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Research in Progress

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Abstract

Deciding which ideas to pursue is an essential step in innovation management. Organizations increasingly open up their decision-making processes internally and externally by harnessing the collective intelligence of crowds. One mechanism for doing so is enterprise crowdfunding, i.e. inviting employees to propose and support ideas on a crowdfunding platform inside the enterprise. In this paper, we empirically analyze such an enterprise crowdfunding endeavor where hundreds of employees endowed with the discretion to spend company budget proposed dozens of ideas and decided to fund 10 of them. Based on log files and information on the employees' roles in their enterprise, we investigate the time course of individual decision-making – i.e., whether they decide rather quickly or more time-lagged which ideas to support Factors that influence decision-making style include characteristics of proposers, supporters, ideas, supporters' activity level, and the progress of the trial. From this, we derive suggestions for future research into crowdfunding, and we propose relevant design parameters for using crowdfunding as a tool for internal openness and Enterprise 2.0.

Keywords: Collective Intelligence, Crowdfunding, Decision-Making, Empirical Study, Idea Assessment, Innovation, Openness.

1 Introduction

The importance of idea assessment in innovation management processes is well accepted (Adams et al., 2006; Schulze et al., 2012). No matter how many good ideas an organization has come up with, without proper assessment and funding they cannot prosper (Hansen and Birkinshaw, 2007). Correspondingly, the topic has been addressed by scholars from various fields (e.g. Baker and Freeland, 1975; Cooper and De Brentani, 1984; Adams et al., 2006). In recent years, new challenges suggest that it is now time to revisit the topic. Research on Idea Management Systems (IMSs) has typically involved a small number of project ideas competing for executives' attention (Bailey and Horvitz, 2010; Westerski et al., 2011). Nevertheless, as seen, for example, in the case of the IBM Innovation Jam, internal openness and open innovation increased the size of idea portfolios to several ten thousand raw ideas (Bjelland and Wood, 2008). Despite the existence of formal idea assessment mechanisms, about 40% of ideas selected for advancement are chosen based on some informal mechanism. About half of these ideas do not receive funding (Barczak et al., 2009). Cooper (2009)

calls the approval of projects without assigning resources "hollow go decisions" and points out that they lead to an overfull pipeline of projects taking very long time to get to market. Recent academic research – especially on open innovation – has tended to focus on generating ideas, rather than on later steps of the innovation process including idea assessment (West and Bogers, 2014).

Crowdfunding, as known from Internet platforms like kickstarter.com, is still fairly new (e.g. Belleflame et al., 2011; Gerber et al., 2014). It provides an opportunity for project *Proposers* to reach out to a large audience to gain funding from project *Supporters* – sometimes in return for pre-defined-givebacks. Enterprise crowdfunding was explored by Muller et al. (2013). When applied inside an organization, crowdfunding potentially addresses some of the aforementioned issues of idea assessment. It engages large groups of an organization's employees, as decision-makers. Therefore, given the collective intelligence and decision support of many, this mechanism can potentially help to better manage large idea portfolios. Finally, it bundles decisions about ideas with the funding of those ideas which should reduce the issue of so called "hollow-go" decisions (Cooper 2009).

While crowdfunding research in general is emerging (Belleflame et al., 2011; Gerber et al., 2014; Hui et al., 2014; Mitra and Gilbert, 2014), there is little coverage on enterprise crowdfunding. In this research in progress paper, we describe a first study of decision-making in enterprise crowdfunding. We explore data, i.e. log files, from IBM's crowdfunding trial, iFundIT, conducted in early 2013 by a large, international IT unit with professional decision makers and real investment decisions. Our overall objective is to investigate enterprise crowdfunding in order to inform corporate decision makers, when and how to employ this mechanism. For this, it is important to understand design parameters of the mechanism as well as the behavior of participants in such a mechanism. Besides general acceptance of the mechanism, a key behavioral aspect of its use is the decision-making style: How do participants come to their decision which ideas to support? This paper aims at uncovering decision-making styles in order to propose design parameters for potential improvement of the mechanism. Subsequently, we call anybody participating in enterprise crowdfunding a *User*. Amongst the users, anybody proposing an idea is called a *Proposer*, and any user dedicating budget to an idea a *Supporter*. Hence, we define the following set of exploratory research questions:

RQ1: Are decisions taken by supporters in enterprise crowdfunding rather quickly or more time-lagged?

RQ2: Does supporters' decision-making style, i.e. quick vs. time-lagged decisions, vary depending on their role in the organization?

RQ3: Do the number of ideas that supporters view and / or invest money in influence their decision-making style?

RQ4: Does the decision-making style vary by the characteristics of the ideas?

RQ5: Does the decision-making style of supporters vary depending on the hierarchical level of the proposer posting an idea onto the enterprise crowdfunding platform?

RQ6: Do similarities between idea proposers and supporters impact the decision-making style?

RQ7: Does the decision-making style of supporters change over the course of a funding round?

The remainder of this paper is organized as follows. The next section provides an overview on the body of knowledge related to idea assessment and crowdfunding research. Then, we describe the data set used for our analysis followed by the results of our exploratory study. In the final section we summarize our findings and discuss future design parameters, limitations, and follow-on research.

2   Background and Related Work

Idea Assessment and Crowdfunding. While idea assessment is a critical step within the innovation management process (Cooper, 2009), research on this topic has been weak, in particular with regards to paying attention to the new challenges deriving from open innovation and increasing internal

openness (West and Bogers, 2014). To help overcome those challenges, the scientific community so far has covered aspects such as rating scales (Sundbo, 1997; Dean et al., 2006; Aas, 2010, Riedl et al., 2010), team-based and crowd-based assessment approaches, comparisons between different approaches (Blohm et al., 2011; Graefe and Armstrong, 2011; Soukhoroukova et al., 2012), and also the composition of teams deciding upon ideas (Riel et al., 2011). The importance of IT solutions for idea assessment is examined and emphasized (Bailey and Horvitz, 2010; Hrastinski et al., 2010; Schulze et al., 2012; Westerski et al., 2011). With regards to crowd-based mechanisms, thumbs up/down or 5-star rating do not seem to perform sufficiently well (Riedl et al. 2010). Graefe and Armstrong (2011) raise issues about the favorability of market mechanisms. The application of crowdfunding for idea assessment inside organizations is new.

Research on crowdfunding on the Internet has received researchers' attention quickly and grown rapidly. Feller et al. (2013) describe crowdfunding research along "four paradigmatic lenses": (a) Type of crowdfunding studied (e.g. lending, equity, or patronage), (b) study design, (c) type of theory developed (e.g. analysis, explanation), and (d) primary focus of the studies. They found current publications leaning towards crowd lending (62%), being of empirical nature (74%), focusing on theories for explanation and prediction or mere explanation (in total 68%), and addressing economic (50%) or social (25%) questions. To name a few, the most prominent papers of current crowdfunding research comprise studies on important features of crowdfunding and comparisons to other forms of funding (Belleflame et al., 2011), grounded theory based on case studies (Ordanini et al., 2011), success factors for proposed ideas (Mollick, 2014), linguistic analysis of successful proposals (Mitra and Gilbert, 2014), the role of geographical distribution and social networks for crowdfunding success (Agrawal et al., 2011), the influence of coordination among supporters in simulated crowdfunding (Wash and Solomon, 2014), the application of crowdfunding in various domains, e.g. the music business (Kappel, 2009), equity-based crowdfunding for start-ups (Schwienbacher and Larralde, 2010; Ahlers et al., 2012), motivations and deterrents for participating in crowdfunding as well as the collaborations needed for crowdfunding success (Gerber et al., 2014; Hui et al., 2014), and analyses of users' support for projects over time (Kuppuswamy and Bayus, 2013). However, literature review did not identify examples for analysis of users' individual behavior using log files.

In a recent paper from entrepreneurial research Vogel and Fischler-Strasak (2014) suggest considering crowdfunding for inter-departmental funding of ideas. In 2012 and 2013 IBM conducted four trials of enterprise crowdfunding within different business units. Research findings addressed topics such as the type of proposed ideas, goals and motivations for participation, or cross-departmental support (Muller et al., 2013, 2014). Also, a first conceptual comparison of enterprise crowdfunding and prediction markets was undertaken (Feldmann et al., 2013). Related to enterprise crowdfunding, Sakamoto et al. (2013) present a conceptual study on the use of crowdfunding in urban communities.

Quick vs. time-lagged decisions. Various streams of research suggest a difference between quick and time-lagged decision-making. Schar (2011) for instance mentions a tendency of teams of convergent thinkers to decide rather fast and teams of more divergent thinkers to take more time and gather more information. In cognitive psychology differences between fast and slow thinking are discussed (Stanovich, 1999; Kahneman, 2011; Evans and Stanovich, 2013). Fast thinking – also termed system 1 or type 1 thinking (Kahneman, 2011) – is associated with attributes such as intuitive, automatic, effortless, and the use of heuristics. Slow thinking – also termed system 2 or type 2 thinking – has the notion of deliberation, i.e. it is more reflective, analytical, rational, and effort intense. In our research we make use of this concept. We name quick decision-making decisions showing the characteristics of fast thinking, vs. time-lagged decision-making showing the characteristics of slow thinking. It is an open question whether a company's senior management would desire more deliberative, time-lagged behavior when involving their staff in decisions. On the one hand, this could result in more rational decisions, on the other hand it is time intensive (thus costly) and it is well known that intuitive, quick decisions can be very good decisions when the decision task is sufficiently familiar.

3   Methodology and Data Set

For the exploration of enterprise crowdfunding, IBM Research developed a proprietary platform on the company's intranet. The platform design includes common crowdfunding features found in kickstarter.com, indiegogo.com, and many others.

In 2012, an initial trial was undertaken involving over 500 employees in the IBM Watson Research Center (Muller et al., 2013). In this context, the procedures for enterprise crowdfunding were defined. For every trial, a senior management sponsor provides a budget that is divided into equal spending amounts amongst the participants. Proposers submit descriptions of their ideas, including funding targets, to the crowdfunding platform, where they get reviewed in terms of legality. Once the ideas are published, they can be viewed and promoted by all users for 30 days. Promotion can include liking, sharing, following, spending a share of the provided personal budget, named "backing", or volunteering personal work time for the realization of the idea. To gain approval, an idea has to achieve its financial funding target.

In 2013, the iFundIT trial was conducted by a large, geographically distributed IT organization comprising of 5,500 members in over 25 countries. Several attributes of the first trial were modified. Ideas should have a clear business focus and a funding target between 10,000 and 50,000 USD. A budget of 2,000 USD was allocated to each person who registered upfront. However, overall not more than 150,000 USD should be spent. Therefore, the trial terminated either when time ran out or when the maximum budget was assigned to ideas. In this paper we aim for a better understanding of the decision-making behavior of users by differentiating quick and time-lagged decision-making based on observed behavior. For this, we present statistical analyses based on log files derived from the iFundIT trial amended by information on the participating users. In general, using log files to analyze user behavior on collaboration platforms is a common approach (e.g. Riedl. et al. 2010).

We also analyzed the types of proposals in the context of decision behavior. Subsequent to the trial we employed a focus group of IBMers, who have not been involved in iFundIT, to cluster the ideas into groups. The decision criterion was consensus. They came up with the following six clusters and assigned each idea to exactly one of these clusters (number of ideas per cluster in parentheses): External Development (4 ideas), Internal Development (27), Feature Request for Internal Improvement (19), Learning (1), Productivity Improvement (1), and Building the Knowledge Base (3).

4   Empirical Results

4.1   Descriptives

359 employees of the IT unit followed the invitation to participate in the enterprise crowdfunding trial and registered for iFundIT. Employees who were not invited could visit the platform and view ideas – 161 persons did so. However, they could neither register for the platform, nor propose ideas, nor receive budget and, hence, could not contribute funds to ideas. 44 registered users (12.3%) actively proposed a total of 55 ideas. Each of these ideas was viewed by at least 25 unique users. 45 ideas (81.8%) received financial backing from at least one user, 10 ideas (18.2%) were funded. In total there were 9,616 events where a user viewed the detailed description of an idea and 572 events where a user backed an idea (10.4 backings per idea, on average 553.67 USD per backing event). Users could back ideas multiple times (if they had sufficient budgeted funds to do so) if they liked and used this feature. Of the 572 backing events, 514 are first-time backings in the sense of a specific user backing a specific idea for the first time. For the remaining 58 backing events, a user invested additional money in an idea that he had previously invested in.

In the following, we are interested in the 514 first-time backing events. For each of these, we analyze backwards along the path to backing, i.e. the history of the user before he decided for the first time to

back that idea. This path can be characterized by time and events. Specifically, we first analyze the time from a user's first view of an idea's description to that user's first backing of that idea. Second, we analyze the number of views a user has on an idea prior to backing it.

The time from a user's first view to first backing of an idea ranges from 4 seconds to 20 days. To account for outliers, a natural logarithm is applied to time measured in hours; the measure is denoted as LOG (TIME TO BACKING). Figure 1 shows the empirically observed distribution of LOG (TIME TO BACKING) – it is clearly bimodal, indicating that many decisions are taken quickly, while others are time-lagged. We categorize backing decisions taken within 1 hour subsequent to the first view as QUICK (TIME), while later decisions are labeled TIME-LAGGED (TIME). We also varied this dividing line; however, results remained qualitatively the same. We observed 418 QUICK (TIME) backing decisions (81.3%) and 96 TIME-LAGGED (TIME) backing decisions (18.7%).
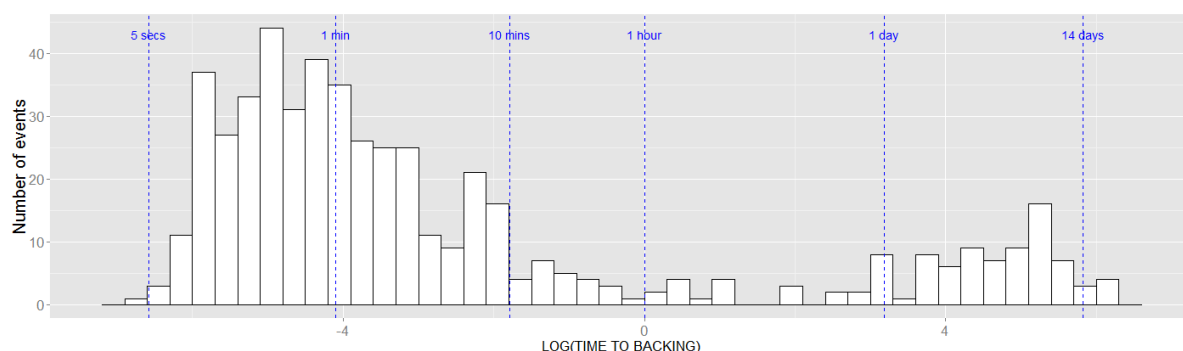

Figure 1.   Distribution of LOG (TIME TO BACKING).

The second measure is the number of views prior to backing. It ranges from 1 to 28. 1 view is mandatory as users could only access the backing function from an idea's description. Again, we use a natural logarithm to account for outliers and refer to the measure as LOG (VIEWS TO BACKING). The majority of backing decisions (67.9%) follows from the first view of an idea's description. In response to RQ1, we categorize these immediate decisions as QUICK (VIEWS) as compared to 32.1% TIME-LAGGED (VIEWS) backing decisions.

4.2   Regression Analysis

To analyze the determinants and correlates of quick and time-lagged backing decisions, we perform a series of 4 multivariate regressions (see Table 1). The data is panel data. We estimated pooled, fixed, and random effects models with user and idea effects and employed F, Breusch-Pagan LM, and Hausman Tests for model selection. The analysis revealed that a random user effects model is adequate for both LOG (TIME TO BACKING) and LOG (VIEWS TO BACKING) as dependent variable. The two models are different statistical approaches to operationalize the same underlying research question: What is the relationship of various observable characteristics and behaviors on the time-lagged or quick decision-making of users in enterprise crowdfunding? All models share the same data set (514 first time backing events) and the same set of 26 independent variables (e.g. the user's role as manager or not and the level in the organization). For ease of presentation, the independent variables are grouped. The models serve as robustness check for each other – the final column of Table 1 summarizes the observed effects; the following discussion sketches selected findings.

RQ2: User role in the organization. To estimate each user's status in the organization, we counted the number of steps from the CEO to the user (Bailey and Horvitz, 2010). Users were 4 to 13 steps apart from the CEO. Steps 10 to 13 are grouped as LOW ORG CHART LEVEL, 4 to 6 as HIGH ORG CHART LEVEL. Medium steps of 7 to 9 are not shown in Table 1, as they are the baseline for the regression analyses. MANAGER is a dummy variable equal to 1 when the user has people management

responsibility and 0 otherwise. The data show that users on a LOW ORG CHART LEVEL tend to take longer prior to backing an idea, and so do managers.

Dependent variable	(1) LOG (TIME TO BACKING)	(2) LOG (VIEWS TO BACKING)	(3) TIME-LAGGED (TIME)	(4) TIME-LAGGED (VIEWS)	Consistent significant effect[1]
Estimation method	Random user effects	Random user effects	Logit	Logit	
User role in the organization					
LOW ORG CHART LEVEL	0.427	0.035	0.873 *	0.453 †	(Positive)
HIGH ORG CHART LEVEL	-0.899	-0.118	-0.546	-0.101	No
MANAGER	0.041	0.031	0.707 †	0.533 †	(Positive)
Activity Level on the Enterprise Crowdfunding platform					
LOG(NUM. IDEAS VIEWED)	1.042 ***	0.167 ***	0.818 ***	1.175 ***	Positive
LOG(NUM. IDEAS BACKED)	-1.362 **	-0.319 ***	-1.704 ***	-1.534 ***	Negative
BUDGET NOT FULLY SPEND	-0.709	-0.155 †	-0.427	-0.153	No
TIME VOLUNTEERED	-0.844	0.008	-0.374	-0.424	No
Idea characteristics					
EXTERNAL DEVELOPMENT	2.142 *	0.330 *	0.938	1.858 *	Positive
INTERNAL DEVELOPMENT	0.238	0.066	-0.108	0.697	No
FEATURE REQUEST	-0.541	-0.045	-0.597	0.112	No
LEARNING	2.049 *	0.273 *	1.321	2.043 *	Positive
PRODUCTIVITY IMPROVEMENT	0.786	-0.160	-13.551	-13.415	No
IDEA FUNDING TARGET	-0.195 †	-0.029	-0.271 *	-0.150	(Negative)
IDEA FUNDED	-0.678 *	-0.082 †	-0.656	-0.562 †	Negative
Proposer characteristics					
LOW ORG CHART LEVEL	0.576 †	0.093 †	0.224	0.245	(Positive)
HIGH ORG CHART LEVEL	-0.125	0.080	0.141	0.200	No
MANAGER	0.027	-0.070	0.092	-0.511	No
Proposer/User similarity					
EQUAL COUNTRY	0.709 †	0.108 †	0.608	0.736 *	Positive
EQUAL ORG DIVISION	-0.118	0.028	-0.076	-0.046	No
Time of first view of an idea by the user					
Week	-1.577 ***	-0.222 ***	-1.109 ***	-0.766 ***	Negative
Tuesday	-0.917	-0.318 †	-0.841	-0.854	No
Wednesday	-2.514 *	-0.433 *	-2.152 **	-2.075 **	Negative
Thursday	-2.071 †	-0.400 *	-1.668 *	-1.410 *	Negative
Friday	-3.713 **	-0.476 *	-2.899 ***	-1.950 **	Negative
Saturday	-3.476 **	-0.539 **	-2.011 *	-2.214 **	Negative
Sunday	-7.271 *	-1.015 *	-18.423	-17.000	(Negative)
Intercept	4.860 **	1.513 ***	4.309 **	2.139 *	N/A
N	514	514	514	514	
R^2 (Cragg and Uhler's R^2 for Logit)	0.294	0.303	0.398	0.311	

*Table 1.   Regression results (Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '†' 0.1).*

RQ3: Activity level on the Enterprise Crowdfunding platform. Users differ widely in how many ideas they view and back: Viewing ranges from 1 to 55 ideas. Backing ranges from 1 to 13 ideas. Both have a consistent significant effect on the decision-making style: users who explore many ideas take a

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[1] Coding of consistent significant effects: Unrestricted "positive" or "negative" effect when 3 or 4 of 4 models show equally directed significant effect at 0.1 level. Restricted "(positive)" or "(negative)" effect when half of the models show equally directed significant effect at 0.1 level. "No" otherwise.

longer time before deciding to back a single idea (see LOG(NUM. IDEAS VIEWED) in Table 1). On the contrary, users who back many different ideas – i.e. users who spread their funds rather than pooling them on a few ideas – decide quicker. Whether a user invests his entire budget and whether or not he volunteers time to any idea has no observable relation to the decision-making style.

RQ4: Idea characteristics. Users seem to decide in a more time-lagged manner on external development and learning projects compared to the baseline category of ideas building the knowledge base. However, given low sample size in most of the categories (4 EXTERNAL DEVELOPMENT, 1 LEARNING, 1 PRODUCTIVITY IMPROVEMENT), this is only a first indication. Here, more data is clearly needed. Interestingly and counter-intuitively, decisions tend to be quicker for ideas with higher funding targets, and for ideas which get successfully funded.

RQ5: Proposer characteristics. When an idea is proposed by a user from the lower levels of the company's organization, users' backing decisions tend to be more time-lagged. Although significance is not strong, this aspect requires further research to disentangle (at least) three potential driving forces: (1) Lower level employees' proposals might be newer to the organization and, hence, require more reflection prior to making a decision. (2) Lower level employees' proposals might be less well prepared and, thus, require more time to reflect. (3) While we find no evidence that the extent of users backing depends on the proposer's role in the organization, social pressure might urge users to back ideas by superiors instantaneously. Based on which hypothesis turns out to be influential, corresponding recommendations for the design can be derived, e.g. better education on proposal writing or, in case the third hypothesis applies, anonymity of idea proposers could be examined.

RQ6: Proposer/Supporter similarity. When an idea's proposer and supporter are both from the same country, backing decisions tend to be more time-lagged. A shared country of origin might increase the likelihood of the user to be directly affected by the idea or the social and organizational pressure to back the idea. While the same arguments may also apply to proposers and supporters coming from the same division, we do not see any significant effects here. In case the effect is observed repeatedly, experiments comparing a local vs. a global setup might be informative.

RQ7: Time of first view of an idea by the user. Over the course of the 4 weeks trial period, backing decisions became quicker. This is partly determined by the construction of the measure (in the last week, you cannot deliberate for 20 days and still back an idea) and might in addition be explained by the second termination condition, i.e. funding running out, increasing experience with the mechanism, or user self-selection of when to enter the platform. The weekday has a consistent significant effect on the decision-making style: When a user's first view is on a Monday, decision-making is most time-lagged. From Wednesday to Sunday, it is significantly quicker than on Mondays. Two hypotheses for further exploration are that (1) on Mondays a general backlog and workload holds users from making backing decisions or that (2) users try to free up their mind and to-do lists prior to the weekend.

5 Discussion and Further Research

This paper contributes to the field of idea assessment with a focus on crowdfunding, a novel approach for internal openness. We explore usage patterns within enterprise crowdfunding for internal decision-making on idea proposals. For our research, we build on data retrieved from iFundIT, the first trial within an operative unit of IBM engaging 359 professional decision makers deciding upon real investments. For this study we focus on the decision-making style of these participants in terms of being rather quick or time-lagged, derived from research on thinking styles in cognitive psychology.

Overall, we find participants' decisions to be relatively quick, with a majority of them taken within one hour and after only one view of the idea's detailed description. Analyzing potential determinants for time-lagged vs. quick decision-making, users from lower organizational levels tend to be slightly more time-lagged. Future research may help to identify the root causes for this behavior, e.g. less decision-making experience vs. a higher conscientiousness. The more ideas a user views and the fewer

ideas he dedicates his budgets to, the slower his decisions. Hence, if a more time-lagged decision making was hoped-for, we suggest to explore a design parameter (DP1) making people view more ideas but finally concentrating their funding on fewer (e.g. a recommender system). Regarding idea characteristics, separate funding rounds for different idea categories (DP2) may tell on whether enterprise crowdfunding is more appropriate for some of them. Furthermore, the correlation regarding geographical similarities between proposer and supporter question the use of local and global funding rounds (DP3). Anonymity of the proposer (DP4) could help investigate whether the proposer's level in the organization is influential. Finally, for the management of future funding rounds, (DP5) advanced guidelines for proposers on idea description, as well as (DP6) awareness campaigns in the early phase of a round and early each week might be interesting to explore.

Although our findings may help to furthering the design and application of enterprise crowdfunding, some limitations apply to our research. The results are based on a single trial lasting for 30 days with a limited number of ideas and participants employed by one company and exposed to this company's culture. Also, there is no theory or benchmark so far to compare our results to. Moreover, ideas were not only communicated via the crowdfunding platform. Due to newsletters and internal emails the first view of an idea by a user on the platform might not be the first exposure to it. However, this factor can hardly be controlled in a field setting. Furthermore, the termination rule based on reaching the overall funding limit might have influenced the participants' behavior. Finally, quality and efficiency of the decisions could not be assessed empirically, as the iFundIT trial did not include alternative decision making processes which would be required to compare decision quality and efficiency.

Future analysis in this domain shall follow multiple paths: It will be informative to explore interrelations of idea characteristics (e.g. novelty, feasibility) and decision-making styles, as well as, more generally, benchmark enterprise crowdfunding with other decision approaches. Via a survey built on the Technology Acceptance Model (Venkatesh and Bala, 2008) and inspired by studies on Internet crowdfunding (Gerber et al., 2014; Hui et al., 2014) one can aim to better understand users' perception of the mechanisms, the level of satisfaction with its outcome, and what motivates them to participate. In addition, we suggest to continue the exploration of design parameters and their impact on users' behavior and to build an enterprise crowdfunding design theory. We strive for a conceptualization of the design parameters, the definition of when companies consider the mechanism to be successful, and how design parameters drive success.

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