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The Effect of Goal Setting on Project Performance in Online Crowdfunding**

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Motivating IT-Mediated Crowds: The Effect of Goal Setting on Project Performance in Online Crowdfunding^{*}

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Abstract

In traditional organizations, stretch goals - difficult and seemingly unattainable goals - have been much debated for their paradoxical effects. Recently, their use as a managerial instrument in IT-mediated crowds has increased. Using online crowdfunding on Kickstarter as an example, we investigate how the use of stretch goals influences project performance. Empirical results show that the use of stretch goals is associated with better project funding performance. Such positive effect is even stronger for projects with higher levels of community engagement. However, stretch goals are less effective in project categories where stretch goals are less novel. Our empirical results also reveal that the use of stretch goals significantly increases a project's likelihood of delivery delay. These results shed light on the potential dark side of using stretch goals in IT-mediated crowds.

Keywords: Goal setting, stretch goals, IT-mediated crowds, motivation, crowdfunding, online community, engagement

Introduction

Internet has allowed information technology (IT) mediated crowds to emerge as a popular organizing form. By IT-mediated crowds, we refer to self-selected and self-managing groups leveraging digital platforms; these individuals are largely unconnected to each other, with weak-tie attachment to a common purpose (Haythornthwaite 2009). Such crowds have emerged as an organizing means to, for example, debug software (Spaeth et al. 2015), generate ideas in innovation contests (Malhotra and Majchrzak 2014), mobilize political action (Wattal et al. 2010), and fund creative projects (Burtch et al. 2013).

Coordination of actions in crowds is challenging because crowd behaviors might not align with the intended goals. Many traditional motivation mechanisms, such as legitimate authority, peer pressure, social interaction, and strong incentives, are weak or absent in IT-mediated crowds. Perhaps surprisingly, stretch goals - difficult and seemingly unattainable goals (Sitkin et al. 2011) - have become a managerial instrument in crowd organizing. Stretch goals are widely used in digital activism and fundraising campaigns by individuals and for-profit/nonprofit organizations to solicit solutions/contributions from the broad public. For example, in the past decade, we have seen a number of colleges and universities run ambitious fundraising campaigns to solicit donations from stakeholders, including alumni, current students and their families, local firms, and international corporations and organizations. On crowdfunding platforms, such as Kickstarter and Indiegogo, entrepreneurs use stretch goals to inspire the crowds to fund financially intensive, technologically sophisticated products, such as 3D printers, smart watches, and large-scale video games.¹

The use of stretch goals in crowd organizing may be surprising because consensus about the effect of stretch goals in traditional organizations has not been achieved (Sitkin et al. 2011). Goal-setting has been touted as the most effective managerial instrument in traditional groups and organizations (Locke and Latham 2002), but much debate still occurs over stretch goals (Kerr and LePelley 2013). On one hand,

¹ <https://www.kickstarter.com/discover/most-funded>

stretch goals are heralded as inspiring (Denning 2012). On the other hand, they are described as demotivating, as destroying intrinsic motivation, and as leading to excessive risk taking (Sherman 1995; Markovitz 2012).

Nonetheless, IT-mediated crowds present an interesting context for studying stretch goals. In the traditional organization setting, the goal-setting theory has identified a number of contingency factors, such as legitimate authority, social interaction, and rewards that can positively impact goal effectiveness (Locke et al. 1988). But with stretch goals, these factors can also lead to strong coercive and social pressures and can drive out intrinsic motivation, giving rise to the negative effects of stretch goals (Sitkin et al. 2011). In IT-mediated crowds, individuals self-select in becoming part of a project (Jameson et al. 2013). This choice-based architecture may reduce the erosion of intrinsic motivation and the negative effects of these contingency factors.

In this research, we aim to answer two fundamental questions: 1) *Do stretch goals improve the crowd's performance?* 2) *How do stretch goals interact with contingency factors in influencing the performance?* Empirical results from the study of the Kickstarter platform show that the use of stretch goals is associated with better project funding performance. This positive effect is even stronger for projects with higher levels of community engagement. However, stretch goals are less effective in project categories where stretch goals are less novel. Our empirical results also reveal that the use of stretch goals significantly increases the likelihood of delivery delay for a project.

This research makes several contributions. We extend the boundary of the goal-setting theory to flat, self-organized IT-mediated crowds. To our knowledge, this is the first large-scale systematic study of goal setting and stretch goals in crowd-based organizing. The results provide insights into how stretch goals can be used strategically to influence crowd behaviors and also shed light on the dark side of stretch goals. The research also fills a gap in our knowledge about goals and online communities (Kraut et al. 2012). Although some research has shown how concrete and challenging goals increase contributions in online communities (Beenen et al. 2004; Ducheneau et al. 2007; Kraut et al. 2012), the literature has not examined

how stretch goals, adjusted from initial goals, influence subsequent performance. Our research also provides insight into the role of community engagement and of goal novelty in moderating the effects of stretch goals.

Goal Setting in Online Crowdfunding

We study the performance effects of stretch goals on Kickstarter, a leading rewards-based crowdfunding platform with more than 9 million backers contributing over 1.9 billion dollars. The crowdfunding platform allows entrepreneurs to solicit capital and feedback from a large number of individuals (called “backers”) to support innovative projects. Financial gains are not the primary driver for backer contributions. Instead, backers support these projects for future products, for certain forms of recognition, and to be part of the community of creative endeavors.

Backer Engagement

On Kickstarter, a project is the basic organizing around which a crowd of supporters is formed. In addition to providing funding support, backers of a project can also form an ad hoc community around the project. Each project has a Comments page (a blog for the project) to facilitate the interactions among the project creator and backers. Backers post comments to express their enthusiasm and provide feedback for the project creator to improve the project. Project creators may incorporate backers’ feedback into their ongoing projects. Continuous engagement with users and supporters help project creators build the community around the crowdfunding project.

Goal Setting and Goal Revisions

Kickstarter utilizes the “All-or-Nothing” funding mechanism - project creators will receive the money they raise only if their projects successful reach the pre-set funding goal. Once this initial funding goal is met, project creators may adjust their funding goal to a higher level, a practice often referred to as “stretch goals” on the Kickstarter platform.² Given their projects have met the initial funding goal, project creators can

² https://www.kickstarter.com/help/faq/creator+questions#faq_50035

keep all the money they raise regardless of whether the stretch goals are met. “Stretch goals” on Kickstarter reveal two essential characteristics, difficulty and unpredictability which have been considered as the two fundamental characteristics of stretch goals in the goal setting literature (e.g., Locke and Latham 2002; Sitkin et al. 2011). The difficulty comes from the high level of funding goal. Project creators usually significantly “stretch” beyond the initial goal, aiming to raise twice or even ten times more money.³ The unpredictability comes from the uncertainty of the residual market size. Since these projects have exploited the early backers and reached their initial funding goal, it becomes difficult to predict how many backers may contribute in the future.

Project Performance

Despite the popularity of stretch goals, there has been no consensus on whether stretch goals are effective in increasing project performance. In a statement to (potential) project creators, Kickstarter emphasized that “[The effect] varies depending on the project, stretch goals are not right for every project.”² One important question is whether stretch goals may motivate backers to contribute more to a project. On one hand, stretch goals may increase energy and the momentum of the crowd.⁴ On the other hand, stretch goals further complicates the campaign because of the additional information backers have to process (e.g., the project creator’s intentions, motivations, and plans). Excess information may lead to information overload.³ Therefore, the effectiveness of stretch goals on project performance remains an empirical question.

As stretch goals have become common on crowdfunding platforms, concerns about whether funded projects can meet their promised delivery dates are also on the rise.⁵ As project creators incorporate various backers’ feedback and ideas into stretch goals and product improvements, project complexity may explode,

³ For example, one project creator we talked to set an initial funding goal of \$75,000 (see <https://www.kickstarter.com/projects/jj1/axis360-modular-motion-control-for-cameras>). This particular project creator was hesitant to use stretch goals because the additional information backers had to process further complicated the campaign). However, he also felt that the stretch goal would increase the crowd’s engagement on the project because of postings by the project creator and the backers. The project creator ultimately decided to try them, and he set the first stretch funding goal at \$300,000 (4 times of the initial goal) and the second at \$700,000 (about 10 times of the initial goal). The project eventually raised more than \$666,000.

⁴ <http://crowdfundingheroes.com/advice/why-stretch-goals-are-critical>

⁵ <http://money.cnn.com/2012/12/18/technology/innovation/kickstarter-ship-delay/>

going beyond the project creator's original plan. The increase in project complexity may can make a project more difficult to complete. Due to limited capacity, fulfilling rewards can be demanding as there are more things to package and ship. In an exploratory study of the Kickstarter platform, Mollick (2014) finds that about 75% of the projects in the technology/design categories are delivered late. The failure to deliver on time has raised great concerns about the accountability of crowdfunding projects. In May 2014, Washington State's Attorney General filed the first consumer protection lawsuit against one Kickstarter project that failed to deliver.⁶ Backers contributes to crowdfunding projects in return for future products or certain forms of recognition. On-time delivery impacts backers' willingness to support crowdfunding projects and the long-term viability of crowdfunding platforms.

Observations from the crowdfunding industry motivate us to look into the effects of stretch goals on project performance. We look into two dimensions of project performance, funding performance and delivery performance, which are presumably the most important measures of project performance in crowdfunding.

Theory and Hypothesis Development

The literature has revealed the paradoxical effects of stretch goals: In some instances stretch goals may increase energy, stimulate novel and innovative thinking, and promote greater persistence in action (Argote and Greve 2007; Sitkin et al. 2011), whereas in other instances, these goals might hinder motivation or promote escalation on a failing course of action (Lee et al. 2015). We develop our conceptual model and hypotheses (Figure 1) in the following sections.

Stretch Goals and Funding Performance

According to the goal-setting theory (Locke and Latham 2002), goals shape how people adjust aspirations. Difficult goals might create positive valence in backers when they perceive that the goal attainment is

⁶ <https://www.techdirt.com/articles/20140504/07153727119/washington-state-files-first-consumer-protection-lawsuit-against-kickstarter-project-that-failed-to-deliver.shtml>

possible, given the progress so far. Difficult goals create negative valence if backers perceive that the goal is becoming less attainable. The positive valence increases energy, urgency, optimism, and persistence, which promote consistent commitment to improved performance. Negative valence decreases motivation and commitment. In this case, stretch goals can be demotivating, overwhelming, and disruptive (Locke and Latham 2013).

Figure 1. Conceptual Model and Hypotheses

In our empirical study of crowdfunding, we theorize that the energizing effect of stretch goals dominates the disruptive or demotivating effect for two reasons. First, Sitkin et al. (2011) argue that stretch goals are less disruptive when past performance is good. In crowdfunding, project creators reveal stretch goals after their project successfully reaches the initial funding goal. Stretch goals coming out at this time are perceived as signaling good project progress. These dynamic, contingent stretch goals are less likely to be demotivating and more likely to be motivating. Second, crowdfunding backers self-select, rather than being assigned to support a crowdfunding project. Self-selection may increase self-satisfaction and positive experiences. This positivity and satisfaction are likely to sustain the critical intrinsic motivation of backers, reducing the negative effects of stretch goals on contribution behaviors. As a result, we hypothesize:

H1. The use of stretch goals increases a project's funding performance.

Goal-setting theory (Locke et al. 1988) also suggests that engagement can enhance aspirations and perceptions of progress toward goals. Engagement can increase intrinsic motivation (Ryan and Deci 2000). Individuals feel a sense of satisfaction from their involvement in a group activity—that is, satisfaction beyond its instrumental value in the form of extrinsic rewards. In online community research, members interact with others to build emotional connection (Blanchard 2007, Bateman et al. 2011). In crowdfunding, backers of a project engage by providing feedback and comments to the project creator. Project creators post updates of funding progress to further engage with backers. We refer to the aggregated total of comments and announcements made by backers and a project creator for a particular project as community engagement. This community engagement is visible to anyone visiting the project pages. Backers see who else is backing the project and what other backers are thinking about the project. As backers experience the passion and confidence of other backers, they are less likely to perceive that the stretch goals are unattainable. Community engagement reveals the morale of the backers/potential backers. If morale is high, then backers are more likely to consider stretch goals to be motivating. However, if morale is low, stretch goals may be less motivating or even demotivating.

The effect of community engagement can be particularly salient in contexts characterized by incomplete information (Dewan and Ramaprasad 2012; Duan et al. 2009; Gu et al. 2013). Most crowdfunding projects fall into this category because individual backers would have difficulty verifying the feasibility of the stretch goals. Observational learning and social influence can emerge in such crowds (Duan et al. 2009; Koh and Fichman 2014). Backers decide whether to support the stretch goals based on the crowd's wisdom. Thus, we hypothesize that the effect of stretch goals is stronger in the presence of higher community engagement.

H2. The effect of stretch goals on funding performance is larger (smaller) when community engagement is higher (lower).

The novelty aspect of stretch goals might influence the effectiveness of the goals. By novelty, we refer to the infrequency of the use of stretch goals by project creators in a given project category. Sitkin et

al. (2011) argue that when an organization lacks the knowledge or practices to address novelty, stretch goals can motivate a broad search to explore whether the means to achieve the goal exist or can be created. Brain researchers have found novelty-based intrinsic motivation with infrequently occurring objects or targets (Taffoni et al. 2014). Thus, the high novelty of stretch goals might enhance intrinsic motivation of project creators and backers to work toward the attainment of goals, whereas the common prevalence of stretch goals reduces such motivation. We hypothesize the moderating effect of novelty as follows:

H3: The effect of stretch goals on funding performance is stronger (weaker) when fewer (more) projects in the same category have used them.

Stretch Goals and Delivery Performance

Goal-setting theory also argues that stretch goals can be double-edged swords (Locke and Latham 2013; Sitkin et al. 2011). Although stretch goals might improve team or organizational performance, they also can promote excessive risk taking and escalation of commitment. In crowdfunding, the use of stretch goals might help project creators solicit significantly more backer contributions. However, project creators and backers are likely to underestimate the pitfalls of overfunding when they are overtaken by their passion to reach stretch goals. Stretch goals can result in an over-commitment to funding performance, such that project creators and backers fail to account for the negative effects of stretch goals on delivery performance (Conlon and Garland 1993; Lee et al. 2015; Sleesman et al. 2012). Great success in funding potentially puts excess pressure on project creators' limited production and fulfillment capacities. We hypothesize this potential dark side of stretch goals as follows:

H4: The use of stretch goals increases the likelihood of delivery delay.

During the funding cycle, project creators may change product design or production plan as new ideas emerge. Backer feedback and community engagement may further promote escalation on a failing course of action (Lee et al. 2015). Due to limited domain knowledge, backers tend to underestimate the costs and complexity to project creators for implementing their recommendations (Huang et al. 2014). As project creators incorporate various backers' suggestions/ideas into stretch goals, project complexity may

explode. Therefore, we hypothesize that crowdfunding engagement may interact with stretch goals in exacerbating delivery delay:

H5: The effect of stretch goals on delivery delay is stronger (weaker) when community engagement is higher (lower).

Data and Methodology

Data Collection

The dataset was collected from Kickstarter. It consists of a complete sample of 68,577 *successfully funded* projects launched between May 2009 and September 2014. Projects failed to reach their initial funding goal are excluded because stretch goals are not available to them. We used both automatic extraction and manual coding to extract relevant data from the website. For each project, a computer program extracted information about the original funding goal, funding duration, the total amount of funding pledged, the number of backers, backer comments, and the promised shipping dates of project outputs. Coding these structured data is straightforward as they were displayed in a unified format on the Kickstarter website.

Stretch goals information and product delivery outcomes were announced by project creators on their project pages. Coding these factual information from text data (i.e., whether a project used stretch goals and whether the project delivered late) requires both manual input and automatic coding. We had three undergraduate research assistants read through the project pages and identify the keywords that indicates whether a project used stretch goals and whether the project has delivered the rewards. The indicator of the use of stretch goals is the mention of “stretch goal[s]” on the Project Description page or the Updates page, whereas the indicator of delivery is the mention of “shipped” and “delivered” on the Updates page. Our computer program read through all the project pages and recoded whether these keywords are present in a project update, and if yes, recoded the posting date of that update. To validate that the computer program correctly extracted these unstructured data, we had the three research assistants to manually code a validation sample of 2,000 projects. The computer-extracted data are highly consistent with manually coded data (matching rate is 95% for stretch goals and 93% for delivery).

The complete sample of 68,577 projects fall into 15 categories (see Table 1), including film & photo (24%), music (21%), publishing (8%), art (8%), games (6%), product design (5%), and technology (3%), etc.

Table 1. Project Category

Category	No. Projects	Percent
Music	16,466	24.01%
Film & Video	14,589	21.27%
Art	6,075	8.86%
Publishing	5,983	8.72%
Games	4,302	6.27%
Theater	4,071	5.94%
Design	3,591	5.24%
Food	3,013	4.39%
Comics	2,207	3.22%
Fashion	2,115	3.08%
Technology	1,941	2.83%
Photography	1,704	2.48%
Dance	1,379	2.01%
Crafts	685	1%
Journalism	456	0.66%
Total	68,577	100%

Measurement Development

This section discusses the operationalization of the key variables and control variables. Measurement of most variables follows directly by their definition in Table 2 without the need of further elaboration here.

A project's funding performance is measured as the ratio of the total amount of funding pledged and the original funding goal, *FundingRatio*. This measure of funding performance has several advantages. With normalization by the original funding goal, the funding ratio controls for project heterogeneity in scale, scope, and other dimensions that determine a project's financial need. Moreover, the measure is particularly useful in studying the effect of stretch goals. As stretch goals are usually announced once a

project passes its initial funding goal, the measure closely captures the effect of stretch goals on the additional funding pledged by backers.

A project's delivery performance is coded as a binary variable, *Delayed*, with the value equal to 1 if a project was unable to deliver project outputs by the promised delivery date and 0 otherwise. For projects that delivered late, we measure the number of days until the project delivers as a continuous variable, *DaysDelayed*.

Community engagement is operationalized as the number of comments posted by the project creator and backers on the project page, *CommentsCount*. This aggregate measure captures the overall intensity of interactions among the project creator and backers. A large number of comments posted on the project page reflects the crowd's strong enthusiasm about the project, the project creator, and the backers.

The novelty/popularity of stretch goals is measured as the percent of projects (within the same category) that have used stretch goals, *SGPopularity*. If a larger percent of projects in a category have used stretch goals, backers are more likely to have seen the use of stretch goals before, and thus the novelty of stretch goals is considered as lower in this category.

Descriptive Statistics

Descriptive statistics of the key variables are presented in Table 2. In our data sample, about 17% of the projects have used stretch goals (Stretch Goals are abbreviated as *SG* in the table). Stretch goals are most often used in the Games categories (used by more than 60% of projects) and are least used in the Music categories (used by less than 2% of projects). Levels of community engagement, as measured by the number of comments, are quite heterogeneous for different projects. In addition, on average, a successful project receives 4.8 times its initial funding goal, and those projects with stretch goals receive over 13 times of their initial goal. About 46% of projects are not able to deliver project outputs by their promised delivery date.

Table 2. Descriptive Statistics

Variable	Definition	Mean	Std. Dev	Min	Max
Initial Funding Goal	The initial funding goal set by the project creator	8,715	31,761	1	2,000,000
Funding Pledged	Total amount of funding pledged by the end of the funding cycle	16,940	117,601	1	13,000,000
Funding Ratio	Ratio of the total amount of funding pledged and the initial funding goal	4.75	220.50	1	41,536.01
Backers Count	Total number of backers contributing to a project	223.70	1,345.93	1	105,857
Delayed	Binary variable (1 if the project delivered rewards after the promised delivery date, and 0 otherwise)	0.46	0.50	0	1
DaysDelayed	The length of delay (in days)	186.57	184.68	1	1092
Has Stretch Goal	Binary variable (1 if the project has stretch goals and 0 otherwise)	0.17	0.37	0	1
Comments Count	The total number of comments and responses posted by backers and the project creator	90	2,053	0	347,736
Stretch Goal Novelty/Popularity	The percent of projects with stretch goals in a project category	0.10	0.13	0	0.63
Rewards Count	The total number of different rewards available to backers for their contributions	9.82	6.10	0	227
Updates Count	The number of updates posted by the project creator	10.10	12.21	0	301
Duration	Length of the funding cycle (in day)	32.96	12.53	1	92

Note: The number of observations is 18,940 for the binary variable, *Delayed*, and 68,577 for other variables. When evaluating delivery performance, we restricted to a subsample of projects with promised delivery dates prior to January 1, 2014. Setting an early cutoff mitigates the right-censoring issue (as delivery delay can be substantial, we do not observe the actual delivery date for projects that had not long passed their promised delivery date.). Projects without delivery information are also excluded.

Table 3 provides a model-free illustration of the differential project performance for two groups of projects: projects without stretch goals and projects with stretch goals. Compared to projects without stretch goals, projects with stretch goals on average raised 3.7 times more funding but are 26% more likely to experience delivery delay. For projects that delivered late, the length of delay is also significant longer for projects with stretch goals (see Table 4). The median length of delay for projects with stretch goals is 165

days, which is 55 days longer than that for projects without stretch goals. For projects with stretch goals, the 25 percentile and 75 percentile (columns P25 and P75) of delay are 53 days and 324 days respectively, which are also significantly higher than those for projects without stretch goals (38 days and 268 days).

Table 3. Project Performance for Projects with and without Stretch Goals

Project Group	Funding Ratio	% Projects Delivered Late
Without Stretch Goals	2.93	43%
With Stretch Goals	13.76	54%

Table 4. Days of Delivery Delay

Project Group	Mean	Std. Dev	Min	P25	Median	P75	Max
Without Stretch Goals	178.99	186.32	1	38	110	268	1,092
With Stretch Goals	206.21	178.90	1	53	165	324	1,039

Empirical Analysis and Results

Effect of Stretch Goals on Funding Performance

We first conducted an Ordinary Least Squares (OLS) regression of *LogFundingRatio* on a set of explanatory variables to investigate how stretch goals and other factors influence a project's funding performance:

$$\begin{aligned}
\log(FundingRatio_j) = & \alpha_0 + \alpha_1 * HasSG_j \\
& + \alpha_2 * LogCommentsCount_j + \alpha_3 * HasSG_j * LogCommentsCount_j \\
& + \alpha_4 * LogSGPopularity_j + \alpha_5 * HasSG_j * LogSGPopularity_j \\
& + ControlVariables + \varepsilon_j.
\end{aligned} \tag{1}$$

Control variables include the reward structure (i.e., the number of reward levels available to backers), creator experience (i.e., the number of projects the creator had launched), and the number of updates posted by the creator. We include category dummies to control for project heterogeneity across categories. We also include time dummies (year and month dummies) to control for potential time trends of the crowdfunding platform.

Empirical results in Table 5 support the hypothesis (H1) that stretch goals have a positive effect on a project's funding performance. The parameter estimate of *HasSG* shows that, on average, the use of stretch goals increases a project's funding performance by about 12% (the main effect of stretch goals).

Table 5. Parameter Estimates of the Model for Funding Performance

DV: LogFundingRatio	Coefficients (Standard Errors)		
	(1)	(2)	(3)
HasSG	0.124*** (0.008)	0.114*** (0.008)	0.111*** (0.008)
LogCommentsCount	0.100*** (0.002)	0.093*** (0.002)	0.093*** (0.002)
HasSG*LogCommentsCount	0.085*** (0.003)	0.086*** (0.003)	0.086*** (0.003)
LogSGPopularity	-0.063*** (0.003)	-0.052*** (0.006)	-0.051*** (0.006)
SG*LogSGPopularity	-0.087*** (0.006)	-0.051*** (0.007)	-0.051*** (0.007)
<i>Control Variable</i>			
LogRewardsCount	-0.101*** (0.004)	-0.093*** (0.004)	-0.094*** (0.004)
LogCreatedCount	0.142*** (0.003)	0.144*** (0.003)	0.145*** (0.003)
LogUpdatesCount	-0.003 (0.002)	-0.001 (0.002)	-0.001 (0.002)
LogDuration	-0.086*** (0.005)	-0.085*** (0.005)	-0.081*** (0.005)
Category Dummies	No	Yes	Yes
Time Dummies	No	No	Yes
Adjusted R ²	0.275	0.286	0.287

Note: Standard errors in parentheses and *p<0.10, **p<0.05, ***p<0.01.

The results also support our hypothesis (H2) on community engagement. The parameter estimate of *LogCommentsCount* suggests that community engagement has a positive effect on a project's funding performance. In addition, the parameter estimate of the interaction term, *HasSG*LogCommentsCount*,

shows that community engagement further strengthens the effect of a stretch goal (i.e., the effect of stretch goals is larger when the level of community engagement is higher).

Model estimates support our hypothesis (H3) on the positive moderating effect of stretch goals novelty on funding performance. The parameter estimate of $SG * LogSGPopularity$ shows that the positive effect of stretch goals is stronger in project categories where stretch goals were less used.

Funding Velocity before and after Stretch Goals

In the previous section, we estimate the effects of stretch goals by contrasting the funding performance of those projects with stretch goals and those without. This cross-sectional approach gives us an estimate of the overall effect of stretch goals on the final funding performance. In this section, we focus on those projects with stretch goals and look into a project's funding performance before and after the announcement of stretch goals. The panel data allows us to investigate the post-treatment effect.

Our panel dataset that tracks a project's daily funding performance over a period of two weeks (7 days before and 7 days following the announcement of stretch goals). We chose 7 days for several reasons. First, a 7-day window seems to be a reasonably short time, which mitigates the concern that potential confounding factors might also change following the announcement of stretch goals. Second, the 7-day window covers a full week. It mitigates the concern of different contributing behaviors on different days of a week (e.g., backers are more likely to contribute during weekends). The 7-day window also ensures sufficient amount of time for backers to learn about the stretch goals and complete their contributions (e.g., backers may see the stretch goals but wait until the weekend to complete the transaction). We specify the empirical model as follows

$$\log(FundingRatioDaily_{jt}) = \delta * AfterSG_{jt} + \lambda_j + \tau_t + \varepsilon_{jt}, \quad (2)$$

where j indexes a project, t indexes time (e.g., the number of days elapsed since the launch of the project on Kickstarter). The dependent variable is the daily amount of funding pledged by backers on day t , normalized by the initial funding goal, i.e., $FundingRatioDaily_{jt} = \text{funding pledged on day } t / \text{initial funding}$

goal. The dummy variable $AfterSG_{jt}$ equals to 1 if project j has already announced stretch goals by day t and 0 otherwise. The fixed-effects dummy variable λ_j controls for observed and unobserved project heterogeneity that may influence a project's funding performance. We include in τ_t a linear term of time t and a quadric term t^2 to control for the time effect that may influences backers' contribution behaviors during different phases of a project's funding cycle.

Empirical results in Table 6 show that the average daily funding pledged one weekend after the announcement of the stretch goals is about 25% (and 13% after adding fixed-effects dummies to control for project heterogeneity) higher than that one week before the introduction of stretch goals.

Table 6. Parameter Estimates of the Model for Funding Velocity

DV: LogFundingRatioDaily	Coefficients (Standard Errors)	
	(1)	(2)
PostSG	0.252*** (0.050)	0.125** (0.062)
Fixed-Effects λ_j	No	Yes
Control of Time Trends τ_t	Yes	Yes
Adjusted R ²	0.149	0.136

Effect of Stretch Goals Difficulty

In previous sections, we measure stretch goals as a binary variable. In this section, we restrict to projects with stretch goals and look into the difficulty of these goals, $SGDifficulty$, which is measured as the ratio of the stretch goals funding target and the initial funding goal. The effect of stretch goals difficulty on a project's funding performance can be captured in the following model:

$$\log(FundingRatio_j) = \alpha_0 + \alpha_1 * LogSGDifficulty_j + ControlVariables + \varepsilon_j. \quad (3)$$

Empirical results in Table 7 reveal similar insights as in previous sections where we treat the use of stretch goals as a binary variable. Funding performance is positively associated with the difficulty of stretch goals.

Table 7. Effects of Stretch Goals Difficulty on Funding Performance

DV: LogFundingRatio	Coefficients (Standard Errors)		
	(1)	(2)	(3)
LogSGDifficulty	0.637*** (0.018)	0.640*** (0.018)	0.640*** (0.018)
<i>Control Variable</i>			
LogCommentsCount	0.119*** (0.013)	0.142*** (0.015)	0.137*** (0.015)
LogSGPopularity	-0.062** (0.026)	0.092 (0.062)	0.093 (0.062)
LogRewardsCount	-0.099** (0.044)	-0.111** (0.045)	-0.107** (0.045)
LogCreatedCount	0.023 (0.033)	0.021 (0.034)	0.022 (0.034)
LogUpdatesCount	0.103*** (0.038)	0.111*** (0.039)	0.113*** (0.039)
LogDuration	-0.214*** (0.076)	-0.215*** (0.076)	-0.193** (0.076)
Category Dummies	No	Yes	Yes
Time Dummies	No	No	Yes
Adjusted R ²	0.608	0.623	0.624

Effect of Stretch Goals on Delivery Delay

We then performed a Logistic regression of *Delayed* on a set of explanatory variables X_j to study whether the use of stretch goals increases the likelihood of delivery delay. Denote by $P = P(\text{Delayed}_j = 1|X_j)$ the probability that project j delivers late, then

$$\log\left(\frac{P(\text{Delayed}_j=1|X_j)}{1-P(\text{Delayed}_j=1|X_j)}\right) = X_j\boldsymbol{\beta} = \beta_0 + \beta_1 * \text{HasSG}_j + \beta_2 * \text{LogCommentsCount}_j + \beta_3 * \text{HasSG}_j * \text{LogCommentsCount}_j + \text{ControlVariables} \quad (4)$$

Empirical results in Table 8 support our hypothesis (H4) that the use of stretch goals significantly increased the likelihood of delivery delay. The odds ratio $\frac{P}{1-P} = \exp(0.143) = 1.154$ (parameter estimate of

HasSG is the main effect of stretch goals), i.e., the odds of a delivery delay for projects with stretch goals are about 15% higher than the odds for projects without stretch goals.

Table 8. Parameter Estimates of the Logistic Model for Delivery Performance

DV: Delayed	Coefficients (Standard Errors)		
	(1)	(2)	(3)
HasSG	0.143*** (0.060)	0.157*** (0.063)	0.171*** (0.064)
LogCommentsCount	0.104*** (0.018)	0.067*** (0.019)	0.063*** (0.019)
HasSG*LogCommentsCount	0.093*** (0.026)	0.056*** (0.027)	0.060** (0.027)
<i>Control Variable</i>			
LogFundingRatio	-0.028 (0.029)	-0.025 (0.029)	-0.025 (0.029)
LogBackersCount	0.381*** (0.019)	0.374*** (0.020)	0.374*** (0.020)
LogRewardsCount	-0.107*** (0.037)	-0.127*** (0.039)	-0.125*** (0.039)
Category Dummies	No	Yes	Yes
Time Dummies	No	No	Yes
LR chi2	2149***	2111***	1635***
Prob > chi2	0.0000	0.0000	0.0000
Log Likelihood	-12188	-11950	-11931

Note: Log Likelihood is a measure of model fit (the smaller the likelihood, the better the model fits the data). LR chi2 is the Likelihood Ratio (LR) Chi-Square test statics of overall model fit. An extremely small Prob > chi2 strongly rejects the null hypothesis that all of the regression coefficients in the model are equal to zero.

The results also support our hypothesis (H5) on community engagement. The parameter estimate of *LogCommentsCount* suggests that community engagement is positively associated with delivery delay. In addition, the parameter estimate of the interaction term, *HasSG*LogCommentsCount*, shows that community engagement further strengthens the effect of a stretch goal (i.e., the effect of stretch goals is larger when the level of community engagement is higher). For projects with stretch goals, having one more backer input increases the odds of delivery delay by about 9%.

Combining H4 (main effect) and H5 (interaction effect), we can see that the use of stretch goals significantly increases the likelihood of delivery delay, especially for those projects with high level of backer involvement. This result sheds light on the potential dark side of using stretch goals in online crowdfunding.

Length of Delivery Delay

For projects that delivered late, descriptive statistics in Table 4 indicate that the length of delay is also significant longer for projects with stretch goals. We specify the linear model to quantify the extent of delay:

$$\begin{aligned} \log(\text{DaysDelayed}_j) = & \gamma_0 + \gamma_1 * \text{HasSG}_j \\ & + \gamma_2 * \text{LogCommentsCount}_j + \gamma_3 * \text{HasSG}_j * \text{LogCommentsCount}_j \\ & + \text{ControlVariables} + \xi_j. \end{aligned} \quad (5)$$

Parameter estimates in Table 9 reveal similar insights as those from the Logistic regression model of delivery delay. Stretch goals and community engagement are positively associated with the length of shipping delay. The third column (Model 2) shows that having stretch goals and one more back input increases the length of delay by 16% and 14%, respectively.

Table 9. Parameter Estimates of the Model for the Length of Delivery Delay

DV: LogDaysDelayed	Coefficients (Standard Errors)			
	(1)	(2)	(3)	(4)
HasSG	0.330*** (0.037)	0.163*** (0.039)	0.007 (0.052)	0.161*** (0.054)
LogCommentsCount		0.144*** (0.010)		0.143*** (0.013)
HasSG*LogCommentsCount			0.130*** (0.015)	0.001 (0.019)
<i>Control Variable</i>				
Category Dummies	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes
Adjusted R ²	0.079	0.097	0.087	0.097

Robustness Checks

Although the preceding analysis provides empirical support for a positive association between the use of stretch goals and project performance, the nature of observational data raises concerns about the causal interpretation of our findings. Self-selection and endogeneity concerns about project creators' use of stretch goals may bias our estimated effect of stretch goals on funding performance (Delivery performance is less subject to such endogeneity concerns due to the long time lag between the use of stretch goals and project delivery.)

To address the potential self-selection and endogeneity concerns about project creators' use of stretch goals, we conducted several robustness checks. First, we identify a set of instrumental variables and re-estimated the model using a two-step Generalized Method of Moments (GMM) approach. Second, we use a propensity score matching approach. Selection bias due to correlation between the observed characteristics of a project and the project's use of stretch goals can be addressed by using a matching technique. Third, we restrict to those projects with stretch goals and look into a project's funding performance before and after the announcement of stretch goals. These three robustness checks address different sources of selection and endogeneity bias.

Potential Endogeneity and Instrument Variables

A project creator might choose to use stretch goals if doing so can increase funding performance. Self-selection bias (Heckman 1979) might occur if factors that affect the project creator's decision to use stretch goals are not included in our model. We used instrumental variables and the GMM approach to address this endogeneity issue (Hansen 1982; Aral et al. 2012). We identified two instrumental variables: 1) total number of projects with stretch goals on Kickstarter, and (2) the number of projects a project creator had backed before she launched the project. These two variables measure a project creator's exposure to the use of stretch goals and hence would be expected to affect the choice. We suspect that a project creator is more likely to use stretch goals if she observes that a large number of other projects have used them (as a result of awareness or peer influence). However, these two variables are less likely to be directly correlated with

potential unobserved variables that might influence a specific project's funding performance and thus can be used to address the potential endogeneity issue.

We performed a series of weak identification tests (F test) and over-identification tests (Hansen's J test). The F statistic is much larger than the recommended threshold of 10, suggesting that the instruments are not weak (i.e., the instruments are correlated with potential endogenous explanatory variables). Meanwhile, the results of the Hansen's J test indicate that the null hypothesis of valid over-identification restrictions cannot be rejected (i.e., the model is not misspecified).

Table 10. GMM Estimates of Funding Performance

Variable	Coefficients (Standard Errors)		
	(1)	(2)	(3)
HasSG	0.320*** (0.037)	0.245*** (0.038)	0.345*** (0.093)
LogCommentsCount	0.109*** (0.003)	0.099*** (0.003)	0.102*** (0.005)
HasSG*LogCommentsCount	0.047*** (0.009)	0.061*** (0.009)	0.043** (0.018)
LogSGPercent	0.052*** (0.003)	0.047*** (0.006)	0.045*** (0.006)
SG*LogSGPercent	-0.101*** (0.009)	-0.065*** (0.010)	-0.075*** (0.014)
<i>Control Variable</i>			
LogRewardsCount	-0.116*** (0.006)	-0.102*** (0.006)	-0.109*** (0.008)
LogCreatedCount	0.142*** (0.005)	0.143*** (0.005)	0.141*** (0.005)
LogUpdatesCount	-0.011*** (0.003)	-0.005* (0.003)	-0.009* (0.005)
LogDuration	-0.082*** (0.006)	-0.082*** (0.006)	-0.081*** (0.006)
Category Dummies	No	Yes	Yes
Time Dummies	No	No	Yes
Adjusted R ²	0.271	0.283	0.277

GMM estimates of the model in Table 10 remain qualitatively unchanged, compared with the estimates of the original model in Table 5. These estimates suggest that the endogeneity issues likely are not significant.

Selection Issues and Propensity Score Matching

Since we did not randomly assign projects to the treatment group (projects with stretch goals), we are unable to control for observed and unobserved variables that might drive project creators to self-select themselves into the treatment group. There might be some variables that might influence project creators' use of stretch goals and simultaneously increase project performance, causing a biased sample with nonprobability sampling (Rosenbaum 2002).

Selection bias due to correlation between the observed characteristics of a project and the project's use of stretch goals can be addressed by using a matching technique based on propensity scores (Rosenbaum and Rubin 1983), which measure similarities in observed characteristics between a pair of projects (one with stretch goals and other not). Propensity score matching is the most developed and popular strategy for causal analysis in observational studies (for recent applications of this method, see Aral et al. 2009; Mithas and Krishnan 2009; Oestreicher-Singer and Zalmanson 2012; Sun and Zhu 2013).

We include all observed project characteristics (all the explanatory variables in Table 5, excluding *HasSG* and the two interaction terms) for propensity score matching. Table 11 summarizes the results from the matching. The mean funding ratios are 0.779 and 0.598 for projects with and without stretch goals respectively, which yields a mean difference of 0.181 (see row 2-4). The *t*-test indicates the difference is highly significant (see row 5-6).

Propensity-score matching operates on the assumption that observable characteristics fully account for the selection of projects into the treatment and control conditions. However, there could still be hidden bias due to unobservable characteristics. We conducted a sensitivity analysis by estimating Rosenbaum bounds (Rosenbaum 2002), which measure how strongly an unobservable must influence the selection

process in order to completely nullify the causal effects identified in the propensity-matching analysis (for recent applications of this method, see Oestreicher-Singer and Zalmanson 2012; Sun and Zhu 2013).

We present the results of the Rosenbaum bounds analysis in the bottom row of Table 11. The critical value of Γ at which the effect of stretch goals becomes insignificant is 1.7, which is similar to the findings of Oestreicher-Singer and Zalmanson (2012) and Sun and Zhu (2013). In other words, an unobservable variable would have to change the odds of selection into the treatment group by at least 70% to nullify the effect of stretch goals on funding performance.

Table 11. Propensity Score Matching

Matching	Results
Number of Matched Pairs	11,526
LogFundingRatio (with Stretch Goals)	0.779
LogFundingRatio (without Stretch Goals)	0.598
Mean Difference between the Two Groups	0.181
<i>t</i> -test Statistics	10.04***
Standard Error	0.018
Rosenbaum Upper Bounds Significant for Gamma (Γ)	1.7

Discussion and Conclusion

This research extends the boundaries of goal-setting theory from traditional hierarchical organizations to IT-mediated crowds. Our results highlight the role of community engagement and the novelty of stretch goals. These results provide insights into how to use stretch goals to improve crowd performance. Our empirical results also reveal that the use of stretch goals significantly increases a project's likelihood of delivery delay. Project creators, backers, and crowdfunding platform owners need to be aware of the potential dark side of using stretch goals.

Theoretical Implications

We extend the boundary of the goal-setting theory to flat, self-organized IT-mediated crowds. In traditional organizations, stretch goals have been heralded for their motivational effects in the popular literature. The academic literature has debated their paradoxical effects. However, little is known about the effect of stretch goals in flat, self-organized IT-mediated crowds, which present an interesting context for this study.

The empirical study adds interesting elements to the debate on the paradoxical effects of stretch goals. In the traditional organization setting, the goal-setting theory has identified a number of contingency factors, such as legitimate authority, social interaction, and rewards that can positively impact goal effectiveness (Locke et al. 1988). But with stretch goals, these factors can also lead to strong coercive and social pressures and can drive out intrinsic motivation, giving rise to the negative effects of stretch goals (Sitkin et al. 2011). In IT-mediated crowds we study, individuals self-select in becoming part of a project (Jameson et al. 2013). This choice-based architecture may reduce the erosion of intrinsic motivation and the negative effects of these contingency factors.

This research also fills a gap in our knowledge about goals and IT-mediated crowds (Kraut et al. 2012). Although some research has shown how concrete and challenging goals increase contributions in online crowds (Beenen et al. 2004; Ducheneau et al. 2007; Kraut et al. 2012), the literature has not examined how stretch goals, adjusted from initial goals, influence subsequent performance. Our research provides insight into the role of community engagement and in moderating the effects of stretch goals. The empirical findings highlight the paradoxical effects of community engagement. High level of community engagement increases the crowd's energy and help maintain the crowd's momentum, which improves funding performance. However, community engagement may promote escalation on a failing course of action (Lee et al. 2015). In the context of crowdfunding, various feedback and ideas from the crowds may increase project complexity and lead to delivery delay.

Managerial Implications

This research provides insights into how stretch goals can be used to influence crowd behaviors and motivate participant contributions. The empirical results have managerial implications for project creators and crowdfunding platforms. For project creators, this empirical study shows that project creators may use stretch goals to motivate the crowd and solicit more contributions from backers. When designing their funding campaigns, project creators consider to incorporate stretch goals to raise extra funding for product improvements.

This empirical study highlights the moderating effect of crowd involvement and provides implications for the design of crowd-based platforms. Crowd-based platforms may design rich social features that facilitate the interactions in the crowds. The ability to build and engage with crowd significantly increases funding performance. These social features are even more important when project creators decide to use stretch goals. As backers experience the passion and confidence of other backers, they are less likely to perceive that the stretch goals are unattainable.

This research also sheds light on the perils of stretch goals in IT-mediated crowds. Since the use of stretch goals significantly increases a project's likelihood of delivery delay, unsatisfied backers may be discouraged from contributing to the projects. Significant delivery delay may hurt the credibility of project creators and the long-term viability of online crowdfunding. When planning for stretch goals, project creators should take into account future delivery performance, instead of simply focusing on funding performance. Project creators should also carefully evaluate cost and technology feasibility when incorporating backer feedback/ideas into stretch goals.

Crowdfunding platforms may design policies to help project creators reduce the chance of delivery delay. Such policies may include, for example, requesting a detailed production plan before project creators launch a new project or introduce stretch goals. Utilizing the rich data from a large number of historical projects, crowdfunding platforms may also provide analytics tools to help project creators better design

their crowdfunding projects. This analytics tools can be very useful as most project creators have limited knowledge in designing a crowdfunding campaign.

Limitations and Future Work

This research is not without limitations. First, this research only studies rewards-based crowdfunding on Kickstarter. Future research may provide evidence on the generalization of the results to other IT-mediated crowds. The effects of goal setting could be different on other virtual communities that purely rely on altruism and voluntary contributions. Future research may look into the effects of goal setting in other IT-mediated crowds, such as Wikipedia and open source software development. Second, we use observational data to in this research. Alternative methodologies such as experimental methods may also provide additional insights into the causal links between goal setting and project performance in IT-mediated crowds.

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