and were discussed in the previous chapter as well. However, in order to study how to design different contest parameters and how individuals may react to the design of a contest and decide to enter that contest, I invited real designers on 99designs website to participate in a conjoint study. In my study, I evaluated the relative importance of each design parameter with each other (especially the feedback system) in motivating participation. Besides, I collected online data on 99designs website to explore how different contests with distinctive design parameters have different participation rates. The number of new participants who join a contest every day (i.e. participation rate) may depend on the design parameters of the contest.

2 Motivations of Participants

As discussed in the previous chapter, participants might have various motives to participate in a contest categorized into two groups: *intrinsic* and *extrinsic* motivations. Pleasure from solving problems, sense of pride from winning a competition, the opportunity to develop skills and gain experiences, learning, altruism, and self-efficacy are examples of intrinsic motivations. Whereas, making money, building reputation, and

appreciation by the contest organizer or other solvers (peers) are examples of extrinsic motivations (Brabham, 2010; Lakhani & Panetta, 2007; Leimeister et al., 2009; Zhao & Zhu, 2012b; Zheng et al., 2011).[7] Both intrinsic and extrinsic motivations play important roles in a solver's decision to join a contest.

After understanding why individuals participate in such activity, companies need to know what steps they should take in order to design an online idea contest.

3 Designing an Idea Contest

Bullinger & Moeslein (2010) illustrate ten key elements that determine the design of an idea contest. The *media*: online, offline, or mixed; the *organizer* which could be any individual, company, public/private organization, or non-profit; the *task/topic specificity* that ranges from low to high specific; the *degree of elaboration* which could be only rough ideas, sketches, or for full concepts and prototypes; the *target group* which could be unspecified (open to everyone) or specified (limited to a geographic location or specific age, expertise, etc.); the *participation*: individually or in teams; the *contest period* that varies from very short term, short term, to long term, or very long term; the *reward system* which could in the form of monetary award such as money; or non-monetary award such as valuable goods) or mixed; the *community functionality* which is the community application and tools for the interaction and communication among participants; the *evaluation* which could be based on self-assessment, peer reviews, by jury of experts, or mixed.

[7] More research has investigated such motivations: Lakhani et al. (2007), Huberman et al. (2009), Füller (2010), Brabham (2010), Kaufmann et al. (2011), Zheng et al. (2011), Afuah & Tucci (2012), Bayus (2013), Bloodgood (2013), Boudreau & Lakhani (2013), Battistella & Nonino (2013), Geiger, Seedorf, Schulze, Nickerson, & Schader (2011), Hossain (2012), Zhao & Zhu (2012a, 2012b, 2014).

MacCormack et al. (2013) identify five general decisions that an organizer faces in designing an idea contest:

1) *Framing the problem*: the first step for an organizer in designing a contest is to frame a problem. Too complex problems would need lots of time and effort from solvers and may not be possible to come up any solution by them. Sometimes, narrowing the focus of a problem would help solvers but it may hinder them to browse the solution space to find innovative solutions. Nevertheless, without defining and framing a problem properly, designing a contest is not feasible.

2) *Establishing a prize*: the type, size, and structure of a prize should be decided before running a contest. Prizes could be in the form of monetary or non-monetary (i.e. valuable goods). For monetary rewards the size (small vs. large) or the structure (winner-takes-all, multiple-prize etc.) may affect the number, quality, and diversity of solvers who join a contest. Competitions with difficult problem to solve need larger award size to intrigue more participation. Financial reward, however, is not always the most important driver for solvers. Building up reputation, connecting with other individuals, and social interactions are other factors that interest potential solvers to participate.

3) *Inviting the participants*: an organizer could invite any specific group of individuals or open the contest to everyone. The specification of individuals may be based on the location, age, gender, skills or expertise. Sometimes, companies set prequalification rules for potential participants for the sake of intellectual property protection. On the other hand, an open entry contest may end up with an enormous number of submissions, which would make it hard to evaluate for the organizer.

4) *Defining the process*: the process determines how participants are able to compete in a contest (i.e. individually vs. in teams) as well as the decision about each phase of a contest from the beginning to its end. Some companies allow collaboration in a contest while others encourage individuals to submit their ideas independently. In addition, the decisions about how participants can submit their ideas, the contest duration, and how the winner would be selected, are as important and must be decided before running a contest.

5) *Building a platform*: contests usually are held by a focal company or by a third party. Companies should decide on whether they have the necessary infrastructure to run a contest or must outsource it to a third-party provider. Accessing a third party to the data might raise privacy concerns. However, creating a platform and managing could be costly and difficult as well.

As mentioned, there are plenty of decisions a company has to make in order to design a contest. However, an optimal design is a harder problem "in that no solution works over all environments and the particular context needs to be considered" (Boudreau et al., 2016). For this reason, I selected 99desings platform where thousands of idea contests are held every day, to study the effect of design parameters on the participation rate of individuals (i.e. how to attract more solvers). My study would benefit a typical contest organizer willing to run a design contest on 99designs website as well as contribute to the idea contest literature by taking less studied features –such as feedback system- into account.

4 Data Source: 99designs Website

99designs is an online graphic design platform and marketplace that provides any member of its community the ability to create design contests in which anyone who is

interested in designing can submit design ideas to win a prize. The contests on 99designs fall in different design categories: logo and identity, website and app design, business and advertising, clothing and merchandise, art and illustration, packaging and label book and magazine. Over thirty thousand designers are active on 99design platform from all around the world, and also, over three hundred thousand contests have been held so far. Anyone can sign up on the platform as a design expert or a typical design seeker looking for a specific design. There is no subscription fee to join this community.

To launch a design contest on 99designs, a contest organizer should first describe her request and what she is looking for, specifically (called "design brief"). Then, she should define an award size for the best design, and choose whether her contest to be blind or unblind.[8] In a blind contest, designers are able to view only their own entries whereas in unblind contests everyone is able to see other submissions (Figure 2.1).

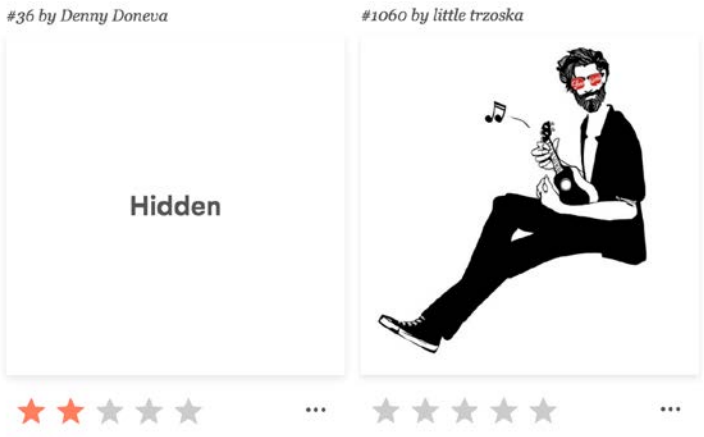

Figure 2.1: Blind (left) vs. unblind (right) contests

[8] On 99designs website, it is recommended to have blind contests over unblind since blind contests attract higher quality solutions.

The standard length for all contests is 7 days; however, the contest organizer can extend it up to 10 days. The range of awards varies, typically, from $100 to more than $2000 depending upon the project requirements. Designing banners, T-shirts, and business cards take less time and effort, whereas, designing a website is more time consuming, hence, the award size changes.

A contest organizer is able to communicate with the contestants in different ways (Figure 2.2). *Rating the designs*, which is based on a star rating (one to five stars) below each design thumbnail image. This type of feedback allows designers to know which design is preferred by the contest organizer and how to create better designs during a contest. Star ratings are publicly visible to everyone even in blind contests where entries are hidden. Admittedly, in an unblind contest, a designer can acquire information about the preference of a contest organizer by monitoring all the entries and how the contest organizer has given feedback to each. *Leaving a comment* is another way of communication between a solver and seeker. This type of communication is only visible by the contest organizer and the feedback receiver. A contest organizer can interact with contestant and guide them to improve their designs.

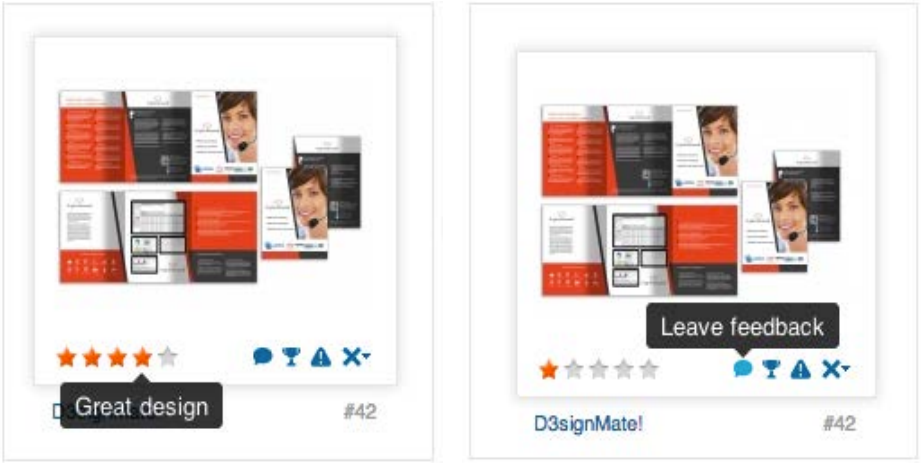

Figure 2.2: Different ways of communication between a contest organizer and contestants

When a designer (i.e. contestant) joins 99designs platform, she can browse among ongoing contests to see which contest matches her preferences to work on. There is a long list of contests (Figure 2.3) in which designers can sort the contests on the prize size, time left, or the number of entries. A typical designer can publicly view some information for each contest and consequently make a decision to enter any one that seems more attractive (i.e. matches her skills or gives her higher chance of winning). For instance, following items are visible to all the users on 99designs:

1) *Prize*: prize of all contests are visible to designers and is sortable from low to high –usually ranges from $50 to $2000;

2) *The project description and requirements*: designers can see which category a project belongs to and how difficult it is in terms of the level of time and effort required to design the project;

3) *Time left*: which indicates when a contest will finish and how much time is left to its end;

4) *Number of participants*: this is public as a number to everyone;

5) *Number of entries*: which shows how many designs have been submitted up already by active contestants in a contest;

6) *The visibility of entries*: blind contests do not allow designers to view other contestants' entries, but unblind entries are completely visible to public;

7) *The star rating*: star rating is public to all designers who can find out whether a contest organizer has provided already any feedback to any design/designer;

8) *Number of rated designs*: this number shows how many entries contest organizer has provided feedback to.

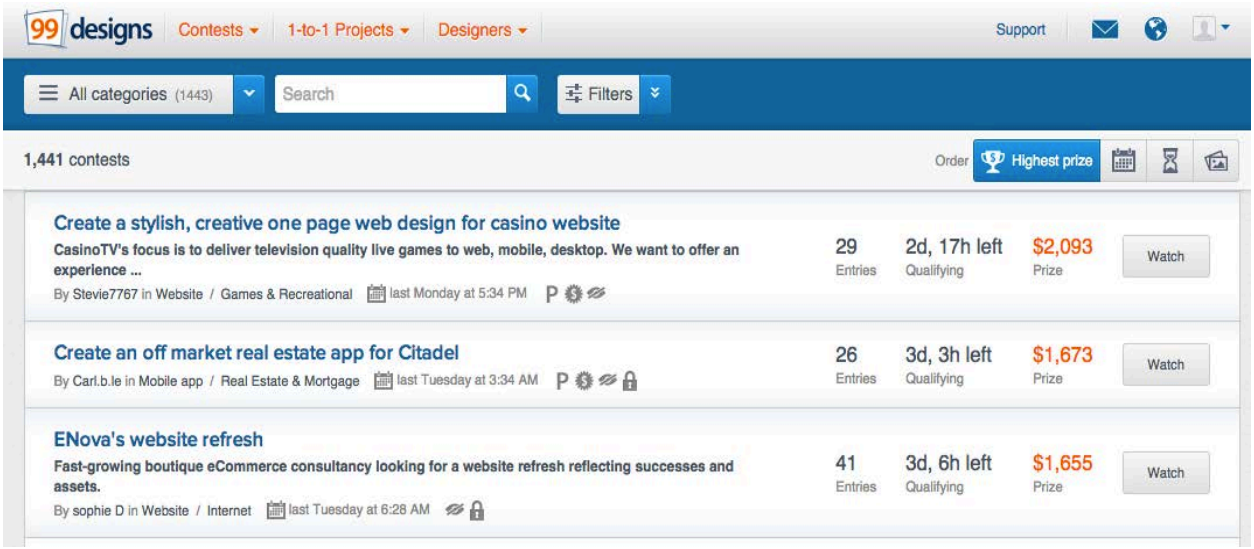

Figure 2.3: Illustrative list of contests on 99designs

Now, the questions are, *first*, how real designers evaluate the public information about different design parameters of a contest in deciding whether to participate in a contest or not? In other words, which design parameter is more important to real designers and may increase the likelihood of selecting a contest by them? Award size might be the primary driver for potential participants, however, other parameters such as the duration of a contest or the difficulty of a project might influence their decisions as well. In the first study of current chapter, I will answer this question by inviting real designers on 99designs website to a conjoint study to explore the relative importance of each design parameters [of 99designs contests] with each other from real designers' perspective.

Second, how is a contest organizer, by setting design parameters for her contest, able to motivate potential designers to participate in her contest? Motivating more designers to participate will lead to having more participation and more submissions during a contest. Admittedly, increasing the number of participants will increase the

chance of finding the best solution for the contest organizer. For this matter, I looked at the number of designers who join contests on 99designs website every day. The number of participants who join a contest every day is known as the *participation rate*. Higher participation rate for a contest indicates that more designers are motivated to participate. The more a participation rate is, the more participants are entering a contest; the more motivating the designs parameters of the contest are for potential participants; and the more solutions eventually would be submitted. In particular, on 99designs website, a contest organizer needs to increase the participation rate for her contest since there might be other contests more appealing to real designers to participate. Having access to the data on 99designs website, I will evaluate the relationship between the participation rate of some contests and the design parameters of those contests. I argue that different design parameters will change the participation rate of a contest because participants evaluate those parameters and contemplate each one.

The answer to these questions would help a contest organizer to better design her contest that attracts more solvers and leads her to more solutions.[9] In the following, I review the literature to demonstrate how design parameters motivate potential individuals to participate in an idea contest, and affect the participate rate of a typical contest.

5 Hypothesis Development for Participation

In this section, I review the related literature on the effect of each design parameter on the participation of solvers. To find the answer for those two questions in the last section, I develop two hypotheses for each design parameter. I start with *Prize* which is thought to be the most important motivation of solvers to participate in idea

[9] Lack of access to all the information on 99designs would not allow the author to measure the quality of entries and the best design at the end of each contest.

contests (Lakhani et al., 2007). The research shows that higher reward size will attract more individuals (Lee et al., 2015; Yang et al., 2009).[10] Nonetheless, greater amount of award could be detrimental since it induces so much effort that participants must be compensated (Connelly, Tihanyi, Crook, & Gangloff, 2014). DiPalantino & Vojnovic (2009) found that participation rate in idea contests would increase logarithmically as a function of the reward size offering by an organizer. They posit that below a certain amount of reward size, individuals would not participate in contests.

Since the range of award size on 99designs is usually from $50 to $2000, I cannot test whether larger amount of prize could be demotivational for solvers to participate in a contest. Thus, according to the literature, I propose:

> ***Hypothesis 1.a:*** *The higher an award size is, the higher the likelihood of participation will be for a potential contestant.*
>
> ***Hypothesis 1.b:*** *The higher an award size is, the higher the participation rate will be for a contest.*

The second design parameter is "*the project description and requirements"* which defines the *difficulty* of a project. Zheng et al. (2011) define contest complexity as "the degree of difficulty of performing the necessary tasks inherent in a solution to the contest." Complexity first might affect the intrinsic motivation of solvers positively since it increases the level of challenge for them. However, the higher the complexity is, the higher the cognitive load would be, which makes solvers lose their interest or enjoyment in doing a task (Morgeson & Humphrey, 2006; Wood, 1986).

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[10] DiPalantino & Vojnovic (2009) have found that high skilled individuals only choose idea contests with higher award size, whereas lower skilled solvers participate more broadly. Thus, the level of expertise could moderate the award size effect.

Accordingly, difficulty of a project could have a conflicting effect on the decision of participants to enter a contest. In practice, companies narrow the focus of a problem in order to reduce the time and effort of participants in a contest (MacCormack et al., 2013). Solvers first evaluate the difficulty of a project and examine how much time and effort it may take; then, based on their ability and the probable outcome that they may receive, decide to enter a contest or not. To see the importance of this parameter I propose:

> ***Hypothesis 2.a:*** *The more a project of a contest is difficult, the lower the likelihood of participation will be for a potential contestant.*
>
> ***Hypothesis 2.b:*** *The more a project of contest is difficult, the lower the participation rate will be for a contest.*

The third characteristic of *time left* indicates when a contest will finish and how much time is left to its end. Longer contest duration attracts more people (Walter & Back, 2011; Yang et al., 2009) since in short period of time it may be hard for solvers to propose solutions. On the other hand, the longer a period of a contest is, the more likely other participants are able to join a contest and the competition would be more intense. In addition, research shows that solvers prefer those projects with fewer participators in order to increase their chance of winning (Yang et al., 2008b). Therefore, I have:

> ***Hypothesis 3.a:*** *The more the time left is, the higher the likelihood of participation will be for a potential contestant.*
>
> ***Hypothesis 3.b:*** *The more the time left is, the higher the participation rate will be for a contest.*

The fourth design parameter is the *number of participants* who have joined a contest so far, which indicates the level of competition in that contest as well. Competition can trigger the sense of challenge (or excitement) in individuals, promotes their intrinsic motivation, and encourages them to participate (Tauer & Harackiewicz, 2004). However, it could undermine the intrinsic motivation and lower the rate of participation (Deci et al., 1981). Thus, I state:

> ***Hypothesis 4.a:*** *The more the number of participants is, the lower the likelihood of participation will be for a potential contestant.*
>
> ***Hypothesis 4.b:*** *The more the number of participants is, the lower the participation rate will be for a contest.*

Number of entries, the fifth parameter, demonstrates how many designs have been submitted by the current participants in a contest. The more submissions/entries submitted, the more likely at least one of them is able to match the needs and preferences of the contest organizer. In other words, more entries show more attempts by participants to generate the best design that could satisfy the contest organizer. Therefore, the higher number of entries in a contest could signal the higher level of competition and lower chance of proposing the winning solution for those individuals who have not yet joined the contest. Although, the higher number of participants lead to higher number of entries and these two terms could be thought to be equal, there are some real examples on 99designs website in which two contests with the same number of participants have different number of submissions/entries. Thus, I have:

Hypothesis 5.a: *The more the number of entries is, the lower the likelihood of participation will be for a potential contestant.*

Hypothesis 5.b: *The more the number of entries is, the lower the participation rate will be for a contest.*

The sixth design parameter, *visibility of entries*, specifies whether a contest is blind or unblind. Greater entry visibility in idea contests results in more participation (Wooten & Ulrich, 2013). However, unblind contests might have an intellectual property issue and solvers may refuse to enter an unblind contest (Bockstedt et al., 2011). The research on this topic is scant and needs further investigations. Therefore, I propose:

Hypothesis 6.a: *Switching the visibility of entries from unblind to blind increases the likelihood of participation for a potential contestant.*

Hypothesis 6.b: *Switching the visibility of entries from unblind to blind increases the participation rate for a contest.*

Seventh, *star rating*, which is a communication method (i.e. feedback) between a contest organizer and participants, and is publicly visible on 99designs website. Rating a design shows whether the contest organizer likes a design or not. This type of feedback may encourage designers to create more designs and improve their submissions. In addition, it enables participants to understand the preferences of the contest organizer. There is no study testing the effect of such feedback on the decision of solvers to enter a contest. However, when I put myself in a solver's shoes, if a contest organizer has already provided feedback to any entry, I will enter that contest because the contest organizer is already revealing her preferences and it would be easier to find her exact need. On the contrary, the argument could be the opposite. When a contest organizer has

already provided feedback to any entry, the chance of winning for those participants who received feedback (or those already in the contest) could be higher because they can create a preferable design sooner than those individuals who have not yet joined the contest. Although further research is required for this parameter, I propose:

> ***Hypothesis 7.a:*** *If a contest organizer has already rated any entry, the likelihood of participation will be higher for a potential contestant.*
>
> ***Hypothesis 7.b:*** *If a contest organizer has already rated any entry, the participation rate will be higher for a contest.*

Eighth, *number of rated designs*, which someone may argue that the more active a contest organizer is in evaluating the submission/entries, the easier for a potential participant to address her needs, and therefore, the higher her chance of winning would be. Thus, I propose:

> ***Hypothesis 8.a:*** *The more a contest organizer has rated entries, the more the likelihood of participation will be for a potential contestant.*
>
> ***Hypothesis 8.b:*** *The more a contest organizer has rated entries, the more the participation rate will be for a contest.*

Other users on 99designs can provide feedback on the entries during a contest when it is unblind. However, this type of feedback might be nonsense since it is more important for participants to receive feedback from the "right" person –a contest organizer in this case (Leimeister et al., 2009). Nonetheless, I propose that:

> ***Hypothesis 9:*** *Receiving feedback from other peers in an idea contest increases the likelihood of participation for a potential contestant.*

In practice, some platforms and real idea contests are lacking such communication functionality between contest organizers and participants. Besides, peer feedback during an idea contest is not a common feature. Therefore, my studies would help contest organizers to take advantage of feedback system in their contests as well as to understand the effect of design parameters on the motivation and participation of individuals. In the next section, based on a conjoint study, real designers on 99designs compare contest design parameters with each other and decide whether to participate a contest or not. The results are discussed afterwards.

5.1 Conjoint Study of Participation in Design Contests

Conjoint analysis is a methodology for the measurement of psychological judgments that answers the question of which attributes are important and how important they really are (Urban, Hauser, & Urban, 1993). In conjoint experiments, respondents express their preferences for "products" (in my study "contests") described by varying levels of attributes. By observing how respondents evaluate contests in response to changes in the underlying feature levels, we can estimate the impact of each feature on respondents' judgments.

One hundred and thirty five designers (80% male) in the age range of 15-52 years participated in my conjoint survey (descriptive information in Table 2.1). According to the design parameters reviewed, I varied the following features and levels for the design of contests:

1) Type of entries visibility: *blind, unblind*

2) Level of project complexity: *easy, hard*

3) Feedback system: *contest organizer feedback, peers feedback, no feedback*

4) Award size: *$2000, $500, $100*

5) Number of entries to date: *1000, 500, 10*

6) Contest period: *1 day, 6 days*

There are various methods to adopt a conjoint study. In full factorial design, all possible combinations of features across all levels are considered. For example, to test the impact of each design feature of a contest, I have to create 2 (type of entries visibility) × 2 (level of task complexity) × 3 (feedback system) × 3 (award size) × 3 (number of entries) × 2 (contest period) = 216 possible combinations and ask the respondents to identify their preferences for each combination. With this number of combinations, participants would be worn out and probably begin giving automatic responses, rather than thoughtful evaluations. Hence, I decided to have one feature, *number of entries to date,* instead of two separate variables such as *number of entries* and *number of participants*. Likewise, *number of rated designs* is not included in the conjoint study to make it less time consuming for the respondents.

Alternatively, partial factorial design is used when there are many features and it is difficult to represent all possible combinations. There are also various methods of designing the questions in conjoint analysis. The choice-based conjoint analysis is a popular way as it is seen most closely resembling the choices that consumers, for example, make when they are purchasing a product. In my study, choices are the contests that real designers decide to enter. I used Sawtooth's Conjoint-Based Choice software to create partial factorial design of features for design contests. Thirty profiles were created by Sawtooth software and, in order to make the experiment simple and less time

consuming, for each question two profiles were presented to the respondents as two choices –without “no choice” option (Appendix).

I invited real designers on 99designs to participate in to compare two different hypothetical design contests with each other, and were asked to choose a contest that they will participate based on different levels of features presented. In each question they chose only one contest while the null choice was not available. At the beginning, all features were presented to the respondents and explained in details.

Table 2.1: Conjoint study sample descriptions

	Statistics		Statistics
Total Participants	135		
		Age (in Years)	
Gender		• Range	15-52
• Female	27 (20%)	• M	30
• Male	108 (80%)	• Mdn	28
		• Std	7.7
Education		**Years active on 99designs**	
• High school	20%	• Less than a year	30%
• Some college	20%	• 1-2 years	41%
• Associates	14%	• 2-3 years	33%
• BA-BS	47%	• 3-4 years	10%
• Master's	21%	• 4-5 years	15%
• Doctoral	0%	• 5-6 years	6%
• Professionals	13%		

5.1.1 Data Analysis and Results

The preference responses of participants along with their demographic information were collected. The choices and features were coded as a binary data (Table 2.2). The choice data were analyzed by means of binary logistic regression. Due to partal factorial design of conjoint study, only main effects are estimated. The logit function of choice is a linear combination of the attribute variables and a estimate of their

coefficients is produced for each attribute level that can be interpreted as an "marginal utility" of participating in a contest for the respondents analyzed.

Table 2.2: Data coding for design parameters and their levels

Features	Levels	Coding
1- Feedback system	Contest organizer feedback	(1,0)
	Peer feedback	(0,1)
	No feedback	(0,0)
2- Award size	$2000	(1,0)
	$500	(0,1)
	$100	(0,0)
3- Number of entries	1000	(1,0)
	500	(0,1)
	10	(0,0)
4- Complexity of project	Difficult	1
	Easy	0
5- Contest period	6 days	1
	1 day	0
6- Entries visibility	Blind	1
	Unblind	0

The results estimated using R software are shown in Table 2.3. According to the *theory of planned behavior*, an individual actual behavior could be predicated by the intention to perform the behavior (Ajzen, 1991; Kim, Ferrin, & Rao, 2008; Zheng et al., 2011), hence, we can infer that the result of conjoint study not only explains the likelihood of participation but also provides insights for the participate rate.

To test my hypotheses, I rely on the Wald test (Greene, 2008). The baseline for award size is $100 which is used as the lowest size. Based on the results, switching the award size from the baseline to either $500 or $2,000 level, increases the likelihood of selecting a contest (i.e. likelihood of participating) for real designers. For instance, if the

reward is switched from the baseline of $100 to $2,000 the log odds of participating in a contest increases by 0.99, holding all other independent variables constant. Besides, The incremental effect on the probability of participation rises by 0.202 when the reward changes from $100 to $2000. The positive and strong coefficients for each award size level (β_1=0.99, $\chi^2(1)$=187.64, p<0.001) supports $H_{1.a}$.

Supporting $H_{2.a}$, the coefficient for the complexity of project indicates that designers are more likely to choose an easy contest (β_3=-0.23, $\chi^2(1)$=8.71, p<0.01) over a difficult contest. If we switch from an easy contest to the difficult one, the log odds of participating in a contest decreases by 0.23 and the incremental effect of the probability of participation alse diminishes by 0.046. Since the coefficient for the variable time left is not siginificant (p<0.1) I cannot support or reject $H_{3.a}$. Larger number of entries in a contest has a negative effect on the likelihood of selecting a contest, which supports $H_{5.a}$ (β_5=-1.59, $\chi^2(1)$=312.11, p<0.001). Furthermore, blind contest attracts more designers than an unblind contest (β_7=0.53, $\chi^2(1)$=46.73, p<0.001). If we switch from an unblind contest to the blind contest, the log odds of participating in a contest increases by 0.53 as well as the incremental effect of the probability of participation which rises by 0.108. Hence, $H_{6.a}$ is supported.

The feedback system has a positive and significant effect on the likelihood of selecting and participating in a contest. For instance, if we switch from a contest with no feedback feature to a contest in which the organizer has provided feedback to the contestants, the log odds of participating in a contest and the incremental effect of the probability of participation increases by 1.6 and 0.325, repectively (β_8=1.60, $\chi^2(1)$=211.66, p<0.001). Unlike the common practices in idea contests, the feedback from

peers compared to no feedback has a greater effect on the participation of designers. if we switch from a contest with no feedback feature to a contest in which the peers provide feedback to each other, the log odds of participating in a contest and the incremental effect of the probability of participation increases by 0.71 and 0.143, repectively (β_9=0.71, $\chi^2(1)$=51.66, p<0.001). These results support $H_{7.a}$ and H_9.

Table 2.3: Logit regression results for the effect of design parameters on the likelihood of participating in a contest

	Logit Coefficients (β_i)	***p*-value**	**exp(β_i)**	**Incremental effect on probability of Selecting a contest**
Intercept	-1.07 (0.14)***	0.000	0.34	
$2000 (**$H_{1.a}$**)	0.99 (0.09)***	0.000	2.71	0.202 (0.000)
$500	0.91 (0.09)***	0.000	2.48	0.184 (0.000)
Difficult (**$H_{2.a}$**)	-0.23 (0.07)**	0.003	1.25	-0.046 (0.000)
6 days (**$H_{3.a}$**)	-0.14 (0.07)	0.060	1.15	-0.028 (0.000)
1000 entries (**$H_{5.a}$**)	-1.59 (0.09)***	0.000	0.20	-0.322 (0.001)
500 entries	-0.97 (0.08)***	0.000	0.37	-0.197 (0.000)
Blind (**$H_{6.a}$**)	0.53 (0.08)***	0.000	1.70	0.108 (0.000)
Contest organizer (**$H_{7.a}$**)	1.60 (0.11)***	0.000	4.97	0.325 (0.001)
Peers (**H_9**)	0.71 (0.09)***	0.000	2.02	0.143 (0.000)

-2 Log likelihood: 4787.299 AIC: 4807.3 χ^2: 76.58
Standard error in parentheses
** Significant at p <0.01
*** Significant at p <0.001

Consistent with the literature, I found that greater award size increases the likelihood of participating in a contest whereas the difficulty of a problem and higher number of entries have negative impacts on this likelihood. Real designers in my study prefered blind contests over unblind ones. However, whether time left has a positive effect on the likelihood of participating in a contest is not supported and needs further investigation.

The important takeaway from the results of this section is the feedback. There are many practices in which feedback system has not been used at all. I found that if this feature is added to a contest, it increases the likelihood of participating in a contest. Even though the feedback from the contest organizer is deemed more valuable to the participants, peer feedback also rises the likelihood of participating in a contest and could be added to the functionality of an idea contest platform. In the next section, I monitor the number of new participants for some design contests on 99designs website and explain how the actual *participation rate* could be affected by the contest design parameters.

5.2 Participation Rate: An Observational Study

Every day more than thousand contests are being held on 99designs website. Over seven days, the usual contest duration, the number of participants who join contests varies. Number of new participants is directly observable online and has different patterns seen in Figure 2.4. For instance, for one contest, few individuals may join in the first day of the contest, and in other days, no one joins any more. However, for another contest, new participants join every day. The number of new participants who join a contest every day is known as *participation rate*. Since users on 99designs website evaluate the public information of design parameters and then decide to participate in a

contest, which parameter would be influential on the participation rate? Higher rate of participation indicates that more designers are willing to participate in a contest. Understanding the effect of design parameters on the participation rate of contests on 99designs website would help a contest organizer to better design her contest.

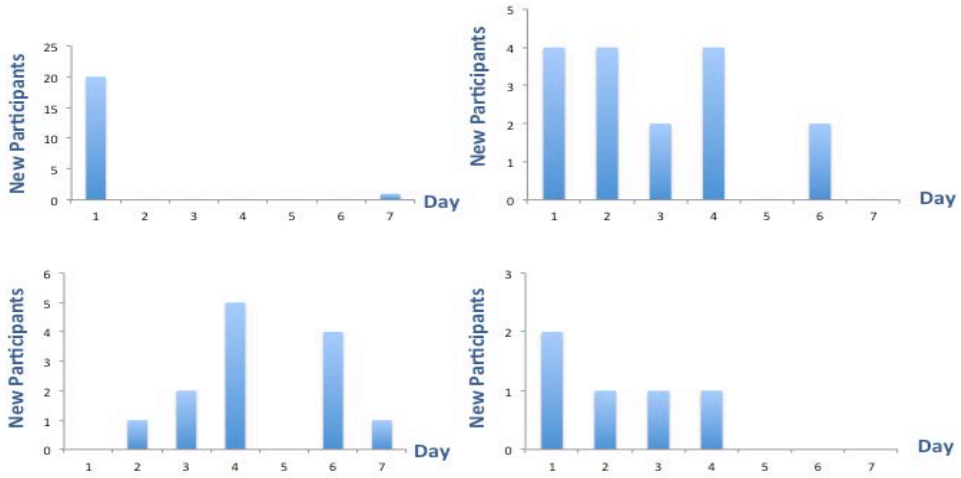

Figure 2.4: Examples of number of new participants per day for some random contests on 99designs

The data collection process is shown in Figure 2.5. I began tracking the number of new participants for two hundred randomly selected contests on 99designs, from the beginning of each contest to the end. After I collected the data of contests for seven days each, based on different features coded the data. The minimum amount of prize was $189 and the maximum was $2199. Total designs submitted varied across contests from zero to 1030. Number of rated designs ranged from zero to 76 designs by a contest organizer. To measure the difficulty of each contest, I asked two experienced designers to evaluate the difficulty of each project and checked for the inter-rater reliability (*Krippendorff's alpha* = 0.89) to check the raters' agreement (Krippendorff, 2007). After interviewing the raters about how they define the difficulty feature, the category of a project along with the requiring level of time and effort for each contest were used to rate the difficulty of

projects. Difficulty was categorized in three different levels: easy, medium, and hard. The number of new participants per day was set as the dependent variable.

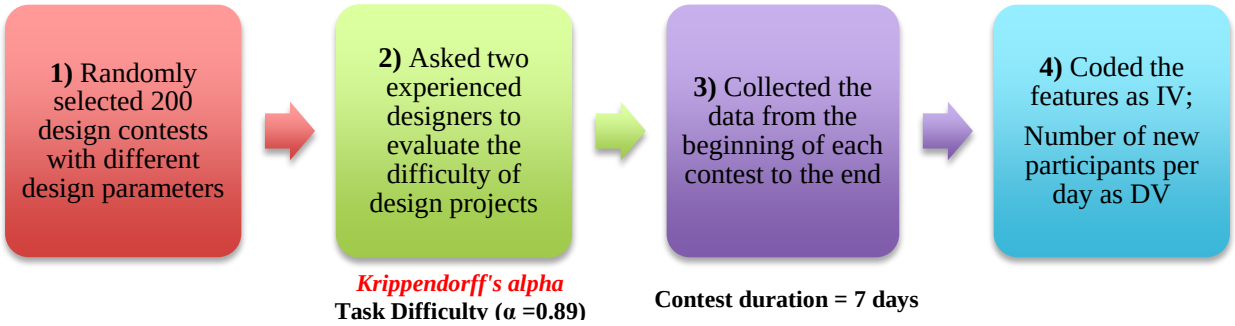

Figure 2.5: Data collection process on 99designs

5.2.1 Data Analysis and Results

The dependent variable in my study is the number of new participants per day (participation rate) and the independent variables are the design parameters –such as award size, difficulty of project, time left, the number of current participants, the number of entries, the visibility of entries, star rating, and the number of rated designs. I explorer whether having larger amount of award in contests increases the rate of participation in contests or not. Feedback, in particular, may have a significant effect on the number of participants who may join a contest. To analyze the data, I used *Negative Binomial Regression*. In *Poisson* distribution, the assumption is the mean and the variance are equal. However, when the variance of data is greater than the mean (so-called over-dispersion problem) negative binomial regression is recommended to use. In negative binomial regression, the dependent variable is a count variable and the log of expected count as a function of independent variables is modeled as a linear function of explanatory variables such as design parameters. Therefore, the interpretation of coefficients in a negative binomial regression would be as follows: if the independent variable is changed by one unit, the difference in the logs of expected counts would be

expected to change by the respective regression coefficient, holding all other independent variables in the model constant. For example, the regression coefficient is expressed as:

$$\beta_i = \log(\mu_{x_i+1}) - \log(\mu_{x_i}), \quad (1)$$

where β is the regression coefficient, μ is the expected number of new participants, and x_i+1 and x_i displays the one unit change in the independent variable x_i. The difference of two logs equals to the log of their quotient; thus, the regression coefficient could be interpreted as the log of the ratio of expected counts, which is called *incidence rate ratio*. In other words, $\exp(\beta_i)$ is the proportionate increase in the expected number of new participants when x_i increases by one unit. For example, if β_i =1.50, then increasing x_i by one unit increases the expected number of new participants by 50%, or if β_i =0.90, then increasing x_i by one decreases the expected number of new participants by 10%.

According to the results in Table 2.4, if we increase the variable *time left*, for example, by one unit, the difference in the logs of expected number of new participants is expected to increase by 0.231 unit, while holding other variables in the model constant. In other words, if we increase time left by one unit, the rate for the number of new participants per day is expected to increase by a factor of 1.259, when all other variables are held constant. This result supports $H_{3.b}$ which states that the longer the contest duration is, the higher the participation rate will be for a contest. Since one unit increase in the number of current participants in a contest, increases the difference in the logs of expected number of new participants by 0.042 unit –i.e. the rate for the number of new participants per day increases by a factor of 1.043- $H_{4.b}$ is then rejected. Having more participants in a contest does not lead to lower rate of participants based on the data. Furthermore, the interesting variable in my study is the *rated* variable, which determines

whether a contest organizer has provided any rating feedback to any entries so far. If a contest organizer has rated any entry/submission within a contest, the rate for the number of new participants per day is expected to increase by a factor of 1.510. This result supports $H_{7.b}$. When potential participants observe that a contest organizer has rated any submission in the contest, they are more interested in participating in that contest since it seems easier to reveal the preferences of the contest organizer and to have a higher chance of winning.

Table 2.4: Negative binomial regression results for the effect of design parameters on the number of new participants per day

	Coefficients (β_i)	***p*-value**	**exp(β_i)**
Intercept	-1.286 (0.243)	0.090	0.276
Award size (**$H_{1.b}$**)	0.000 (0.000)	0.189	1.000
Hard (**$H_{2.b}$**)	-0.078 (0.323)	0.809	0.925
Medium	-0.048 (0.303)	0.875	0.953
Time left (**$H_{3.b}$**)	0.231 (0.049)***	0.000	1.259
Number of Participants (**$H_{4.b}$**)	0.042 (0.014)**	0.002	1.043
Number of entries (**$H_{5.b}$**)	0.003 (0.004)	0.471	1.003
Blind (**$H_{6.b}$**)	-0.823 (0.322)	0.011	0.439
Rated (**$H_{7.b}$**)	0.412 (0.378)**	0.001	1.510
Number of rated designs (**$H_{8.b}$**)	-0.004 (0.010)	0.692	0.996

Log likelihood: -400.552 $\chi^2(9)= 109.21$
Likelihood-ratio test of alpha=0: $\chi^2(1)=196.53$, p=0.000
Standard error in parentheses
** Significant at p <0.01 *** Significant at p <0.001

6 Discussion

By studying 99designs website where thousands of design contests are run every day, I provided some implications for a contest organizer to design her contest more effectively. The goal in idea contests is to invite and attract more individuals to participate in a contest. The design of a contest could encourage more individuals to enter the contest. In my first conjoint study, I attempted to understand how real designers contemplate the public information of contest design parameters to decide to enter a contest. In addition to award size, difficulty of a project, number of entries, and visibility of a contest, feedback system was taken into account as well. Many contests do not have any communication method between a contest organizer and participants. The results of my study demonstrate that providing feedback from a contest organizer increases the likelihood of participants for potential users compared to no feedback. Likewise, peer feedback, which is not common in idea contests, increases the likelihood of participation.

In my second study, I collected online data from 99designs website to see how different design parameters affect the number of new participants who join contests every day. As a result, when more time is left, more new participants are willing to enter a contest. Unlike the common expectation about the intensity of competition in a contest and its negative effect on the participation rate, higher number of participants in a contest does not lower the number of new participants on 99designs website. Besides, when a contest organizer has already provided feedback to any submission/entry in a contest, more individuals would be interested in participating in the contest. This result is supporting the previous study indicating feedback would increase the likelihood of participating for potential contestants. Feedback is a design parameter which has not been studied as a factor to motivate more participation in idea contests. My study is the first

research investigating the effect of feedback –from either the contest organizer or peers- on the likelihood of participating and the participation rate of a contest. Even though the optimal design of an idea contest depends on the environment in which the contest is running, my research on 99designs website shed lights on the effect of design parameters on the motivation of individuals and the relative importance of providing feedback in attracting more participants.

7 Limitations & Future Research

In my conjoint study, I intended to capture the importance of each design feature from the real designers' perspective. In addition, by scraping data from 99designs website, I tried to evaluate the real data to see how the participation rate for idea contests changes depending upon different design features. The limitation of both studies is the lack of ability to capture the interaction effects of design features as well as how the ability (i.e. experience) of designers could alter the expected results. Furthermore, individuals might have distinct and different motivations that drive them to participate in an idea contest – from winning a financial reward to the enjoyment of doing a design task. My studies are unable to fully reveal the participants' motivations. Moreover, the motivations of participants may change over time. Individuals may tend to join contests with fewer participants or with higher award size. By gaining more experience, they may change their strategic behaviors in order to increase their chance of winning. Last but not least, the findings of my study are context-based and could not be generalized to other examples of idea contests.

Chapter 3

The Effect of Feedback on Idea Quality

1 Introduction

Idea contests have common design parameters in practice: award(s) for the winner(s), the specification of a problem needed to be solved, the duration of the contest, the visibility of entries, and feedback. Feedback is the communication method between a contest organizer and participants (or among participants). However, many real idea contests lack this feature and contest organizers do not allow any form of communication during a contest. For example, InnoCentive[1] is the largest problem-solving marketplace where organizations are able to post their key challenges and invite a diverse group of solvers to submit their innovative ideas and solutions. Big companies and organizations such as Booz Allen Hamilton, Eli Lilly, NASA, Cleveland Clinic and etc. partner with InnoCentive to outsource their problems to the crowd. A company seeking for innovative solutions, can post a problem online, define an award for the best solution, and set a deadline for solvers to submit their ideas. For each contest that is always run as blind, it is mentioned “after the challenge deadline, the seeker will complete the review process and make a decision with regards to the winning solution. All solvers that submit a proposal will be notified on the status of their submissions at the end of the contest; however, no detailed evaluation of individual submissions will be provided.” No feedback is provided during idea contests on InnoCentive platform.

[1] See www.innocentive.com

However, other platforms, such as Threadless[2], enable users to communicate with each other and share information through commenting on submissions or sending private messages. The user interactions on online platforms could help the sense of community among members to be shaped (Bullinger et al., 2010). Contest organizers also, by means of platform communication tools, are able to communicate with contestants and provide feedback on their entries, which this interaction eventually could lead to a close and trusting relationship between a contest organizer and individuals (Zheng et al., 2011), as well as to gain learning for individuals (Leimeister et al., 2009). When a contest organizer provides feedback on an individual's submission, the individual can make some adjustments and/or improvements to her idea and refine it. Different types of feedback in different forms are allowed on Threadless platform.

Feedback is the information provided by an external source (e.g. a company, supervisor, subordinate, co-worker, or peer) regarding aspects of one's performance or output in order to reduce discrepancies between current performance and a goal (Hattie & Timperley, 2007; Kluger & DeNisi, 1996). It's a general communication process in which a sender conveys a message, which contains information about the accuracy, adequacy, or the quality of a recipient's output or response, to the recipient (Bourne & Bunderson, 1963; Ilgen, Fisher, & Taylor, 1979). In research, feedback is considered a directive, learning, incentive or motivational function that impacts behavior and performance of individuals (Nadler, 1979; Payne & Hauty, 1955).

[2] See www.threadless.com

2 Feedback Characteristics

Feedback could be in different shapes and formats. In the literature, various characteristics of feedback are studied in other contexts than idea contests. Brief overview of such characteristics are as follows.

1) *Type of Feedback*: feedback could be about the behavior or the consequence of an individual's behavior; about an outcome or the process of performing a task;

2) *Feedback Source*: feedback could be provided by any source such as managers, teachers, supervisors, subordinates, co-workers, peers, researchers, experts, mechanical devices, customers and etc.

3) *Feedback Privacy*: feedback could be provided publicly, in private, or a combination of both;

4) *Feedback Recipient*: refers to those who receive feedback such as individuals, groups, or combination of both;

5) *Feedback Content*: which is the information about the discrepancy between the performance of one individual/group and a standard, or the performance of an individual/group compared to another individual/group;

6) *Feedback Mechanism*: is called feedback *medium* as well, which describes the means of communicating feedback such as verbal, written, graphical and etc.

7) *Feedback Frequency*: that refers to how often feedback is provided such as daily, weekly, monthly, annually and etc.

8) *Feedback Valence*: is defined as "the positive or negative outcome of the comparison between an individual's creative performance and situational criteria" (Zhou, 1998).

Since feedback is mostly about the aspects of one's performance or output in order to reduce discrepancies between current performance and a goal, the effect of feedback and its characteristics on the performance and motivation of individuals have been vastly addressed in the literature. For instance, in the context of psychology and organization behavior, providing feedback enhances performance. In organizations, leaders use feedback to motivate and direct subordinates' performance. It is an important resource for organizations. After receiving feedback, an employee decides to put more effort toward those goals set by the manager or may have more payoffs for her. Researchers have investigated how goals, set by managers, influence the behavior of employees and how feedback improves organizational productivity. Goals, that should be specific and challenging, may impact behaviors through cognitive and motivational way, for instance, by motivating individuals to exert more effort to meet task requirements (Locke & Latham, 1984). In the literature feedback is shown to be able to increase or lower performance of individuals depending on the context (Liden & Mitchell, 1985).

In the context of education, the effect of feedback on learning and teaching has been the principal focus. Winne & Butler (1994) claim that "feedback is information with which a learner can confirm, add to, overwrite, tune, or restructure information in memory, whether that information is domain knowledge, meta-cognitive knowledge, beliefs about self and tasks, or cognitive tactics and strategies." It is a part of teaching process regarding whether a student is performing and learning well in the classroom or not. Teachers compare the current condition of a student with a predefined standard, student's prior performance, or to success/failure on doing a task. Feedback should answer the questions of "how students are going?" and "where to go next?" It could be

about a task, a process of doing a task, about self-regulation, or about a student's self (Hattie & Timperley, 2007).

3 Feedback's Effects in General Contests

In contests and tournaments (both in static and dynamic types), feedback can be used to reveal the information of how well players are performing. This information may have different impacts on the motivation and performance of participants in various conditions. Understanding of such effects is important for a contest organizer interested in using feedback during a contest.

For example, Ederer (2010) studied dynamic tournaments in organizations, in which workers compete with each other over a fixed prize, and addressed the effect of interim feedback. Interim feedback occurs at usually midway of performing a task when a manager (or generally an evaluator) informs workers of their performance and progress towards attaining a goal. In their model, two risk-neutral agents compete with each other and a risk-neutral principle, interested in maximizing total output of agents, decides whether to transmit the information about agents' performance to them in the middle of a two-stage tournament. Ederer demonstrates that depending on the form of effort disutility function of individuals, full-feedback policy or no-feedback policy could be used by the principle to motivate agents and increase their total output at the end of the second stage. Besides, his findings illustrate that interim feedback could be motivational for high-performers and discouraging for all competitors due to disclosure of asymmetries.

In a maze-solving experiment, Freeman & Gelber (2010) find that, in the presence of performance feedback (both absolute and relative type), low ability individuals increased their level of output more when multiple prizes were offered –compared to a single prize condition- whereas high ability individuals performed similarly under both

prize structures. In the absence of performance feedback, however, the output of both low and high ability individuals were quite the same regardless of the prize structure, while low ability individuals did not give up on winning a single prize at all.

Goltsman & Mukherjee (2011) also investigate a dynamic tournament context and show that an optimal feedback policy is to disclose the information of agents only if all competitors perform poorly at the intermediate stage. Aoyagi (2010) investigate the strategic effect of information feedback in a multi-stage tournament when the principle privately observes the effort of agents and decides whether to reveal some or all that information to the agents before the next stage, depending on the functional form of disutility of efforts.

Ederer & Fehr (2006) conduct an experiment in which agents select efforts over a two-period competition and found that providing feedback decreases second-period effort of agents. Eriksson, Poulsen, & Villeval (2009) investigated three different feedback policies: no feedback, interim feedback, and continuous feedback. They found that feedback does not improve feedback, low-performers do not quit the race, and top-performers do not reduce their effort.

Genakos & Pagliero (2012) found that revealing information on relative performance of competitors induces top-performers to underperform in a dynamic tournament even though they might have higher motivation to perform well. Gürtler & Harbring (2010) found that if the principal is committed to communicate the performance information at the beginning of a contest, then not revealing that information reduces agents' efforts. Furthermore, the principal should always reveal the performance

information unless the heterogeneity is so large. However, this revelation would discourage low-performers.

Hannan, Krishnan, & Newman (2008) studied the effect of providing relative performance feedback under two schemes of compensation: tournament incentive scheme (compensating based on performance rank) and individual incentive scheme. They found that relative performance feedback improves the performance of individuals when they are compensated based on individual incentive scheme and diminishes their performance when compensation is based on tournament incentive scheme. In the absence of relative performance feedback, participants performed better under the tournament incentive scheme.

Casas-Arce & Martínez-Jerez (2009) after analyzing sales contests of a company found that after relative performance evaluation (RPE) top performers reduced their effort since they feel more confident about their winning chance. Likewise, low-performers decrease their effort when the gap between top runners and low performers was large.

3.1 Feedback in Idea Contests

The research in this area is so scarce and needs further investigations. Wooten & Ulrich (2014) by running real design contests on 99designs website, find that *directed feedback* (in-process feedback) increases the rate of submissions by participants more than *no feedback* and *random feedback* conditions. Directed feedback, also, decreases the variance in quality of ideas submitted, increases the quality of low-quality submissions, but does not change the quality of top ideas. Providing feedback, on average, helps

individuals to improve the quality of their submissions, increases the average quality of all submission, but does not impact the quality of top ideas.

Halac, Kartik, & Liu (2014) studied some patent races and derived the principal's optimal feedback mechanism that should be full disclosure and a winner-take-all prize or no disclosure and splitting award among successes (equal-sharing). Gross (2016) by using four thousand winner-take-all commercial logo design contests observed that feedback decreases participation (in terms of continuing to compete or quitting the contest), improves the quality of subsequent submissions, and increases the total of number of high-quality ideas at the end of a contest. Moreover, he suggests that random feedback to only a subset of participants leads to more high-quality entries compared to complete feedback.

As mentioned, the effect of feedback on performance could be very heterogeneous. Feedback can motivate individuals to put more effort, submit more ideas, improve the quality of their submissions, or demotivates them. Revealing asymmetries among competitors might affect the behavior of top vs. low performers in a contest and could not be helpful in all situations. The only thing that we are sure about feedback in the literature is that feedback affects the self-efficacy, motivation, and performance of individuals. It is a key challenge for a contest organizer to understand how to attract more participants in a contest, how to motivate them to participate more and submit high-quality ideas, and how to retain them (Battistella & Nonino, 2013).

Therefore, as a design element in idea contests, which is not being used in many real examples, knowing the effect of feedback on the performance of participants is worth noting. A contest organizer needs to know:

1) Does feedback affect the performance of individuals during an idea contest?

2) Does feedback affect the quality of ideas submitted?

3) How do low vs. high performers react toward receiving feedback?

4) In what form should feedback be provided to contestants?

Two types of feedback have received significant attention in the literature and in practice as well: *relative* and *absolute* performance feedback. To study the effects of these feedback types and holding other parameters fixed, I designed a single-stage (one round), single shot (one submission per participant), with fixed prize idea contest and used three feedback mechanisms: *no feedback*, *absolute performance feedback*, and *relative performance feedback*. Feedback in my experiment was designed by a jury of experts, without any pre-announcement, and was transmitted to participants only one time and in a private message.

In the next section, I review the research on absolute vs. relative feedback and explore the effect of such feedback on the performance of individuals. Performance in idea contests is usually measured by the number and the quality of ideas a participant submits. Since my experiment was single-shot, I defined 1) likelihood of revising ideas and 2) quality of ideas generated as the indicator of participants' performance. My findings would help a contest organizer to decide to use proper form of feedback (absolute or relative) in a contest.

4 Related Literature and Hypothesis Development

According to control theory, when there is a discrepancy between current performance and a goal, individuals are motivated to reduce it (Annett, 1969; Podsakoff & Farh, 1989). In goal setting theory, feedback helps individuals to exert effort in order to attain a goal (Locke & Latham, 1984).Therefore, I can propose that feedback leads to

exerting more effort and increasing performance compared to providing no feedback. However, in some studies, for example by Eriksson et al. (2009), providing feedback does not improve the performance of individuals. Therefore, as revising the ideas is similar to the performance, I have:

> ***Hypothesis 1:*** *Providing feedback increases the likelihood of revising ideas in the idea contest more than providing no feedback.*
>
> ***Hypothesis 2:*** *Providing feedback increases the quality of ideas more than providing no feedback.*

Individuals in top percentile when receive absolute feedback, which is indicating that the best idea score is 10, see smaller difference between their score and the best score, compared to low percentile participants. Social cognitive theory states that the magnitude of discrepancy between an individual's actual performance and a goal adversely affects the performance and effort of the individual (Bandura & Cervone, 1983; Neubert, 1998). Thus, I propose that:

> ***Hypothesis 3:*** *Providing absolute feedback rather than no feedback increases the likelihood of revising ideas for top percentile participants more than for low percentile ones.*
>
> ***Hypothesis 4:*** *Providing absolute feedback rather than no feedback increases the quality of ideas for top percentile participants more than for low percentile ones.*

Festinger (1954) social comparison theory states that people compare their abilities, opinions and performance with others and based on this comparison adjust their level of effort and performance. Therefore, relative performance feedback can help them

to improve performance. Barankay (2012) in a study on furniture salespersons found that by providing relative performance feedback employees were less likely to increase their performance. Azmat & Iriberri (2010) with the data on high school students' performance found that the relative performance information leads to increasing effort by all students. However, Eriksson et al. (2009) demonstrate that relative feedback does not change the performance of individuals. He claims that low performers when receive the relative performance feedback may be discouraged and lower their performance as well as top performers who may slack off due to their confidence of winning. On the other hand, top performer might not slack off because they can increase their chance of winning by exerting a little more effort. Thus, I propose:

> ***Hypothesis 5:*** *Providing relative feedback rather than no feedback increases the likelihood of revising ideas for top percentile participants more than for low percentile ones.*
>
> ***Hypothesis 6:*** *Providing relative feedback rather than no feedback increases the quality of ideas for top percentile participants more than for low percentile ones.*

Festinger (1954) believes that objective information is more useful and helpful than comparative information. Moore & Klein (2008) in a lab experiment tested that absolute feedback is more influential than relative performance feedback. However, Charness, Masclet, & Villeval (2014) show that relative information can stimulate the competitive preferences of participants and be more driving. Therefore, I propose that:

> ***Hypothesis 7:*** *Providing absolute feedback increases the likelihood of revising ideas more than relative feedback.*

Hypothesis 8: *Providing absolute feedback increases the quality of ideas more than relative feedback.*

5 Experimental Design

In a real idea contest, I investigate how absolute and relative feedback affect the performance of participants. I use three different mechanisms –*no feedback, absolute performance feedback,* and *relative performance feedback*- to find the most useful form of providing feedback. A jury of experts without any pre-announcement designed feedback in my experiment, and provided feedback to participants only one time and in a private message. Participants were undergraduate students studying in a school of business of a public university invited to participate in a real idea contest to win $300 cash prize. Four hundred and ninety eight students (55% male and 45% female) entered this contest. Demographic information is shown in Table 3.1. None of participants had prior experience in entering such contests before.

Table 3.1: Demographic information

	Statistics		**Statistics**
Total Participants	498		
		Age (in Years)	
Gender		• Range	19-23
• Female	273 (55%)	• Mean	21
• Male	225 (45%)	• Median	21
		• Std. Dev.	2.1

The theme of the contest was as following:

"Think about a new student at your college. There are different needs and problems he/she may have and face as a new student. Can you come up with a creative solution that would help a new student to adapt to the college life? The first best idea will receive $300 cash prize. You need to define a problem and describe its importance in details, and come up with a creative original solution to solve that problem. Your idea

could be a product or service that would be eventually implemented by the college. You can only submit one idea."

Moreover, participants were told about how *the best* will be determined. Prior research has identified different dimensions for the quality of ideas such as *technical feasibility* (the feasibility to develop the idea with a reasonable price with existing technology), *novelty* (originality of the idea), *specificity*, *demand* (market size and attractiveness), *overall value*, and *customer benefit* (Girotra, Terwiesch, & Ulrich, 2010; Poetz & Schreier, 2012).

Accordingly, I selected 1) *Need/problem description* (how well a participant described the need/problem and how important and appropriate it is), 2) *Solution novelty* (how novel and original the idea is), 3) *Solution feasibility* (how feasible it is for the college to implement that idea with the existing technology) and 4) *Overall value*. The quality score of ideas was calculated based on the average scores of these four quality dimensions. According to the average score and based on how in general an idea is innovative, judges chose a score from 1 to 10 an indicator of overall quality of an idea which later on was used as a feedback given to some participants.

All participants had four weeks to submit their best ideas. There was no pre-announcement of receiving feedback. Each idea submitted was evaluated by a panel of two judges based on a Likert scale from 1 to 10 for all four dimensions. All ideas evaluated were ranked on the quality score, which was a number between 1 and 10. Then, three different percentiles were identified: bottom 25% of all participants, above 75%, and the middle percentile. Three different conditions of feedback –no feedback, absolute

feedback, and relative feedback- were assigned randomly to the participants in each three percentiles. The content of feedback was as follows.

1) **Absolute Feedback**: "*Judges evaluated your idea (based on the quality criteria); your idea quality is* X *out of 10 (10 is the score of the best idea and 1 is the score of the worst idea).*

2) **Relative Feedback**: *Judges evaluated your idea (based on the quality criteria); your idea quality is at the* X^{th} *percentile (meaning that your idea is better than* X% *of other participants and worse than* (100-X)% *of them).*

After random assignments of feedback, all participants were asked if they are willing to revise their ideas and make some improvements, regardless of feedback type they received. They were given one week to revise and resubmit. After one week, another panel of two judges evaluated all ideas again and scored them based on four idea quality dimensions. The inter-rated reliability (Krippendorff, 2007) was tested for the first panel (α_1), the second one (α_2), and the difference between two panels for all unchanged ideas (α_3). The process of this experiment is shown in Figure 3.1.

Among 498 participants, 123 individuals received no feedback. The rest (375 individuals) received some form of feedback: 192 participants the relative feedback and 183 individuals the absolute feedback. Performance of individuals in idea contests, particularly, is defined in terms of number of entries an individual submits and the quality of those entries. However, since my contest was single-shot, performance could be measured based upon the individuals' decision to revise and resubmit ideas. If individuals decide to revise and resubmit, it means that they are willing to stay active and increase their chance of winning. Since the revision may cause some improvements, the quality of

revised (or unchanged) ideas was measured as well. Both the *average quality* and the *quality of top ideas* were considered in the analysis of data.

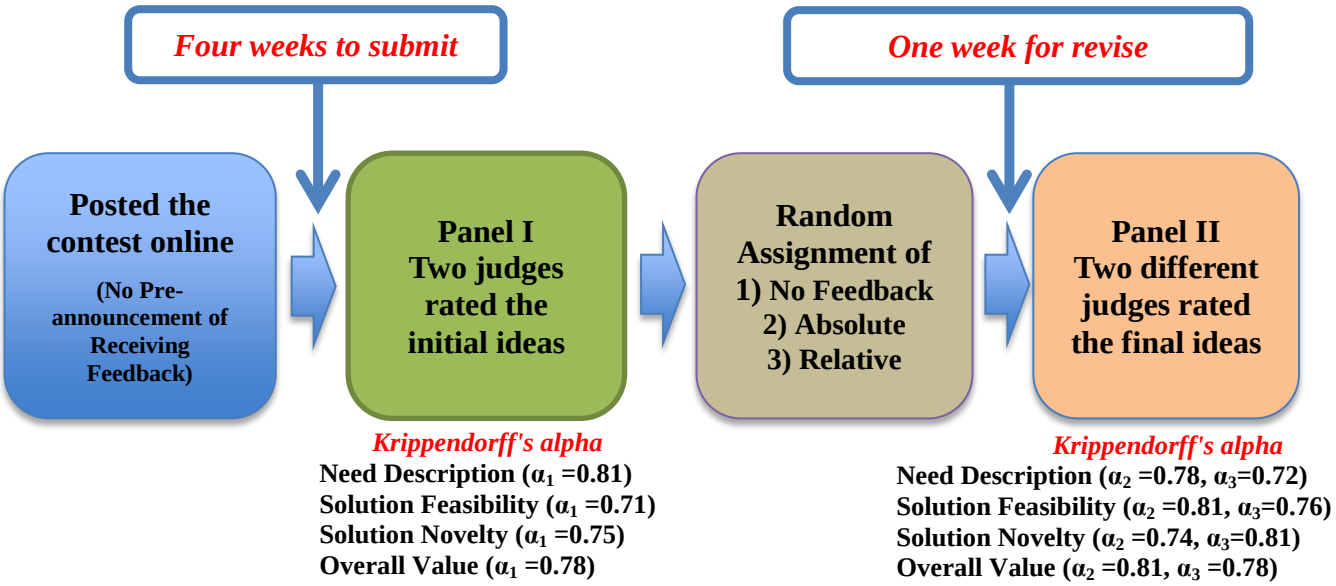

Figure 3.1: The process of idea contest experiment

6 Data Analysis and Results

To test the effect of feedback on the likelihood of revising ideas, I used the logit regression with the dependent variable *revise and resubmit* (RR) and independent dummy variables of *relative feedback* (F_R), *absolute Feedback* (F_A), and *bottom 25% percentile* (Q_{25}), and *top 75% percentile* (Q_{75}). If the quality of initial idea is among the low 25% percentile compared to all other ideas, the dummy variable Q_{25} takes the amount one; same as Q_{75}, which indicates whether the quality of initial idea is among top 75% percentile. Age, gender, and GPA are covariates in this model:

$$\text{Logit}(RR) \sim \alpha_0 + \alpha_1 F_R + \alpha_2 F_R Q_{25} + \alpha_3 F_R Q_{75} + \alpha_4 F_A + \alpha_5 F_A Q_{25} + \alpha_6 F_A Q_{75} + \alpha_7 \text{Age} + \alpha_8 \text{Gender} + \alpha_9 \text{GPA}. \quad (2)$$

When participants receive any type of feedback, the quality of their idea is revealed; otherwise, they do not know about their idea quality. The descriptive

information of idea quality for the whole participants along with those who received no feedback, absolute feedback, or relative feedback is depicted in Table 3.2.

Table 3.2: Descriptive information of initial and revised ideas

		Statistics	# ideas revised	Statistics
Total number of ideas submitted	498	**Quality of all initial ideas** • Min: 1 • Max: 9 • Mean: 4.56 • Median: 5 • Std. Dev.: 2.39 • 25% percentile: 3 • 75% percentile: 7	238	**Quality of all revised ideas** • Min: 1 • Max: 9 • Mean: 6.11 • Median: 7 • Std. Dev.: 2.21 • 25% percentile: 5 • 75% percentile: 8
# ideas received no feedback	123		0	
# ideas received absolute feedback	183	**Quality of initial ideas** • Min: 1 • Max: 9 • Mean: 4.50 • Median: 5 • Std. Dev.: 2.38 • 25% percentile: 3 • 75% percentile: 7	86	**Quality of revised ideas** • Min: 2 • Max: 9 • Mean: 6.73 • Median: 7 • Std. Dev.: 1.73 • 25% percentile: 6 • 75% percentile: 8
# ideas received relative feedback	192	**Quality of initial ideas** • Min: 1 • Max: 9 • Mean: 4.58 • Median: 5 • Std. Dev.: 2.38 • 25% percentile: 3 • 75% percentile: 7	152	**Quality of revised ideas** • Min: 1 • Max: 9 • Mean: 4.56 • Median: 5.76 • Std. Dev.: 2.37 • 25% percentile: 4 • 75% percentile: 8

By looking at the table above, we can infer that providing feedback to the participants increases the likelihood of revising ideas. None of those participants who received no feedback attempted to revise their ideas, which makes sense since the quality of their ideas was unknown and they did not know whether the idea quality was among up or low percentile. In addition, those who received relative feedback were more likely

to revise their ideas (79% of them) than those who received absolute feedback (47%). However, according to the results of logit regression shown in Table 3.3, we can see that although switching from no feedback to either relative (F_R) or absolute (F_A) feedback increases the likelihood of revising ideas; the effects are not statistically significant. Therefore, we cannot support H_1. Similarly, H_5 and H_7 are not supported either.

Table 3.3: Logit regression results for the likelihood of revising idea comparing low vs. top percentiles

	Logit Coefficients (α_i)	***p*-value**	**Odds Ratio**	**Incremental effect on probability of revising an idea**
Intercept	-18.53 (587.40)	0.974	0.00	
Relative Feedback (F_R)	19.62 (587.39)	0.973	8.66×10^7	2.67
Relative×Lower percentile quality (F_RQ_{25})	0.58 (0.42)	0.166	1.79	0.07
Relative×Upper percentile quality (F_RQ_{75})	0.27 (0.44)	0.540	1.31	0.03
Absolute Feedback (F_A)	19.59 (587.39)	0.973	8.41×10^7	2.66
Absolute×Lower percentile quality (F_AQ_{25})	-2.38 (0.40)***	0.000	0.09	-0.32
Absolute×Upper percentile quality (F_AQ_{75})	-1.29 (0.40)**	0.001	0.27	-0.17
Age	0.00 (0.08)	0.978	1.00	0.00
Gender	-0.22 (0.24)	0.361	0.79	-0.02
GPA	0.01 (0.20)	0.961	1.01	0.00

AIC: 425.68, Log likelihood=-202.83
Standard error in parentheses
** Significant at p <0.01 *** Significant at p <0.001

The only significant result indicates that receiving absolute feedback for those who are among low (25%) or top (75%) percentiles decreases the likelihood of revising and the incremental effect of the probability by 0.32 and 0.17, respectively. The difference between these coefficients -1.29 and -2.38 based on the likelihood-ratio test is statistically significant ($\Delta\chi^2$ =6.49, *df*=1, p<0.001) showing that providing absolute feedback rather than no feedback increases the likelihood of revising ideas for top percentile participants more than low percentile ones (supporting H_3). Next, consider the model of the quality of the ideas the participants submitted. I used a linear regression model to find the effect of relative and absolute feedback (and covariates) on the quality of revised ideas:

$$Q_2 \sim \beta_0 + \beta_1 Q_{25} + \beta_2 Q_{75} + \beta_3 F_R + \beta_4 F_A + \beta_5 \text{Age} + \beta_6 \text{Gender} + \beta_7 \text{GPA}. \quad (3)$$

where Q_2 is the quality of final ideas (mean-centered) regardless of being revised or unchanged; Q_{25} is the dummy variable that shows whether the initial idea quality belongs to bottom 25% percentile; and Q_{75} that is the dummy variable for top 75% percentile. The results are shown in Table 3.4. The effect of relative feedback on the quality of final idea is positive and statistically significant (β_3=1.04, $F_{1,490}$=63.47, p<0.001) the same as absolute feedback with the positive and significant effect (β_4=0.57, $F_{1,490}$=19.25, p<0.001). The difference between these two coefficients are statistically significant ($F_{2,490}$=7.46, p<0.001) supporting H_2 and rejecting H_8.

Table 2.4: Linear regression results for the effect of feedback types on the final quality

	Coefficients (β_i)	*p*-value	t-value
Intercept	-0.30 (0.83)	0.731	-0.36
Low percentile quality (Q_{25})	-3.42 (0.118)***	0.000	-29.02
Upper percentile quality (Q_{75})	2.02 (0.13)***	0.000	15.53
Relative Feedback (F_R)	1.04 (0.13)***	0.000	7.96
Absolute Feedback (F_A)	0.57 (0.13)***	0.000	4.38
Age	0.02 (0.03)	0.487	0.695
Gender	-0.00 (0.10)	0.987	-0.02
GPA	-0.01 (0.08)	0.889	-0.13

F-statistic: 286.1 on 7 and 490 *df*, p-value: < 0.001
Standard error in parentheses
* Significant at p <0.1 ** Significant at p <0.01 *** Significant at p <0.001

To test the effect of relative vs. absolute feedback on the low vs. top percentile ideas, I use the following model.

$$Q_2 \sim \gamma_0 + \gamma_1 Q_{25} + \gamma_2 Q_{75} + \gamma_3 F_R + \gamma_4 F_R Q_{25} + \gamma_5 F_R Q_{75} + \gamma_6 F_A + \gamma_7 F_A Q_{25} + \gamma_8 F_A Q_{75} + \gamma_9 \text{Age} + \gamma_{10} \text{Gender} + \gamma_{11} \text{GPA}. \quad (4)$$

where Q_2 is the quality of final ideas (mean-centered) regardless of being revised or unchanged; Q_{25} is the dummy variable that shows whether the initial idea quality belongs to bottom 25% percentile; and Q_{75} that is the dummy variable for top 75% percentile. The results are shown in Table 3.5.

Table 3.5: Linear regression results for the effect of feedback on the low vs. top percentile final quality

	Coefficients (γ_i)	***p*-value**	**t-value**
Intercept	-0.41 (0.83)	0.621	-0.49
Low percentile quality (Q_{25})	-3.01 (0.23)***	0.000	-12.68
Upper percentile quality (Q_{75})	2.64 (0.25)***	0.000	10.31
Relative Feedback (F_R)	1.26 (0.22)***	0.000	5.68
Relative×Lower percentile quality (F_RQ_{25})	-0.04 (0.30)	0.886	-0.14
Relative×Upper percentile quality (F_RQ_{75})	-0.73 (0.32)*	0.026	-2.23
Absolute Feedback (F_A)	1.20 (0.21)***	0.000	5.50
Absolute×Lower percentile quality (F_AQ_{25})	-1.03 (0.30)***	0.000	-3.39
Absolute×Upper percentile quality (F_AQ_{75})	-0.87 (0.33)**	0.009	-2.62
Age	0.01 (0.03)	0.686	0.40
Gender	-0.02 (0.10)	0.789	-0.26
GPA	-0.01 (0.08)	0.889	-0.13

F-statistic: 514.8 on 10 and 487 *df*, p-value: < 0.001
Standard error in parentheses
* Significant at p <0.1** Significant at p <0.01 *** Significant at p <0.001

When no feedback is provided, the mean-centered quality of ideas for those participants neither in top nor in bottom percentile (Q_{25}= Q_{75}=0), which I call them

middle percentile ideas, equals to the sum of the intercept and other covariates coefficients. However, when we switch from no feedback to the relative feedback, for the middle percentile ideas, the mean-centered quality increases by 1.26, which is statistically significant. This change is 1.20 when we switch from no feedback to absolute feedback for the middle percentile ideas. If we switch from no feedback to relative feedback and from lower percentile ideas to upper percentile ideas, the final quality decreases by 0.69 but it is not statistically significant; therefore, I cannot accept or reject H_6. Similarly, when we switch from no feedback to absolute feedback, and from low percentile ideas to top percentile ideas, we see an increase in the final quality by 0.16 which is not statistically significant using F-test. Thus, I cannot accept or reject H_4.

7 Discussion

In a field experiment, I explored the effect of relative vs. absolute feedback on the performance of participants in an idea contest. I invited undergraduate students to participate in a contest to submit their innovative ideas and solutions for a defined problem. A jury of experts evaluated the ideas and randomly assigned three types of feedback mechanism –no feedback, absolute feedback, and relative feedback- to the participants in different percentiles of initial ideas. The goal was to understand how (de)motivational the feedback could be in an ideas contest. The performance in my experiment was defined based on the decision of participants to revise and resubmit their ideas. Although the primary results of the contests shows that providing feedback increases the number of participants who revised their ideas, the logit regression results were not statistically significant. The only significant result on the likelihood of revising ideas was that receiving absolute feedback for those who are among low (25%) or top

(75%) percentiles, decreases the likelihood of revising ideas, but increases the likelihood of revising ideas for top percentile ideas more than for low percentile ones.

Feedback, in general, could increase the quality of all ideas in different percentiles while relative feedback was more influential than the absolute feedback. Providing relative feedback increased the quality of ideas more than absolute feedback. The quality of ideas for top vs. low percentile participants changes after receiving relative or absolute feedback. Providing relative feedback decreased the final quality of top percentile ideas compared to low percentile ones but the results were not statistically significant. Absolute feedback increased the final quality of top percentiles compared to low percentile ideas but I could not support this finding as well. After obtaining more subjects, I would be able to find significant results for my hypotheses. Nonetheless, the findings of my study would help a contest organizer to better design her contest in order to have more participation with higher quality of submissions. Feedback increases the participation of contestants within a contest and may lead to increase in the quality of top ideas.

8 Future Research

More research should investigate the effect of feedback on the performance and behavior of individuals within idea contests. For instance, pre-announcement of feedback and its effect on the performance of participants should be investigated in research studies. Whether a contest organizer credibly pre-commits to a feedback policy, studying how individuals react to that commitment would be interesting. Some individuals may submit their ideas earlier with low quality in order to receive feedback from the contest organizer to have enough time to make improvements. Frequency of giving feedback is another characteristic that received less attention in idea contest settings. Regular vs. random and stochastic revelation of performance needs to be explored. Feedback privacy

is very important. Public feedback has been seen to be more effective than private feedback in other contexts (B. F. Greene, Willis, Levy, & Bailey, 1978; Welsch, Ludwig, Radiker, & Krapfl, 1973). Mihm & Schlapp (2015) recently considered the uncertainty of outcome in their analysis. They found that when the contest organizer is concerned about contestants' average performance, providing no feedback or public feedback would be optimal option. However, when the company wants the best possible performance but performance uncertainty is high, providing private feedback outperforms no feedback and public feedback.

Feedback coming from peers vs. experts needs more investigation as well. In idea contest setting, most practical examples use the expert (i.e. contest organizer) feedback instead of peer feedback within the contest. How individuals react to the peer feedback is an interesting topic for further research. Kluger & DeNisi (1996) discussed the sign of feedback as negative or positive feedback and noted that either positive or negative feedback could influence the performance of individuals. However, negative and positive feedback needs more accurate definition. Hannan et al. (2008) found that the effect of relative performance feedback depends on the structure of contest prize. For instance, with multiple prizes even low performers may have motivation to increase their effort to win the prize; whereas in a winner-takes-all scheme they may quit (Freeman & Gelber, 2010). Feedback can also affect the creative performance of individuals. Amabile & Gryskiewicz (1987) found that supportive and informative feedback could positively impact creativity. In some contests, individuals are allowed to submit as many ideas as they want. Providing feedback may affect them to generate new and more innovative ideas within the contest.

1 Appendix

1.1 Conjoint Survey Questions

Which contest do you prefer to enter according to the described features of each?

(1 of 15)

Type of contest	Blind	Unblind
Complexity of project	Easy	Difficult
Feedback	Peers	Contest organizer
Award size	$2000	$100
Number of entries	1000 entries	500 entries
Contest period	1 day left	6 days left
Click		

(2 of 15)

Type of contest	Blind	Unblind
Complexity of project	Difficult	Easy
Feedback	No Feedback	Contest organizer
Award size	$500	$2000
Number of entries	500 entries	10 entries
Contest period	1 day left	6 days left
Click		

(3 of 15)

Type of contest	Blind	Blind
Complexity of project	Easy	Difficult
Feedback	Peers	Peers
Award size	$500	$100
Number of entries	10 entries	1000 entries
Contest period	6 days left	1 day left
Click		

(4 of 15)

Type of contest	Blind	Unblind
Complexity of project	Difficult	Easy
Feedback	No Feedback	Contest organizer
Award size	$2000	$100
Number of entries	1000 entries	10 entries
Contest period	6 days left	1 day left
Click		

(5 of 15)

Type of contest	Unblind	Unblind
Complexity of project	Difficult	Easy
Feedback	Contest organizer	Peers
Award size	$500	$100
Number of entries	500 entries	500 entries
Contest period	1 day left	6 days left
Click		

(6 of 15)

Type of contest	Blind	Unblind
Complexity of project	Easy	Difficult
Feedback	No Feedback	No Feedback
Award size	$500	$2000
Number of entries	10 entries	500 entries
Contest period	1 day left	6 days left
Click		

(7 of 15)

Type of contest	Unblind	Unblind
Complexity of project	Difficult	Easy
Feedback	Peers	Contest organizer
Award size	$2000	$500
Number of entries	10 entries	1000 entries
Contest period	1 day left	6 days left
Click		

(8 of 15)

Type of contest	Blind	Blind
Complexity of project	Easy	Difficult
Feedback	Contest organizer	Peers
Award size	$100	$100
Number of entries	1000 entries	500 entries
Contest period	6 days left	1 day left
Click		

(9 of 15)

Type of contest	Unblind	Blind
Complexity of project	Difficult	Difficult
Feedback	Peers	No Feedback
Award size	$500	$2000
Number of entries	1000 entries	10 entries
Contest period	6 days left	1 day left
Click		

(10 of 15)

Type of contest	Unblind	Blind
Complexity of project	Easy	Easy
Feedback	No Feedback	No Feedback
Award size	$2000	$500
Number of entries	10 entries	500 entries
Contest period	1 day left	6 days left
Click		

(11 of 15)

Type of contest	Unblind	Blind
Complexity of project	Difficult	Difficult
Feedback	Contest organizer	Peers
Award size	$2000	$100
Number of entries	1000 entries	10 entries
Contest period	1 day left	6 days left
Click		

(12 of 15)

Type of contest	Unblind	Blind
Complexity of project	Difficult	Easy
Feedback	No Feedback	Peers
Award size	$500	$2000
Number of entries	1000 entries	500 entries
Contest period	1 day left	6 days left
Click		

(13 of 15)

Type of contest	Blind	Unblind
Complexity of project	Easy	Difficult
Feedback	Contest organizer	Peers
Award size	$500	$100
Number of entries	500 entries	1000 entries
Contest period	1 day left	6 days left
Click		

(14 of 15)

Type of contest	Blind	Unblind
Complexity of project	Easy	Easy
Feedback	Contest organizer	Peers
Award size	$100	$2000
Number of entries	10 entries	500 entries
Contest period	1 day left	1 day left
Click		

(15 of 15)

Type of contest	Blind	Unblind
Complexity of project	Easy	Difficult
Feedback	Contest organizer	Contest organizer
Award size	$500	$100
Number of entries	10 entries	1000 entries
Contest period	6 days left	6 days left
Click		

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