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How crowdfunding platforms change the nature of user innovation – from problem solving to entrepreneurship

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ABSTRACT

Crowdfunding has become a key research trend in recent years providing a new form of acquiring funding for innovation projects from users prior to the realization of the product in a 'market before the market'. In this paper, we link the concept of crowdfunding with the user innovation phenomenon and show how user innovators harness crowdfunding to complement their innovative behavior and obtain funding to build firms and produce products in a more professional way. Conducting three case studies ranging from low- to high-tech crowdfunding campaigns, we investigate how crowdfunding impacts constituent dimensions of user innovation theory such as user motivation, user role, user community, collaboration between users and user investments. In particular, we argue that crowdfunding platforms (CFPs) may give rise to a more widespread occurrence of user entrepreneurs, who found a firm to commercialize their product or service in a marketplace they have created for their own need. Hence, we show the development from traditional user innovation to crowdfunding-enabled user innovation, which democratizes not only the creation but also the more large-scale commercialization of new products and services.

1. Introduction

While the concept of firms producing and selling products to consumers is still prevalent, a large body of research has found empirical support for a phenomenon called user innovation (von Hippel, 2005; Shah and Tripsas, 2007; Schweisfurth, 2017). Research found that users are an important source of innovation with up to 40% of consumers in a population being innovators themselves (Franke et al., 2016). Likewise, it has been estimated that the economic power of users even surpasses domestic R&D spending by industry in value (von Hippel et al., 2012). At the heart of the user innovation phenomenon is the benefit users expect from using a new product which is a key motivator to create products not available in the market yet (Baldwin and von Hippel, 2011). Nevertheless, researchers found that some users are also motivated by economic incentives and start commercializing their innovations and selling them to other users (Baldwin et al., 2006; Shah and Tripsas, 2007). Due to the increased efficiency of communication and sharing, the Internet has revolutionized the way users collaborate with one another (Bilgram et al., 2008; Ooms et al., 2015). While users were increasingly able to collaborate and pool their resources and skills, they still lacked the financial resources firms have in place to drive innovation in a more sophisticated way. In particular, users compensate the absence of high financial investments by relying on high variable cost structures, e.g. rather than buying an expensive machine for efficient production, they invest more time producing the product with inferior tools. However, more recently, a new breed of social platforms has emerged enabling users not only to communicate and collaborate, but also to financially support one another. Crowdfunding platforms (CFPs) serve as an intermediary empowering users to acquire funding (i.e., pre-orders from early adopter markets) (Belleflamme et al., 2014; Tomczak and Brem, 2013; Bilgram et al., 2017). Thus, CFPs complement user communities addressing the mere purpose of collaborating and additionally provide funding offering user innovators new paths of innovating.

While the role of (online) communities and social media has been investigated by user innovation researchers, surprisingly, the impact of CFPs on user innovation is still widely unexplored; even though this interaction is already happening we have not yet understood the new 'connections' between the two phenomena. Hence, this article aims to shed light on the interrelation of the merging fields of crowdfunding and user innovation. In particular, we argue that CFPs may give rise to a more widespread occurrence of user entrepreneurs and evoke user

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innovation systems in which users more easily and frequently extend their role from need identifiers, ideators and prototypers towards full-fledged entrepreneurs with access to sufficient funding to start a firm and scale their business. To understand the impact of CFPs on user innovation, we adopt five dimensions from social exchange theory (Füller, 2010) and investigated them through the lens of the CFP phenomenon. On the basis of a case study in three markets, we show the development from traditional user innovation to crowdfunding-enabled user innovation. To the best of our knowledge, this is the first paper taking a closer look at the intersection of these two fascinating phenomena.

2. Theoretical background

In this section, we provide a brief theoretical background on the phenomena of crowdfunding and user innovation to ensure a common understanding and derive five crucial dimensions of user innovation to investigate the conceptual link of both phenomena.

2.1. User Innovation

Empirical research findings show that users play an important role in new product development and sometimes can even contribute to increased innovativeness of an entire industry (Baldwin et al., 2006). Based on von Hippel's (1976, 1978) early work, users have increasingly been considered as a valuable alternative source of innovation in the industrial sector. In addition, studies of the last decades showed that users also often innovate in the areas of consumer goods (Lüthje, 2004; Brem and Bilgram, 2015). Moreover, recent research shed light on leading-edge user innovators within firms and highlighted the advantages of integrating so called embedded lead users (Schweisfurth and Raasch, 2015; Ernst and Brem, 2017). For the phenomenon of innovating users, Füller (2010) offers a comprehensive framework which builds on social exchange theory (e.g. Kollock and Smith, 1998). In the following literature review, we refer to the key aspects in literature following this framework. We complement this review with the Shah and Tripsas (2012) reasoning of user investments which adds an additional financial facet to 'how' users innovate.

2.2. User motivation

Motivation of users and their economic role in the ecosystem is a key object of investigation in user innovation literature. Unlike firms who have professionalized the manufacturing of products to answer a demand in the market and benefit from selling their solution, the motivation of users to invest significantly in a solution manifests in the benefits they expect to achieve from using the innovation. Research further shows that intrinsic motives and process benefits such as enjoyment of solving a task are key drivers for users to innovate within user communities (Raasch and von Hippel, 2013). Füller (2010) summarized the motivation of innovating users, and mentioned that they are inspired by such factors as playful task, curiosity, self-efficacy, skill development, information seeking, recognition (visibility), community support, making friends, dissatisfaction with existing products, and monetary benefit. Due to the benefits users expect from a superior product as well as from undergoing the creative process, they invest significant amounts of time and money and join forces with peer users to collaboratively develop solutions to their problems (von Hippel, 2005).

2.3. User roles

Previous research showed that user innovators are likely to have specific personal characteristics that make them more prone to get actively involved in development of new products. When analyzing who is more likely to innovate, research identified certain personal characteristics that user innovators could have in common, for example: domain specific skills, adoption and innovativeness, novelty seeking (Lüthje, 2004; Füller 2010). Interestingly, different people with user innovator character and mindset could behave differently in long term perspective. Some keep innovating on their own and for themselves, while others evolve into new roles and eventually become user entrepreneurs. Shah and Tripsas (2007) describe user entrepreneurs as individuals, who found companies to commercialize a product or service, and who are users of that product or service at the same time. Hence, their motivation is to benefit (1) from selling a product or service to other users and (2) from serving their own needs. Thus, user entrepreneurs can also be seen as a kind of extreme case of user innovators or lead users, and they can adopt different roles depending on the focus of their activities: from self-focused to market focused (Baldwin et al., 2006; Hienerth, 2006).

2.4. User communities and user collaboration

User communities are not new in the sense that such communities are existing since a long time already in an offline community context. However, through the advantages of Web 2.0 technologies, online communities emerged as a key area of user innovation (Bilgram et al., 2008). Especially in the domain of open source software, user communities have become a driving force that significantly shaped an entire industry (Lakhani and Von Hippel, 2003). User innovation occurs in such communities as more resources such as time and knowledge are available, and all information is also accessible over a long period of time. All profit from "free revealing" which is an important phenomenon in the user innovation domain supporting community-based innovation (von Hippel, 2005).

Looking into the question with whom user innovators communicate or collaborate during the development process, a large body of research shows that user innovation frequently occurs in the communities, where innovators meet common-minded people and profit from idea exchange, support, feedback and other benefits (Franke and Shah, 2003, Harhoff et al., 2003, von Hippel 2005, Füller, 2010, Shah and Tripsas, 2012). Driven by these benefits, they not only discuss their ideas or inventions, but freely reveal the results of their work in the community. (Harhoff et al., 2003, Lakhani and Von Hippel, 2003). The phenomenon of free revealing has been documented and researched by several scholars, and is considered one of the crucial aspects of the user innovation theory (Franke and Shah, 2003, Harhoff et al., 2003, von Hippel 2005). We expect that in the context of crowdfunding, the benefits of free revealing and reciprocal community support would also take place, and will be complemented by additional types of rewards.

2.5. User investments

Many user innovators do not have the aspiration to found a firm and earn money from selling the product or service. On the contrary, they are driven by the benefit they expect from a solution which addresses their own need (Urban and von Hippel, 1988). Depending on the individual profit expectation, different options arise as to who may realize a product or service and bring it to market (see Fig. 1).

When user innovators evolve into the role of user entrepreneurs, gaining profit adds to their motivation – similarly to established firms. However, the cost structure of production makes a difference: user entrepreneurs have to rely on the model with low investment and high variable costs to start inventing and creating the first samples of the product; established manufacturers have sufficient fixed capital for large-scale production and low variable costs (Shah and Tripsas, 2012). This cost structure gives certain advantage to user entrepreneurs in developing radically new products, because despite having limited capital, they can be more flexible with cost management and investment decisions. Nonetheless, at certain point the need of larger investments can prevent user innovators from developing their products further.

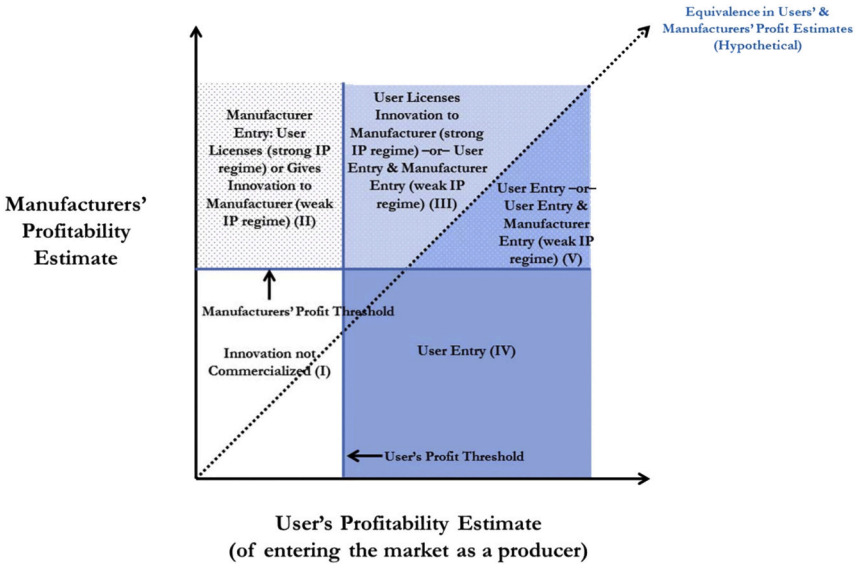

Fig. 1. Who will commercialize a user innovation?
Source: Shah and Tripsas (2012), p. 25.

Moreover, in some cases large manufacturer can overtake the development process and successfully commercialize the innovations created by users, because of access to larger budget for development and marketing activities. Thus, lack of financial resources can create a significant barrier for user innovators to develop and commercialize their own ideas (Shah and Tripsas, 2012). We believe that CFPs can lower this barrier and allow user innovators to not only develop their inventions into market-ready products, but also to profit from commercialization of their inventions. Hence, the question arises what kind of company such users will start to commercialize their idea further. We add this dimension as a 'what' question as we investigate crowdfunding cases ranging from low- to high-tech later in this paper.

However, it is important to note that these user entrepreneurs are not a new phenomenon in the context of social media or other developments. These users were also existing before, as the following example shows.

Christine Gruber and her husband decided to create a baby swing, when their son Marco was born in 1995. The reason to do it by themselves was the fact that they could not find an appropriate solution on the market. They wanted to create a self-surging baby swing, and one which can be also used afterwards once the kid grows and does not need a baby swing any longer. The result is the so-called Sleep&Toy baby swing, which can be used for kids between 0 and 8 years of age (see Fig. 2).

After producing the first swing for themselves, other people began asking them to create one for them. Hence, in 1998, they started to sell the product from home and online. Since 2009, they have their own store in their home village Golling/Salzach (Austria). These days the store has 200 square meters and offers a broad variety of products beyond a baby swing. If they didn't create the baby swing for themselves, this store would not exist. Especially for a small city like Golling, such a startup is a big win for their economic development. Usually, such entrepreneurs would go to bigger cities, if their main motivation was turnover and profit.[1]

2.6. Crowdfunding

While the generation of new products has been democratized, the diffusion and commercialization in larger markets has often been out of reach for users or individual inventors (Mollick and Robb, 2016). The reason lies in the historically established process of transforming invention into viable businesses, which presumes that inventors need to convince a limited group of experts and investors to support their idea and provide the necessary resources for its implementation (Mollick and Robb, 2016). In the absence of support, valuable products created by users run the risk of staying unnoticed, underestimated, and never reaching the market. Crowdfunding has been changing this pattern by democratizing the possibility to raise financial resources from the large crowd - any individuals who are willing to support further development of a certain idea or project (Belleflamme et al., 2014; Mollick and Robb, 2016; Mollick, 2014). Crowdfunding is a phenomenon that builds on the broader concept of crowdsourcing, which assumes that an individual or a firm can receive ideas, feedback, or support in accomplishing certain tasks from the public, usually through the internet (Belleflamme et al., 2014; Kleemann et al., 2008). As defined by Belleflamme et al. (2014, p.4) "crowdfunding involves an open call, mostly through Internet, for the provision of financial resources either in the form of donation, or in exchange for future product or some form of reward to support initiatives for specific purposes". Thus, the primary goal of crowdfunding is to collect the necessary financial resources to develop certain projects, basically it aims at acquiring funding from the crowd. Depending on the model of crowdfunding, individuals who provide financial contributions receive different benefits: pre-ordered future products, rewards from a project team, a share of future profits (or equity crowdfunding), or just the pleasure from supporting a favorite project (Belleflamme et al., 2014; Tomczak and Brem, 2013).

Crowdfunding can be applied to raise money for several purposes, based on the specific type of platform: organizing a one-time event, realizing an art project, accomplishing a social initiative, creating a start-up or doing any other activity that would require a certain amount of user investment (Mollick, 2014). In the context of our research, we focus on the role of crowdfunding as a source of entrepreneurial seed capital and an enabler of user innovation.

Crowdfunding is facilitated by a number of online platforms where people can register a project and try to raise funds from the backers, i.e., individuals willing to contribute financially to the projects. These online platforms have shown impressive growth, and continue to develop, opening an opportunity for entrepreneurs and inventive individuals (Belleflamme et al., 2014). Moreover, CFPs can be regarded as communities where individuals can not only invest and receive funding, but also communicate, provide feedback on ideas, and give non-financial support to one another. Due to the unique combination of financial and social benefits, CFPs create powerful social networks that have high potential in spurring innovation. Among others, Kickstarter.

[1] This information is based on the website http://www.sleep-toy.com and from a personal interview with the founder.

Fig. 2. Sleep&Toy description with applications from 0 to 8 years.
(Source: http://www.sleep-toy.com)

com, Indiegogo.com, Seedmatch.com and Startnext.com could be distinguished as the most known and recognized ones.

2.7. Crowdfunding-enabled user innovation

In order to highlight the impact of crowdfunding on user innovation, we refer to dimensions derived from Füller's (2010) virtual co-creation framework addressing the 'why' (*user motivation*), 'who' (*user roles*), 'with whom' (*user community*), 'how' (*user collaboration* and user *investment*) and 'what' (the investigated *crowdfunding cases* ranging from low- to high-tech) which also constitute important facets of user innovation literature (see chapter on user innovation). While specifically designed for the case of online co-creation, we argue that crowdfunding in its core is a form of social exchange (Kollock and Smith, 1998) and specifically a further developed form of co-creation. According to Belleflamme et al. (2014), crowdfunding enables similar interactions as in co-creation such as sharing ideas and providing feedback, but additionally allows for funding innovation projects.

As indicated, both crowdfunding as well as user innovator are known concepts in theory and practice. However, no conceptual linkage was made before connecting these two domains, which also takes an explicit focus on the commercialization aspect. To fill in this gap, we pay attention to the interrelation between the development of CFPs and the advancement of user innovation by presenting implications for these five crucial dimensions of social exchange: (1) user motivation, (2) user roles, (3) user community, (4) user collaboration and (5) user investments.

3. Method

In order to substantiate our discussion, we draw on qualitative data from actual crowdfunding initiatives which provide insights into how the existence of CFPs motivates user innovators to turn into user entrepreneurs. We apply the netnography method used to investigate consumer behavior in online environments by analyzing online data and listening to consumer conversations accessible on the Internet

(Kozinets, 2002). The netnography approach has been previously taken in research projects with similar goals such as by Füller et al. (2007) who investigated user innovation and user roles in online basketball communities or by Belz and Baumbach (2010) who identified lead users in online communities. Similarly, Jeppesen and Frederiksen (2006) applied the netnography method to understand users' motivations to co-innovate with firms. As the netnography method is qualitative and immersive in nature, it allows us to shed light on key principles of user innovation and reflect them in the context of CFPs. For instance, the motivations driving users, the collaboration among them and the sharing of information and dialogues on CFPs can be observed and interpreted.

We follow a passive, non-participatory netnographic approach which concentrates on retrieving data accessible on the Internet rather than collecting data by interacting with individuals online. Our research process comprises of three steps adopted from Bilgram et al. (2011). First, we defined our research field based on the five key dimensions in user innovation theory and derived keywords to search for relevant social media sources. Second, we screened the Internet and retrieved data. During the screening and retrieval, process we focused on selecting content created by either user innovators or the first customers using their products: blogs maintained by user innovators, project descriptions on crowdfunding websites, user comments on blogs and crowdfunding websites, published interviews with user innovators, social media sites referring to the crowdfunding case. In addition, we have also reviewed reputable editorial content providing insights into crowdfunding initiatives. Third, we analyzed and interpreted the data. Data analysis was guided by the principles of grounded theory methodology (Corbin and Strauss, 1990). Empathic reading of the content, collected for each case, was used to immerse in the data. Since the data was collected from multiple sources, data triangulation allowed validating the facts about each user innovator. During immersion in the data, theoretical memoing was used to capture ideas, associations, and relationships (Glaser, 1998). After performing profound analysis of each case individually, cross-case analysis was completed to identify patterns in the stories and insights about user innovators becoming user entrepreneurs through CFPs. Finally, memos documenting the learnings, ideas and insights were analyzed, sorted and summarized according to five dimensions of user innovation. Insights triangulation among researchers was used throughout the data analysis process to ensure reliability and objectivity of the findings.

We selected three crowdfunding cases based on the following criteria. The projects showcased characteristic criteria of user innovation such as the central unsolved problem users are facing and the absence of an existent solution in the market. This was particularly important to ensure we select a proper case for our postulation that CFPs stimulate entrepreneurial spirit among user innovators who previously only innovate for themselves. Moreover, to foster the intelligibility of our case we aimed to identify a particularly 'simple' product that does not require technical understanding to assess the solution and specific functions of the product. The project was also supposed to be a successful crowdfunding case as we intended to compare the case to the successful user innovation cases outlined in previous literature. The three cases are crowdfunding examples from three different industries ranging from low- to high-tech (i.e. a planner, a bike helmet and a smartphone keyboard) in order to address different objects of user innovation and examine the impact of crowdfunding respectively.

We selected the **'Passion Planner'** crowdfunding campaign to gather data to substantiate our framework. The 'Passion Planner' was a successful campaign initiated by Angelia Trinidad to address the perturbing issue she referred to as "analysis paralysis" which she experiences in a depressive period following her graduation. During that post-grad depression, she conceptualized a tool linking daily planning with bigger life goals (see Fig. 3). The second case provides insights into the crowdfunding initiative **Thousand Helmet** by Gloria Hwang. After the loss of a friend due to a bicycle accident, she was dedicated to develop bike helmets that are not only safe but also have an appealing design so that more people are willing to wear them. To contrast our case studies in the low- to medium-tech industries, we chose a third crowdfunding initiative in the high-tech field. The **TOHKBD keyboard** emerged from a typical user community which revolved around the open source smartphone called Jolla. Three users, Andrew Zhilin, Dirk van Leersum and Kimmo Lindholm prototyped a keyboard which was attachable to the Jolla phone and successfully marketed it to the community via a Kickstarter campaign (see Fig. 3).

4. Case Studies Results

4.1. User Motivation: How do CFPs change users' motivation?

User innovators are primarily driven by solving their own unanswered needs and are motivated by the performance benefits of their innovative solutions (Urban and von Hippel, 1988; Lüthje, 2004; von Hippel, 2005). In the selected cases, personal needs were the main triggers for starting the respective innovation process. For example, Angelia Trinidad, the author of Passion Planner, explains that she started creating her own planner because she needed a tool to organize her thoughts, but she could not find a suitable solution on the market. Therefore, she decided to design her own[2]:

> *"One day after feeling pretty lost and depressed after I graduated, I decided to take action to get myself out of the post-grad funk. I sat down and mapped out on paper what I wanted to do with my life. […] I thought about when I felt most productive and most fulfilled in my life and I realized that during those moments, I always had a planner by my side. However, I wasn't happy or satisfied with the planners currently available on the market. They we're practical but not personal, so I decided to make one myself. I took all of the strategies that I had learned from reading more than 200 self-help and personal productivity books and incorporated them into the tool that I wish someone gave me when I was feeling lost."*[3]

> *"I searched from the perfect planner, but it didn't exist. So, I made my own."*[4]

> *"We ask ourselves, "What if I don't make as much money as so and so?", "What if I make the wrong choice?", "What would blah, blah, blah, think of me?", "Will my parents agree with this choice?", "Am I thinking over all the possibilities and weighing the consequences?" …We think, we think, we think… and think some more… but fail to ACT. Our perfectionism paralyzes us, the fear of failure is too much, and the cons of making the wrong choice make us imagine and psychologically experience the stresses of what potentially could go wrong. We find ourselves feeling stuck, alone and lost.*

> *How do I know all of this? I've done it myself. And why do I think I have a solution? Because I've made a product that I wish someone gave me when I was feeling lost."*[5]

Similarly, we observed a strong personal motivation in the case of Thousand Helmet, designed by Gloria Hwang, who felt like she needed to wear a helmet after she lost a friend in a bike accident. Interestingly, Gloria thought of not only a better product, but also a behavioral change associated with it. There are many bike helmets on the market, but none of them is attractive enough to actually wear it every day:

[2] Please note that the direct quotations used to substantiate and illustrate our findings have not been proofread and may include typos or grammatical errors.

[3] http://www.obliviousnerdgirl.com/oblivious-interviews/oblivious-meets-passion-planners-angelia-trinidad.

[4] http://www.passionplanner.com/about-us/.

[5] https://www.kickstarter.com/projects/angeliatrinidad/passion-planner-start-focusing-on-what-really-matt/posts/672886.

Fig. 3. The products from the three selected crowdfunding campaigns, Passion Planner, Thousand Helmet and TOHKBD as displayed on Kickstarter. (Sources: https://www.kickstarter.com/projects/angeliatrinidad/passion-planner-the-one-place-for-all-your-thought; https://www.kickstarter.com/projects/812287807/thousand-finally-a-bike-helmet-youd-actually-want; https://www.kickstarter.com/projects/2028347278/tohkbd-the-other-half-keyboard-for-your-jolla/posts/1294882)

"I'd say my motivation was mostly personal. I was a long time biker, but I never wore a bike helmet because I thought they looked too sci-fi ish."[6]

"And then a friend of mine passed away from a really bad accident. It was a head-first injury, in New York City; he wasn't wearing a bike helmet. And for me I was just… afterwards, it was just that feeling of: I need to start wearing a bike helmet to be responsible to myself, to be responsible to people around me. And I went on the market to find something I really liked, and, you know, could kind of represent."[7]

While the strong personal need cannot be denied as a main trigger of user innovation, the bundle of motives is more diverse. For instance, user innovators are sometimes interested in positive social impact that they could create; or they want to reciprocate the support of their community and are motivated by the peer recognition they experience by selling a superior solution; finally, they might be interested in commercializing their idea.

For example, in addition to the personal need, Gloria immediately thought about social impact that her idea could have. It encouraged her to start working on designing a better helmet for herself and for the others.

"I really thought to myself `Hey, you know if you make a bike helmet people actually want to wear, I think you can solve a public health crisis. You can prevent a lot of injuries and fatalities every year.` And beyond that, I feel like you can really encourage cycling within cities because I thought people were like me. Like, the main reason they didn't want to bike was because they don't want to feel unsafe. So if you could give people way to feel safe then maybe they'd bike more."[8]

"So for me, Thousand came out of wanting to solve a problem that I thought could potentially save lives. I didn't start thinking about the business opportunity until a little on down the road."[9]

Similarly, after Angelia Trinidad found a solution for herself, she became strongly convinced that she should share her Passion Planner with the others – to help people who experienced the same problem:

"At the beginning of 2013, while suffering from the feeling of "directionless floating" caused by post-college uncertainty, I realized that I was clearly not the only person facing this dilemma."[10]

"I wanted to help people overcome that feeling by making a tool that sat them down to clearly define their goals and dreams, break them down into more actionable steps, and then write them in a place that they would see and use everyday. A planner was PERFECT for this. I wanted people to use this planner as a compass to guide their daily decisions. It's simple. You ask yourself, is what I am going to do today going to get me closer to my goals? Yes? Do it. No? Don't do it. I wanted to make a tool that encouraged people to not only think about their goals, but take action towards making those goals a part of their daily lives. That's how Passion Planner was born."[11]

In the case of TOHKBD keyboard, we saw how intrinsic user motivation was strongly supported by the motivation to contribute to the community and receive its support and recognition. There was the need and existing demand in the Jolla community for a keyboard as a supplement to the Jolla open source phone.

There were hobbyists working on the OtherHalf (OH) concept though. Dirk van Leersum (dirkvl) had created many different OHs and even opened a small web store to sell them. He worked in collaboration with Kimmo Lindholm (kimmoli), a prolific Sailfish software developer and OH tinkerer. After creating some cool OHs like the TOHOLED, they — joined by designer Andrew Zhilin (wazd) — revealed their most ambitious project yet: the TOHKBD. One of the designers of the keyboard mentioned:

"Responding to the unprecedented demand for a proper QWERTY smartphone, an international party of passionate developers including me, as a product and industrial designer in collaboration with product manager and hardware engineer Dirk van Leersum (Netherlands) and software engineer Kimmo Lindholm (Finland), have decided to develop the best mobile hardware keyboard, suitable for everyone from casual users and gamers to enthusisasts and power users."[12]

Github page of the project says:

"Naturally, a keyboard OtherHalf was the most requested feature by the community by far. Jolla however was still getting started and getting their phone launched with the minimum of Sailors at the time. This was left to the community to develop. In June 2013 one idiot thought he could easily make this -how hard could it be, really?- and started on his journey. After some time this foolish individual make TOHKBD-rev1: hackish, ugly, frankensteined, terrible durability and way too much work to assemble. But it worked. After this project ended there was a period of other Funky-TOH development, with during that time a lot of requests of making more keyboards. Little did they knew that in the background the imfamous 'dirkvl' together with his trusty 'kimmoli' were cooking up a new version. A better one. The One. With an open application on the hashweb/tweetspace Andrew joined the team and provid himself to be the missing piece of the three piece puzzle. With a complete team, a solid

[6] https://www.forbes.com/forbes/welcome/?toURL=https://www.forbes.com/sites/forbesstylefile/2017/06/08/designer-spotlight-thousand-bike-helmets-become-a-stylish-safety-accessory/.

[7] https://www.marketplace.org/2017/07/19/business/can-better-designed-bike-helmet-make-people-safer-road.

[8] https://www.marketplace.org/2017/07/19/business/can-better-designed-bike-helmet-make-people-safer-road.

[9] https://www.forbes.com/sites/forbesstylefile/2017/06/08/designer-spotlight-thousand-bike-helmets-become-a-stylish-safety-accessory.

[10] http://www.passionplanner.com/about-us/.

[11] A planner was PERFECT for this.

[12] https://www.behance.net/gallery/27500387/TOHKBD-The-Other-Half-Keyboard-for-Jolla-Smartphone.

design and a strong backing from the rest of the community, the TOHKBD-team set out onto the open crowdfunding sea. And struck gold."[13]

In response to the introduction of the TOHKBD keyboard, one of the excited early owners remembers his feelings when he got to know about the project:

"If there's one thing I miss from the old pre-touchscreen phones we used to have, it's physical keyboards. Physical QWERTY keyboards, to be exact. […] Sadly, after Nokia's betrayal and the subsequent flop with the N950, the market wasn't looking that good. […]

User innovators are driven by different types of motivation in the process of development of their idea. Depending on the motivation, they adopt certain user roles: from inventor that is only interested in solution, to user entrepreneur.

4.2. User role: How do CFPs affect the transformation of the user role?

Even before the rise of CFPs and other two-sided marketplaces (Tomczak and Brem, 2013) for existing products (e.g., Etsy.com), the commercial side of user innovation had been observed and documented by researchers. For instance, apart from using their own inventions, users in the domain of surfing and kayaking have been found to additionally benefit from selling their innovations (Franke and Shah, 2003; Baldwin et al., 2006; Lettl et al., 2006). Baldwin et al. (2006) describe the transformation of user innovators to user entrepreneurs in the context of an extreme sports community. User innovation research describes how users discover that their needs are quite common among fellow users in their community and that their solution to this problem is in demand. Based on this perception, user innovators start replicating their solution and sell products to community members. Aroused by the interest of like-minded peers in their community and word-of-mouth recommendations, some user innovators become user entrepreneurs and found small-scale 'lifestyle firms' to produce small batches of the products they invented. In other words, these users became 'hobby entrepreneurs' who, in the first place, were still guided by the motivation to develop products for their own benefit, but additionally tapped the commercial benefit dimension by selling their inventions.

As Mollick (2014) suggests, with its function as an alternative source of funding, crowdfunding may hold important implications for user innovation and the role of user innovators within the innovation ecosystem. In detail, crowdfunding may provide a new mechanism facilitating user innovators to undergo the transition from innovating for themselves and fellow members of the user community to becoming entrepreneurs (Franke and Shah, 2003; Shah and Tripsas, 2007). Research provides anecdotal evidence that in some cases users indeed adopt an entrepreneurial role, for instance by helping to find funding or building and maintaining a network (Lettl et al., 2006). Nonetheless, many are not managing to bring their innovations out of the small circle of local communities. In that case, innovations that could have created benefit for millions are not reaching their potential customers. It can be assumed that there are many different reasons for that phenomenon, at the personal as well as on the environmental level (Brem et al., 2017).

Apparently, innovative users, who try to sell their inventions, take on a hybrid role in merging motives and behaviors of both users and firms. The emergence of CFPs adds to the equation in several ways. CFPs serve as intermediaries that facilitate the transition from users to entrepreneurs. In particular, CFPs provide standard processes and access to a 'market before the market' and capital. Thus, CFPs are lowering the threshold between user and firm domain by decreasing the effort of raising funds. As a consequence, more users may consider the option of using crowdfunding to accelerate and professionalize their innovation endeavor and profit from *both* using and selling the innovation. What is more, users may be more inclined to consider founding a full-fledged firm that goes beyond the 'lifestyle' status of many early-stage user firms. In contrast to 'lifestyle' firms which can be regarded as a by-product of innovating to solve their own needs, the exposure to a real market of anonymous customers increases the distance to customer and the professionalism. What often used to be rather a favor to a fellow enthusiast or community member sold for little more than material costs may likely turn into a real commercial transaction (Baldwin et al., 2006). A hobby may become a profitable profession and user community members veritable customers.

As we saw in the case of Angelia Trinidad, founder of 'Passion Planner', she decided to opt for crowdfunding and got surprised by the success of it:

"I designed a planner that not only helps you plan your daily life, but also helps you define and chase what you want out of life. We launched it on Kickstarter, and it became a viral phenomenon. In what felt like overnight, I went from working in my parents' garage, to a warehouse with a full staff."[14]

In light of the overwhelming success she decided to scale her lifestyle firm of rather experimental nature to a solid business.

In a similar manner, CFPs may also convince users expecting to benefit only marginally from using the product themselves, but having a strong entrepreneurial spirit to innovate. In other words, the combined benefit from using and selling may exceed the perceived costs and activate users to innovate and exploit a solution.

Generally speaking, we argue that CFPs revolutionize the motivational structure of user innovators and their roles within the industry. By offering a systematic approach for commercializing user innovation at lower efforts and costs, CFPs make commercial benefits available to user innovators and extend the current bundle of benefits. Thus, CFPs may foster user innovation and enable faster and more efficient and a more comprehensive transition from user innovation to user entrepreneurship. Through CFPs, user innovators can now deliberately develop into entrepreneurs or sell their idea to other companies. This decision can be made on the success of the crowdfunding campaign, and their related profitability estimate (Shah and Tripsas, 2012).

4.3. User Community: How do CFPs change user communities?

Research has pointed out the important role of communities and particularly online communities for the emergence of user innovation (Franke and Shah, 2003). These communities naturally originate from groups of like-minded users with a shared interest, similar need patterns and enthusiasm for a hobby, a particular product or brand (Kozinets, 2002).

Using online forum technologies or existing communication platforms (e.g., Reddit, Facebook, WhatsApp), users oftentimes create a digital environment to have a shared space for exchange and discussions. Unlike conventional one-to-one communication patterns, online communities allow for a many-to-many interaction mode that helps to utilize collective knowledge and use experience as well as extensive temporal resources (Bilgram et al., 2008). Members of online networks benefit from higher levels of connectedness, cross-functional interaction and receptivity, which positively affect knowledge exchange and innovativeness (Ooms et al., 2015).

With the rise of CFPs, digital type of community-based environment has started to complement traditional user communities. While user communities (Franke and Shah, 2003; Füller et al., 2007) primarily supported a collective innovation process among users confronted with the same 'need gap', CFPs serve as two-sided market places to match

[13] https://github.com/dirkvl/TOHKBD.

[14] https://www.crowdfundinsider.com/2015/10/76294-passion-planners-fourth-kickstarter-surpasses-340000-in-less-than-two-weeks/.

entrepreneurs and customers. While the same individuals may participate in both communities, there are distinct focuses of co-creation in both environments.

As a professional intermediary operated by firms, CFPs allow user innovators to meet the demand side, get an initial market reaction and acquire funding way before to the actual market launch. Hence, CFPs become a relevant community environment in a later stage of the innovation process, usually, when a minimum viable product has already been developed to propose and depict the concept to the crowd (Frederiksen and Brem, 2017). In their role as marketplaces, CFPs help to collect the financial resources required to produce a small series of the product (Mollick, 2014).

The TOHKBD case is special as it highlights the power of user innovation communities such as the Jolla community and the underlying larger Linux community. At the same time the case highlights how CFPs do not replace user innovation communities but represent a marketplace as a second environment focused on funding and customer relationship management.

> *"Reaching the goal was crazy. Andrew was sending me ALLCAPS messages every ten seconds and Kimmo was flabbergasted. I knew there were a lot of people ready to order as soon as possible, so the first 100 orders were a given for me. Maintaining 10k/hour for the rest of the day… At moment of writing we are at 95k and still going, which means I am in the top 5 campaigns in the Netherlands about to be the 4th to reach 100k." (Dirk van Leersum).*[15]

In other words, user communities in the original sense facilitate collective invention processes, while CFPs provide a platform to link these solutions to a test market of early adopters, thus initiating the diffusion and commercialization of the invention. Thereby, the members of user communities and CFPs are distinct. In contrast to oftentimes 'strong ties' among fellow users within user communities, the crowd on CFPs mainly consists of early adopters, i.e., customers who are willing to invest in the product at this early prototype stage. Contrary to the intensive user-user collaboration, we argue that the relationship between crowdfunders and entrepreneurs on CFPs is rather based on weaker ties which emanate from the focus on the commercial transaction. In this capacity, CFPs provide a communication platform through which customers can be kept up-to-date about the advances and decisions in the product development process (Belleflamme et al., 2014). Unlike the bottom-up nature of user communities, CFPs rely more heavily on a top-down 'one-to-many' communication mode, i.e., the entrepreneur communicating with customers and only limited customer-customer interaction. Thus, CFPs may also serve as a viable tool for customer relationship management prior to the market launch.

4.4. User collaboration: How do CFPs affect collaboration among users?

In local communities, user innovators are likely to receive advice from other users regarding the design of the product and technical implementations of the features. In online communities, first prototypes thus can be intensively tested in iterative feedback loops within a larger sample of users who share their experiences and improve the product, which is in line with the effectuation-thinking logic (Frederiksen and Brem, 2017). Additionally, the collective mode enables users to combine different ideas, find new need-solution pairs and thus propel innovation at a higher pace. For instance, Füller et al. (2007) provide insights into the innovative behavior of users within online communities in the field of basketball. Users are found to share product ideas and elaborated designs with other basketball enthusiasts and discuss developments and trends in the industry.

At first sight, these communities appear to be odd and illogical as users share information and knowledge without a direct financial benefit. Harhoff et al. (2003) argue that expected reciprocal contributions and improvements by others, the manifestation of a new advantageous standard as well as low levels of rivalry within the community and the recognition by other users may account for this phenomenon. Similar pro-social and collaborative behavior has even been found among competing users in firm-led co-creation initiatives (Hutter et al., 2015). Therefore, collective invention and 'free revealing' are well established principles which provide substantial benefits for user innovators.

In the case studies, we observed that free revealing occurs also when a user innovator plans crowdfunding campaign. For instance, Angelia Trinidad made her Passion Planner available for download as a PDF from the very beginning:

> *"From day one, we have offered the PDF for anyone to use for free; we launched our Pay-it-Forward program, a program that allows people pay a planner forward to a stranger in need at half the cost; and we've given thousands of Passion Planners to 84 non-profits all around the country."*[16]

Similarly, data on hardware components of TOHKBD keyboard, such as the casing, frame, keypad, layouts and the magnet system for DIY users are provided on Github including visualizations and CAD files.[17]

> *"I have started putting files up on GitHub. Some parts are not yet finalized or not ready for publishing, these will not be put online yet. But if you have specific questions feel free to email me.*
>
> *The goal is to have everything online in an orderly fashion. It will be perfectly possible to completely build a TOHKBD with all the files, but the main goal is to improve repairabililty and make it easier for the DIYers to add or change things."*[18]

The designers of the TOHKBD received a lot of feedback in response to their openness (even though they decided not to use some of the ideas, they explained their opinion):

> "*We are getting a lot of questions about adding extra displays, tranparent solar panels, nfc/sim/qi extensions and other elaborate features. We will not add such functionality as this will increase the risk, increase thickness, prolongs the delivery time and shifts the focus from the primary objective: the best typing experience!"*[19]

Apart from the purposes of funding and communication, customers on CFPs also become part of the co-creation process. In detail, the proposed prototype is further developed, refined and eventually produced. Mollick (2014) points out that crowdfunders may provide valuable feedback and help to adapt the product to the specific customer needs. In the environment of CFPs inventors can collect feedback from the future customers and realize which features or product details create the highest interest, which aspects would be the most desirable, and which modules of a product need improvement. What is more, backers of the crowdfunding projects sometimes share suggestions or advice regarding communication strategies or the further development of a future, not yet existent company.

The designer of Thousand Helmet Gloria Hwang remembers her Kickstarter campaign as one of the best experiences she had in her business because of the community support that she received:

[15] http://reviewjolla.blogspot.de/2014/11/interview-all-these-people-in-community.html.

[16] https://www.crowdfundinsider.com/2015/10/76294-passion-planners-fourth-kickstarter-surpasses-340000-in-less-than-two-weeks/.

[17] https://github.com/dirkvl/TOHKBD.

[18] https://www.kickstarter.com/projects/2028347278/tohkbd-the-other-half-keyboard-for-your-jolla/posts/1142677 Update Nr.11.

[19] https://www.kickstarter.com/projects/2028347278/tohkbd-the-other-half-keyboard-for-your-jolla/posts/1039822, Update Nr.1.

"*Kickstarter backers are really invested in helping a creator's project come to life. When we were just getting off the ground, we had a lot of manufacturing delays, and I expected everyone to be really upset with us (and rightfully so). But more often than not, our backers would send us letters of encouragement, and tell us that they had our back; they really became our community. To this day, Kickstarter is one of the best experiences I've had as a business.*"[20]

Only on Kickstarter she received over 500 comments from her backers. Below are few examples with suggestions from the future owners of Thousand Helmet:

[Comment from a backer] "So glad this is taking off! Looking forward to mine.
Quick question: is there any heat for adding a small webbing strap (optional perhaps?) to the back to hook a light on? It's much safer to put your rear light at driver's-eye-level rather than on your rack.
Something like the grey strap on this:
http://imgapp.banggood.com/thumb/view/upload/2012/chenjianwei/SKU071206n(1).jpg
…but obviously, you know, nicer."[21]
[Gloria's reply] "@Isaiah Tanenbaum: Great idea! Thousand's goal has always been to design a bike helmet you'd actually want to wear. We are always looking and open to ideas that can help us achieve this goal. We will definitely take your comments into consideration :)"
[Comment from a backer] "Stretch Goal! Minimalist Belt Bag assorted colours of helmet :)"
[Gloria's reply] "Martin- fun idea! Anyone else have stretch goal ideas? Patrick- thanks for the compliment! We almost named Carbon Black, Bullitt Black as a homage to McQueen."

Angelia Trinidad also received hundreds of encouraging comments and extra ideas from her backers on Kickstarter. Below are few examples of contributions from the user community:

[Comment from a backer] "The more that I contemplate this, the more that I like it. Every time I have ever looked for a planner, I have wished that I could find one like this. Good job on marketing and documenting the process. Chronicling a sampling of the best success stories after the first year might be a good idea for future marketing too".[22]

[Angelias reply] "@elizabeth thank you! i am definitely going to do that, if this helps anyone feel a little better about everything that they have to juggle in their lives, i will consider that a success story! i've already had a few people email me saying how much the free PDF is helping them, so I am super stoked and happy with how it's all working out. i plan on making an online community where people can share what they have accomplished with their planners and hopefully have a way where people can help one another with advice of how to attain their goals, especially if they have already accomplished them (aka people who have decided to live a healthier life helping others who aren't too sure where to start) thanks for sharing your thoughts!"[23]

Broadly speaking, CFPs are communities revolving around their function as marketplaces, and user communities provide platforms for collaborative user innovation. Parmentier and Mangematin (2014) argue in this context that firms move to challenging dual roles. They have to open and manage their corporate boundaries, and have to monitor and orchestrate the user communities at the same time. Hence, there are specific differences in user communities and CFPs. Nucciarelli et al. (2017) highlight that crowdfunding do not only bring capital to companies, but also specific technological and market knowledge. Before this background, the following Table 1 summarizes key differences between the two concepts.

4.5. User Investment: How do CFPs impact the investments made by users?

According to previous research the main motivation of users, i.e., benefits from using an advanced solution, may mingle with motives of commercializing the solution. Despite their focus on benefits from using their own innovation, user innovators have also been observed to become user entrepreneurs, who also make their solution available to fellow users within their community, and sell these products. These so-called 'lifestyle firms' are characterized by a specific cost structure with low investments and high variable costs. While users have become increasingly active players in new product development, the privilege of scaling and mass-producing products has remained in the hands of firms due to their financial resources allowing for cost advantages (Baldwin et al., 2006).

For example, the prototype of TOHKBD keyboard already existed before crowdfunding – it was made with 3D printed pieces:

"By the time I joined the project, Dirk already had a working prototype of the keyboard attachment for the Jolla smartphone, but it has been built with DIY-grade 3 pieces and been using spare parts from QWERTY smartphone from 2009 that didn't quite meet top standards either. […] At the same time I've been figuring out requirements for the perfect mobile keyboard. Since we had no R&D budget, I've decided to consider all reviews and user ratings of all previous QWERTY smartphones to figure out all the weak spots and strong points. That allowed me to design perfect shape for each key without countless prototyping iterations and virtually zero funds spent."[24]

Crowdfunding was used later to produce the products and generate customers (who funded to be the first to receive a product):

"Since we essentially have a 'go' already on the project -but the final batch size is still unknown, we will do our best to prepare everything for final production."[25]

Not every user innovator decides to take an entrepreneurial path due to a lack of motivation or resources that are necessary for turning an invention into an innovation. It is known that user innovators are primarily driven by personal benefits from using their own invention, and they are not seeking any financial rewards for their effort (von Hippel, 1988). However, it was found that user innovators rarely go through the innovation process on their own (Franke and Shah, 2003). In most cases they benefit from the assistance of other people – users with a similar interest.

Nonetheless, although support and assistance of the user community along the innovation process led by a user innovator is important, it is not sufficient for full-scale development and extensive diffusion of innovation (Franke and Shah, 2003). Moreover, a lack of financial resources, lack of time, or lack of confidence regarding the success of an innovation on the market are some of the factors that may impede entrepreneurial activities of user innovators.

At the same time, research showed that crowdfunding can be regarded as a powerful enabler of entrepreneurship and a way of democratizing funding of new product development (Belleflamme et al., 2014; Mollick and Robb, 2016). Thus, user innovators who need financial resources and support from a larger community than the local

[20] https://www.forbes.com/sites/forbesstylefile/2017/06/08/designer-spotlight-thousand-bike-helmets-become-a-stylish-safety-accessory/#2101b3f41318.
[21] https://www.kickstarter.com/projects/812287807/thousand-finally-a-bike-helmet-youd-actually-want/comments.
[22] https://www.kickstarter.com/projects/angeliatrinidad/passion-planner-start-focusing-on-what-really-matt/comments.
[23] https://www.kickstarter.com/projects/angeliatrinidad/passion-planner-start-focusing-on-what-really-matt/comments.
[24] https://www.behance.net/gallery/27500387/TOHKBD-The-Other-Half-Keyboard-for-Jolla-Smartphone.
[25] https://www.kickstarter.com/projects/2028347278/tohkbd-the-other-half-keyboard-for-your-jolla/posts/1039822, Update Nr.1.

Table 1
Comparison of key areas of user communities and CFPs.

	User communities	Crowdfunding platforms
Phase in value creation	Early ideation, prototyping	Production, commercialization
Purpose	Collective invention: Idea generation, testing	Collective funding and prediction (capital); collaboration and refinement (need information); CRM (relationships)
Type of platform	Collaborative innovation community	Two-sided market place with feedback functionality
Type of ties	Strong ties	Weak ties
Information sharing	Very open and (mostly) free; many-to-many; equal level	Limited communication between user user entrepreneur and (potential) customers; one-to-many
Organization	Natural gathering and bottom-up organization of like-minded users	Professionally managed two-sided market place
Actors	(Lead) users	(User) entrepreneurs and early adopters

one, can benefit from opportunities opened by CFPs.

For example, in the case of Thousand Helmet we learnt that for certain product categories, like bike helmets, the product must be built to production level for being certified. Thus, an entrepreneur must invest a significant amount of money in development without any certainty that the product will be certified and accepted on the market. Gloria Hwang remembers her challenges:

> *"The helmet development process takes a year and a half. You have to pass CPSC testing in the U.S. which is, like, 20 different tests. We also sell a lot in Europe. So we have CE testing, which is an additional 20 other tests. So that whole testing process takes like four months. And the really crazy thing about bike helmets is you have to build everything to production level before you can test it. So that means you have to invest all of the money in design, in all the molds. You have to build the whole thing of what you're going to sell to the public, and before you can, you have to test it. And if that fails, you've got to go to the beginning again."*[26]

In order to finance the development process, she started a Kickstarter campaign, and was very surprised by its positive results:

> *"While I was at Toms, I had this idea and I was like, okay, I'm going to start working nights and weekends on it. And I put together a Kickstarter concept. At the time, I was trying to raise twenty grand. By the time that campaign closed, we had close to a quarter of a million dollars. I actually thought Kickstarter was broken! Because pledges were coming in but they were all from people I didn't know. So I just thought I was a system glitch."*[27]

5. Discussion

In this paper, we explore how the emergence and advancement of CFPs influence the widely-researched phenomenon of user innovation. Key implications of our findings are that CFPs open up and increase the occurrence of user entrepreneurs who sell rather than just use a solution. Several reasons account for this implication: funding is easily available (large markets of users with similar needs), uncertainties are reduced (robust feedback on market acceptance due to 'hard currency') and not only self-centered and need-driven users are attracted, but also more market-oriented (and less need-driven) ones. Thus, CFPs complement rather than substitute the purpose of traditional user communities. User communities facilitate the creative process of generating a solution, while CFPs help assess, fund and scale the solution to fully exploit it.

5.1. Implications for theory

Thereby, the article contributes to the theory of user innovation and user entrepreneurship in multiple ways highlighting changes in key dimensions of user innovation, i.e., users' motivation, the roles users take, the communities they create to collaborate and the investments they make to bring innovations to life. Overall, we suggest that CFPs have an important role in the further development and transformation of user innovation theory. The paper also provides managerial implications pointing out how firms and policy makers may capitalize on the intersection of user innovation and crowdfunding.

Our case study provides evidence that CFPs are likely to foster user innovation and, in particular, support the evolution of user innovators towards user entrepreneurs. CFPs may occur as a central locus for core activities of user innovators ranging from consumer feedback (e.g., comments by backers on CFPs) and market acceptance (i.e., the overall funding volume achieved as an indicator for relevance and desirability) to funding (i.e., funding provided by backers). Three major reason could be identified why CFPs drive user innovation which we will outline in the following.

5.1.1. 1 Easy market access and acquisition of significant funding

To date, research on user innovation has focused on user communities as the key 'nuclei' of innovation providing platforms for users to jointly *create* value along the innovation process (e.g., identify an opportunity, create and evaluate ideas, develop a concept and an appropriate solution) (Shah and Tripsas, 2007; Hienerth and Lettl, 2011). Similar to user communities facilitating the collaborative creative process resulting in a user solution, CFPs serve as enablers, however, supporting the *scaling* and *commercialization* of user solutions. They are the 'fuel' that allows really new ideas to come to life and thrive as they provide significant financial resources by tapping 'markets before the market' that unite users in need of a certain situation beyond the boundaries of a user community.

While efforts of user innovators have been predominantly focused on creating products for their own benefit and the benefit of their communities (von Hippel, 2005), the emergence of CFPs creates a new breeding ground for scaling up user innovation and addressing larger markets. In doing so, CFPs may eliminate an important threshold that banned users from commercializing their innovation: the lack of financial resources or access to these (Lüthje et al., 2005; Lettl et al., 2006). Similar to the privilege of product creation that had been overturned by the democratization of innovation and the emergence of user innovation (von Hippel, 1988), CFPs may infuse user innovation with financial resources and extend user innovation into the domain of commercialization. In other words, the ever-increasing forward-integration of users' activity in value creation (i.e., from purchase decisions to active need articulation, from idea generation to the development of solutions) may be at the verge of yet another revolution due to the democratization of commercialization.

[26] https://www.marketplace.org/2017/07/19/business/can-better-designed-bike-helmet-make-people-safer-road.

[27] https://www.marketplace.org/2017/07/19/business/can-better-designed-bike-helmet-make-people-safer-road.

5.1.2. 2 Reduction of uncertainties via robust consumer feedback

A key barrier to commercializing innovations and go beyond solving one's own need is the uncertainty of how relevant and desirable the solution will be in the market and how big that market will be (Baldwin et al., 2006; Hienerth, 2006). Addressing these uncertainties, we highlight that CFPs provide a completely new form of feedback mechanism producing compelling data of actual buying behavior before major risks are taken and investments made (Bilgram et al., 2017). While user innovators have long harnessed the feedback of the community to improve their solutions (von Hippel, 2001; Lakhani and Von Hippel, 2003; Hienerth and Lettl, 2011), CFPs introduce a 'hard currency' indicating the relevance and urgency of solving a problem (Bilgram et al., 2017). As CFPs require a monetary up-front investment, i.e., real money, the feedback offers an unprecedented validity and robustness in terms of market acceptance. What is more, the upfront payment ensures that funding can be used to invest in means of production thus significantly reducing the personal risk for user innovators considering becoming entrepreneurs.

5.1.3. 3 Providing user innovators benefits from using and from selling new products/services

User communities have been found to be place to seek and provide assistance, but usually do not operate as market places where innovations are sold (Franke and Shah, 2003). While selling their solution (i.e., not just using it to solve own needs) has been a valid yet oftentimes side-opportunity for user innovators in the past (Shah and Tripsas, 2007), the mechanisms and established markets of CFPs encourage user innovators to embrace the opportunity of selling to larger markets. We suggest that CFPs apparently appeal a larger number of market-oriented user innovators who originally would not have been motivated enough to innovate by their own needs. In a nutshell, the observations of our case studies indicate that the 'joint motive' of addressing own needs *and* selling a solution on CFPs may attract a larger number of innovative users. Therefore, CFPs may eventually narrow the gap between user innovators who are more self-centered (i.e., determined to solve their own need) and pure entrepreneurs who are driven by the commercial motive of generating revenues from selling the solution to others.

The following Table 2 summarizes our key propositions for crowdfunding-enabled user innovation within the investigated dimensions user motivation, user role, user community, user collaboration and user investment and contrasts them with the theoretical foundations of traditional user innovation. Therefore, user motivation refers to the fact that selling their solution (and not just using it themselves) is no longer a favorable yet small side-opportunity for a small number of user innovators but a serious motivation for a larger number of market-oriented user innovators who originally would not have been motivated enough by their own needs to become innovative. The user role changes describe a threshold of becoming a full-fledge user entrepreneur scaling the business opportunity, the evolution from pure user innovator to entrepreneur is facilitated. CFPs in their current constitution cannot (and maybe also should not) replace the purpose of user (innovation) communities: user communities facilitate the creative process of bringing about a solution while CFPs provide robust feedback regarding market acceptance and funding.

5.2. Implications for practice

We also argue how CFPs impact the way firms make use of user innovation beyond the known approaches such as the lead user method or co-creation (Urban and von Hippel, 1988; Bilgram et al., 2008; Füller, 2010). In particular, we suggest that the informational advantage gained through the 'hard currency' of CFPs cannot only be used by user innovators, but by firms as well. Data such as the funding volume may support firms' decision process by lowering the risk of making investments (e.g., buying the user innovation or copying it). Hence, CFPs can serve as a 'tool' for user innovators to measure the commercialization potential of their product. Depending on the individual user profitability threshold, different options arise (see Fig. 2).

To reflect our discussion into new roles of users, we put the user roles in the context of opportunities for firms, which is summarized in the following Table 3. It starts with an 'ordinary' consumer, who wants to buy and use products. There is no direct interaction with the company beyond the simple demand these users are creating. From there, the role of a critical consumer evolves who is willing to support the company with information relevant to its products. These consumers are not actively creating own products, but they want and do express themselves by articulating their needs and experiences, e.g., in online communities, blogs and other social media applications like Facebook

Table 2
Overview of traditional user innovation with crowdfunding enabled user innovation.

Dimension	Traditional user innovation	Crowdfunding-infused/enabled user innovation
User motivation	Mostly need driven: benefit from using a new solution (need fulfillment) and revealing it in a community	Hybrid motive: benefit from using and from scaling and commercially exploiting a solution
User role	The role of users can be dynamic and users oftentimes evolve through different stages (from a self-centered to market-oriented mindset) User innovator may (1) remain a user innovator (self-centered) or (2) become a user entrepreneur and start a 'lifestyle firm' (community-oriented) (3) become a seller mainly focused on selling the product to other users (market-oriented).	CFP serve as transition catalysts for users to evolve throughout different mindsets and activate corresponding resources. User innovator may (1) less likely remain a user innovator, (2) more likely become a user entrepreneur and (3) be equipped with the resources and market access to actually opt to found a firm Using CFPs has become one additional option for user innovators to think bigger than user entrepreneurs in pre-CFP times while not taking as big of a risk as user innovators used to take when they decided to scale their innovation.
User community	Self-organized and self-managed community Free-revealing among users Facilitation of finding like-minded users via self-selection	Systematized and formalized market and procedure Semi-free revealing of user firms in relation to customers Mostly information necessary to build trust and customer relationships
User collaboration	Small-N feedback from fellow users (user-user collaboration) Collaboration efforts mostly focused on gaining solution information by building on others' ideas and experience knowledge	Large-N feedback from backers (user-backer collaboration) Collaboration efforts mostly focus on gaining need information and marketing the innovation Backers on CFPs frequently become active advisors to user entrepreneurs during the process of concept refinement and production
User investment	Capital-extensive approach: High variable costs and low investments User innovator provides own funds for prototyping and production User innovators invest significant amounts of time rather than financial funding	More capital-intensive approach: Lower variable costs and medium investments; User innovator provides own funds for initial prototyping Production is funded by crowdfunding backers

Table 3
User roles and its implications for companies.

Role of user	Explanation	Opportunity for firms
Consumer	Making economic purchase decisions and creating demand that indirectly influences product portfolios; value is destroyed	Value is created by firms by offering products based on demand information gathered in the market
Critical consumer	Articulating needs and communicating them to firms by means of market research to help firms understand the demand	Consumer needs are researched by companies beforehand to better direct their production efforts and develop user-centric products
User innovator	Creating own innovative solutions to benefit from using them	Investigating user innovation or integrating lead users in own NPD efforts
'Lifestyle firm'	Providing self-created solutions to fellow users with no particular profit-orientation	Analyzing user entrepreneurship for rather high-risk potential to buy or copy
User entrepreneur	Commercializing own products through investments (own funding as well as crowd-based funding) and more professional firm structures to benefit from selling products	Analyzing user firms (e.g. on crowdfunding platforms) for low-risk potential to buy or copy

or Instagram. Hence, this user role is close to established concepts like opinion leaders or early adopters (Schreier et al., 2007). The next level is the user innovator, who is the traditional user creating an own innovative solution to benefit from using it. This person has no motivation to further commercialize it, as the focus is on the solution of a specific problem (von Hippel, 1988). The 'lifestyle firm' also solves a problem, which the user then sells to like-minded users from his community in a 'lifestyle shop' (Hienerth, 2006). These 'lifestyle firms' are characterized by a specific cost structure with low investments and high variable costs (Shah and Tripsas, 2012). The further extreme version is then a real user entrepreneur commercializing his or her own product. This is an important distinction: the 'lifestyle firm' identifies a need, creates a product and sells it as he or she discovers that there is also a certain demand on the market. However, the focus is here to provide self-created solutions to fellow users with no particular profit-orientation. In contrast, the user entrepreneur commercializes his or her own products through strategic investments and a professional firm structure. So even though a 'lifestyle firm' may evolve to a user entrepreneur once having a high demand, this is not necessarily a given path.

It is already very important that companies are aware of these user roles, but it will become even more essential in future. Because these days, many companies still treat all customers the same way, even though the rise of open innovation in the 2000's initiated certain changes in awareness already. However, these changes are mainly linked to focus on external collaboration in general: lead users or specific collaboration partners. An awareness of our introduced five user roles will help to identify specific types of users, and to develop strategies how to interact with them (as indicated in Table 3, opportunities for firms). In many cases, such users will not be interested or even able to evolve to entrepreneurs. This offers two interesting opportunities for firms. With using approaches like netnography, companies can integrate these critical consumers or user innovators systematically in their new product development processes. The other opportunity is that companies can directly work with the user or even buy the company, if a sufficient commercialization potential can be identified through a crowdfunding campaign. Hence, this would implicate a new task for corporate innovation management as a new way of product development, and for corporate venture management to identify suitable investment objects. Finally, with Amazon, a well-known marketplace of products by mature companies has decided to facilitate startups with a separate marketplace called Amazon Launchpad.[28] This platform grants startups direct access to millions of Amazon customers. Following the access to funding for production provided by CFPs, Amazon Launchpad is a good example how established firms can use the potential for commercialization in the early product life cycle with CFPs.

[28] https://www.amazon.com/Amazon-Launchpad/b?node=12034488011.

5.3. Implications for policy makers

From an economic perspective, our study also provides an interesting implication for policy makers. CFPs establish 'pre-markets' for other users that exceed the volume of previous markets user entrepreneurs served (Baldwin et al., 2006). In other words, they create a 'market before the market', i.e. an early adopter market before the mass market. In doing so, CFPs may overall accelerate diffusion of innovations, and in certain cases even contribute to an increased innovativeness of whole industries. Thus, we propose that through their impact on user innovation, CFPs might indirectly stimulate the course and intensity of innovation in certain industries and accelerate diffusion of innovations. By establishing systematic market places for early adopters and innovative consumers, user entrepreneurs can more easily reach a large number of potential customers with their offerings. While user communities used to be limited to regional boundaries in pre-Internet times or to a rather small group of fellow lead users (Shah and Tripsas, 2007), CFPs have made user innovations accessible for a wider population. Following the research on the impact of user innovation on the innovation capabilities of nations (von Hippel et al., 2012), we argue that governments may be advised to utilize 'democratic' crowdfunding mechanisms to distribute innovation funding and support the widely under-recognized economic power of user innovators.

6. Limitations and further research

Although we base our research on a review of the key literature, we would like to emphasize that the main goal of this work is to present a conceptual framework that would initiate a discussion around this important topic, and at the same time spawn further research. Such research should focus on qualitative and quantitative investigation of the interrelationship between crowdfunding and user innovation. We use three case studies for our research, so it would be interesting to look into further cases if our patterns can be found there as well. In more detail, it would be also worthwhile investigating if there are cultural differences regarding the introduced user roles. Also on a personal level, future researchers might look into further factors like the influence of gender or age.

Moreover, we want to pay attention to an important assumption underlying our research. In the absence of data on the motivation of individuals, who employ crowdfunding as a means of realizing innovation projects, we acknowledge that a significant share of these individuals may be pure entrepreneurs, i.e., individuals who primarily want to *sell* products and have no or only a secondary interest in *using* the product for their own benefit. Thus, we assume that all individuals using CFPs are to some extent entrepreneurs, but only a particular share of them are user innovators. Future researchers might also want to question this assumption.

Last but not least, we encourage longitudinal studies which follow the entrepreneurs and their project to link their behavior also to market success. Based on such information, success factors could be derived to

help future user innovators and entrepreneurs to grow their business successfully.

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