# Show me the money! An analysis of project updates during crowdfunding campaigns

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# Show Me the Money! An Analysis of Project Updates during Crowdfunding Campaigns

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## ABSTRACT
Hundreds of thousands of crowdfunding campaigns have been launched, but more than half of them have failed. To better understand the factors affecting campaign outcomes, this paper targets the content and usage patterns of project *updates*–communications intended to keep potential funders aware of a campaign's progress. We analyzed the content and usage patterns of a large corpus of project updates on Kickstarter, one of the largest crowdfunding platforms. Using semantic analysis techniques, we derived a taxonomy of the types of project updates created during campaigns, and found discrepancies between the design intent of a project update and the various uses in practice (e.g. social promotion). The analysis also showed that specific uses of updates had stronger associations with campaign success than the project's description. Design implications were formulated from the results to help designers better support various uses of updates in crowdfunding campaigns.

### Author Keywords
Crowdfunding; updates; crowdsourcing.

### ACM Classification Keywords
H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces - Web-based interaction.

## INTRODUCTION
Crowdfunding offers a new paradigm for entrepreneurs to initiate, expand, or advertise their business ideas [10, 25]. While the concept of crowdfunding is still nascent [4], it has already shown immense promise. At the time of this writing, for example, Kickstarter, the largest online crowdfunding platform, has successfully funded 48,393 campaigns. These campaigns have generated 782 million US dollars from more than 4.7 million people [36]. Many campaigns have succeeded in reaching their funding goals, however, more than half of the campaigns have failed [36].

A key challenge is therefore to understand why some campaigns succeed while others fail. Prior work has highlighted the relation between the project representation and the outcome of a campaign [12, 23, 35]. The results suggest that project creators should focus on improving the project representation, which mainly includes the video and textual description on the project page (see Figure 2a). For example, the top rule for success suggested by Kickstarter is to create a video for the project page [35].

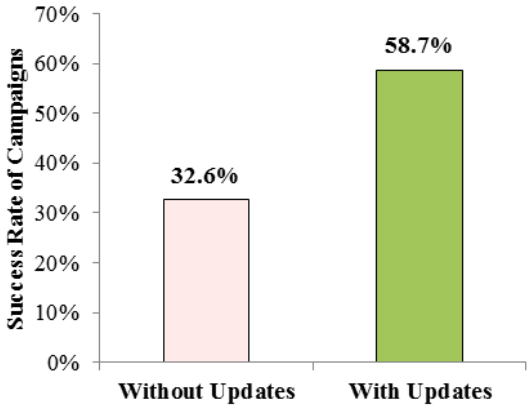


**Figure 1. The success rates of campaigns with updates and campaigns without updates.**

Besides careful preparation of a project's representation, creating *updates* is also an important part of managing a campaign [13]. The form of a project update is similar to a blog post (see Figure 2b) and the design intent is to "keep backers (funders) informed of a project's progress" [34].

Updates are critical to the success of a campaign. For example, we sampled 8,529 campaigns from Kickstarter and found that the chance of success of a project without an update was only 32.6%. In contrast, as shown in Figure 1, the chance of success with updates is 58.7% ($\chi^2$ = 285.18, $p$< .001). This suggests that updates may be as important as the creation of the project representation in determining the outcome of a campaign. However, prior work has not examined the types of updates created in a campaign, the distribution of updates across categories or time, or how different types of updates relate to the campaign outcomes.

In this paper, to better understand the nature of project updates, we analyzed how creators use updates during crowdfunding campaigns and how these updates relate to the success of the campaigns. Our main contributions are:


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**(a) Project page of a campaign** **(b) One of the project updates of the camapign**

**Figure 2. (a) The project page is the main page of a campaign on Kickstarter.com. The campaign shown is raising funds for an iPhone application that can help people find free beaches in Malibu. This campaign has four updates so far. If a user (e.g. funder) clicks on the "update" tab, s/he will see the updates displayed in reverse chronological order. (b) An update of the campaign posted in the middle of the campaign. Project creators in this update introduced two new rewards (poster and a beach bag) to attract additional funders. In this update, project creators also encourage people to promote the campaign in a social network.**

- An empirically-based taxonomy of the types of project updates created during a campaign. We identified seven types of themes in the updates and found differences between the stated design intent of updates and how project creators actually use project updates in practice.
- We report how the different types of updates relate to the outcomes of the campaigns. Results revealed the relative importance of the update representation (i.e. its content) compared to the project representation (e.g., the presence of videos and images and description length).
- Design implications for crowdfunding tools to better support the practice of creating and using updates during a campaign, thereby improving their effectiveness.

## RELATED WORK

The factors that lead to successful fundraising have been of great interest to researchers [5, 19]. Recent studies have highlighted the importance of the project representation and have found that many attributes related to the project page (see Figure 2a) can influence the success of a campaign. For instance, Kickstarter suggests that the number one rule of success of a campaign is to have a video on the project page to communicate the overall project ideas [35]. Prior work confirms that the outcome of a campaign is related to the presence of a video [12] and the quality of the video [23]. Prior work has also revealed that the success of a campaign is related to the textual content of the project page such as the length and readability of the content [12], and certain phrases used in the content [22].

In addition to the project representation, Kickstarter also provides the ability to create project updates. The intent of an update is to "keep backers (funders) informed of a project's progress" [34]. However, creators are free to provide any information about the project through an update. Researchers have included project updates in their regression analysis of campaign outcomes [18, 23]. The number of updates was found to be positively related to the success of a campaign and support the recommendation that creators provide frequent updates [35]. However, because prior work has treated updates as a single variable, it is not known what types of updates are created, which ones occur most often or when they occur during a campaign, or how the different types of updates relate to campaign success.

The initial settings of a campaign such as the amount of the funding goal and the duration of the campaign can also predict its success. For example, Muller et al. [25] found that the quantitative differentiator between successful and unsuccessful campaigns is that successful campaigns have a smaller amount of funding goals than unsuccessful campaigns. It has also been found that the duration of a campaign is negatively related to its success [23]. The social network of project creators is often the initial funding source of many campaigns and plays an important role in determining success [1, 23]. For example, Mollick found that the number of Facebook friends of creators is positively correlated with the success of campaigns.

Qualitative studies have been conducted to understand the success of crowdfunding campaigns and the motivation and barriers to participation [11, 13, 14]. Hui et al. [13] conducted interviews with project creators and participant observation to understand the work needed for the creators. They found that successful creators made large efforts in reaching out to personal on- and off-line networks for funds during the campaign. Yet, it is not clear how the degree of this effort influences the outcome of the campaign.

Our research contributes to this corpus of prior work by studying a crowdfunding site from a unique perspective – the use of project updates. To the best of our knowledge, we are the first to report the types of updates created during crowdfunding campaigns and to report the relationship between the different update types and campaign success.

## RESEARCH QUESTIONS AND DATA SET

Our study was designed to understand the practice of using updates in crowdfunding campaigns and centered on two key research questions:

**RQ1**: What are the usage patterns of updates? What types of updates occur during campaigns, how often do they occur, and when does each type of update occur?

**RQ2**: How are the types of updates associated with the success of a campaign? How important is the representation of updates compared with the representation of the main project in explaining the success of a campaign?

A quantitative analysis was conducted for our study. For data collection, we used the site thekickbackmachine.com which lists the project IDs of Kickstarter projects in reverse chronological order. Using a custom extractor, we first collected the listed project IDs from thekickbackmachine and then collected the corresponding content from Kickstarter. In total, we collected publicly available data from 8,529 campaigns on Kickstarter. The campaigns started between March 19, 2013 and May 17, 2013. The mean duration of a campaign in the data set was 32.1 (days) with a standard deviation of 10.2. For each campaign, we collected the updates that were posted before the outcome of the campaign was determined (successful or unsuccessful). A majority of the campaigns (58.6%) had at least one update. Project creators can choose to provide a private project update that can only be viewed by its funders. We found 3,098 private updates that we could not collect, and we only collected the updates that can be accessed by the public (the potential funders). This collectively provided us with a corpus of 21,234 updates. The data set includes the content of each campaign and the content and timestamp of each update.

## ANALYZING UPDATES (RQ1)

To identify the types of themes in the project updates, we applied Latent Dirichlet Allocation (LDA), an unsupervised generative method that is often used to discover hidden themes in documents and the words associated with each theme. The method enables analysis of large amounts of unlabeled documents by clustering words that frequently co-occur. Several steps were performed to process the data.

**Step 1**: Sample the data. The updates were not distributed evenly across the projects. For example, some projects had many updates while others had only a few. If we directly applied topic modeling on the updates, the identified themes and the words associated with a theme might be too specific to the content of some of the projects. To avoid this, we randomly selected three updates from a project or all the updates from a project if it had fewer than three.

**Step 2:** Clean the data. We converted the text to lowercase and removed the punctuation characters such as ();:'".

**Step 3:** Create "Bag of words". We adopted a bigram "bag of words" model, a common approach in computational linguistics [21]. That is, we used single words (unigrams), and two word phrases (bigrams) to represent the text.

We first attempted to perform LDA on the preprocessed text by treating each update as a *document*. However, we found that the resulting themes had too much overlap (i.e. many themes shared the same words), making the interpretation of the themes difficult. This is a known limitation of standard LDA. An alternative that has been applied in the text mining community is to decompose the document into finer granularities such as the sentence level in order to detect more specific topics and reduce the overlap [15] [1]. Thus, we applied LDA at the sentence-level, meaning that each sentence was treated as a document.

**Step 4:** Decompose the updates into sentences. We separated all text into sentences based on terminal punctuations (".", "?", and "!"). We excluded sentences that had fewer than three unigrams (15% of the sentences were removed); as these sentences were too short for successful model training and were usually not too meaningful. By applying LDA at the sentence-level, we found the themes easier to interpret because there was less overlap.

Researchers typically examine the output of different themes in order to decide the number of unique themes [32]. Following this data-driven approach, two experts familiar with crowdfunding reviewed the outcomes from the LDA models. The experts started by fixing a large number of themes (30 in this case), and reduced the number if they could find duplicates (e.g. themes described by the same set of words). The experts were able to finalize seven unique themes from the LDA results and category labels were assigned to the themes and any disagreements were resolved by discussion.

We then created a dictionary based on the results of LDA and used the dictionary to assign themes to the updates. Specifically, we constructed dictionaries to represent the identified themes by selecting the top 60 words (unigrams and bigrams) that were most strongly associated with each theme according to the LDA model. We also excluded a few words that are related to project categories or locations (e.g. game, music, and New York). This dictionary-based approach was applied to the entire data set. We classified an update to belong to a theme if it contained at least two unigrams or bigrams from the corresponding dictionary. By this definition, a majority of the updates belonged to only a single theme.

To verify the reliability of the produced taxonomy, we recruited two people to code a sample of the updates based on the taxonomy. First, the coders received training in which they were introduced to the categories, definitions,

[1] Sentence-level LDA works well when most of the sentences contain only a single theme. This was the case for our data set. < 1% of the sentences in our data set included multiple themes.

| Category | Dictionary words | Examples |
|---|---|---|
| **Social Promotion** | facebook page, twitter, help spread, tweet, follow facebook, please share, tell friend, share link, friends, family | *"Please tweet or post the link to this update on all your social network sites to help spread the work about…"* *"One of the best ways you can stay involved is to like our Facebook page."* |
| **Progress Report** | progress report, new update, first update, last update, half done, get done, milestone reached, journey continues, halfway, moving ahead, ahead schedule | *"We are more than half done with our remodel windows, a few paint touch ups, and bakery area left."* *"We have a few things for our first update so let's get to it. First I would like to show you …"* |
| **New Content** | new idea, new concept, new project, new blog, new picture, new cover, new link, video update, design update, brand new | *"We would like to introduce all our backers to this great new concept David presented us with today."* *"We were also looking forward to revealing some fun new ideas to try to keep the momentum and enthusiasm going"* |
| **Reminder** | weeks remain, days remain, hour left, final week, final countdown , crunch time, clock ticking, last push, weeks counting, finish line | *"We are down to the final week of our campaign. Please take a moment to pledge …"* *"Less than 24 hours to go … one last push and one last reminder."* |
| **Answer Question** | how began, why need, please read, what happen, when project, when campaign, answer question, feedback, explain, faq section | *"We added some new things to the FAQ section and explained different ways to back the project."* *"We will only be online intermittently today to answer questions."* |
| **New Reward** | new reward, change reward, better rewards, additional reward, improved reward, extra reward, incentive bonus, reward level, pledge level, reward update | *"We're happy to announce two new reward levels with full HD capability."* *"For any contributions of $20 or more, here are [sic] your new bonus…"* |
| **Appreciation** | thanks support, greatly appreciate, everyone's support , humbled, grateful, excited, generosity, bottom heart, huge thank, thanks (for) reading | *"Thank you all for your support I feel so very blessed and loved"* *"We are humbled and extremely appreciative for all your efforts to help us…"* |

**Table 1. The taxonomy of the types of updates created during crowdfunding campaigns.**

and examples in the taxonomy. They then coded updates on a small sample of the data and resolved disagreements. Then, they independently coded a random sample of 200 updates. There was good agreement between the coders and the dictionary-based method derived from the taxonomy with a Fleiss' kappa of 0.77.

### Types of Updates

The themes identified in the updates demonstrated the creative use of project updates on the crowdfunding site. The stated design intent of project updates is to help project creators keep their funders informed on the development of the project [34]. This intention was confirmed by the identified theme *Progress Report* (see Table 1). More interestingly, six other unexpected uses of updates were identified: 1) *Social Promotion* encourages people to promote a project and spread the word in their social networks. 2) *New Content* introduces new project ideas to the existing content of the project. 3) *New Reward* provides new reward levels for a pledge. Reward was something creators offered people in exchange for their pledges of funds. 4) *Answer Questions* from people such as funders and potential funders. 5) *Reminders* encourage people to pledge. Figure 3 shows the percentages of updates in each of these themes. We will elaborate these themes below.

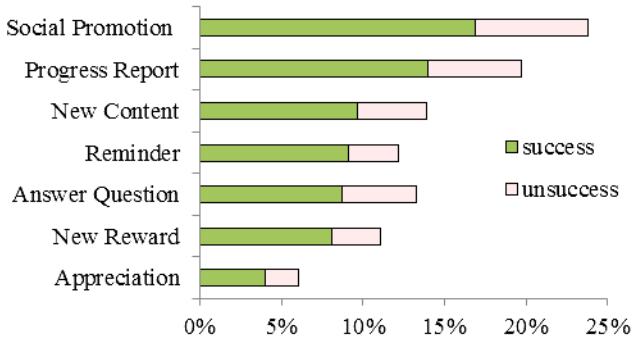



**Figure 3. Distribution of updates in the seven themes.**

*Social Promotion* is the most popular theme of the updates during the crowdfunding campaigns (23% of the updates). Project creators frequently encouraged supporters to promote a project in social media. This pattern revealed the emerging needs of project creators to gain additional exposure to their projects through the use of social media.

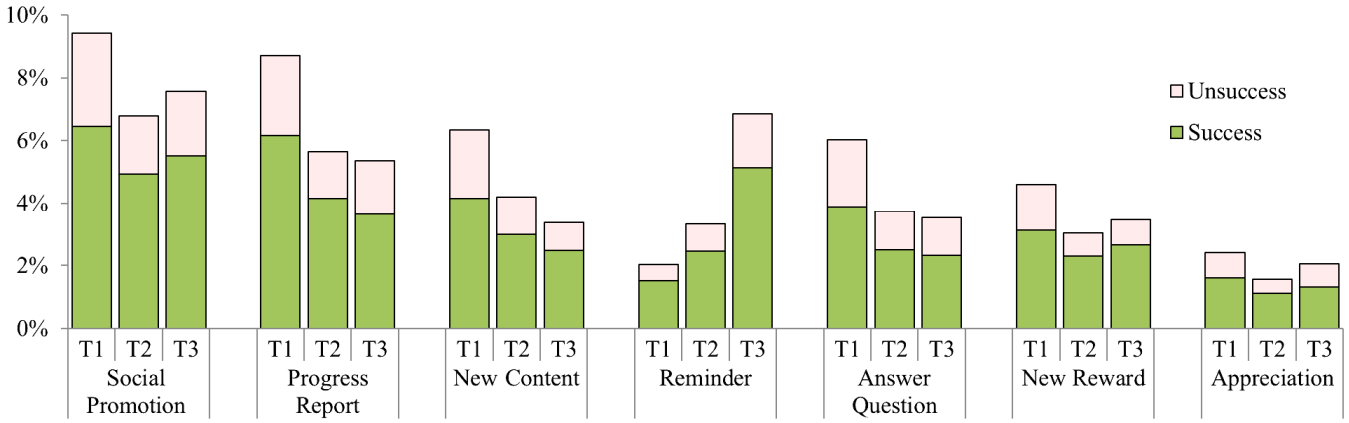



**Figure 4. Distribution of updates in three phases. T1, T2, T3 refer to the initial, middle and final thirds of a campaign respectively.**

Both *New Content* and *New Reward* updates indicated that project creators revised their projects during the campaign. However, these revisions could be viewed from two different perspectives. *New Content* updates emphasized changes of the content of the project itself, while *New Reward* updates indicated that creators offered new rewards to attract funders. Metaphorically, *New Reward* can be viewed as offering discounts on the product to attract customers, while *New Content* can be viewed as improving the product itself to attract customers. Both of the strategies could influence the sales of the product; however, which strategies would be more effective in promoting the project in the context of crowdfunding campaigns? We will attempt to compare the effects of these strategies when we address the second research question (**RQ2**).

Kickstarter has provided a separate section for creators to answer questions from funders and potential funders. However, the *Answer Questions* theme in the updates indicated that many creators still use project updates as a platform to answers questions and explain their projects.

### Timing of Updates

We investigated the temporal use of updates during the campaigns. We evenly divided the duration of a campaign into three intervals (phases): initial, middle, and final phase and an update of the campaign can be assigned to one of these phases based the posted time of the update. Figure 4 shows the distributions of updates in the three phases.

Interestingly, the distributions of the *New Content* and *New Reward* updates in the three phases were significantly different from a uniform distribution ($\chi^2 = 285.18$, $p<.001$; $\chi^2 = 70.10$, $p<.001$). The number of *New Content* updates in the initial phase was higher than the number of updates in the middle and final phases, indicating that creators adjusted their project content earlier rather than later during a campaign. In contrast, the number of *New Reward* updates increased in the final phase. These usage patterns indicate that project creators initially focus on revising their project content, but shift attention to adjusting rewards in the final phase.

Similar to *New Reward* updates, the number of *Social Promotion*, *Appreciation*, and *Reminder* updates were all increased in the final phase compared to the middle phase ($p<.001$). One interpretation of the results is that in the final phase of campaigns, project creators were more likely to utilize these types of updates to help them reach their funding goal. In particular, the *Reminder* updates were rarely used in the initial phase of the campaigns and they were the least popular among all types of updates. Conversely, *Reminder* updates were the second most popular in the final phase and project creators were on average three times more likely to use *Reminder* updates in the final phase than in the initial phase.

In addition, both Figures 3 and 4 show that successful campaigns had more updates than unsuccessful campaigns across different update themes and different time phases. In the next section, we will examine how updates were related to the outcomes of the campaigns.

## ASSOCIATION BETWEEN UPDATES & SUCCESS (RQ2)

To address the second research question, we used hierarchical logistic regression to produce an analytical model for the campaign outcomes. Hierarchical logistic regression allows us to divide the predictor variables into blocks such as update types, update representation, and project representation, and compare the relative importance of the blocks. Specifically, the regression starts with no blocks in the model, tests the addition of each block using Nagelkerke $R^2$, adds the block that improves the model the most, and repeats this process for the remaining blocks. This allowed us to study which blocks were more important for the success of a campaign.

For the dependent variable we gave successful campaigns a value of 1 and failed campaigns a value of 0. 4081 projects were successfully funded, while 4448 projects were not. The following explanatory variables related to updates and projects were investigated. They were divided into one block of control variables and the four analytical blocks:

- *Update Theme*. This block included the ratios of the update themes and the number of updates. For each

campaign, we first applied the dictionaries to all of its updates (an update belongs to a theme if it contained at least two unigrams or bigrams from the corresponding dictionary), counted the number of updates in each update theme, and then computed the ratio of the number of updates in each theme to the total number of updates. For example, *Progress Report* in table 2 refers to the ratio of *Progress Report* updates in a project to the total number of updates in that same project.

- *Project Representation*. Following prior work [12], we measure the representation of a project by the attributes related to the content of the project page: 1) *Title Length* is the number of words in the project title. 2) *Body Length* is the number of words in the project description. 3) *Number of URLs* is the number of URLs referenced in the project page. 4) *Number of Images* is the number of images included on the project page. 5) *Number of videos* is the number of videos included on the project page. 6) *Readability* of the project description is measured by the Flesch ease of reading score. These scores usually range between 0 and 100.

- *Update Time.* When we computed *Update Theme* block, we had the updates in each theme for a campaign. We further divided the updates in a theme into three phases: initial (T1), middle (T2), and final (T3). We counted the number of updates in each phase of a campaign and computed the ratio of the number of updates in each phase to the total number of updates in the theme.

In addition, we entered the control variables including campaign category, campaign duration, and the funding goal into the regression model as the initial block [23].

Except for the initial block of the control variables, each analytic block of variables was incrementally added to the regression model. The blocks were added to the model one at a time, using the statistical criterion of maximizing the Nagelkerke $R^2$ of the included blocks. For example, of the remaining blocks, the next block added was the one that maximized the prediction ability over the preceding model. This process was repeated until all blocks were added.

Table 2 shows the parameters for the logistic regression and the final analytical model of campaign outcomes based on the procedure described above. The control variables in the initial block was consistent with prior work [23]. Given that we focus on project updates, we only report their effects over and above the control variables for the sake of simplicity. *B* is the estimated coefficient for each variable in the model's equation. If the Wald statistic is significant ($p < .05$) then the parameter is useful to the model. Overall, the final logistic regression model correctly classified 77.5% of the campaigns, compared to the correct classification of 51.5% of campaigns in the base model. We should point out that we do not intend to present our model as a ready-to-use solution for a prediction system (more analysis on causality is needed), but the accuracy indicates that our model provided a reasonable fit to the data (True Positive Rate is 74.1%, True Negative Rate is 80.6%), providing validity to our analysis on the association between updates and the outcomes of the campaigns.

### Importance of Update Themes

The *Update Theme* had the most predictive power in predicting the outcome of campaigns. All the independent variables in this block were positively correlated to the success of a campaign ($p < .001$). Among the seven types of updates, we found that *Reminder* updates offered the most significant influence within our model ($B = 2.000$, $p < .001$), followed closely by *Progress Report* ($B = 1.818$, $p < .001$), *New Reward* ($B = 1.690$, $p < .001$), and *Social Promotion* ($B = 1.528$, $p < .001$). The effects of *Reminder* updates reflect the power of the ask in traditional charity fundraising activities [2, 3] and social media systems [33]. Surprisingly, *Answer Questions* updates had the least influence, though it was still predictive ($B = 0.711$, $p < .001$). One explanation is that updates dedicated to answering questions might have conflicting effects on campaign outcomes. On the one hand, these updates can help people better understand a campaign. On the other hand, these updates reflect that people have difficulties in understanding or appreciating the campaign.

Another interesting finding was that *New Reward* updates ($B = 1.690$, $p<.001$) were more likely to increase the chance of success of a campaign than *New Content* updates ($B = 1.187$, $p<.001$) ($p<.001$ for the difference, t-test). However, as shown in Figure 3, there were more *New Content* updates than *New Reward* updates during the campaigns ($p<.001$ for the difference). These results indicate that project creators currently spend more effort revising their project content than revising their reward levels. Yet, after a campaign is launched, the analysis shows that revising reward levels is a more effective strategy than revising project content for achieving campaign success.

### Update Representation vs. Project Representation

Interestingly, we found that *Update Representation* was more predictive of the campaign success than *Project Representation*. We tested this by the following procedure (not shown in Table 2): After the *Update Theme* was entered into the model as the first block, both *Update Representation* and *Project Representation* were entered into the model as the second block, and both significantly improved the regression model ($p < .001$ in each case). However, adding *Update Representation* ($\mathbf{R^2} = 0.49$, $\mathbf{R^2_\Delta} = 0.11$) increased the predictive ability of the model more than adding *Project Representation* ($\mathbf{R^2} = 0.41$, $\mathbf{R^2_\Delta} = 0.03$). Though prior work has demonstrated the importance of the project representation [12, 23], our results reveal that the representation of updates serve an even larger role during a campaign.

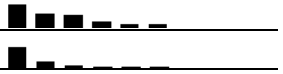
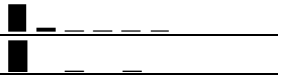
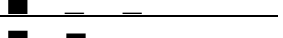
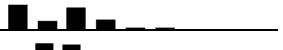
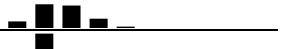
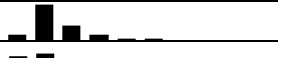
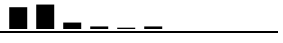
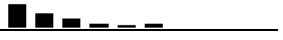
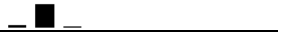
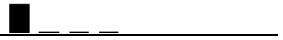
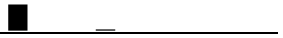
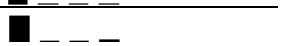
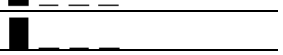
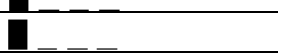
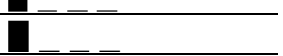
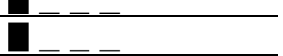
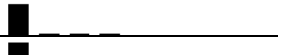
| | | | *B* | SE | *p* | Mean | STD | Distribution |
|---|---|---|---|---|---|---|---|---|
| **Update Theme** $R^2 = 0.38$ $R^2_\Delta = 0.25$ | Social Promotion | | 1.528 | 0.111 | <.001 | 0.107 | 0.220 |  |
| | Progress Report | | 1.818 | 0.128 | <.001 | 0.086 | 0.196 |  |
| | New Content | | 1.187 | 0.151 | <.001 | 0.055 | 0.155 |  |
| | Reminder | | 2.000 | 0.171 | <.001 | 0.052 | 0.150 |  |
| | Answer Questions | | 0.711 | 0.160 | <.001 | 0.049 | 0.145 |  |
| | New Reward | | 1.690 | 0.172 | <.001 | 0.046 | 0.142 |  |
| | Appreciation | | 1.201 | 0.187 | <.001 | 0.031 | 0.123 |  |
| | Num. of Updates | | 0.440 | 0.015 | <.001 | 2.489 | 6.000 |  |
| **Update Representation** $R^2 = 0.49$ $R^2_\Delta = 0.11$ | Title Length | | 0.331 | 0.016 | <.001 | 2.999 | 2.673 |  |
| | Body Length | | 0.008 | 0.001 | <.001 | 72.05 | 109.7 |  |
| | Num. of URLs | | -0.248 | 0.054 | <.001 | 0.302 | 0.683 |  |
| | Num. of Images | | 0.010 | 0.044 | 0.81 | 0.116 | 1.207 |  |
| | Num. of Videos | | -1.522 | 2.836 | 0.59 | 0.000 | 0.012 |  |
| | Readability | | -0.059 | 0.009 | <.001 | 3.995 | 7.313 |  |
| **Project Representation** $R^2 = 0.53$ $R^2_\Delta = 0.04$ | Title Length | | -0.016 | 0.012 | 0.184 | 5.694 | 2.458 |  |
| | Body Length | | -0.001 | 0.000 | <.001 | 910.3 | 703.8 |  |
| | Num. of URLs | | 0.077 | 0.007 | <.001 | 10.77 | 7.248 |  |
| | Num. of Images | | -0.012 | 0.004 | <.05 | 6.513 | 9.597 |  |
| | Num. of Videos | | 0.061 | 0.026 | <.05 | 1.258 | 1.146 |  |
| | Readability | | -0.047 | 0.012 | <.001 | 9.496 | 2.570 |  |
| **Update Time** $R^2 = 0.54$ $R^2_\Delta = 0.01$ | Social Promotion | T1 | 0.578 | 0.265 | <.05 | 0.045 | 0.174 |  |
| | | T2 | 0.015 | 0.262 | 0.953 | 0.041 | 0.164 |  |
| | | T3 | 0.456 | 0.255 | 0.074 | 0.049 | 0.186 |  |
| | Progress Report | T1 | -0.075 | 0.147 | 0.611 | 0.108 | 0.288 |  |
| | | T2 | 0.583 | 0.171 | <.001 | 0.071 | 0.228 |  |
| | | T3 | -0.431 | 0.167 | 0.05 | 0.063 | 0.219 |  |
| | New Content | T1 | -0.163 | 0.239 | 0.496 | 0.029 | 0.151 |  |
| | | T2 | -0.102 | 0.243 | 0.674 | 0.030 | 0.153 |  |
| | | T3 | 0.082 | 0.269 | 0.760 | 0.029 | 0.150 |  |
| | Reminder | T1 | 0.400 | 0.371 | 0.281 | 0.031 | 0.163 |  |
| | | T2 | 0.228 | 0.356 | 0.522 | 0.049 | 0.198 |  |
| | | T3 | 0.086 | 0.344 | 0.802 | 0.096 | 0.280 |  |
| | Answer Question | T1 | -0.452 | 0.256 | 0.078 | 0.028 | 0.147 |  |
| | | T2 | -0.198 | 0.256 | 0.439 | 0.026 | 0.144 |  |
| | | T3 | 0.208 | 0.260 | 0.423 | 0.028 | 0.150 |  |
| | New Reward | T1 | 0.231 | 0.260 | 0.373 | 0.023 | 0.137 |  |
| | | T2 | 0.536 | 0.282 | 0.058 | 0.024 | 0.137 |  |
| | | T3 | 1.180 | 0.267 | <.001 | 0.032 | 0.164 |  |
| | Appreciation | T1 | 0.079 | 0.290 | 0.785 | 0.017 | 0.121 |  |
| | | T2 | -0.121 | 0.292 | 0.679 | 0.015 | 0.114 |  |
| | | T3 | -0.277 | 0.238 | 0.244 | 0.022 | 0.140 |  |

**Table 2. Hierarchical logistic regression results for predicting the success of a campaign (Left columns). Nagelkerke $R^2$ was reported with each block and the contribution of each block was statistically significant ($p$<.001). Right columns show the descriptive statistics of the predictors.**

The success of campaigns was positively correlated with the length of the update content (title and body), while it was negatively correlated with the length of project page content. Also, the average length of the updates and project page is about 70 words and 910 words respectively (see Table 2). One interpretation is that updates of many unsuccessful campaigns were too short to provide sufficient information for potential funders, while the project page of many unsuccessful campaigns were too lengthy for potential funders. Similarly, URLs in the updates and project page had the opposite effect on campaign outcomes.

The readability of both updates and project page had an overall effect of decreasing the likelihood of the campaign being successful. This indicated that funders appreciated sophisticated content rather than simple or naive content. Also, the effect of the presence of a video in the project representation was consistent with prior work [12, 23].

### Timing of Updates

The ratio of the number of *Social Promotion* updates in the initial phase to the total number of *Social Promotion* updates during a campaign is positively correlated to the success of the campaign ($B = 0.578$, $p < .05$). This positive correlation suggests that if a project creator wants to socially promote their project in updates, more promotion in the initial phase is more likely to increase the chance of success.

The high ratio of *Progress Report* updates in the middle phase increased a campaign's chance of success ($B = 0.583$, $p<.001$). However, Figure 4 shows that the number of *Progress Report* updates decreased from the initial phase to the middle phase. Specifically, the ratios of *Progress Report* updates in the initial and middle phases to the total number of *Progress Report* updates were 45.6% and 30.1% respectively. One explanation of these results is that many campaigns provided progress reports in the initial phase and this may have increased funders' expectations for progress reports in the later phases of the campaign.

The ratio of *New Reward* updates in the final phase had a positive correlation with the probability of campaign success ($B = 1.180$, $p<.001$). Metaphorically speaking, if we think of adding new reward levels during a campaign as changing the price of a product to increase sales, discounts in the final phase are more effective than discounts in the initial phase for crowdfunding campaigns.

In addition, we found that the posted time of *Reminder*, *New Content*, *Answer Question*, and *Appreciation* updates did not have significant effects on the success of a campaign. This indicates that the effects of these types of updates are not related to the time of posting.

## DESIGN IMPLICATIONS

We foresee many opportunities for systems to better support a campaign during crowdfunding activities based on the findings from our data analysis.

### Support Various Uses of Updates

Seven different uses of updates were identified in our study, and a majority of the updates were not used to report project progress. One explanation is that the platform studied does not offer appropriate tools for project creators to perform the desired activities (e.g. social promotion) and the project creators had to compensate by using updates. In addition, the update types are mixed together and displayed in reverse chronological order on the platform. It may therefore be difficult for project creators to highlight certain types of updates or convey specific messages effectively.

System designers may consider the various uses of updates and design tools to support these uses accordingly [29]. For example, in order to help project creators communicate a message more effectively during crowdfunding campaigns, future systems can allow the creators to assign tags to their updates, and the system can map different visual attributes such as color schemes to each type of update. Also, systems could provide templates for and examples of each type of project update, creating awareness of the types of updates available and making it easier to create effective updates.

### Improve Update Representation

In our dataset, we found that the update representation was more important than the project representation in predicting the success of a campaign. Although project representation has received considerable attention from the research community, relatively little attention has been directed at improving the representation of project updates. One way crowdfunding platforms can help is to allow creators to learn from prior successful examples. For instance, many crowdfunding sites [37] provide a comprehensive taxonomy to classify various prior projects, and project creators can easily navigate the projects and find relevant examples [17]. This usage echoes research findings in education and cognitive psychology, such as the results of LeFevre and Dixon [20] who found that examples are important in the learning process and example-driven approaches are often more effective than instructions without examples.

However, current platforms do not offer an efficient way for project creators to learn and improve the presentation of their updates. One solution is to provide specific guidelines such as encouraging project creators to be more specific and detailed in their updates [16]. Another solution is to help creators find useful examples to follow. For instance, based on the categorized list of update themes and the associated words, future systems can offer a sitemap or an index tool to help users navigate through the updates and the corresponding projects, and find relevant examples from which to base the creation of their own updates.

### Connect Updates with Social Media

Our results showed that *Social Promotion* updates were the largest proportion of all update activities. This highlights the importance of social media for promoting crowdfunding projects. Prior work has also recognized the increasingly important role of social media for businesses [5, 13, 24, 27].

For crowdfunding, many sites allow project creators to embed a link of their social media profiles (e.g. Facebook page) to their project page and updates. Beyond supporting links to social media content, systems should help creators better harness the speed and reach of social media platforms to more effectively promote their campaigns. For example, tools could be designed to help creators develop and execute strategies for advertising their campaigns via social media (e.g. what to say, when to say it, and to whom).

### New Reward and New Content

*New Reward* updates were more predictive than *New Content* updates for the outcome of campaigns. This does not mean that project creators do not need to revise their product ideas, but rather that creators also need to pay more attention to the adjustment of their rewards during the campaign. Based on literature in cognitive science and business strategies [8, 26, 30], the relatively high predictive power of *New Reward* updates is likely to occur in low-involvement choices among a large number of alternatives. In other words, when competition increases, the price difference (the reward that people receive) becomes a differentiator in the market. This phenomenon reflects the highly competitive nature of crowdfunding campaigns.

We also found that the high ratio of *New Reward* updates in the final phase of a campaign is positively correlated to the success of the campaign. One possible explanation is that the initial reward offered by the campaign may tend to serve as a contrasting reference point and the additional rewards change funders or potential funders' perceptions on the campaign and thus affect their pledge decisions [9, 28].

Providing attractive rewards during a campaign is a challenging task and how systems can offer assistance constitutes an interesting area for further research. For example, a system can generate aids based on the content of project pages and prior updates to help creators brainstorm diverse ideas about rewards [31].

### Prompt for an Update

Creating updates during a crowdfunding campaign can increase its chance of success; however, a significant portion of the campaigns did not have any updates. System designers may therefore consider adding prompts for project creators to create updates. Also, our results revealed that the effects of *Social Promotion*, *Progress Report*, and *New Reward* updates were more significant during certain phases of the campaign. Systems could incorporate these findings into the design of the prompts to guide project creators as to when to post an update to maximize its effect.

Frequent updates used to solicit support from funders reflect frequent communication used in social media to bridge social capital or gain other benefits [7]. Future work should examine how different communication strategies in updates (beyond its theme) affects support from potential funders, similar to how the language used in online posts affects the likelihood of a reply [6].

## LIMITATION

This is a quantitative study based on data collected from a single crowdfunding platform. Our approach is useful for describing what happens, but a more comprehensive study is needed to increase the generalizability of the results and more systematically reveal the causal relations between the various dynamic events that occur during the campaign and the campaigns' success. Qualitative studies can be applied to understand the expectations and perceptions of the updates from both creators and funders' perspectives. On the other hand, although we only studied one crowdfunding platform, the results of our work may be used to guide and compare the analysis of campaigns on other sites [38, 39]. Such comparisons can lead to more generalizable knowledge, which can be applied to further improve the effectiveness of crowdfunding.

## CONCLUSION

Project updates are an important part of managing a campaign on a crowdfunding platform, but how updates are leveraged in practice and how they relate to the success of the campaign is unknown. This paper has made three contributions to closing this knowledge gap. First, we identified seven types of project updates made during crowdfunding campaigns and found differences between the stated design intent and the actual uses of updates (e.g. for social promotion). Second, we reported the statistical relations between the different types of updates and the outcomes of the campaigns. One significant result was that how project creators communicate with potential funders during a campaign is more predictive of success than the representation of the project page. Finally, the results were formulated into design implications for improving crowdfunding platforms and tools. Most importantly, designers should consider the functionality of project updates and how to better support their various uses in a campaign. The outcomes of this work can help creators better manage their crowdfunding campaigns and lead to better tools for guiding and reducing the effort.

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