



## THE CROWDFUNDING PLATFORMS AS TOOLS FOR DESIGNERS TO CREATE CONNECTED OBJECTS

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**Abstract:** Creativity supports social and economic prosperity, and, by the development and popularity of the Internet and its technology, the computer-mediated crowdfunding platforms become a creative economic environment to serve business and innovation. On the other hand, the application of digital technologies applies to objects generates innovative products, i.e. smart devices, becoming one of the popular categories presented on crowdfunding platforms. This research aims to investigate the feasibility of using crowdfunding platforms to support design of connected objects. The paper reports some case studies (connected objects) taken as reference from four crowdfunding platforms, and some interviews with designers. The results show the role of crowdfunding platforms in the creation of innovative connected objects and how the platforms can influence creativity.

**Keywords:** *Crowdfunding platforms, connected objects, creative tools, design methods*

### 1. Introduction

Creativity is the process of bringing something new into being (Naiman, 2015). Creative work is often done in teams involving experts of different disciplines and, very often, designers employ tools to envision and present the new concepts, so to support the collaboration between people with different competences and expertises, to find new technical solutions, and to complete the creative generation of innovative products through discussions and co-design. Designers can also foster a community of users to validate their creations, and to receive feedbacks in different phases of the design process (Shneiderman et al., 2006). In this paper, we focus on Crowdfunding Platforms as an opportunity to share ideas in design, and to receive feedbacks suitable to improve and refine the design of innovative objects. The Crowdfunding Platforms are online environments in which everybody can display creative ideas, so to receive comments and advice, and to collect money supporting product development, engineering and production. Crowdfunding Platforms (CPs) are quite effective in encouraging the group of individuals to pitch their creative ideas to the crowd in anticipation of financial support, (Belleflamme & Schwienbacher 2014), and they are obtaining great popular interest, especially in the development of smart things and connected objects.

Connected products are physical objects embedded with processors, sensors, software and connectivity, that allow data to be exchanged between the product itself and its environment, with the manufacturer, the operator/user, and other products and systems (Rowland, C. et al., 2015). Connected objects are developed by IoT technology, to realize specific functions such as control at a distance, reduction of power consumption, or more complex performances, such as home automation. The

development of smart products meets new demands or optimizes the functions of traditional non-connected products, for several different purposes, from health-care to wellbeing, from sport to interior design. Their design requires additional knowledge concerning traditional industrial design due to their innovative characteristics; interaction and user experience design theories provide the suitable methodological background. The invention of a connected object is not an easy task, and, despite the huge number of innovative solutions that every year are presented on the market, only a few actually encounter success; the embedding of digital technologies into products poses several issues in terms of feasibility, usability, acceptability, maintenance, and other complex issues, such as those related to ethics in design. Interaction and Experience Design approaches usually employ design processes based on user studies, so to investigate potential needs, wishes and constraints.

CPs can be used to receive feedbacks and our research aims to understand if and how it is possible to integrate current Interaction Design methodologies with activities on CPs to exploit collective intelligence in the design of connected objects. Our research includes questions such as: which contribution can be provided by the online sharing of ideas during each phase of the design process? How can the dialogue on CP orient creativity? Can we define a strategy for a convenient use of interaction on these platforms so to support design processes? For which kinds of projects, the platforms provide suitable knowledge? Should we consider CPs as one content in Interaction Design and Experience Design education? In order to give answers to these questions, our research includes several activities and, between others, the analysis of some case studies concerning the development of connected objects through four different CPs, and interviews with professional designers.

## 2. The Crowdfunding Platforms and their role in creativity

### 2.1. The mechanisms and features of Crowdfunding Platforms

The participators of Crowdfunding Platforms are creators who initiate projects, require funds so to produce the final objects and services, but also funders who choose projects they like, contribute money and get rewards from the project development. Thanks to this process, CPs provide a unique mechanism to judge whether the project should get to completion or not. There are two funding models, All-or-Nothing and Keep-it-All; in the first, if the funding goal is not reached, the funds are returned to funders, and the creator receives nothing; in the second one, producers can keep the money they raise even though their funding goals are not achieved. This research involved four representative platforms to study and select cases (Figure 1), two are from China, Hi Taobao, which belongs to Alibaba, and Demohour; both of them only serve for China. The other two are from the USA, Kickstarter and Indiegogo; they are open to many countries, and all of them use All-or-Nothing model.

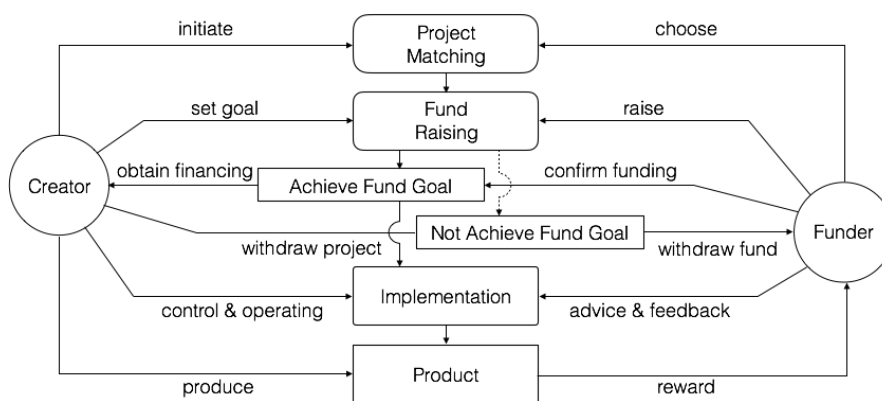


Figure 1. The mechanisms of the CP with All-or-Nothing model

### 2.2. Creativity and CPs

Since its launch in April 2009, Kickstarter community counts several million members who combined in pledging billions of dollars to fund creative ideas in categories like art, music, film and video,

games, design, and technology, (Kuppuswamy & Bayus 2015). Given these numbers, it is easy to understand that the platform plays a very important role in supporting creativity, and in the involvement of new subjects in the generation of innovative concepts. In this respect, we can say that creativity is the core and reason of being of CPs, which offer a new place for the presentation, sharing and support of ideas. Also, platforms offer new business models and new opportunities with respect to production systems. From another point of view, we can consider the role of platforms in enabling new networks and collaboration paradigms, since they offer the environment for fast communication between designers and producers. Through comments and message systems, designers can foresee user needs and preferences, but also to understand constraints and goals of producers; therefore, designers can optimize their products and measure the attractiveness of their creativity through the feedbacks. One of the most exciting things about the social interaction on the web, is its tendency to democratize the creative industry, allowing creators - artists, musicians, publishers, filmmakers, writers, entrepreneurs - to bypass the traditional industry distribution model and supporting visibility and self-promotion directly by the publishing of their creative outputs on platforms that connect them with their audience (Popova, 2010). This makes the project creators get the feedbacks in time and optimize the product immediately.

What's more, thanks to the mechanisms of the model All-or-Nothing, the CPs offer the advantages of risk reduction, while supporting user participation with a non-financial reward.

### **3. Creativity in the design of connected objects**

#### **3.1. Design methodologies for technology-based products**

Connected objects allow the automation of functions and the collection of data; they enable the construction of systems capable to enhance lifestyles, to provide better use of resources, and to increase of efficiency in several contexts (Babin, 2017).

Most connected objects require interaction with their users so to access to functionalities. Even when smart objects are presented as an upgrade of existing traditional products, their use requires adaptation of habits; in several cases, smart products based on digital technologies and control interfaces ask the users to develop new knowledge and abilities and, in some cases, they pose barriers in terms of cultural background or education. So, in most cases, the production and distribution of a technology-based innovative product faces relevant issues: are the new functionalities worth of a change in habits and behaviours? Is the reward associated with the use of the innovative product meaningful enough to balance the cognitive efforts involved in its use? How can we predict and manage the possible consequences associated with the use of the new product, so that we can refine it and make acceptable to users? The understanding of the user experience is a critical factor in design, affecting the competitiveness of innovative objects and services.

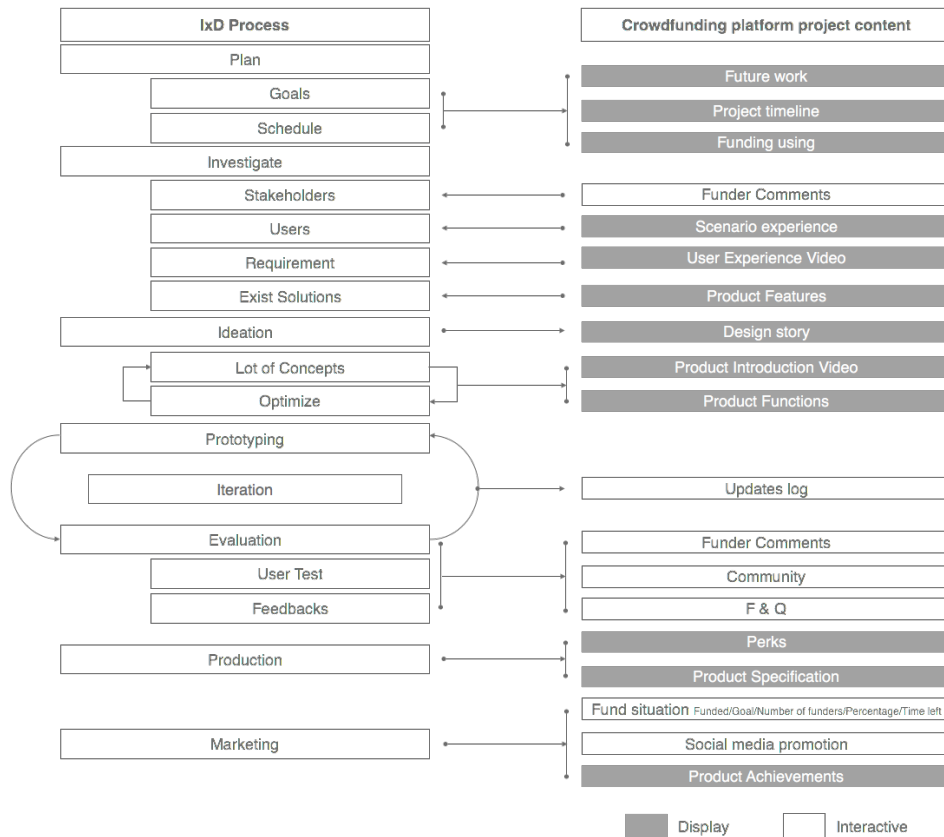
Even for big companies, capable of investing huge capitals in the development and promotion of innovative products (as, for example, the smart glasses), the optimization of a new object is not an easy task. It requires the capability to investigate the user experiences with respect to something that is not already there and therefore cannot be tested and experienced in full by users.

User studies are expensive and time demanding, they are not easy to carry on, especially when very new products are involved, and, quite often, they are above the reach of little design companies or young start-ups. In the last decades, a rich literature has proposed design approaches based on user studies (User Centered Design, Goal-Directed Design, Activity-centered Design); recently a number of alternative approaches are appearing, indicating diverse emerging strategies such as Lean UX, Sprint design and Agile UX. The design methodologies are evolving under the evolution of technologies, society needs and values, and user behaviours; the change mainly concerns the development of products based on connectivity and digital technologies. Therefore, the appearance of CPs appears as an additional way to verify creative ideas, but also as a possible shortcut to the creative development of new objects. While it is evident that the second interpretation is already adopted in their professional activity by several designers, we wonder if we can consider platforms as a tool and which are their limits/potentials.

### 3.2. Comparing approaches to the design of connected objects

If we observe the activities of participators of CPs, we can extract a model of the design process employed by inventors when proposing their ideas on the web. We can also compare this model with a scheme summarizing the process indicated as an ideal one for the project of interactive products, as it comes from dedicated literature. In this comparison, it is possible to confront tasks and goals, and we can find corresponding activities. As a reference, we considered, among others, the work of some authors that produced an ample description of IxD methodologies (Sharp & Preece 2007).

With respect to crowdfunding based processes, we analyzed the before mentioned CPs, mainly considering the proposals of new material objects employing digital technologies to provide very straight and simple additional functionalities. In Figure 2, you can see the comparison between the two models.



**Figure 2.** Comparison between Interaction Design and CP based design processes

On CPs, we consider two main types of events: one is the display of the product through stories and scenarios, and the presentation of the design team and context, so to make funders understanding the concept, and eventually invest on it. Another one is the interaction between creators and funders, including comments, replies and updates of the product through new releases. Some CPs offer specialized private communication tools for creators and funders. The funders also can use link functions to share the project on social media.

In here reported comparison, we consider that the interaction on crowdfunding platforms mainly corresponds to the phases of concept generation, prototyping and evaluation; in CP based approaches, the final product depends on the advice and comments from funders who can also be the potential users. We can consider the discussion on CPs as iterations of collaboration steps involving users, producers and designers. Individuals from different regions can discuss together through the platforms, in public, so influencing the funding.

### 4. Case studies about the design of connected object

#### 4.1. Cases-Smart cups

We investigated the destiny of several different concepts presented on CPs. We focus here on one category only for the sake of brevity: the smart cups. In CPs, we find several projects about smart cups, and most attracted supporters and funds. A smart cup is a typical update of a traditional function; it uses technology to promote healthy behaviours, provides water intake measurement, reminds drinking, offers temperature control and other features, also through smartphone applications. We selected six different smart cups (figure 3) from the four CPs, all reaching the fundraising goals.



**Figure 3.** Smart cups for case study

**Table 1.** Fundraising comparison of smart cups

Name	Platform	Year	Price (\$)	Raised amount(\$)	Funders
Ozmo	Kickstarter	2016	79/99	31,020	187
Eightcups	Indiegogo	2016	99	12,637	85
Cuptime	Demohour	2015	60	262,564	3513
SIGG	Hitaobao	2017	60	163,705	2681
AYSING	Hitaobao	2016	46	37,271	20899
Drinkers Guard	Hitaobao	2017	20	170,720	3228

**Table 2.** The function and feature comparison of smart cups

Name	Functions					Features
	Temperature display	Keep warm	Remind	Optimize habit	Set goals	
Ozmo	○	●	●	○	●	1. Coffee warm 2. Syncs with wearable device
Eightcups	○	○	●	○	○	Earn points to exchanged for cashback
Cuptime	●	○	●	●	●	
SIGG	●	○	●	○	●	Community
AYSING	●	○	○	●	○	1. Sterilization 2. Liquid recognition 3. Excessive alert
Drinkers Guard	●	○	○	○	○	Water quality detection

We compared these smart cups, considering fundraising (Table 1), functions and features (Table 2). We can summarize here some findings.

- Each of them has unique features so to meet user's need, and make the product more valuable.
- Reminds of drinking, and temperature display is the main functions.
- Eightcups have the least functions but the highest unit price; customers funding it should really appreciate its feature.
- AYSING got the highest funds by the rich features.
- Cuptime was one of the earliest generation smart cups released in 2015, it had the highest number of functions and got the highest raising amount.

Through case study analysis, we intended to see if the successful capital raising of a project on a CP is an indicator to predict the success of a product in markets. The raised amount collected by Cuptime could refer to a successful project. However, the reactions of user experience were turned to negative when the product was offered to the market. The producer of “Cuptime” also said "... It is not as good as a traditional cup for things such as carrying, keep warm... Data of water intake are worthless... monitoring the record of drinking water cannot play any practical value. Most customers no longer use it after a period of using.” This and other examples demonstrate that the success on CPs is not simply related to the market success of a product. Nevertheless, if we consider in the whole the activities and information on CPs, we see that they provide an interesting environment to support creative design. We can see, as an example, that the latest smart cups presented on CPs learned from the Cuptime experience, and proceeded to add further features. The SIGG one employs its eight led lights depending on the drank volume of water, it points a goal for users to achieve, gives timely indications about what user is supposed to do, and it lets the user know when the goal is achieved. Thus, the evolution of an innovative product seems to be accelerated by the exposure on a CP.

## 4.2. Interviews with designers

In order to investigate the amount of content and the contribution of knowledge provided by CPs, we decided to confront the results of our investigation on platforms with the feedbacks provided by interviews with industrial designers. The aim is to compare the hints on a specific product and its different interpretations collected on platforms, with those based on personal expertise of designers. We invited three Chinese design experts with different positions and background for interviews, to judge these products by subjective evaluation. The positions of the interviewed experts are associate professor of industrial design; senior product and interaction designer; design director of a Chinese design company.

We set two kinds of questions. The first one aimed to understand their knowledge and attitude toward smart cups and their expectation about the product as designers and customers. The main questions for this part were:

Question 1. Have you heard about smart cups before? How did you think about it?

Question 2. From the point of view of a designer, what is a perfect smart cup in your ideality?

The answers to this part of the interviews showed different attitudes and expectations of the three experts. In a more general sense, they showed different attitudes toward smart products. We report here some answers to Question 2.

*Interviewee 1*

- Don't think “a cup becomes smart” is meaning something.
- A perfect smart cup should not interfere with the water intake behaviour of the user too much.
- A smart cup should open the functions following the habits of the user.

*Interviewee 2:*

- A smart cup could tell users to drink enough water for health, and give advice.
- It must have good appearance.
- It should be used for a long period without charging the battery.

*Interviewee 3:*

- The smart cup requires mature technology to realize and support it.
- The data collected from different users by the cups is more valuable.
- The big data from individuals is useful for deep research to develop a better smart cup.

- The interaction ways with smart cup need to be improved.

From our interviews, “smartness” of cups does not seem desirable enough to offer a new experience; it looks like more like a marketing strategy. To produce meaningful innovation, it should offer value beyond its traditional attributes, from appearance to functions. Data are valuable, but how to use them, is still to be researched and understood.

In the second phase, we asked interviewees to evaluate the physical appearance and functions of these cups from a designer’s point of view.

**Table 3.** Evaluation of physical appearance

	<b>Interviewee 1</b>	<b>Interviewee 2</b>	<b>Interviewee 3</b>
Ozmo	Color and materials is comfortable	Three levels material make it not so tedious	Frosted texture makes it have high quality
eightcups	Appearance looks like traditional vacuum cups	Straight and narrow	The appearance looks too ordinary
Cuptime	Like a plastic cup ; White colour is elegant	The curved surface is the bright spot	Like a toy
SIGG	Glass makes it different but modern	Good for open and take away	Glass material have the feeling of purity
AYSING	Shape is outstanding by streamline	The led screen makes it as a high-tech object	Shape is futuristic
Drinkers guards	Digital led is life behind in this era	More like an industrial tool not for life	Shape and color are not charming

**Table 4.** Evaluation of functions

	<b>Interviewee 1</b>	<b>Interviewee 2</b>	<b>Interviewee 3</b>
Ozmo	Heat is only for coffee, not water	The three led is too waste for charge only	Syncs with smart wearable device is user-friendly
eightcups	Earn points for cash is a motivation for user	It has to charge battery only for reminding.	Tedium and opportunistic
Cuptime	Remind the temperature is good to avoid hurt	Function is simple	It can't be used outdoor
SIGG	Communication is useless for water intake	Eight led lights make the purpose more clearly	Eight led lights make people know what to do
AYSING	Excessive intake alert is good for health	More hygienic	Fit for different kind of drinks
Drinkers guards	Water quality detection is attractive	The use way is not easy	Water quality detection is related to smart

While we cannot describe in detail all our research activities in this paper, we can shortly summarize some results of our analysis based on case studies and interviews in the following issues.

- Convincing scenarios of use of a product is a question to answer for designers.
- Colours, materials and forms still play a primary role in attracting customers and funders.
- Creative appearance is important in innovative products based on technology.
- Detail components attract attention, (such as the led lights and screen on the cup). Lights can be useful to create attention and less intrusive information outputs (Rowland et al., 2015).
- Unique features are positively evaluated. Drinkers Guard was judged as “strange and not charming” of its appearance, but it raised 170,720 USD by 3,228 funders supporting it. In some cases, the function is more important than appearance, especially when related to health.

- Functions for sharing data have probably an overestimated importance. As an example, individual water intake data are not meaningful for users.

## 5. Conclusion

The results presented in this paper are only a part of the research aimed at the renewal of design methodologies for university education. Our focus is on smart products since the ability to design connected objects represents a natural, unavoidable challenge for the industrial designers of the near future. Activities in CPs offer support to the creation of innovative products, but they should be undertaken with adequate caution and awareness of the complexity of design processes aimed at innovation. The success received by a product on CPs indicates the interest aroused by the concept, and the amount of raised money is the sign of a potential market. However, funding success does not mean that the quality of a product is good enough to satisfy users. Designers and funders can produce a dream together through a CP and its tools. That is quite valuable to feed and elicit creativity.

At the centre of crowdfunding is human to human communication (Gerber et al., 2014). The communication between producers and creators supports the latter and increase the confidence of funders; the product is optimized in this interactive process. Sharing on social media can promote the popularity of a project. The proposal of ideas on CPs influences the creativity of other designers, and help in learning and thinking. The popular judgement contributes to the creative process, offering hints that designers could use. The design process, therefore, can be iterated quickly, and the later producers can extract experience from the former ones.

CPs can act as a large platform for creators and designers, to show their ideas with lowest costs; it provides evidence whether the concept is popular or not, inform on how many similar products exist, and, the most important, opportunities to understand how to improve a solution thanks to funders' comments and advice. Therefore, CPs is becoming a tool to test a concept, and to orient, designers to make a better one, while failure examples can help designers in avoid ingenuous mistakes.

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