The Role of Customer Investor Involvement in Crowdfunding Success

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Abstract

Entrepreneurs increasingly use reward-based crowdfunding to finance innovation projects through a large number of customer investments. The existing academic literature has predominantly studied the process and the efficiency of these crowd investments. However, we argue that the involvement of customers goes beyond the provision of capital. As investors, customers enter a principal-agent relationship with project creators. As a result, project creators are often confronted with a crowd of customer investors who try to influence the development of product ideas. We show that project creators can actually benefit from this influence, as customer investors partly substitute for the support usually received from conventional investors. Greater involvement of customer investors thus increases the likelihood of funding success. This holds when we control for creator ability and project quality. However, the positive effect of involvement is lower for teams, because customers face lower agency costs when they invest in team projects. We also link the involvement of customer investors during crowdfunding to the crowdsourcing literature and show that its positive effect can be attributed to the elicitation of external information through distant search.

1 Introduction

Entrepreneurs increasingly use reward-based crowdfunding to finance innovation projects through direct customer investments.[1] The growing literature on the topic has predominantly studied the exchange of financial resources between backers and project creators (Kuppuswamy & Bayus 2015), examining backers' contribution patterns (Agrawal et al. 2014a; Burtch et al. 2013; Burtch et al. 2015; Mollick 2014; Lin & Viswanathan 2016) and the rationality of crowd investments (Mollick & Nanda 2016). The facilitation of innovation through customer investments is a key benefit of crowdfunding (Younkin & Kashkooli 2016).

However, the involvement of customer investors in reward-based crowdfunding projects goes beyond the exchange of financial resources. Like conventional investors, customer investors enter into a principal-agent relationship with project creators as a result of their financial stake in the project (Jensen & Meckling 1976). As principals in this relationship, customers depend on project creators to develop a product that maximises their utility (Nambisan 2002). To limit divergence from their optimal product, each customer is incentivised to monitor project progress and influence the development of product ideas (Nambisan 2002; Agrawal et al. 2014b). Thus, when entrepreneurs seek investments through reward-based crowdfunding, they often face strong influence from a crowd of customer investors.

The objective of project creators is to create products that can successfully raise funding. The elicitation of external information from customers and their involvement in product development can facilitate the development of such a product (von Hippel 1994; Lilien et al. 2002). However, the principal role of customers may also impede project success. A crowd of dominant customer investors with strong influence on the project can subject project creators to the perils of group irrationalities (Isenberg 2012). The loss of strategic autonomy to dominant customers is a key concern for innovating entrepreneurs (Fischer & Reuber 2004). Indeed, it is well documented that "customers' short-term and current experience bias" (Wind & Mahajan 1997, p.6) and their lack of technical knowledge (Magnusson 2009) can steer projects into competitively undesirable technologies (Nijssen et al. 2012) or niche products (Ramdas et al. 2007).

Thus, an important first question is whether project creators can benefit from the involvement of customer investors or whether increasing influence from the crowd decreases funding success. In line with the former proposition, we argue that in crowdfunding, customer investors assume some of the activities usually carried out by conventional investors. Such external value-adding activities commonly include project monitoring, support, and control, and are shown to increase start-up performance (Bottazzi et al. 2008). Thus, project creators whose customer investors substitute for this

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[1] Reward-based crowdfunding is the act of "raising capital from many people through an online platform" in return for rewards (Agrawal et al. 2014b, p.63). Because rewards are often products, project backers are customers of these products (Kuppuswamy & Bayus 2015; Fleming & Sorenson 2016). For an overview of other forms of crowdfunding, see Kuppuswamy & Bayus (2015). We discuss limitations to this view in §4.

support run more successful crowdfunding projects. We further argue that the positive effect of customer input on funding success is moderated by the agency costs faced by customer investors. Team project creators possess more resources and are less likely to fail (van Knippenberg et al. 2004). As a result, customer investors face fewer agency costs and their value-adding activities for team project creators are therefore less useful.

Monitoring, support, and control of crowdfunding projects by customer investors can benefit project creators in several ways, such as through the exchange of human resources and social capital (Fleming & Sorenson 2016) and through the creation of a customer-oriented reputation (Schreier et al. 2012). But do customer investors also influence the products being developed, and do product changes in response to customer input increase the likelihood of success? This is the second research question we address in this study. Building on the product development literature, we argue that customer investors share "sticky" information about their desired product applications (von Hippel 1998). At the same time, customers' investment in the project aligns their incentives more closely with those of the creators, so that customers are less likely to ask for costly niche ideas (e.g., Ramdas et al. 2007). The result is a more feasible set of customer ideas, which allows project creators to identify opportunities and adapt their products to a wider range of customers. The effect of customer input on funding success is, thus, mediated by the extent to which project creators change their products in response to customer ideas.

Finally, we link the involvement of customer investors in crowdfunding projects to the crowdsourcing literature. By interacting with customer investors, crowdfunding project creators elicit external information—such as ideas for new markets or product applications. The elicitation of information from external "problem solvers" is also the underlying mechanism of crowdsourcing (Jeppesen & Lakhani 2010). A main advantage of crowdsourcing derives from the transformation of distant search into local search through the elicitation of distant information from problem solvers (Afuah & Tucci 2012). Does the involvement of customer investors with distant investment experience also increase performance of crowdfunding projects? This is the third and last question we seek to answer in this paper. We argue that this is indeed the case, as customer investors' shared role as problem owners and problem solvers facilitates the appropriation of distant knowledge in complex problems. Furthermore, the exchange of knowledge in crowdfunding pertains largely to the application of a given product. Hence, the involvement of customers with investment experience in distant domains of application (e.g., theatre and video games) increases the likelihood of funding success.

We study the involvement of customer investors in crowdfunding projects by using a unique dataset comprising 21,023 projects from a diverse set of teams, entrepreneurs, and industries. Unlike most of the previous innovation literature, which uses data about successful innovations, such as granted patents (e.g., Singh & Fleming 2010; Chatterji & Fabrizio 2011; for a discussion of patent data, see Hall et al. 2013; also, Fontana et al. 2013), pre-screened innovation projects (e.g., Bajaj et al.

2004; Lilien et al. 2002) or management questionnaires (e.g., Foss et al. 2010; Gruner & Homburg 2000), our data comprises a balanced set of successful and unsuccessful projects, thus making our study unsusceptible to selection bias (Dahlander & Piezunka 2014). Our detailed data also allows us to granularly observe actual instead of perceived customer input and to employ a range of unique and strong control variables, such as creator preparedness and success history.

An important empirical issue in many innovation studies is the endogeneity of project quality. In our setting, for instance, project quality may increase both performance and customer investor involvement: Good projects may attract more funding and customers may be more motivated to support such projects. We address this issue by using the introduction of a mobile app as an instrumental variable for customer involvement, thereby controlling for project and team quality (we discuss our instrumental variable in more detail in §3.5).

The results of our empirical analysis confirm the hypotheses. (1) As few as three messages from customers increase the average likelihood of funding from 8% to 58% (ceteris paribus). (2) Teams benefit less from customer input than individual creators. (3) The effect of customer input on funding success is partly mediated by the extent to which project creators adapt their products to customer ideas. (4) The likelihood of funding success increases with customers' funding experience in distant domains of application.

Our paper provides important contributions to the crowdfunding and crowd-based knowledge sourcing literatures. The exchange of non-financial resources, such as knowledge, human labour, and social capital, has received little attention in the existing crowdfunding literature (Kuppuswamy & Bayus 2015; Fleming & Sorenson 2016). Departing from the emphasis on the financial exchange mechanism for the first time in the academic literature, we investigate the role of information exchange during crowdfunding. We advance the idea of a principal-agent relationship between customer investors and project creators and show that project creators can benefit from the involvement of customer investors. The mechanism resembles the elicitation of solutions in crowdsourcing (Afuah & Tucci 2012). Crowdfunding may therefore be considered a distinct form of "crowd-based knowledge sourcing" (Piezunka & Dahlander 2015) that combines the elicitation of solutions with their funding. Our study also has implications for the entrepreneurship literature, as we show that crowds of customer investors can, at least in part, substitute for the value-adding activities usually performed by conventional angel investors or venture capitalists (Fischer & Reuber 2004; Bottazzi et al. 2008; Ley & Weaven 2011).

We develop our hypotheses in full in the next section, analyse them in §3 and discuss results, limitations, and avenues for future research in §4.

2 Hypotheses Development

By investing in the development of products, backers in crowdfunding become "consumer investors" (Kuppuswamy & Bayus 2015). Their investment often supports the development of products that are

otherwise unable to attract conventional forms of capital (Younkin & Kashkooli 2016). After investing in a project, backers can start to interact with project creators. Our first argument regards the baseline effect of customer investor input on crowdfunding success.

Like traditional investors, customer investors enter into a principal-agent relationship with the recipients of their investment. In this relationship they face a moral hazard (Hart & Holmström 1987), because project creators may not be incentivised to develop a product that maximises each customers' utility (e.g., von Hippel 1998; Nambisan 2002). A sub-optimal product results in agency costs for customers in the form of residual loss of utility (Jensen & Meckling 1976). To mitigate agency costs, customer investors can influence project creators by requesting and providing feedback on the current state of the project and suggesting future activities (Nambisan 2002; Agrawal et al. 2014b). Such monitoring, support, and control activities by traditional investors are shown to increase the performance of entrepreneurial projects (Bottazzi et al. 2008). By influencing project creators, customer investors thus take on the value-adding activities traditionally performed by conventional investors. In crowdfunding, for example, customer investors suggest new market segments that have not yet been targeted by project creators, or they provide contacts to technical specialists who can assist with product development, or they offer specific ideas for the product under development which will make it more attractive to other potential backers.[2] Such external support for project creators is a key condition for the success of crowdfunding start-ups (Ley & Weaven 2011). Due to the small size of individual investments, the ability to perform these activities is a feature of the crowd as a whole rather than of individual customers. An active base of crowdfunders providing external support to project creators therefore increases a project's chances of success.

From the project creator's perspective, customers' financial investment also adds credibility to their feedback and suggestions. It reduces the moral hazard that advice from customers who are not financially invested may have (e.g., superficial feedback or unfeasible ideas). This facilitates reflective reframing among project creators and customers whereby they build upon each other's comments and develop a shared understanding of the needs the product should address (Hargadon & Bechky 2006). A shared understanding allows project creators to address customer needs more accurately. Project creators who receive more customer input are therefore more likely to be successful.

HYPOTHESIS 1 (H1). *During a crowdfunding campaign, greater customer input increases the likelihood of funding success.*

Our baseline argument for Hypothesis 1 posits that customer investors can improve the chances of crowdfunding success by performing value-adding activities relating to project monitoring, support,

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[2] We draw these examples from a random sample of customer investor input in our data and from project creators' descriptions of their crowdfunding experiences (e.g., Stegmaier 2013).

and control. Extending our baseline argument, we contend that this effect is weaker for teams than for individual project creators, because customer investors face fewer risks when funding team projects.

External knowledge is a key resource for crowdfunding projects, since entrepreneurs are resource constrained and depend upon knowledge rejuvenation (Yli-Renko et al. 2001; Priem et al. 2012). Team project creators possess more knowledge than individual creators, because each team member brings her or his own previous knowledge and perspective (West & Anderson 1996). Teams also have larger ex-ante social networks that can provide relevant resources (Singh & Fleming 2010). Because of these resources, team project creators are less likely than individual project creators to fail or to create an unsatisfactory product (van Knippenberg et al. 2004). Thus, the likelihood to incur residual loss (Jensen & Meckling 1976) is lower when customers invest in team created projects. Lower agency costs, in turn, reduce the need for customer investors to perform value-adding activities for project creators. Therefore, the effect of customers' input on funding success is less pronounced for teams.

HYPOTHESIS 2 (H2). *During a crowdfunding campaign, customer input's beneficial effect on funding success is lower for teams than for individuals.*

The preceding hypotheses explain the general effect of involving customer investors on the likelihood of funding success. The described effect may be a result of the advice given, better monitoring of progress, or the acquisition of a customer-oriented reputation. We now extend our line of argument specifically to the products of crowdfunding projects and the role that customer investors play in their development.

Customers are experts on product applications (von Hippel 1998), meaning how products are used and how they generate value for consumers (Priem 2007). The elicitation of such application-specific information can improve product development performance (e.g., Lilien et al. 2002). However, latent application-specific information is "sticky," meaning that it is costly to transfer from customers to organisations (von Hippel 1998). In crowdfunding, customers share sticky information because their investment in the project motivates them to influence product development. By sharing application-specific information, such as requesting a certain feature, customers can reduce agency costs (residual loss) by directing product development towards their own needs.

When project creators are confronted with a large crowd of customer investors who are acting only on behalf of their self-interest, it is hard to know which ideas have the potential to increase a product's success and which are expressions of costly niche interests (Nijssen et al. 2012; Ramdas et al. 2007). Following an unsound idea or trying to address all ideas may result in a product that is unfeasible, too costly, or unattractive to other customers. In that sense, it is not just the customers who face a moral hazard from the project creators; the project creators also face a moral hazard from customers' involvement in product development. However, customers' financial stake in the project

requires them to consider project failure as a potential outcome of their influence. When they submit ideas, customers therefore have to balance their interest in a product that perfectly matches their needs with feasibility and costs. Hence, customers' financial investment reduces the moral hazard of backers and leads to a stronger alignment of incentives between project creators and customer investors. Therefore, the incorporation of customers' sticky information on average increases the likelihood of project success.

HYPOTHESIS 3 (H3). *The effect of customers' input on the likelihood of project success is mediated by the extent to which project creators incorporate it into their projects.*

In the previous paragraphs, we discussed the implications of customer investor involvement in general (H1 & H2) and for the development of products (H3). For project creators, input from customers is a way to elicit external information. The elicitation of external information resembles traditional crowdsourcing approaches, in which a problem owner ("solution seeker") posts a problem and subsequently receives information from external problem solvers (Jeppesen & Lakhani 2010).

The benefit of crowdsourcing is traditionally understood to stem from its transformation of distant search into local search (Afuah & Tucci 2012). By interacting with a crowd of problem solvers with distant knowledge, companies can optimise over larger parts of the solution space and thereby increase the average performance of solution search.

However, there are differences between the elicitation of external information during crowdfunding and traditional crowdsourcing approaches. Importantly, the problems faced by crowdfunding project creators, such as how to improve a given product, are difficult to define, modularise, and evaluate. Well-defined problems that are easy to delineate and modularise, however, are usually a requirement for the transformation of distant search into local search through crowdsourcing (Afuah & Tucci 2012). Taskcn (Liu et al. 2014) and TopCoder (Boudreau et al. 2011) are examples of crowdsourcing platforms with well-defined problems and clear performance criteria.

In crowd*funding*, this limitation is addressed by the sharing of roles between problem solvers and problem owners. In crowd*sourcing*, problem owners and problem solvers are usually different: On one side is a firm looking for a solution, and on the other side is a crowd of problem solvers whose only involvement with the problem is the process of solving it. In crowdfunding, the role of problem owner is shared between project creators and the crowd. Because the customer investors own part of the project and are looking to improve the product for themselves (so they get more for their money), they are problem owners in their own right. This reduces the effort required for the project creator to communicate and modularise the problem and facilitates the evaluation, transfer, and recombination of distant knowledge, which are otherwise made more challenging by complex problems (Afuah & Tucci 2012).

Another difference is that crowdfunding projects usually request funding for an existing product prototype. The benefit of distant search thus does not pertain to coming up with an entirely new solution or product idea. Instead, the benefit of distant search during crowdfunding comes from the identification of new domains of application for an existing product, which are often drivers of performance improvements (e.g., Levinthal 1998). For instance, a customer who has previously been funding theatre projects may be able to help a computer-games project by pointing out that an interesting story with well-developed and enacted characters might be more interesting to a wider range of people. Customers who, as a result of their distant funding experience, can provide project creators with distant information about application domains are therefore particularly useful to interact with.

HYPOTHESIS 4 (H4). *During a crowdfunding project, input from customers with distant funding experience increases the likelihood of success.*

3 Analysis

We analyse our hypotheses using data from Kickstarter.com, a reward-based, all-or-nothing crowdfunding platform.[3] This data has four key advantages: (1) Kickstarter projects vary with respect to product, entrepreneur, and industry, and we observe both successful and unsuccessful projects. (2) We observe individual customer messages, which allows us to use a detailed measure of customer input. (3) The presence of changes to project descriptions is observable to us, but not to customers. (4) An exogenous shock about halfway through our sampling period lets us derive causal implications.

Crowdfunding projects on Kickstarter fall into a diverse set of 13 categories, such as Art, Fashion, Games, and Technology (see Appendix A for all categories) and come from 138 countries (the United States, the United Kingdom, and Canada having contributed the most projects). This allows us to observe customer input in a large variety of contexts, and it helps us avoid any industry or market-specific biases. With an average funding goal of $20,000, crowdfunding projects are rather small compared to full-fledged corporate product development projects and are often at the forefront of the creative industry. Yet, crowdfunding projects tend to be comparable to smaller units of innovation such as patents, which are often from individual inventors (e.g., Singh & Fleming 2010). Since many entrepreneurs use reward-based crowdfunding for pre-sales, we treat crowdfunders as customers (Kuppuswamy & Bayus 2015; Fleming & Sorenson 2016); we discuss limitations to this interpretation in §4. In the following paragraphs of this section, we describe the data elicitation process, its descriptive statistics, and the variables.

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[3] "All-or-nothing" means that project creators can only keep the raised money if they reach their minimum funding goal by the end of the funding timeframe. We control for campaign goal and duration in our analyses (see §3.4).

3.1 Data

Our data set consists of *all* publicly accessible crowdfunding projects asking for funding between October 2012 and June 2013. To ensure that we fully observe projects (both interactions and the resulting outcome) within a complete sample, we exclude projects that start less than one month after the start of the data collection or end less than one month before the end of the data collection.[4] We also exclude 43 projects that were suspended mostly due to legal issues, as well as a few projects with partly missing data. This leaves us with 23,461 projects in our initial sample. Of these projects, 440 are very short projects (less than 10±2 days in duration). We exclude these projects, since a meaningful operational effect resulting from customer input is less plausible in these projects. 1,771 projects were cancelled before the end of their funding phase. We exclude cancelled projects, since we cannot observe the complete funding phase and cannot conclude whether a project would have been successful had it had the complete funding phase.[5] Finally, we exclude 227 projects from the analysis due to a very long tail in the distribution of customer input, which allows us to report more conservative estimates (see §3.3.1). This leaves us with 21,023 crowdfunding projects over a period of seven and a half months. On average, there are a little less than 100 new projects every day during this time period. Roughly 48% of these projects are successful in that they raise the amount of funding they had asked for (cf. Mollick 2014). The mean crowdfunding duration is 32 days, and the median is 30 days.

--- Insert Tables 1 & 2 about here ---

3.2 Dependent Variable

We use funding success as our dependent variable. Project i is successful ($FS_i := 1$), if and only if its amount pledged exceeds or equalises its ex-ante set funding goal and it was not cancelled or suspended within the set time limit. A project has failed ($FS_i := 0$) if and only if its amount pledged does not exceed or equalise its ex-ante set funding goal and it was not cancelled or suspended within the set time limit.

On Kickstarter, the large majority of projects offer their products or services to customers in return for money and generate sales as a result. While the exchange of money for products or services is the common practice on Kickstarter, there are some limitations. For instance, funders can pledge very small amounts of money without receiving a product in return, or they may only receive a replica or memorabilia. Yet even in these cases, the generative mechanism leading to funding is very similar to the one generating sales for products.[6] Therefore, the amount of funding that projects receive in

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[4] The reason is that we would otherwise introduce into the sample a significant bias for short projects, since we only fully observe short projects at the beginning and the end of the data collection. Since 30 days is the median project duration, we exclude one month on either side of the time horizon.
[5] When we perform a robustness check treating cancelled projects as failed projects, results hold at weaker levels.
[6] N.B. charities or charitable donations are not allowed on Kickstarter (Kickstarter 2015).

many cases corresponds to the amount of advance sales they have generated as a result of their innovation activity (Fleming & Sorenson 2016); in less clear-cut cases, it is the result of a very similar mechanism. To make it possible to compare the funding of projects of different sizes, we have to include a benchmark in our measurement. The benchmark we use is a project's funding goal, which reflects a project creator's realistic expectation of the minimum feasible project budget. The resulting metric $funding \, / \, funding \, goal$ can be interpreted in terms of meeting sales or profitability goals. Profitability and sales benchmarks are one of the most-used success metrics for innovation projects (Griffin & Page 2003; e.g. "estimated sales over five years", Lilien et al. 2002). Advance sales are also highly predictive of post-launch sales (Moe & Fader 2002), and an astonishing 96% of difficult technology projects on Kickstarter deliver their promised goods (Mollick 2014).

As briefly mentioned, to compare the funding of projects of different sizes, we use as benchmarks the ex-ante, set funding goals, which we can expect to be drawn from identical distributions. We binarise the ratio $funding \, / \, goal$, as projects tend to be either *just successful* or completely unsuccessful (like two consecutive power distributions). Additional funding tends to cease as projects reach their original funding goal, and most successful projects are, thus, *just successful* without reaching far beyond their funding goal. Moreover, since projects do not receive any money if they do not pass their funding goal, there is no difference in success between funding ratios < 1, and most unsuccessful projects have small funding ratios. Using the ratio directly as a dependent variable would thus limit the interpretability of the results. Also, we are interested not in the hype surrounding a project, but in a robust and comparable measure of project success.

3.3 Explanatory Variables

Since funding may be achieved before the nominal end of the funding phase, all explanatory variables are only considered up until a project equalises its funding goal or fails.

3.3.1 Customer Input

We measure customer input (CI_i) as the count of customer comments on Kickstarter.com.[7] Customers can only comment on projects they have funded. To only count coherent individual pieces of information, we count customer comments only once if they are not separated by responses from a project creator.

To make generalisable statements, we exclude 227 extreme projects (1.07%) with aggregate customer input greater than the 99th percentile. Since projects above the 99th percentile are 80% more likely to be successful than projects below, the exclusion of outliers allows us to report more conservative estimates. We qualitatively evaluate customer input in Appendix C.

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[7] There may be interaction outside the comments (e.g., via email or private message), but such interaction should not bias any effect of customer input observed within the comments.

3.3.2 Distant Funding Experience

We measure customers' distant funding experience as the inverted share of customers' proximal funding experience weighted by their input. This resembles measures such as "content distance" (Piezunka & Dahlander 2015), which measures distance based on previous experience. We thus define distant funding experience $D_i \in [0,1]$ as

$$D_i = 1 - \sum_{Customer\ j} \frac{F_{jc}}{F_j} \cdot \frac{CI_{ij}}{CI_i}.$$

F_{jc} is the funding experience of customer j in category c of project i (proximal funding experience), and F_j is the total funding experience of customer j across all categories. $\frac{F_{jc}}{F_j}$ is the share of a customer's proximal funding experience with respect to project i; it measures the closeness of the customer to the project's domain. $\frac{CI_{ij}}{CI_i}$ is the share of customer j's input out of all received customer input of project i (i.e., customers with more impact are weighted higher). The term $\sum_{Customer\ j} \frac{F_{jc}}{F_j} \cdot \frac{CI_{ij}}{CI_i} \in [0,1]$ is the weighted proximal funding experience of project i's customers. We invert this equation to simplify interpretation; we subtract $\sum_{Customer\ j} \frac{F_{jc}}{F_j} \cdot \frac{CI_{ij}}{CI_i} \in [0,1]$ from 1 and get D_i, which is the weighted distant funding experience of project i's customers.

3.3.3 Team Project Creator

We categorise a project as from a team ($T_i := 1$) if the terms "we" and "us" are used exclusively in the project description (6,980 projects) and as a project from an individual if the description exclusively uses "I" and "me" (3,848 projects). The resulting sample, which only includes projects that are exclusively categorised as team or individual projects, is smaller than the full sample ($N = 10,828$); however, the samples are comparable in terms of success rates (sample with team variable: 48.67% vs. full sample: 47.93%) and customer input (1.71 vs 1.99).

3.3.4 Incorporation of Customer Input

We measure the number of project changes by counting changes to the project update timestamp. The update timestamp is an attribute in the HTML code of the project page, which marks the current time whenever the project description changes. We observe the timestamp once every 12 hours, and it is thus a lower bound for the number of changes a project receives (R_i). The timestamp is only visible in the intricate HTML code of the project page and cannot be seen by customers. In our model we then use the instrumental variable (which does not have any direct effect on project changes) to measure project changes in response to customer input (see §3.6).

At the end of the funding phase, the product specifications as they are visible on the project page determine the eventual specifications and design of the product, and the project page cannot be changed after the end of the funding phase (Kickstarter 2014b). It is thus important for project

creators to incorporate all relevant customer input into the product specifications as soon as they arise.[8]

3.4 Control Variables

We include strong control variables from our unique data set to account for potential confounders—in particular, creator ability, project quality, and project complexity.

We control for the number of **videos** in the project description. Videos are difficult to make and require significant work and talent from the project creator (equipment, scripts, prototypes, locations, filming, cutting, sound, etc.). At the same time, videos are one of the most important factors when customers decide whether to fund a project (Kickstarter 2014a). The number of videos in the project description is therefore an excellent control for creator ability and the project's appeal (Colombo et al. 2014). Similarly, we control for whether a project has a separate **website** (Colombo et al. 2014), which requires capital and effort to create and maintain and is a sign of high-quality projects.

We control for the extent of projects' **risks section**. In this section, project creators are asked to describe all potential risks associated with their project, reflecting their "ability to complete the project as promised and whether … the creator is being open and honest about the risks and challenges they face" (Kickstarter 2012). A creator's openness about the risks associated with their project is a good control for their understanding of the project as well as for their own belief in the likelihood of success. Risk is also an important outcome of complexity, and projects with more associated risks are thus likely to be more complex (Bosch-Rekveldt et al. 2011).

We control for whether a project is run by an **incorporated** organisation with a legal name (e.g. Limited, Ltd., LP). The organisational background of a creator is a good control for their resources, their experience with new product development, and their ex-ante funding network. Moreover, projects of incorporated organisations may be more complex than other projects. We also control for project creators' crowdfunding **experience**, measured by the number of previous projects they have created.

We control for project **goal**[9] as a project creator's realistic expectation of the minimum feasible project budget. The budget allows us to control for the size and complexity of the project (Bosch-Rekveldt et al. 2011; Müller & Turner 2007). For instance, a project with a goal of $20,000 (a board game) is less complex than a project with a goal of $100,000 (sunglasses with inbuilt headphones) and a project with a goal of $1,000,000 (a computer game). Similarly, we control for the **duration** of a project, which is also a common measure of project complexity (Bosch-Rekveldt et al. 2011).

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[8] We do not "measure" the content of product changes. We do not measure whether product creators change researcher-defined product attributes, but only whether the sum of their changes as a result of customer input affects funding success.
[9] Standardised separately for USD and GBP projects.

We control for **previous customer engagement** as the sum of customers' previous interaction with other projects. Certain customers may be particularly engaged with projects, and some projects may attract such customers more than others.

Finally, we control for project **category**. Categories include Photography, Dance, Games, Publishing, Music, Comics, Film & Video, Design, Technology, Fashion, Theater, Art, and Food. Project frequencies, number of funding transactions, and amount of customer input vary significantly across categories (see Figure 6 in the Appendix), which indicates diverse patterns of behaviour in different categories. The base category for all analyses is Design, since Design projects are well represented in the sample and have a good degree of commenting behaviour while avoiding the extremes of other categories (e.g., Games).

3.5 Instrumental Variable

In addition to strong control variables, we use an instrumental variable to eliminate all remaining endogeneity issues (Wooldridge 2010). As an instrument we use the release of the Kickstarter Mobile app on 14 February 2013. The app allows project creators and customers to interact easily even when no computer is available. As a result, the amount of customer input increases. Since the app's release is independent of individual creators' ability and project quality, the resulting increase in customer input is also independent of creator ability and project quality. Therefore, any change in the likelihood of project success as a consequence of increased customer input through the mobile app is exogenous, and we can be confident that this is not a by-product of some unobserved creator ability or project quality. We implement this in a two-stage estimation (Wooldridge 2010). In the first stage we estimate the exogenous increase of customer input as a result of the app release. In the second stage we use the estimated exogenous increase in customer input to estimate its impact on funding success. The second-stage results we obtain are therefore not biased by creator ability and project quality. In the following paragraphs we describe and evaluate the instrumental variable in detail.

--- Insert Figure 1 about here ---

"Kickstarter isn't a store" where customers spontaneously buy products, but a collaboration and co-development platform (Kickstarter 2012). A main purpose of the mobile app is to let project creators and customers easily keep track of their projects and interact with each other (Kickstarter Executive 2014). The app's commenting function is easy to use (see Appendix B, Figure 7, left screenshot) and no repeated login is required. As expected, the release of the mobile app significantly increased customer input across all Kickstarter categories (see Figure 1). The F-statistics in the corresponding models are also well above the common threshold of 10 (see §3.7).

It is possible that we are observing a seasonal trend co-occurring with the introduction of the mobile app. Since we do not possess data on the same timeframe during previous years, we must evaluate the trend as we observe it in our data. Figure 2 displays the development of the 30-day moving average of the weighted daily average customer input (solid) and new projects (dotted) by

project start dates. The time frame covered by our sample is approximately centred on the release of the mobile app (dotted vertical line). There is a noticeable and steady increase in customer input for projects starting roughly 15 days before the introduction of the mobile app (mean project duration is 30 days). This increase quickly stabilises at around 150% of pre-app customer input. The first-stage model remains significant if we exclude the 2012–13 Christmas period (first stage: $F = 11.51$). We are therefore very confident that we are observing not a seasonal trend but rather a substantial increase in customer input due to the release of the mobile app.

--- Insert Figure 2 about here ---

The app also enables the funding of projects, but there is strong evidence that this is not a violation of the exclusion restriction. First, the funding feature of the mobile app is very hard to use, as customers have to have an Amazon account and repeatedly remember and enter their credentials (see Appendix B, Figure 7, right screenshot). While this may not be a major problem when using an Internet browser (due to cookies and stored passwords), it significantly impedes funding over the mobile app. This assessment is supported by customer reviews of the mobile app, for example, "Good app, but I wish it was possible to donate without having to create an account and go through Amazon payments. I think this turns a lot of potential backers off." (iTunes user, 27.08.2014). To alleviate the difficulty of the funding function, Kickstarter later rolled out its own payment system replacing the previously used Amazon payment system (Kickstarter Executive 2014).[10] Second, crowdfunding customers are usually highly engaged and spend a lot of time researching different projects as "shadow artists". Due to the uncertain nature of Kickstarter projects (Kickstarter projects still have to be developed), backers look at projects with due diligence to understand the associated risks before funding them. This is reflected in project descriptions, which often span several pages, containing multiple pictures, videos and even blueprints. However, assessment of such detailed information and diligent evaluation of projects is very difficult on the small screens of mobile phones. For these reasons, it is unlikely that the app independently creates significant funding.

3.6   Model Specification

Funding success is a discrete, dichotomous variable, hence a logit model is preferred over a linear probability model (Pindyck & Rubinfeld 1991). To control for endogeneity, we use a control function approach in a two-stage estimation (Wooldridge 2010; Liu et al. 2010), which is the preferred method when dealing with endogeneity issues in logit models (Guevara & Ben-Akiva 2012). In the first stages we regress customer input and project revisions on the exogenous variables and the instrument (Z) in an OLS model. We then use the predicted residuals of the first stages ($\hat{u}$) in the second stage logit estimations. The second-stage estimators are consistent up to scale (Wooldridge 2010); in the case of logit models, the obtained estimators are smaller than the true effect sizes (Guevara & Ben-Akiva

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[10] The rollout of the new payment system is outside of our data time frame and does not affect our IV.

2012). As the obtained standard errors may not be strictly valid, we use a nonparametric bootstrap to obtain correct standard errors in the second stages (Wooldridge 2010). We arrive at the following regressions for H1 and H4 in the first and second stages respectively (Model 1):[11]

$$CI = \beta_0 + \beta_1 Z + \beta_2 D + \beta_C C + u$$
$$FS = \gamma_0 + \gamma_1 CI + \gamma_2 D + \gamma_U \hat{u} + \gamma_C C + v$$

where CI is customer input, Z is the instrument, D is distance, and C is a vector of control variables (subscript dropped for readability).

For the moderation model (H2; Model 2) we include the team (T) variable in both stages. In the second stage we also include interaction terms for customer input, team, and the first-stage residuals (for a similar approach to endogenous interaction terms, see Liu et al. 2010):

$$CI = \beta_0 + \beta_1 Z + \beta_2 D + \beta_3 T + \beta_C C + u$$
$$FS = \gamma_0 + \gamma_1 CI + \gamma_2 D + \gamma_3 T + \gamma_4 T \times CI + \gamma_U \hat{u} + \gamma_{UT} T \times \hat{u} + \gamma_C C + v$$

We next discuss our mediation model. In our initial model (Model 1), funding success (FS) is the dependent variable, customer input is the explanatory variable, and we are interested in $FS = \gamma_{CI} \times CI$. To investigate the incorporation of feedback, we employ a mediation model (e.g., Singh & Fleming 2010). A mediator is a third variable "which represents the generative mechanism through which the focal [explanatory] variable [CI] is able to influence the dependent variable [FS] of interest" (Baron & Kenny 1986, p.1173). Our mediator variable is the number of project revisions (R), and we are interested in $R = \delta \times CI$ and $FS = \gamma_R \times R$. We again use the introduction of the mobile app as an instrument, but this time we use it for our mediator R. Since project managers cannot revise their project using the app, there is no direct causal link between the introduction of the app and increased revisions. Therefore, the number of revisions is independent of the instrument and can only be influenced by increased customer input (∂). Any effect of the instrumented number of project revisions on funding success then represents γ_R as a result of ∂. We thus arrive with the following models for H3 in the first and second stage respectively (Model 3):

$$R = \beta_0 + \beta_1 Z + \beta_C C + u$$
$$FS = \gamma_0 + \gamma_1 R + \gamma_U \hat{u} + \gamma_C C + v$$

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[11] In this model, the impact of customer input does not change as a result of accumulation, although this may be plausible in a long-term model. Since the observed time frame in our sample is only 32 days on average, we assume the marginal impact of customer input to be constant.

3.7 Estimation Results

Tables 1 and 2 show the descriptive statistics and correlations for the full sample. We find no issues of multicollinearity for our models.

We evaluate the quality of the instrumental variable in a model without controls (model not shown). We report the expected significant positive effect of the introduction of the mobile app on customer input ($\beta_1 = 0.34, p < 0.01$) and a first stage F-statistic well above the common threshold of 10, indicating a strong instrumental variable ($F = 20.22$). According to the control function approach (see §3.6), the second stage includes the estimated first stage residuals ($\hat{u}$) to control for unobserved confounders. We find significant residuals in the second stage, which indicates an endogeneity problem and thus justifies the use of an instrumental variable ($\gamma_U = -0.47, p < 0.01$) (Wooldridge 2010).

<div align="center">--- Insert Table 3 about here ---</div>

Table 3, Model 1 shows the results relevant to H1. We include all control variables in Model 1 to test our hypothesis. We find a significant positive effect of aggregate customer input on funding success while controlling for unobserved confounders in the second stage ($\gamma_1 = 0.92, p < 0.01$). We therefore find support for the overall beneficial effect of customer input as hypothesised in H1. For a one-unit increase in aggregate customer input, the odds of getting funded are expected to change by $e^{\gamma_1} - 1 = e^{0.92} - 1 = 151\%$, ceteris paribus. To further aid interpretation (Hoetker 2007), we graph the predicted probability of funding success ($\widehat{\Pr}(FS = 1 \mid X)$) of the second stage logit model in Figure 3. To do so, we hold all other variables at their means (if not otherwise specified) and predict funding success at different levels of customer input. The mean of customer input across all projects is 1.99, and from Figure 3 we can see that, with all other variables at their means, the likelihood of funding success improves from 8% to 36% compared with 0 aggregate customer input. We also note that incorporated organisations have slightly less successful crowdfunding projects ($\gamma_{Inc} = -0.24, p < 0.10$).

<div align="center">--- Insert Figure 3 about here ---</div>

In Model 2 we include the moderating effect of team project creators in the second stage and find a significant negative coefficient ($\gamma_4 = -0.07, p < 0.05$), supporting H2. As can be seen in Table 3, Model 2, second column, teams are more likely to run successful projects ($\gamma_3 = 0.28, p < 0.10$). The increased positive effect of customer input for individual creators thus partly compensates for their disadvantage.

For the mediating role of project revisions, we again evaluate the quality of the instrumental variable in a model without controls. We find the expected significant positive effect on project revisions ($\beta_1 = 0.62, p < 0.01$) and a first-stage F-statistic well above the common threshold of 10, indicating a strong instrumental variable ($F = 159.32$). We find significant residuals in the second

<div align="center">16</div>

stage, which indicates an endogeneity problem and thus justifies the use of an instrumental variable ($\gamma_U = -0.32, p < 0.01$) (Wooldridge 2010).

Table 3 Model 3 shows the results relevant to H3. We find a significant positive effect of the number of changes on funding success while controlling for unobserved confounders in the second stage ($\gamma_1 = 0.29, p < 0.01$). We therefore find support for the mediating effect of project changes as hypothesised in H2. For a one-unit increase in aggregate project changes resulting from customer input, the odds of getting funded are expected to change by $e^{\gamma_1} - 1 = e^{0.29} - 1 = 34\%$, ceteris paribus. The mediating effect of project changes shows a slower increase in the likelihood of funding success to 100%, which may indicate a partial mediation (see Figure 4).

<center>--- Insert Figure 4 about here ---</center>

Table 3, Model 1 also shows the results relevant to H4. We report a significant positive effect of distant funding experience with $\gamma_2 = 1.99, p < 0.05$. We defined D_i for project i as

$$D_i = 1 - \sum_{Customer\ j} \frac{F_{jc}}{F_j} \cdot \frac{CI_{ij}}{CI_i}.$$

D_i is small if there are many long interactions with customers who primarily have experience in the same category and large if there are many long interactions with customers who have experience outside the project's focal category. Hence, we find support for the beneficial effect of distance as hypothesised in H4. For a one-standard-deviation increase in distance (0.36), the odds of getting funded are expected to change by $e^{\gamma_2 \times 0.36} - 1 = 105\%$, ceteris paribus. From the predicted probabilities in Figure 5 we can see that distant funding experience significantly increases the likelihood of funding success with all other variables at their means: At the mean value of distance ($D_i = 0.76$) the likelihood of funding success is 35%, whereas with $D_i = 0$, the likelihood is 11%.

<center>--- Insert Figure 5 about here ---</center>

We have conducted a number of additional empirical analyses to ensure the robustness of our results.

First, instead of using a binary form for our dependent variable, funding success, we develop a slightly more granular version of it. We partition funding success into four categories: not funded by a lot (less than 75% of the goal was raised), not funded by a little (more than 75% but less than 100% of the goal was raised), funded by a little (more than 100% but less than 112% of the goal was raised; 112% is the 75-percentile of the funding ratio) and funded by a lot (more than 112% of the goal was raised). Customer input significantly increases the chances of a project being in any higher funding level, especially for the > 112% level.

Second, more experienced teams could set lower goals to more easily succeed, but our results indicate that the opposite is true. In addition to controlling for goal, we examine the correlation between project creators' preparedness (including funding experience, number of pictures, and length

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of risks section) and project goal. The correlations are significantly positive ($p < 0.01$), suggesting that experienced and well-prepared teams set higher goals.

Third, we implicitly control for customer seniority in Model 1 by calculating distance relative to F_j in the denominator (total funding experience of customer j across categories). We also run an additional analysis explicitly controlling for weighted customer funding experience, and all results hold.

Fourth, there was a different payment system in place for UK-based projects than for other projects during our data collection timeframe, and this could bias the results of the two-stage estimation procedure with the mobile app as the instrument. We run Model 1 excluding UK based projects and find a significantly positive effect of customer input ($\gamma_1 = 0.73, p < 0.01$).

4 Discussion

Out study contributes to the growing academic literature on crowdfunding. We depart from the current emphasis on the exchange of financial resources (Kuppuswamy & Bayus 2015) and instead study the exchange of information between customers and project creators. We argue that, as in equity-based crowdfunding (in which backers receive shares instead of products), customers' investment in reward-based crowdfunding projects creates a principal-agent relationship between the investing customers as principals and the project creators as agents. In this relationship, customers face a moral hazard as a result of their dependence on project creators and potentially conflicting objectives (Jensen & Meckling 1976; Hart & Holmström 1987). By influencing the development of product ideas and monitoring project progress, customers can reduce creators' divergence from customers' objectives (Nambisan 2002). We argue that this is beneficial to project creators, as customers' influence substitutes for the support usually received from conventional investors (e.g., angel investors or venture capitalists; Bottazzi et al. 2008). This effect is driven by the agency costs faced by customer investors: Projects with higher risk of creating residual loss benefit more from the value-adding activities of customer investors. The implication that crowd investors are not a passive source of capital is an important addition to the study of crowd investors (e.g., Mollick & Nanda 2016). Instead, crowd investors seek involvement in their investments to mitigate the risks of the principal-agent relationship and maximise their expected returns. Understanding crowd investments as principal-agent relationships offers interesting opportunities for future research. For example, are crowd investors better than conventional investors at minimising agency costs?

We also link the elicitation of external information during crowdfunding to the more general concept of crowd*sourcing* or "crowd-based knowledge sourcing" (e.g., Afuah & Tucci 2012; Piezunka & Dahlander 2015), in which a "problem owner" seeks solutions to a problem from a public crowd of "problem solvers." In the case of crowdfunding, the "problem" at hand is the creation of a product that can successfully raise funding. We show that the appropriation of ideas from the crowd of customer investors into the product under development increases the product's chances of funding.

We also show that, as with crowdsourcing, distant search increases the value created from crowd input (Afuah & Tucci 2012). This is surprising, because the kinds of problems found in crowdfunding differ from those found in crowdsourcing in terms of problem complexity and divisibility into subproblems. We argue that customers' principal role facilitates distant search for such problems, because it reduces the costs of problem communication and modularisation.

The existing literature on crowd-based knowledge sourcing focuses on two approaches: Fixed-problem crowdsourcing (the Netflix prize, Afuah & Tucci 2012; Dell Storm Sessions, Sullivan 2010) and open-problem crowdsourcing (Dell IdeaStorm forum and my Starbucks Idea, Bayus 2013). In fixed-problem crowdsourcing, a problem owner is looking for solutions to a defined problem, such as the most efficient way to predict film rental (Netflix). It can involve contests with monetary rewards (Netflix) and problem solvers may either cooperate (Facebook translations) or compete (Netflix). In open-problem crowdsourcing, an organisation is looking for suggestion-box-style feedback on a wider range of topics (Piezunka & Dahlander 2015), such as Dell's effort to improve its products through continuous customer feedback (Bayus 2013). There is usually no financial reward, and customers participate for acknowledgement (Sullivan 2010). The creation and selection of ideas is influenced by an on-going community process, which involves voting and commenting on others' ideas (Bayus 2013; Dahlander & Piezunka 2014).

The elicitation of information from customer investors in crowdfunding combines fixed- and open-problem crowdsourcing with the financial investment of problem solvers: The problem at hand (to create a successful product) is more fixed than an entirely open suggestion box, but solutions can vary widely. The combination of crowd judgments with crowd investments may offer interesting research opportunities. For example, Atanasov et al. (2016) recently studied prediction markets vs. prediction polls in crowdsourcing. The prices paid by agents in prediction markets resemble investments into unfinished products by backers (Mollick & Nanda 2016). To follow up on these studies and the present paper, one could link the size of individual investments with the backer's influence on the project and the project's success. Should project creators listen to the backers with the biggest or smallest investments?

The disintermediation of producers and consumers is another interesting aspect of crowdfunding. The advent of industrialisation has removed consumers at the end of the value chain ever further from the producers of goods (Priem 2007). The reversal of this trend through crowdfunding and, more generally, the Internet can offer interesting research opportunities for organisational researchers. For instance, to what degree does the removal of intermediaries increase efficiency, and, in contrast, when does it lead to the inefficient allocation of resources?

Our study comes with some limitations. First, we argue that backers on reward-based crowdfunding platforms are customer investors, who invest in the development of a product which they receive as a return on their investment (Kuppuswamy & Bayus 2015). Unlike in equity-based crowdfunding, reward-seeking backers face agency costs from residual losses in product utility rather

than financial losses. This may not always be strictly true, for instance when families and friends invest in a project, or when an investment is too small to receive a product and the return is negligible (e.g., a souvenir). However, previous literature has noted the dominant use of reward-based crowdfunding for pre-sales (Fleming & Sorenson 2016). The majority of backers, who receive a product in return for their investment, are thus customer investors. As mentioned above, investigating the influence of customers at different investment levels may be a worthwhile research opportunity. There are also no charities or charitable causes in our data.

Second, at present reward-based crowdfunding is predominantly used by entrepreneurs. While there are a few projects by larger organisations in our sample, the applicability of our results to such organisations may be limited. Yet the involvement of customer investors in entrepreneurial projects can be useful for established organisations too (Fleming & Sorenson 2016). For instance, the development of a high-risk product can be made contingent on a successful crowdfunding project. This way, organisations raise some of the required capital, benefit from the free promotion of their product, and can reduce the associated risks by listening to customer investors. Crowdfunding may therefore be a new form of involving customers virtually and financially in new product development projects (Nambisan 2002). The use of crowdfunding by large corporations is an interesting area for future research. For instance, our results indicate that incorporated organisations have slightly less successful crowdfunding projects. Why would that be the case? Is it because organisations are less reliant on external funding, or because their processes are not adapted to open interaction with customer investors?

Third, we measure the incorporation of customer input into the product as changes to the project description; we do not measure the extent or content of those changes. However, in our model we only use the variation accounted for by the instrumental variable. Because the instrumental variable has no direct causal effect on changes (project creators cannot edit project descriptions through the app), all changes we measure are a result of customer input. Our results thus represent the average effect of all changes being made by project creators in response to customer input. This offers an opportunity for future research to track specific customer requests and how they are incorporated into products.

Fourth, our dependent variable is funding success. While this is an important measure of success for project creators, it may be interesting to look at the bottom line or other success variables. Surveys are an initial and easy-to-perform way to acquire data on other success metrics, although ultimately one would want to link crowdfunding data with, for example, IPO or profit data.

Our study results in a number of directly applicable guidelines for entrepreneurs wanting to use crowdfunding. First, input from customer investors can improve a project's chances of success—in fact, it can make the difference between funding and failure. It is good to listen to customer investors, because their feedback and support to some degree replaces the help that entrepreneurs usually receive from angel investors or venture capitalists. Second, individual project creators can particularly

benefit from customer input, whereas teams derive less benefit from customer input. Third, projects that are adapted to customer input are more likely to get funded. This is not because customers are happy to be influential, but because projects tend to get better. Fourth, customers who have more experience in categories other than the project's (e.g., backers from theatre who invest in a video games project) give more valuable input. Their feedback might not be as easy to implement, but they offer more heterogeneous insights on the market, and incorporating these insights is worth the effort.

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Tables and Figures

Table 1   Descriptive Statistics (N = 21,023)

Variable	Mean	Std. Dev.	Min	Max
Funding success	0.48	0.50	0	1
Customer input	1.99	5.49	0	52
Team	0.64	0.48	0.00	1.00
Project updates	4.57	3.58	1	49
Distant Funding Experience	0.76	0.36	0	1
Duration	32.90	10.10	13	61
Experience	0.09	0.54	0	22
Goal	-0.01	1.01	0	84
Currency	0.10	0.30	0	1
Videos	1.07	0.92	0	23
Incorporated	0.02	0.14	0	1
Website	0.86	0.35	0	1
Risks section	142.84	118.31	0	7291
Prev. customer engagement	1.57	6.09	0	111

Note. For "Team" N = 10,828.

Table 2   Correlation Matrix (*N* = 21,023)

Variables	1	2	3	4	5	6	7	8	9	10	11	12
(1) Funding success	1											
(2) Customer input	0.21***	1										
(3) Project updates	-0.04***	0.3***	1									
(4) Distant Funding Experience	-0.28***	-0.41***	-0.21***	1								
(5) Duration	-0.12***	0.03***	0.1***	-0.02**	1							
(6) Experience	0.02***	0.05***	-0.01**	0	-0.03***	1						
(7) Goal	-0.05***	0.03***	0.02***	0	0.05***	0	1					
(8) Currency	-0.08***	0.01	0.02***	0.02***	0	0	0	1				
(9) Videos	0.06***	0.12***	0.11***	-0.12***	0.02**	-0.02**	0.01	-0.02***	1			
(10) Incorporated	-0.02***	0.04***	0.04***	-0.04***	0.01*	-0.01	0.01	0	0.02**	1		
(11) Website	0.1***	0.08***	0.07***	-0.1***	0.01	0.01	-0.01	-0.02***	0.12***	0.03***	1	
(12) Risks section	-0.01	0.1***	0.12***	-0.09***	0.03***	-0.01	0.03***	0.01*	0.11***	0.03***	0.08***	1
(13) Prev. customer engagement	0.06***	0.19***	0.1***	-0.13***	0.01	0.04***	0.01*	0.02***	0.03***	0.03***	0.02***	0.03***

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Table 3   First and Second Stage Regressions

Variables	Model 1		Model 2		Model 3	
	First Stage Customer Input	Second Stage Funding Success	First Stage Customer Input	Second Stage Funding Success	First Stage Project Revisions	Second Stage Funding Success
Mobile app	0.20*** (0.07)		0.16** (0.08)		0.67*** (0.05)	
Customer input		0.92*** (0.16)		1.32*** (0.29)		
Distant Funding Experience	-4.97*** (0.09)	1.99** (0.78)	-4.55*** (0.12)	3.32*** (1.28)		
Team			0.46*** (0.09)	0.28* (0.15)		
Customer input × team				-0.07** (0.03)		
Project revisions						0.29*** (0.04)
Duration	0.01*** (0.00)	-0.03*** (0.00)	0.01*** (0.00)	-0.03*** (0.00)	0.04*** (0.00)	-0.03*** (0.00)
Experience	0.33*** (0.06)	-0.22*** (0.06)	0.09 (0.06)	-0.07 (0.04)	-0.19*** (0.04)	0.09*** (0.03)
Goal	0.10*** (0.03)	-15.78*** (0.64)	0.17*** (0.04)	-17.01*** (1.09)	0.03 (0.02)	-7.80*** (0.40)
Currency ($1 := GBP$)	-0.02 (0.11)	-0.28*** (0.06)	0.07 (0.13)	-0.31*** (0.08)	0.08 (0.08)	-0.45*** (0.05)
Videos	0.29*** (0.04)	-0.13** (0.05)	0.28*** (0.05)	-0.17** (0.08)	0.32*** (0.03)	0.05* (0.03)
Incorporated	0.06 (0.24)	-0.24* (0.14)	0.15 (0.28)	-0.19 (0.20)	0.37** (0.17)	-0.25** (0.11)
Website	0.54*** (0.10)	0.14 (0.10)	0.38*** (0.12)	0.03 (0.12)	0.60*** (0.07)	0.44*** (0.05)
Risks section	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00** (0.00)	0.00*** (0.00)	0.00 (0.00)
Prev. customer engagement	0.08*** (0.01)	-0.05*** (0.01)	0.06*** (0.01)	-0.05*** (0.02)	0.03*** (0.00)	0.03*** (0.00)
Residuals		-0.71*** (0.16)		-1.09*** (0.29)		-0.28*** (0.04)
Residuals × team				0.05* (0.03)		
Category dummies	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	6.45*** (0.22)	-5.17*** (1.05)	5.90*** (0.28)	-7.39*** (1.72)	3.29*** (0.14)	-1.69*** (0.19)
F-Stat	308.83		157.98		111.17	
LR χ^2		3,917.63		2,395.74		2,610.69
R^2	0.25		0.26		0.10	
Pseudo R^2 (McFadden 1974)		0.25		0.26		0.10
Number of observations (projects)	21,023	21,023	10,828	10,828	21,023	21,023

Note. Standard errors (first stages) and nonparametric bootstrap standard errors (100 replications; second stages) in round brackets.
*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Figure 1   Average Customer Input by Category Before and After the Release of the Mobile App
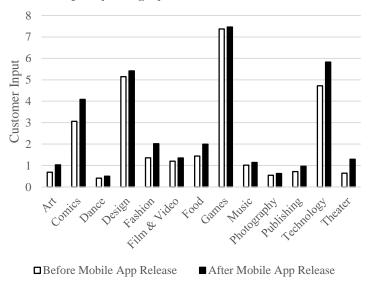

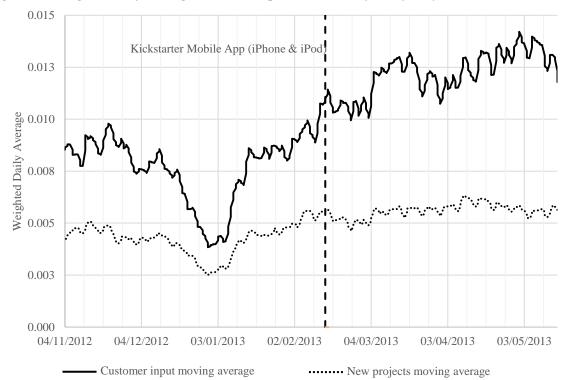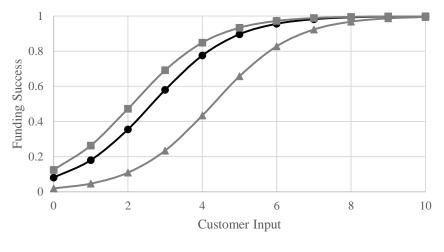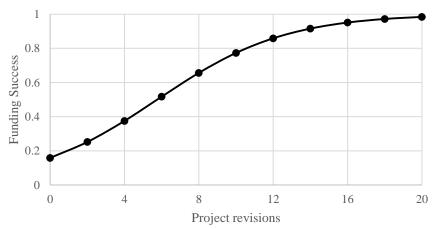**Figure 2   Weighted Daily Average Customer Input and New Projects by Project Start Dates**

Figure 3   Predicted Likelihood of Funding Success for Customer Input and Distant Funding Experience (D)
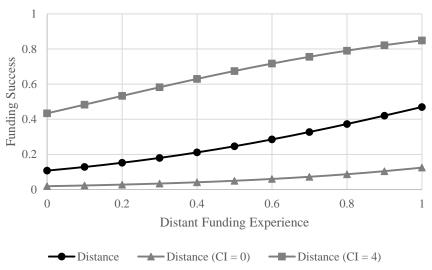

Note. All other variables at their means.

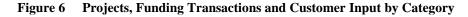**Figure 4   Predicted Likelihood of Funding Success for Project Revisions**

Note. All other variables at their means.
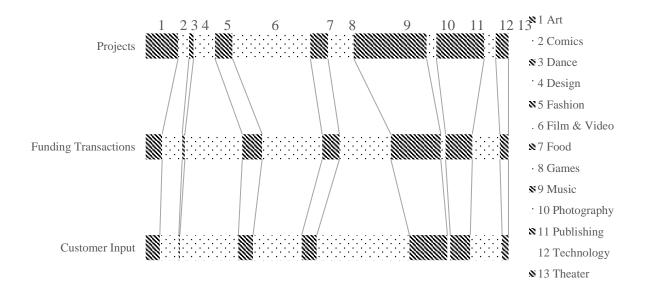
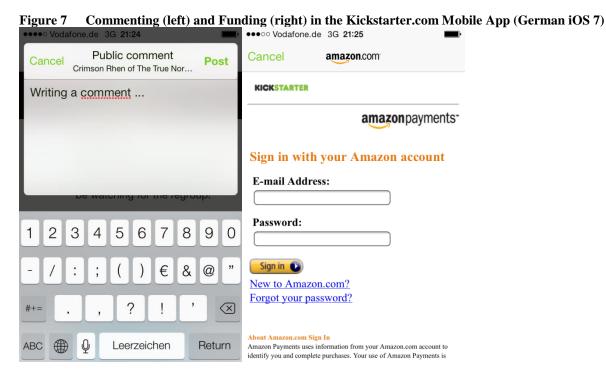**Figure 5   Predicted Likelihood of Funding Success for Distant Funding Experience and Customer Input (CI)**

Note. All other variables at their means.

Appendix A

Figure 6   Projects, Funding Transactions and Customer Input by Category

Appendix B

Figure 7   Commenting (left) and Funding (right) in the Kickstarter.com Mobile App (German iOS 7)

Appendix C

To assess the reliability of the customer input measurement, we randomly select 25 interactions with 2 or more messages between project creators and customers and evaluate them qualitatively. The 25 interactions from our draw account for 69 messages of which 59 are meaningful with respect to the project (86%). The few less meaningful interactions are measurement errors in our analysis – they are "false positives". We can safely assume the impact of false positives on funding success to be E[0] and their inclusion thus only makes our results more conservative (Wooldridge 2010).

A typical interaction from our random draw discusses the functionality of the product. For instance, the project "AGENT: The World's Smartest Watch" asks for funding to develop a next generation smartwatch.[12] During the funding phase, customer J. asks:

"Hey I was just curious.. What is the initial storage space approximately going to be around? I noticed the pebble[13] can only hold up to 8 apps/watch faces.. Is the AGENT going to have the same limitation?"

The project creator responds:

"@[J.] -- there may be some practical limit as to how many watchfaces or apps are easy to navigate to on a smartwatch--but that's certainly more than eight :) We've been measuring the size of

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[12] AGENT smartwatch, see https://www.kickstarter.com/projects/secretlabs/agent-the-worlds-smartest-watch, funded 20 June 2013.

[13] Pebble is a Kickstarter.com funded smartwatch from 2012, see
https://www.kickstarter.com/projects/597507018/pebble-e-paper-watch-for-iphone-and-android.

a lot of the watchfaces that developers have been working on and technically we can fit more than a hundred of those on the watch. We'll establish some best practices as we go on this journey together."

Customer J. is worried about a certain functionality (the amount of apps/watchfaces) and expresses the relative importance of this feature to him. The project team then elaborates on their thoughts on the matter, how they try to solve the problem and that they plan on finding the best solution together with their customers. This interaction exemplarily illustrates meaningful customer input.