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Designing for Crowdfunding Co-creation

How to Leverage the Potential of Backers for Product Development

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Abstract Crowdfunding is now established as a valid alternative to conventional methods of financing for startups. Unfortunately, to date, research has not investigated how backers can be encouraged to support entrepreneurs beyond funding. The aim of this study is to design and evaluate certain design elements for reward-based crowdfunding platforms that can engage backers in co-creational activities for product development. The study uses a design science research (DSR) approach and the theoretical concept of psychological ownership to inform a new design and then experimentally test that design. The results suggest that the derived artifacts positively influence co-creational activities in crowdfunding and that feelings of psychological ownership play an important mediating role. The contribution of this research is threefold. First, this paper extends crowdfunding's application potential from merely a method of financing to a method of value creation with customers for product development. Second, the study advances DSR by applying a new DSR approach that shows whether a design performs as hypothesized by

theory. Third, this research allows the exploration of backers' individual behavior as opposed to their collective behavior.

Keywords Crowdfunding · Co-creation · Design science research · Design experiment

1 Introduction

Crowdfunding has gained considerable popularity in recent years (Simons et al. 2019). One of the most popular types is *reward-based crowdfunding*, in which people can invest money in a venture in exchange for a non-monetary return (Kuppuswamy and Bayus 2017). Interestingly, more and more startups as well as established firms use this form of crowdfunding to showcase their product prototypes to potential customers and to collect money for developing and launching these product prototypes.

Crowdfunding, as well as crowdsourcing (Hammon and Hippner 2012), offers great potential for co-creational activities (Majchrzak and Malhotra 2013) between entrepreneurs and backers (i.e., funders of crowdfunding campaigns). For instance, Gerber and Hui (2013) found that one important motive for people to participate in reward-based crowdfunding is "to make things happen". Existing research suggests that campaigns that offer backers the possibility of participating in the development of a firm's products and services have significant effects on that firm's market success (Stanko and Henard 2016). Thus, crowdfunding can be used to validate ideas with backers that in reward-based crowdfunding also constitute potential customers (Belleflamme et al. 2014; Mollick 2014). Further research shows that campaigns that actively engage backers lead to a company's heightened focus on radical

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product development, thereby significantly affecting the product's future market success (Stanko and Henard 2016, 2017). The engagement of backers is mostly enabled through IT functionalities inherent to crowdfunding platforms that allow entrepreneurs to visually present their business ideas (e.g., video uploads) and to communicate with potential backers¹ (e.g., updates and comments).

Although the above findings provide a first hint toward reward-based crowdfunding's potential to harness the crowd for a start-up's innovation activities, research on this topic is still embryonic. There is relatively little research to date that discusses how start-ups can systematically use reward-based crowdfunding platforms to harness the co-creation potential of early customers for their innovation activities. Therefore, relatively little is understood about how crowdfunding platforms must be designed in order to encourage and foster customer participation in innovation activities such as the co-creation of new products.

To study the aforementioned "research-/design-gap", we employ a design science research (DSR) approach (Hevner and Chatterjee 2010) to design an IT artifact to encourage the co-creation behavior of potential customers in crowdfunding campaigns. To derive the design requirements for our artifact, our study applies psychological ownership theory (Pierce et al. 2003). Accordingly, we address the following research question:

Research Question *How can crowdfunding platforms be designed that facilitate potential customers' co-creation engagement in developing new products?*

In order to answer this question, our study follows the DSR process proposed by Kuechler and Vaishnavi (2008), who distinguish between awareness of the problem, suggestion, development, evaluation, and conclusion. In order to create awareness regarding the potential of potential customers' co-creation engagement in crowdfunding, we first review literature on the topic of crowdfunding. Based on this awareness and following a theory-driven design approach, we derive our design requirements and develop a set of design principles. The resulting design principles further guide us in the development of a more concrete instantiation of our IT artifact. Finally, we evaluate our artifact in an experiment.

The main contributions of our study are threefold. First, we introduce the concept of crowdfunding co-creation to evolve reward-based crowdfunding from a mere method of financing to a more holistic approach for product development. In doing so, we consider crowdfunding platforms as adaptable and evolving artifacts that offer room for

improvement (Zhao and Zhu 2014). Second, our design approach contributes to methodological advances in DSR (Niehaves and Ortbach 2016) by establishing and examining a link between the design of our artifact, its effect on human psychology, and how this relationship affects co-creation behavior (i.e., our design goal). Third, this research provides the first examination of individual crowdfunding behavior by examining psychological antecedents to crowdfunding co-creation.

The remainder of this paper is as follows: (1) we set the context of this study by reviewing current literature on 'crowdfunding' and co-creation to define 'crowdfunding co-creation'; (2) we determine meta design requirements from the definition of crowdfunding co-creation; (3) we derive a meta design to address our requirements based on knowledge drawn from psychological ownership theory, and (4) we develop and evaluate an artifact (i.e., design elements) according to this design.

2 Theoretical Background

2.1 Current Crowdfunding Research

Crowdfunding has received substantial interest from academics as well as practitioners in recent years (Kuppuswamy and Bayus 2017; Mollick 2014). Current research on crowdfunding revolves around four major research streams as well as a number of diverse research topics (Beaulieu et al. 2015). The four major research streams include research on the types of crowdfunding, the success factors within a crowdfunding campaign, contribution behavior of individuals in crowdfunding ecosystems, and the design of information technology (e.g., platforms) facilitating the crowdfunding process. Other research topics include the impact of crowdfunding, privacy issues in crowdfunding, as well as the viability of crowdfunding. Table 1 summarizes these research streams and provides a listing of literature within each stream.

One stream of literature in the field of crowdfunding concerns the different types of funding models that are employed by the capital seeker. Most research distinguishes four types of crowdfunding models: donation-, reward-, lending-, and equity-based crowdfunding (Bradford 2012; Griffin 2012; Gierczak et al. 2016). The main difference between these crowdfunding types lies in their exchange conditions (i.e., what investors get in return for their investment) as well as the purposes they are used for. For example, in donation-based crowdfunding, donors are usually not rewarded through a financial or material return, which is why this type of crowdfunding is mostly applied for social or philanthropic projects (Giudici et al. 2012; Meyskens and Bird 2015). On the other hand, in equity-

¹ In the following we will refer to backers mostly as potential customers since in reward-based crowdfunding most supporters are potential buyers of the product.

Table 1 Research streams within crowdfunding literature. Adapted from Beaulieu et al. (2015)

Stream	Topics	Literature
Crowdfunding types	Donation-based crowdfunding	Bradford (2012), Griffin (2012), Meyskens and Bird (2015), Mitra (2012), Giudici et al. (2012), Thies et al. (2014) and Belleflamme et al. (2014)
	Reward-based crowdfunding	
	Lending-based crowdfunding	
	Equity-based crowdfunding	
Success factors	Effects of project quality and the size of the entrepreneur's social network	Mollick (2014), Kuppuswamy and Bayus (2017), Clauss et al. (2018), Thies et al. (2014), Lukkarinen et al. (2016), Courtney et al. (2017), Allison et al. (2015), Lin and Viswanathan (2015), Belleflamme et al. (2014), Zvilichovsky et al. (2018), Ahlers et al. (2015), Calic and Mosakowski (2016), Davis et al. (2017), Leung and Sharkey (2013) and Moss et al. (2015)
	Effects of videos, use of updates and comments, and use of social media	
	Effects of linguistic cues, campaign targets, and previous backing-history	
Contribution behavior	Motivation of capital givers	Bretschneider and Leimeister (2017), Jiang et al. (2018), Ley and Weaven (2011), Thies et al. (2016, 2018), Hong et al. (2018), Gerber and Hui (2013), Zvilichovsky et al. (2018), Cholakova and Clarysse (2015), Colombo et al. (2015), Lin et al. (2013), Sonenshein et al. (2011) and Zhang and Liu (2012)
	Effects of financial return on contribution behavior	
	Effects of network effects on contribution behavior	
Design of information technology	Role of crowdfunding platforms in mediating transactions	Burch et al. (2018), Haas et al. (2014), Cumming et al. (2015), Roma et al. (2018), Siering et al. (2016) and Wessel et al. (2017)
	Role of IT in managing information and risk between entrepreneurs and backers	
	Effect of information technology on fraudulent behavior and on intensity of competition	
Other	Viability of crowdfunding	Braet et al. (2013), Mutengezanwa et al. (2011), Burch et al. (2013), Hong et al. (2018), Drover et al. (2017), Iyer et al. (2015) and Mollick and Nanda (2015)
	Impact of crowdfunding on socio-economic factors	
	Privacy issues in crowdfunding systems	

and lending-based crowdfunding, investors obtain a financial reward either in the form of interests or a holding in the company (Mitra 2012). Therefore, these crowdfunding types are commonly used for commercial purposes such as granting backers or companies a loan.

The type of crowdfunding that has received most research interest so far is reward-based crowdfunding. Reward-based crowdfunding differs from the other types of crowdfunding in how it rewards backers. In reward-based crowdfunding, backers are rewarded with non-monetary rewards, which can take various forms, such as the product that is advertised by the campaign, mementos of the campaign, invitations to events as well as the appreciation of supporters (Thies et al. 2014). Entrepreneurs can use this flexible reward scheme to pre-sell² their products and services as well as to determine customers preferences and willingness to pay for certain services and products (Belleflamme et al. 2014; Mitra 2012). Because of these unique properties, reward-based crowdfunding is often

used by companies that develop new products and services for B2C markets.

The second stream of research examines the factors that positively influence the success of a campaign. Previous research in this field shows that an entrepreneur's probability to successfully raise money via crowdfunding is dependent upon factors such as project quality and the size of the entrepreneur's social network (Mollick 2014; Davis et al. 2017). Further research suggests that crowdfunding success is positively related to the use of interactive media, such as videos (Mollick 2014), the regular use of updates and comments (Clauss et al. 2018; Kuppuswamy and Bayus 2017), and the use of social media (Courtney et al. 2017; Lukkarinen et al. 2016; Thies et al. 2014). In addition, existing research examined how linguistic cues as well as the campaign targets can help the entrepreneur to build a community around her campaign (Allison et al. 2015; Lin and Viswanathan 2015; Ahlers et al. 2015; Calic and Mosakowski 2016; Leung and Sharkey 2013; Lin et al. 2013; Moss et al. 2015). Moreover, the entrepreneur's ability to address the right community in order to reach her funding goal – as well as her previous backing-history – have been investigated (Belleflamme et al. 2014).

² Pre-selling refers to a process where users/backers can acquire the rights for a certain product or the rights associated with a certain product (i.e., the product itself or the rewards discussed earlier) even before it has been produced.

The third research stream looks at the contribution behavior of individuals in a crowdfunding ecosystem. Existing research in this stream includes research by Gerber et al. (2013), Bretschneider and Leimeister (2017), as well as Cholakova and Clarysse (2015), who investigated the motivation of capital givers. They were able to show that backers in crowdfunding are motivated beyond financial return and participate in crowdfunding for reasons such as to help others or to be part of a community. The influence of network effects on the contribution behavior has also been investigated in previous research (Jiang et al. 2018; Ley and Weaven 2011; Thies et al. 2016, 2018; Hong et al. 2018; Zvilichovsky et al. 2018; Colombo et al. 2015; Sonenshein et al. 2011; Zhang and Liu 2012).

The fourth research stream is concerned with the design of information technology (e.g., platforms) facilitating the crowdfunding process as well as interactions between different platform actors. Existing research in this stream shows that crowdfunding platforms have an important role in mediating transactions between capital seekers and capital givers (Burtch et al. 2018; Haas et al. 2014). In addition, it shows that IT mechanisms are crucial in efficiently managing information and risk between entrepreneurs and backers (Cumming et al. 2015; Roma et al. 2018). Apart from that, the effect of information technology on fraudulent behavior (Siering et al. 2016) and on the intensity of competition between crowdfunding campaigns (Wessel et al. 2017) has been investigated.

In looking for other important research topics in the field of crowdfunding, we identified studies that deal with the viability of crowdfunding and its impact on socio-economic factors as well as with privacy issues in crowdfunding. Regarding the viability of crowdfunding, Braet et al. (2013) posit that in small markets, like the movie industry, crowdfunding does not have the potential to be successful on a long-term basis. Contrary to that, Mutenganzanwa et al. (2011) were able to show a positive relationship between microcredits that have been realized via crowdfunding and the socio-economic lives of people. Also, the ability to predict future market success with the help of crowdfunding has been investigated in previous research endeavors (Mollick and Nanda 2015; Iyer et al. 2015). In addition to that, previous research found support for the assumption that crowdfunding has a positive influence on creating awareness and attention for a new venture (Burtch et al. 2013; Drover et al. 2017). Also, Burtch and Chan (2019) reported on evidence for the positive effect of the success of medical crowdfunding campaigns on the reduction of personal bankruptcy filings. When it comes to privacy issues in crowdfunding systems, existing research investigated how far social norms for information sharing and the provision of information

control mechanisms are able to facilitate the success of crowdfunding campaigns (Burtch et al. 2013).

One thing that all the afore-mentioned research has in common is that it conceives of crowdfunding as mainly a funding mechanism. However, there is more recent research suggesting that crowdfunding offers considerable value beyond funding. For example, Stanko and Henard (2016) suggest that crowdfunding offers entrepreneurs opportunities to actively integrate backers into a company's innovation activities (e.g., product development activities). Their research further shows that crowdfunding campaigns that integrate their customers in innovation activities during crowdfunding are more likely to be commercially successful (Stanko and Henard 2017). A similar finding is reported by Brem et al. (2017), who show that crowdfunding democratizes innovation by allowing companies to integrate customers in the large-scale commercialization of the companies' products and services. While these studies provide initial evidence that crowdfunding can be used to interact with customers for other reasons than funding, there is still relatively little understanding on how existing crowdfunding infrastructures can be used to systematically leverage backers to co-create new products.

2.2 The Co-creational Potential of Reward-Based Crowdfunding

Co-creation denotes an active, creative, and social process that is based on collaboration (Roser et al. 2013), in which companies seek to transfer innovative solutions from customers to a firm (Seybold 2006; Tapscott and Williams 2008). Information technologies (IT) play a critical role in enabling co-creation. The web offers new possibilities to design virtual environments in such a way that they increase customers' experiences with a product, thereby easing the process for customers to co-create new products with companies as well as stimulating their potential to come up with innovative product ideas (Füller and Matzler 2007; Hippel and Katz 2002; Nambisan 2002).

Virtual Ideas Communities (VIC) are a good example of such virtual environments. VICs – where distributed groups of individual customers and product users focus on voluntarily sharing and collaborating on new ideas – are used by firms as a practice for integrating customers into ideation for new product development (Bayus 2013; Bretschneider et al. 2015; Di Gangi and Wasko 2009). VICs provide certain IT functionalities for idea uploading, storage, commenting, and visualization. This means that in VICs customers can post their ideas, vote for presented ideas, and comment on other customers' ideas and thereby help improve ideas in a collaborative manner (Bayus 2013; Bretschneider et al. 2015). Other examples that have been

shown to effectively support the co-creation of ideas include toolkits for innovation (Hippel 2001), idea competitions (Schweitzer et al. 2012), and forums (Di Gangi and Wasko 2009).

Since crowdfunding shares a lot of functionalities with the above-mentioned tools – for example, it provides backers with functionalities to upload and update their business ideas and to receive feedback on them – we believe that it offers a promising environment for entrepreneurs to collaborate with potential customers on the development of new products. One type of crowdfunding that is particularly conducive to engage potential customers in such co-creational activities is reward-based crowdfunding (Lipusch et al. 2018). One of the main reasons for this is reward-based crowdfunding's focus on consumer products as well as its flexible reward and selling agreements allow companies to collect customer preferences before the product goes into mass production. Reward-based crowdfunding also features certain characteristics that differentiate it from other common co-creation methods. In contrast to other co-creation methods that rely on potential customers or proxies of real customers, reward-based crowdfunding allows entrepreneurs to gather feedback on products and services from actual customers (i.e., customers that like the idea or the respective product so much that they are prepared to buy it before it is made generally available). Furthermore, reward-crowdfunding allows for co-creating in a far more realistic environment because it revolves around companies with actual prototypes. Also, since crowdfunding allows potential customers to make a preliminary financial commitment, it might provide startups with more reliable feedback regarding customers' actual purchase intentions (Belleflamme et al. 2014). This is beneficial compared to other methods such as VICs that exclusively deal with mere ideas. Finally, reward-based crowdfunding combines the best of two worlds as it can be used as a tool to collect creative product ideas (Gerber and Kuo 2012) as well as a tool for product funding.

2.3 How to Leverage the Co-creational Potential of Reward-Based Crowdfunding

While reward-based crowdfunding seems to offer a lot of advantages in terms of co-creating new products with customers, this potential doesn't seem to be fully utilized by current crowdfunding platforms. This is also reported by current research, suggesting that the facilities of comments and updates are rarely used in crowdfunding campaigns. This is peculiar, since current research suggests that the number of comments is a positive predictor of crowdfunding success (Mollick 2014). Further research seems to imply that the active integration of backers – one way to do

so could be through more interactive communication – has a significant effect on a company's market success (Stanko and Henard 2017). Despite this evidence, interactive co-creational activities have received almost no research attention so far. We believe that one reason why a lot of companies still fail to leverage the full potential of the crowd and the feedback that comes with it is functional fixedness (Adamson 1952). Users of crowdfunding platforms might be fixated on crowdfunding's purpose as a funding mechanism without considering the possibilities it offers beyond this functionality (Giones and Oo 2017). Against this background, it can be argued that existing platforms fail to create an environment that encourages participants to engage in more interactive co-creation (Füller and Matzler 2007; Nambisan 2002) such as, for example, product development activities. This leads us to propose our first meta-design requirement:

DR1 *Crowdfunding platforms should encourage potential customers to provide feedback on the products and services of entrepreneurs.*

Active involvement in the form of allowing customers to give feedback serves as an important community benefit as it allows potential customers to influence the potential form and function of a product. It also serves a wider purpose of increasing customers' willingness to pay (Belleflamme et al. 2014). One of crowdfunding's main benefits and distinguishing characteristics compared to other crowdsourcing approaches is the financial support that emerges from the crowd. For example, Belleflamme et al. (2014) define crowdfunding as an open call to an undefined group of individuals for the provision of financial resources. Thus, in contrast to the broader concept of crowdsourcing where the focus is on obtaining solution knowledge from a dispersed crowd of individuals, in crowdfunding the focus is on obtaining funds from a dispersed crowd of individuals. It is these funds that put a company into a position to take the actions that are required to solve the problem that is proposed by a crowdfunding initiative. Another advantage of this incorporated funding mechanism is that it captures the potential customers' actual (purchase) intentions and preferences more accurately (Belleflamme and Lambert 2014). We therefore argue that a study that focuses on co-creation in crowdfunding should capture the element of monetary support. This leads us to propose our second meta-design requirement:

DR2 *Crowdfunding platforms should encourage potential customers' intention to increase their financial support in a project.*

Combining our two meta-design requirements, we arrive at the concept of *crowdfunding co-creation* that we regard as a dual-value proposition, constituting funding as well as

feedback. Crowdfunding co-creation thereby represents the design goal that the artifact developed in this paper must satisfy.

3 Research Approach

To address the aforementioned meta-design requirements, we pursue a design science research (DSR) approach (Hevner and Chatterjee 2010; March and Smith 1995). We chose this approach as it has been shown to be an effective method to design IT artifacts to solve real world problems (Hevner and Chatterjee 2010; March and Smith 1995; Peffers et al. 2007). Our paper deals with a problem of this kind as it aims to construct and evaluate an IT artifact to facilitate co-creation in the context of existing crowdfunding systems. Our study follows the general DSR process proposed by Kuechler and Vaishnavi (2008), who distinguish between awareness of the problem, suggestion, development, evaluation, and conclusion. Figure 1 provides an overview of the actions we undertook at each process step as well as their corresponding outcomes.

In order to create awareness of the problem, we start our DSR process by reviewing literature on the topic of crowdfunding and by establishing the role of reward-based crowdfunding in the context of other co-creation methods. Based on this, we suggest a definition of crowdfunding co-creation from which we derive our meta-design requirements. To develop our artifact, we follow a theory-driven design approach.

We begin with the concept of psychological ownership, which acts as our kernel theory to explain psychological perceptions and behavior of individual customers in

crowdfunding. Building on our kernel theory, we discuss three concepts that enhance psychological ownership and match these with solution knowledge derived from related literature to arrive at design principles. The design principles further guide us in the development of a more concrete instantiation (i.e., design elements) of our IT artifact. Finally, we evaluate our artifact (i.e., our design elements) in an experiment (i.e., evaluation). We conclude our design process by discussing the implications of our design for research and practice.

To evaluate our design elements, we refer to the framework proposed by Niehaves and Ortbach (2016) (see Fig. 2). We follow this approach as it helps us to address a common shortcoming of current DSR approaches, namely to overcome the conceptual gap that often exists between the design of an artifact and its intended design goal (Niehaves and Ortbach 2016). Thus, while current theory-informed design approaches can usually show that a design has a certain effect, they often cannot show “how” these effects unfold. Our framework however is comprehensive and includes both a design model and a measurement model. We distinguish between the design model which mainly constitutes cause-related aspects of an artifact (i.e., theories and knowledge used to inform design as well as the actual design), and the measurement model which mainly constitutes effect-related aspects of an artifact (i.e., the outcome of the design as well as how the outcome comes to be). By including both models in our framework, we are not only able to explain how theory helps us to arrive at our design, but we can also show if our design works the way it was intended (i.e., as theorized). In other words, we not only show how psychological ownership theory informs the design of our artifact (composed of

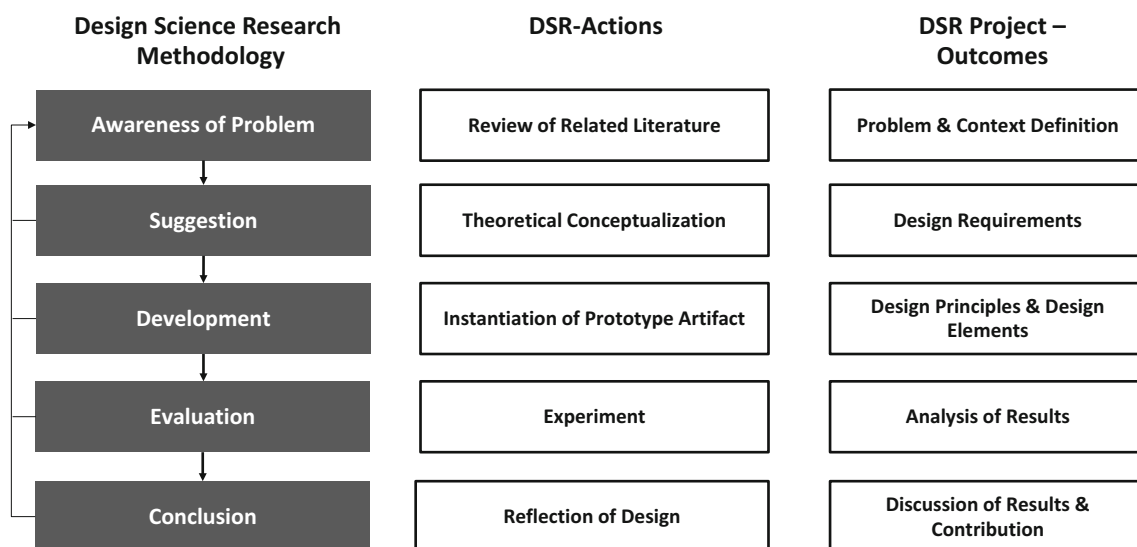


Fig. 1 General design science research approach. Adapted from Kuechler and Vaishnavi (2008)

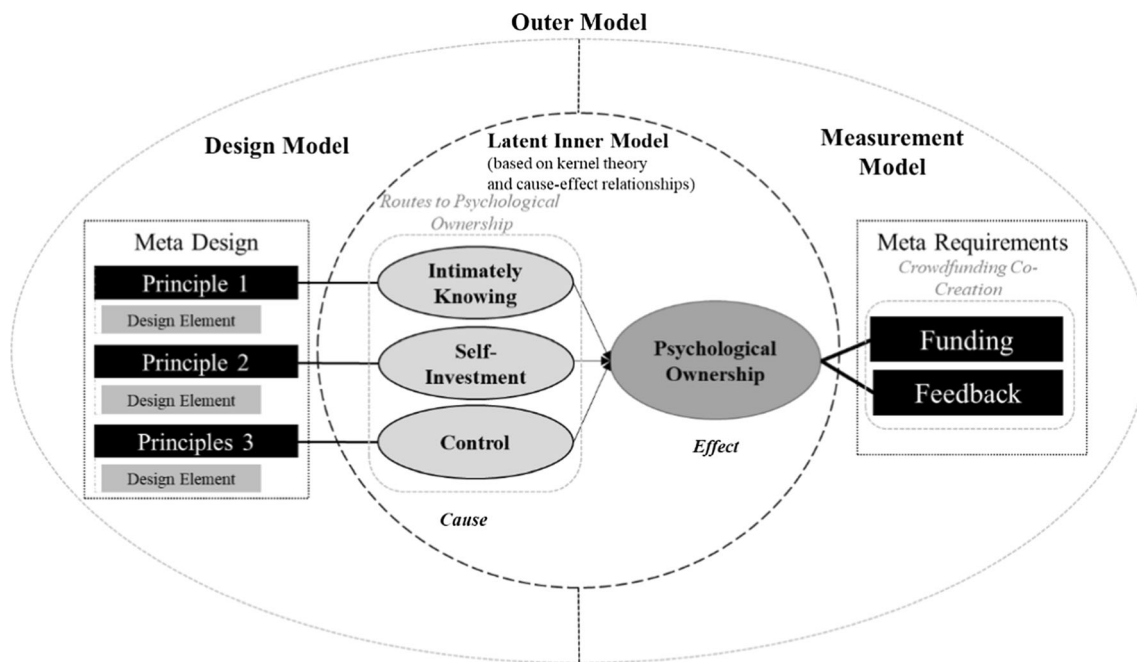


Fig. 2 Proposed evaluation framework. Adapted from Niehaves and Ortbach (2016)

three design elements), but we are also able to explain how our artifact in turn influences potential customers' psychological ownership feelings (as operationalized by Avey et al. (2009) and how these feelings mediate the outcome our design is aiming for (i.e., crowdfunding co-creation).

4 Development of a Solution

4.1 Translating the Concept of Psychological Ownership into Design Principles

To come up with a solution that addresses our meta design requirements, we aim to design a new IT artifact for a crowdfunding platform that will increase the crowdfunding co-creation behavior of potential customers. As mentioned before, we define *crowdfunding co-creation* as a combination of funding and feedback that is provided by potential customers (also see Fig. 2). Although we argue in chapter 2.2 that crowdfunding platforms offer an infrastructure that would theoretically enable co-creation, one thing that is missing is a set of principles that would encourage potential customers to engage in co-creational activities more frequently. To this end, we draw on the *psychological ownership theory* (POT) (Pierce et al. 2003) as a guiding concept to inform the design of a suitable solution. In the following, we elaborate on the concept of psychological ownership that we use to derive adequate design principles that help us to develop our artifact toward

a more concrete solution (i.e., an artifact prototype that can be evaluated).

Psychological ownership is the feeling that something is yours and it suggests that factual ownership of an object is not necessary to elicit ownership feelings toward that object (Kahneman et al. 1991; Thaler 1980). The difference between psychological and factual ownership can be explained by the following example. A worker may feel that a product she manufactured at work is hers (i.e., psychological ownership), but legal ownership of it is actually conferred to the organization (Van Dyne and Pierce 2004). Consequently, psychological ownership refers to a state of mind or feeling that makes people perceive a certain target as theirs despite not factually owning this target. Psychologists found that feelings of psychological ownership about different things can emerge in different ways. One way is via intimate knowledge: i.e., the more we know something about an object, the more likely we are to feel it belongs to us (Van Dyne and Pierce 2004). Another way is self-investment. By expending physical and mental energies, time, ideas, or skills on something, we begin to feel greater ownership (Van Dyne and Pierce 2004). Finally, there is control. Having control over a target can result in psychological ownership due to enhanced feelings of self-determination and responsibility (Van Dyne and Pierce 2004; Furby 1978).

These psychological ownership feelings, in turn, have important psychological as well as behavioral consequences. Regarding the psychological effects, people have

been shown to strongly identify with and attribute increased value toward objects they have developed these feelings for (Thaler 1980). In terms of behavioral implications, psychological ownership has been shown to be strongly associated with favorable behaviors. For example, it has been found that workers with high levels of psychological ownership are more likely to engage in extra-role behavior that benefits the organization as well as exhibit more commitment and loyalty toward their organization (Avey et al. 2009; Van Dyne and Pierce 2004).

This effect – namely that higher levels of psychological ownership in an individual lead to a certain behavior of this individual – is also acknowledged in investigations from the field of consumer behavior. For example, in different experiments, Fuchs et al. (2010) and Dickert et al. (2018) found that consumers with higher levels of psychological ownership feelings about certain products are more likely to make positive buying decisions concerning these products and more often give feedback on these products. This situation is comparable to our concept of crowdfunding co-creation, in which potential customers make decisions for pre-selling prototypes and give feedback on these prototypes. Therefore, we argue that to address our design requirements (i.e., to increase peoples' likeliness to engage in co-creational activities) on a psychological level, the design for new IT artifacts for crowdfunding platforms must enhance the psychological ownership of potential customers. While research seems to suggest that psychological ownership feelings positively influence peoples' behavior, to the best of our knowledge, information on how to systematically design IT artifacts for crowdfunding platforms that foster such feelings is nascent. In order to develop design principles for such IT artifacts, we rely on the above-mentioned three main concepts from the psychological ownership theory (Pierce et al. 2003): “intimately knowing”, “self-investment”, and “controlling”.

4.1.1 Intimately Knowing

The concept of “intimately knowing” relates to the fact that strong ownership feelings toward objects often emerge from a lived relationship with these objects (Beaglehole 1932; Weil 1952). What is meant by this is that people develop strong ownership feelings toward things they regularly engage, interact, and associate with. In line with this, it is argued that such feelings emerge as part of an ongoing process of association in which individuals accumulate information about the object to be owned (Beggan and Brown 1994; Rudmin and Berry 1987). The more information individuals accumulate about the ownership target, the higher are the feelings of ownership they develop and hence the attachment to the object (Beggan and Brown 1994; Rudmin and Berry 1987). Building on

this notion of getting to intimately know an object, we argue that a crowdfunding platform must allow potential customers to get to know a campaign's product in order for them to be motivated to engage in co-creational activities regarding that product. Since the web makes it difficult to “feel, touch and try” (Jiang and Benbasat 2004) a product, it is important to create a virtual product experience (Nambisan 2002). Creating such an experience usually goes beyond consuming information that is single-handedly provided by the creator of the product (e.g., web-based product manuals or videos); it involves discovering the product through multiple and heterogenous information sources. Thus, similar to an online shopping experience, potential customers of a crowdfunding platform must be given the chance to gradually acquire information on a product and compare this information against other information sources. In line with this, we propose the following design principle (DP):

DP1 *Crowdfunding platforms must provide potential customers with rich and multiple sources of information of a product to positively influence the crowdfunding co-creation behavior of potential customers.*

4.1.2 Self-Investment

The concept of “self-investment” (Rochberg-Halton 1980) relates to the fact that we develop strong ownership feelings toward things we do. The most prominent analogy to understand this concept of self-investment might be the relationship between work and psychological ownership. Philosophers argue that there is a strong relationship between labor and ourselves in a sense that we feel strongly attached to what we create, shape, or produce (Locke and Laslett 1988). Since labor entails our physical and psychological effort as well as a certain time investment, the outcome of our labor contains much of ourselves, which naturally leads individuals to develop high ownership feelings toward these outcomes. Self-investment not only refers to work-related outcomes, but also pertains to investing thoughts and ideas in an object. Building on this idea of self-investment, we argue that it is important that crowdfunding platforms enable various forms of self-investment in order to positively influence the co-creational efforts of potential customers toward a certain product. Therefore, we argue that crowdfunding platforms have to act as “engines for creation” (Ondrejka 2007). This means that crowdfunding platforms need to be interactive (Kohler et al. 2011; Williams and Cothrel 2000) in a sense that they encourage co-creation behavior among potential customers. This is especially important in crowdfunding systems, where potential customers often do not perceive the opportunity to create value beyond funding (Giones and Oo

2017) (see chapter 2.3). Consequently, new design elements of crowdfunding platforms have to encourage potential customers to engage in co-creational activities beyond funding. This leads us to propose the following design principle:

DP2 *Crowdfunding platforms must provide ways to encourage potential customers to state their preferences, thoughts, ideas, and feedback on the campaign's product to positively influence the crowdfunding co-creation behavior of potential customers.*

4.1.3 Control

The concept of “control” relates to the fact that ownership feelings often emerge toward objects that we exert control over (Compeau and Higgins 1995; Furby 1976; McClelland 1951). Furby (1976), for example, remarks that the more control people can exercise over an object, the more they perceive the object as part of themselves. This notion is also supported by early research indicating that objects that can be manipulated are more likely to be regarded as part of the self than objects for which this is not the case (McClelland 1951; Prelinger 1959). Building on this notion of control, we argue that crowdfunding platforms must not only enable and encourage co-creation, but need to make potential customers feel that they are in control of the outcome of their co-creation process (Nambisan 2002) in order to motivate their participation. While it can be argued that self-investment might promote feelings of control among potential customers, it might not be sufficient to produce such feelings. This can have several reasons. For example, potential customers might feel that they cannot influence the ultimate outcome of their co-creation activities. Just because people are provided with the opportunity to give feedback does not mean that their feedback is adequately acknowledged by the company that is seeking feedback nor that it is integrated into the company's product. To address this problem, new design elements of crowdfunding platforms must allow potential customers to effectively participate in decisions regarding the product design (Bandura 1997). In line with this, we propose the following design principle:

DP3 *New crowdfunding platforms must allow potential customers to effectively participate in decisions influencing the final product outcome in order to positively influence the crowdfunding co-creation behavior of potential customers.*

4.2 Design Elements to Address our Design Principles

To address the first design principle, the crowdfunding platform must present future potential customers with

multiple and heterogenous sources of information about the startup's products to allow potential customers to intimately know their offering. However, as startups typically do not have a long-standing history, very little information about the startups offering is publicly available. Therefore, potential customers of existing crowdfunding platforms are dependent on the information provided by the startup team, which naturally results in a very one-sided and narrow presentation of the startup's offerings. Even in cases where initial reviews or reports on the startup's products are already accessible on the web, these are not made available in a consolidated manner on existing crowdfunding platforms. Consequently, one problem of existing crowdfunding platforms is that potential customers rarely have the opportunity to intimately know a startup's offering. This in turn results in high perceived risk and information asymmetry which in turn inhibits the probability for successful crowdfunding co-creation. One way to solve this problem is through using external product reviews,³ which are integrated into the crowdfunding platform. To integrate these product reviews, we provided potential customers with a summary of product reviews that were taken from external websites and exemplary customers. The summaries were accompanied by the actual source of the reviews as well as a short rating that displayed the general sentiment of the review.⁴ Such product reviews allow potential customers to not only draw on additional, less-biased information, but to experience products through other perspectives and to gradually acquire more holistic information of the product (Chen and Xie 2005; Zhu and Zhang 2010). This is an important pre-condition for people to become familiar with the product, thereby fostering their ability to engage in product feedback (Dahan and Hauser 2002).

To address the second design principle, crowdfunding platforms have to provide potential customers with the possibility to state their preferences, thoughts, and ideas on the campaign's product, in order to allow them to become emotionally invested in the product. To achieve this goal, existing crowdfunding platforms provide potential customers with comment functionalities that allow potential customers to leave feedback. The problem with these comment functions, however, is that they are rarely used by potential customers. In other cases, companies do not use them in a targeted way. This means that companies do not use these functions to acquire targeted information on their products. Rather, they let potential customers decide on

³ These product reviews can be provided by early users who test the product before others or by special communities who, due to their thematic interest, report and review certain new products.

⁴ This was done to account for users who are likely to skip textual information and focus more on visual cues such as ratings.

their own how to make use of the comment function, which often results in “unsolicited information” (e.g., complaints without a concrete solution information, etc.). Hence, to promote the exchange of relevant solution information, new approaches are needed that encourage potential customers to provide more specific feedback on potential products (e.g., the exact features a product must contain).

One specific way to address this shortcoming is via participatory updates. Participatory updates are used by companies to ask customers about their preferences regarding a product (Leimeister et al. 2009; Piller and Walcher 2006). They differ from conventional updates which are mainly used to keep potential customers informed about the company’s progress without giving them the possibility to engage in specific feedback on a product. To implement our participatory update, we provided potential customers with an interactive prompt that called them to action and allowed them to openly contribute their ideas through a text form. To ensure that potential customers can contribute purposefully and to prevent potential customers from providing feedback that is too arbitrary, the interactive prompt was accompanied by an instruction that made clear on which aspect feedback was sought. In particular, we asked potential customers which additional features they would like to have integrated into the product. This stands in contrast to conventional crowdfunding platforms where potential customers are not asked for specific feedback and can leave behind arbitrary comments.

To realize the third design principle, crowdfunding platforms should provide potential customers with the opportunity to effectively participate in decisions that influence the final product outcome. This means that it is not enough to give potential customers the opportunity to contribute their ideas and thereby become emotionally invested (see design principle 2) in a certain product; it is also important to convey to customers that their contributions are valued by the company. This can be achieved through showing that they have an actual effect on the design of the final product. This is often difficult to achieve through conventional IT functions, such as for example comments. Thus, while comment functionalities allow customers to openly post their ideas not every customer idea will find its way into the final product. One way to counteract this problem is to provide customers with a voting mechanism that allows them to choose among a selected list of features or design decisions that could be implemented in the final product. In this way, customers are given the possibility to control the final product outcome even though their specific ideas might not be considered in the final product. To implement such a selective voting mechanism, we provided customers with a drag-and-drop mechanism, which they could use to rank a list of

pre-selected product features according to their preferences. This mechanism was used to allow customers to democratically vote on product features, the three most highly ranked of which, they were told, would be incorporated into the final product. Our voting mechanism contrasts with more generic voting mechanisms found on crowdfunding platforms in that it allows customers not only to vote on binary outcomes – such as whether they like a certain campaign or not – but to engage in more complex decision processes (e.g., deciding on the design of the product). Prior literature shows that engaging people in such decisions promotes feelings of self-efficacy which in turn positively influences people’s use and contribution behavior (Jiang and Benbasat 2004; Stone and Henry 2003). An overview of our complete design is provided in Table 2, giving three possible routes to psychological ownership (PO), the related design principles (DP1, DP2, DP3), and the associated design elements.

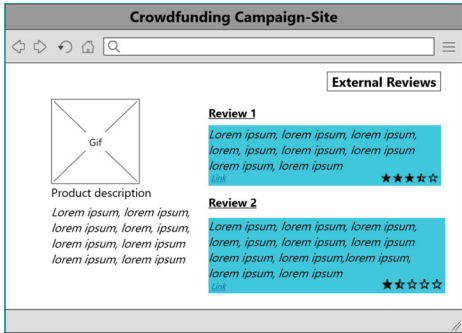
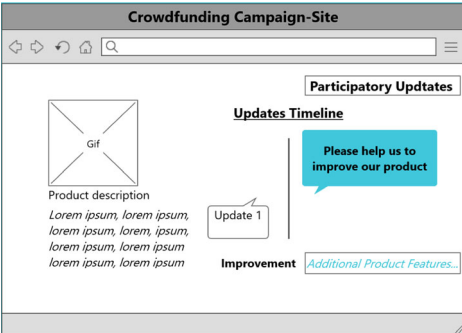
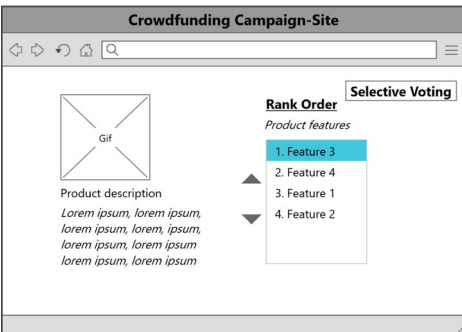
5 Evaluation

5.1 Experimental Design

In order to evaluate our design, we first have to determine the outcome variables of our measurement model (i.e., the dependent variables we would like to influence with our design). As already mentioned above, the aim of our design is to foster crowdfunding co-creation (for a detailed overview of the design requirements, see Sect. 2.3). Crowdfunding co-creation is essentially composed of two variables, namely feedback and funding. Hence, the main purpose of our measurement model is to find out if our design elements increase the amount of feedback and funding during a campaign.

To test if our design instantiation meets our stipulated design requirements, we conducted a randomized 2 × 1 web (design-) experiment on Amazon Mechanical Turk (AMT). AMT is an online labor marketplace that is often used for data collection in the social sciences. Research indicates that samples drawn from AMT are more reliable as they are demographically more diverse than typical research samples, which primarily consist of American college students (Mason and Suri 2012). Research also suggests that in many respects the AMT population is quite representative of populations on crowdfunding platforms such as Kickstarter (Chan and Parhankangas 2017; Mason and Suri 2012). Participants in our experiment were compensated with US\$1.30 for a task with a duration of approximately 15 min, which corresponds to the fee typically paid on AMT for a task of similar length (Sheehan and Pittman 2016).

Table 2 Overview of the meta design (i.e. design principles and design elements)

Routes to PO	Meta design	Design elements
Intimately knowing	DP1: <i>New CPs must provide potential customers with rich and multiple sources of product information to positively influence crowdfunding co-creation</i>	External reviews 
Self-investment	DP2: <i>New CPs must provide ways to encourage potential customers to state their preferences, thoughts, ideas, and feedback on the product to positively influence crowdfunding co-creation</i>	Participatory updates 
Control	DP3: <i>New CPs must allow potential customers to effectively participate in decisions influencing the final product outcome to positively influence crowdfunding co-creation</i>	Selective voting 

To test our design, we created two prototypical instantiations of crowdfunding campaigns. In one, we used the design of a conventional crowdfunding campaign as our control condition. In the other, we used the design of a crowdfunding campaign that featured our design elements

(see Table 2) as our treatment condition. This resulted in our control condition differing from the treatment condition in several important respects. The control condition primarily featured one source of product information (i.e., the company offering the product) as opposed to the

treatment condition that featured multiple endorsements from various sources. Additionally, the control condition featured only regular updates (i.e., progress updates), as opposed to the treatment condition which gave participatory updates. Finally, the control condition did not feature any voting mechanisms, whereas the treatment condition did. Besides that, both designs were identical in terms of the content they featured to ensure the isolated effect of our implemented design.

We chose to model our campaigns on a real crowdfunding campaign that advertised smart luggage. We chose this setting to mimic reality as closely as possible. Moreover, luggage constitutes a product that everybody can relate to and that can be easily used as a design object, therefore providing us the possibility to systematically integrate participants into product design decisions.

The experiment followed a strict sequence. Before entering the experiment, the participants were informed that the whole procedure would take approximately 15 min and would consist of two parts, namely a clickable crowdfunding campaign (part 1) and a questionnaire (part 2). Additionally, they were told to put themselves in the position of a potential funder and to read the campaign content carefully and conscientiously.

Once the participants had agreed to enter the experiment, they were asked to self-assess their mood on a 7-point Likert scale. We measured this variable before the participants engaged in the experimental manipulation in order to control for effects that might be attributable to their mood. After measuring the participants' mood, a short definition of reward-based crowdfunding was displayed. This was done to ensure that all participants understood the context of the study. Next, the participants were randomly assigned to one of the two crowdfunding campaign designs (i.e., either the control condition or the treatment condition). During the campaign, the subjects were given the possibility to leave feedback on the featured product, which constitutes our feedback measure in this study. Directly following the campaign, the subjects were asked to indicate their likeliness to support the respective campaign on a 7-point Likert scale as well as to state a relative funding amount with which they would support the campaign. In addition to that, we measured the participants' psychological ownership using the scale from (Avey et al. 2009).

After the experiment, a short questionnaire was forwarded to the participants that was used to collect the most important control variables such as gender, age, country of origin, education, and income. To control for other influencing factors, we additionally measured participants' product interest (Franke et al. 2010) as well as their experience with crowdfunding (Griffin et al. 1996).

5.2 Results

Participants took an average of 11.15 min ($SD = 5.57$) to complete the experiment. The study initially attracted 133 participants. However, we had to exclude 11 due to inconsistent responses and 3 due to cheating (i.e., bots), thereby ending up with a net sample of 119 participants. This 89.4% completion rate corresponds to the typical completion rates of online experiments (Davis and Metcalf 2016; Sayama and Sayama 2011).

Most participants in the sample were male (62.2%). The mean age of participants was 34.9 years ($SD = 9.81$). Most participants came from the US (70.3%), followed by participants from India (26.3%), and a small percentage of participants (3.4%) stating other countries. The participants of our experiment were fairly well educated, with 73.1% reporting to have received higher education (i.e., at least an associate degree). Regarding income, 66.6% of participants reported an income below US\$ 50,000. Thus, in terms of gender, age, education, and income, participants in our sample seem to be highly representative of visitors of reward-based crowdfunding websites.⁵ To comply with ethical standards, we further asked the participants about the appropriateness of the payment. The results show that the majority of the participants (89.9%) considered the payment as fair.

To examine the differences in the provision of feedback between our two conditions, we conducted a Chi square test. Our results indicate that the subjects in the treatment group provided significantly more feedback than subjects in the control group ($X^2(1, N = 119) = 21.620, p < 0.01$). In addition to that, we conducted a Mann–Whitney-U-Test to examine differences in the elaboration of feedback (as measured by the total number of words each feedback contained) between both groups. Our results suggest that the feedback provided by the treatment group was significantly more elaborate ($Mdn = 74.53$) than the feedback provided by the control group ($Mdn = 46.65$), $U(119) = 939, z = -4.57, p < 0.01$). To examine the differences regarding the subject's intention to fund as well as their perceived psychological ownership, we conducted a *t* test. Our results show that participants in the treatment condition indicated a significantly higher likeliness to support the respected campaign financially ($M = 4.56, SD = 1.60$) (as indicated by their likeliness to fund) compared to participants in the control group ($M = 3.90, SD = 1.69$), $t(117) = 2.17, p < 0.05$). To test differences in relative funding, we conducted a further Mann–Whitney-U-Test. The results reveal that participants in the treatment group contributed significantly higher funding amounts

⁵ <https://artofthekickstart.com/crowdfunding-demographics-understand-kickstarter-and-indiegogo-backers/>.

Table 3 Results of the t-test for psychological ownership

Variables	Condition	Mean	SD	T-value	<i>p</i> value
Self-efficacy	Control	3.07	1.65	6.72	0.000
	Treatment	5.06	1.55	6.72	0.000
Accountability	Control	3.66	1.51	1.96	0.052
	Treatment	4.19	1.41	1.96	0.052
Belongingness	Control	2.91	1.58	7.26	0.000
	Treatment	5.02	1.58	7.26	0.000
Self-identity	Control	2.76	1.52	7.34	0.000
	Treatment	4.84	1.57	7.34	0.000

(Mdn = 74.43) as compared to participants in the control group (Mdn = 46.73,) $U(119) = 944.5$, $z = -4.39$, $p < 0.01$).

An additional t-test was conducted to examine the differences in the participants' feelings of psychological ownership across both conditions. Our results show that the people in the treatment group exhibit significantly higher scores on three dimensions of psychological ownership (i.e., self-efficacy, belongingness, and self-identity) (see Table 3).

To test the causal relations of our variables, we conducted a partial least square regression. We created a structural model (see Fig. 2) containing the variables of psychological ownership, likeliness to fund, likeliness to give feedback (i.e., feedback frequency) as well as a dummy variable indicating the experimental condition. Our structural model is successful in explaining a moderate amount of variance in feedback (i.e., likeliness to provide feedback) ($R^2 = .400$) and funding (i.e., likeliness to fund) ($R^2 = .641$) and a small portion of variance in psychological ownership ($R^2 = .264$). Additionally, we conducted a Sobel test to test for mediation of psychological ownership on funding and on feedback. Our results suggest that psychological ownership partially mediates both feedback ($t = 4.92$, $p < 0.001$) and funding ($t = 6.11$, $p < 0.001$).

To control for other influencing factors, we applied a t-test to examine if the variables mood, product interest, and experience (i.e., continuous variables) differ between the two conditions. Our results show that there is no significant difference in these variables among both groups (see Table 4). Hence, we can rule out that the observed differences in our dependent variables (i.e., funding and feedback) are due to one group being overly represented by people having a better mood, being more interested in the product, or being more experienced potential customers.

To examine differences among other influencing factors that take the form of categorical variables, such as income and education, we conducted a Chi square test. Our results suggest no significant differences in education among the two groups ($X^2(5, N = 119) = 1.963$, $p = 0.854$), nor in

Table 4 Results of the t-test for other influencing variables

Variables	Condition	Mean	SD	T-value	<i>p</i> value
Mood	Control	2.74	1.11	0.419	0.676
	Treatment	2.65	1.30	0.419	0.676
Product Interest	Control	4.72	1.78	1.746	0.083
	Treatment	5.22	1.35	1.746	0.083
Experience	Control	3.93	1.80	0.805	0.422
	Treatment	4.18	1.66	0.805	0.422

income ($X^2(7, N = 117) = 5.369$, $p = 0.615$). Against this background, we can conclude that the observed differences in funding are not due to one group being made up of individuals with higher educational degrees and greater income. Taking all the results into consideration, it can be concluded that the other influencing factors that we controlled for in this study do not account for the observed effects of our main variables (i.e., psychological ownership, funding likeliness, and feedback frequency).

In summary, our results suggest that subjects who are systematically integrated into decisions on the product design are significantly more likely to support a campaign financially as well as through feedback. Moreover, our results suggest that psychological ownership feelings mediate subjects' supporting behavior. Our preliminary findings have important consequences for entrepreneurs seeking funds. Our findings suggest that our new design elements can be effectively used to influence customer behavior with the potential of increasing the success of crowdfunding co-creation.

6 Contribution to Theory and Practice

This paper investigates how to leverage the innovation potential of potential customers by encouraging them to engage in co-creation for product development on reward-based crowdfunding platforms. We took the psychological ownership theory as the kernel theory to develop certain design elements that would encourage potential customers to increase feedback and funding towards a company's products and services. The evaluation of the proposed design principles and design elements revealed that these artifacts lead to the desired outcome. Our research provides three main contributions to previous work.

First, we contribute to emergent crowdfunding research (Belleflamme et al. 2014; Stanko and Henard 2016, 2017; Brem et al. 2017), which so far suggests only on a theoretical basis that crowdfunding is more than a mere financing mechanism and that it can be used by companies to integrate customers into their innovation processes. Through proposing and testing new design elements, we

not only contribute by validating these theoretical assumptions but also to a better understanding on how crowdfunding platforms must be designed to effectively leverage the co-creation potential of customers. By so doing, we also contribute to the propagation of design-oriented research (DSR) approaches in crowdfunding. With our research, we extend current crowdfunding research beyond its current domination by empirical studies investigating only given phenomena (i.e., the design of existing crowdfunding platforms) on crowdfunding contexts.

Second, we contribute to the application and advancement of new DSR approaches by applying the DSR approach of Niehaves and Ortbach (2016), which allows us to evaluate our artifact in greater depth. By applying this rather young approach, we can not only show that our design affects co-creation (i.e., the intended design goal of this study) but also how it affects the intended design outcome (i.e., through manipulating psychological ownership feelings). This provides us with an advantage over current DSR approaches that employ rather unidimensional and simplistic evaluation techniques (e.g., Davis et al. (1989)) and hence provide no understanding of how a design achieves a particular goal.

Third, our research proposes psychological ownership as a theoretical lens to explain and design individual co-creation experiences. It addresses an important research gap that has received only little attention so far (Zhao and Zhu 2014). Previous research mainly focused on the macro level of crowdfunding projects as the explanatory variable of collective funding success (e.g., Agrawal et al. 2015; Kuppuswamy and Bayus 2017; Mollick 2014). Our results stress the role of psychological ownership to foster individual's likeliness to engage in crowdfunding co-creation. Consequently, this research allows us to obtain a better understanding of the psychological antecedents of crowdfunding and how they drive individual customer behavior.

From a managerial perspective, this study provides new insights for practitioners such as entrepreneurs on how to leverage crowdfunding apart from gathering financial resources. Thus, by making use of new design elements in crowdfunding, entrepreneurs can leverage not only money from the crowd, but also valuable feedback and ideas. This might help them to offer products and services that better reflect market needs, which in turn may benefit a company's long-term success.

7 Limitations and Future Research

While this research has made several important contributions, it also has certain limitations. First, our results rely on a prototypical instantiation of a crowdfunding campaign that was tested in an experimental setting. While this

experimental setting benefits the internal validity of our results (i.e., experiments minimize the systematic error that accrues due to other influential factors), it is questionable if our insights hold up in the field (i.e., if they are externally valid).

Second, some might argue that our paper exhibits a methodological shortcoming because the design elements have been manipulated together in a 2×1 experimental design and that a richer design would have manipulated each design element individually to be able to examine the isolated effects of these design elements. While this might be true from a methodological standpoint, it contradicts the assumptions implied by psychological ownership theory. According to Pierce et al. (2003), the process by which psychological ownership emerges is characterized through complex interactions between several factors that are facilitating psychological ownership and, hence, can hardly be examined in an isolated manner. Consequently, we decided to manipulate the three design elements in a 2×1 experimental design in order to examine the full potential of psychological ownership within a crowdfunding environment. However, future research might pick up on that issue and manipulate each design element individually to be able to examine each design element separately. This would allow for the examination of distinct effects, as well as the interaction between the different sub-constructs of the psychological ownership theory, thereby developing a richer picture of the effects of psychological ownership on crowdfunding success.

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