UNIVERSIDADE FEDERAL DO PARANÁ
ISADORA BURMEISTER DICKIE

PROPOSITION OF A REFERENCE MODEL OF CROWD-DESIGN FOR SUSTAINABILITY

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ISADORA BURMEISTER DICKIE

PROPOSITION OF A REFERENCE MODEL OF CROWD-DESIGN FOR SUSTAINABILITY

Tese submetida ao Programa de Pós Graduação em Design, Setor de Artes, Comunicação e Design, Universidade Federal do Paraná, como requisito parcial para obtenção do grau de Doutora em Design.

Orientador: Prof. Aguinaldo dos Santos, PhD.

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This thesis is dedicated to
the most influential women of my life:

my mother, *Jane*;
my godmother, *Ruth*;
my grandmother, *Lilian* (*in memoriam*);
my aunt, *Maria Amélia*;
my sisters, *Nadine*, *Aurora* and *Lilian*;
and my cousin, *Betina*.

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"It's not about just coming up with the one genius idea that solves the problem, but trying and failing at a hundred other solutions before arriving at the best one."

Tom Kelley, IDEO

RESUMO

A rápida expansão das Tecnologias de Informação e Comunicação (ITCs) na sociedade atual tem proporcionado o surgimento de novas possibilidades para a participação de stakeholders no processo de desenvolvimento de produtos. Uma dessas abordagens é o crowd-design, um modelo emergente de projeto e sistema de produção que usa conhecimento e recursos disponíveis na multidão, geralmente através da Internet, com a finalidade de resolver problemas e/ou criar conteúdo. Considerando que o desenvolvimento sustentável impulsiona pressões para um papel proativo do design em face aos atuais desafios ambientais, econômicos e sociais da nossa sociedade, esta tese propõe um modelo de referência do processo de crowd-design alinhado aos princípios da sustentabilidade. Para o desenvolvimento deste modelo, o método da Revisão Sistemática de Lieratura foi conduzido para o levantamento de definições e princípios associados a abordagens baseadas em multidão (crowd-based) para o desenvolvimento de produtos e suas implicações para a sustentabilidade. Os métodos Pesquisa-Acão e Estudo de Caso com Observação Participante foram aplicados para investigar duas iniciativas desenvolvidas através do processo de crowd-design proposto pelo Projeto Sustainability Maker (SuM). Juntamente com os achados da literatura, os dados coletados foram analisados através de uma Análise Comparativa sobre o processo de crowd-design (seu delineamento, atores envolvidos, tarefas, entre outros) e os princípios de sustentabilidade a ele associados.

Palavras-chave: crowdsourcing, proceso de desenvolvimento de produtos, sustentabilidade.

ABSTRACT

The rapid expansion of Information and Communication Technologies (ITCs) in today's society has provided the emergence of new possibilities for stakeholders participation in the product development process. One such approach is the crowd-design, an emerging mode of project and production system that uses knowledge and resources available in the crowd, usually through the Internet, for the purpose of solving problems and/or creating content. Considering that the sustainable development has been prompting pressures to a more proactive role of design in the face of current environmental, economic and social challenges of our society, this thesis proposes a reference model of the crowd-design process aligned to the principles of sustainability. For the development of this model, Systematic Literature Review was conducted for the search of definitions and principles associated to crowd-based approaches for product development and its implications for sustainability. Action Research and Case Study with Participant Observation methods were applied to investigate two initiatives developed through the crowd-design process of the Sustainability Maker Project (SuM). Along with the literature findings, the collected data were analyzed through a Comparative Analysis regarding the crowd-design process (its delineation, involved actors, tasks, among others) and the sustainability principles embedded on it.

Keywords: crowdsourcing, product development process, sustainability.

LIST OF ACRONYMS AND ABBREVIATIONS

DfS – Design for Sustainability

ICT – Information and Communication Technology

NDS/UFPR - Design & Sustainability Research Center of the Federal University of Paraná

PDP – Product Development Process

OD – Open Design

OI – Open Innovation

OSI – Open Source Innovation

OSS – Open Source Software

SD – Sustainable Design

SLR – Systematic Literature Review

SuM – Sustainability Maker Project

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1. INTRODUCTION

1.1 CONTEXT

The present PhD thesis was developed within the Sustainability Maker Project (SuM), carried out by the Design & Sustainability Research Group of the Federal University of Paraná (NDS/UFPR) and led by the "econcept"[1], a German company focused on Sustainable Design. The European Community funded the SuM Project through the LIFE program (LIFE11 ENV/ DE/000342) while the Dutch company WEBclusive developed the crowd-design platform used on the SuM Project. Both the PhD candidate and her supervisor were members of the Advisory Board of the SuM Project.

The SuM Project was a collaborative initiative that involved a consortium of organizations and Universities across the globe. Its main objectives were: (1) to facilitate the connection of people that might have a relevant role as far as the resolution of sustainability-related problems are concerned; and (2) to create a platform for developing sustainable solutions with the crowd.

The platform is called 'innonatives' (www.innonatives.com) and it was designed to manage web-based innovation challenges and the sharing of ideas, comments and, also, the engagement of stakeholders through crowd-based processes. This platform was launched as a prototype after testing in 2013. It intended to connect people and organizations that want to tackle sustainability related problems using the knowledge and skills available in the crowd. Hence, the present thesis has used the innonatives.com platform throughout the field study which enabled an in-depth understanding on the use of crowd-design towards sustainability.

[1]"econcept" is an agency for Sustainable Design (SD), founded in 1996. "econcept" is specialized in Design for Sustainability (DfS), Ecodesign, Eco-Innovation, Sustainable Production Consumption Systems and Sustainable Product Service Systems. Its core activities are design, consulting, research and education as well as networking, publication and communication of results. Furthermore "econcept" participated in other EU projects such as: MEPSS, SusProNet and SCORE. The agency has a wide international network, is member of O2, LeNS, DESIS, Eco-Innovation network, LCA network, and active in communicating, educating, organizing conferences and spreading knowledge about Sustainable and Eco Design and Innovation (SuM, web, 2015).

1.2 RESEARCH PROBLEM

As each design problem is different from the other, so are the methods of product development which are subject to adjustments for each specific problem. In the 1970s, Jones (1970) argued that the complexity of design problems follows a hierarchy and, therefore, inferred that the conventional methods to address more prosaic design issues presented inadequacies when dealing with problems of greater complexity.

In a more recent study, Dubberly (2008) stated that solving problems of greater complexity demands the exploration scope within each specific design process should to be extended beyond the immediate interactions. It should consider impacts and interactions within more complex systems, with its wide network of connections between people, activities, objects and scenery. As a result, the design practice has to cope with a continuous flow of new developments to encompass functions and areas that until then "did not correspond to their everyday practices" (Pastori *et al.*, 2009, p. 13). Thus, this paradigm shift in the design process, when dealing with complexity, demands a continuous expansion of knowledge regarding methods and tools to support the decision-making and creative process.

The development of solutions aiming sustainable consumption and production often implies dealing with complexity, that being the focus of the present thesis.

Sustainability-related problems are often referred to as 'wicked problems' because their complexity poses a real challenge to society, and requires the involvement of many different actors (Tischner & Beste, 2017). Rittel & Webber (1971) state that 'wicked problems' are difficult or impossible to solve because of incomplete, contradictory, changing requirements which are difficult to recognize and define. They are systemic problems with complex interdependencies and many actors and factors involved. Of difficult analysis, wicked problems' solution of one aspect may reveal or create other problems. There is no ultimate true or false solution; a solution of a wicked problem can only be better or worse. Thus, wicked problems cannot be solved by the application of traditional methods but demand creative solutions.

The search for sustainable development has prompted pressures to a more proactive role of design in the face of current environmental, economic and social challenges of our society. Indeed, the concern of the design community with sustainable development is relatively recent, with discussions traced back to the early 60s (Buckminster Fuller; Victor Papaneck), and with its effective introduction within the

Product Development Process (PDP) occurring only in the mid-80s (Bonsiepe, 2004). Since then, various studies have shown the impact of this new paradigm on the way designers conceive solutions, reflecting on changes in the design process and consequently on the characteristics of its end results (systems, products, services, *etc.*).

However, effective proposition of solutions towards sustainability demands ownership of the solutions by stakeholders if it is desired that these solutions prevail. The key issue nowadays is how to get a large number of stakeholders effectively involved in the development of solutions and how to get such involvement in a cost-time efficient way.

Fortunately, new Information and Communication Technologies (ICTs) have contributed to open new opportunities to tackle the sustainability challenges posed to design. This has enabled more effective approaches to deal with complexity. More particularly, the Internet has provided new ways of interaction between people and between people and companies from various sectors and geographical locations. Solutions for global problems can be articulated and receive contributions from local communities and, at the same time, local problems can be articulated and dealt with involving global communities. The rapid expansion of Internet access around the world provides further impulse for this new paradigm. For instance, in Brazil, a survey carried out in 2015 shows that 57,8% of the Brazilian population has access to the Internet, in a fast growing process (IBGE, 2016).

Figure 1.1 (next page) summarizes the current scenario presented above, as well as the practical implications for the design activity. As earlier mentioned, the rapid evolution of ICTs has enabled content creation and sharing through/with the crowd. As a result, a new approach called 'crowd-design' has emerged, where the design process is oriented to/from/with/throughout the crowd. According to Mendonça (2007, p. 18), this new approach for the design practice is "indispensably allied to a digital infrastructure in interactive social networks without barriers".

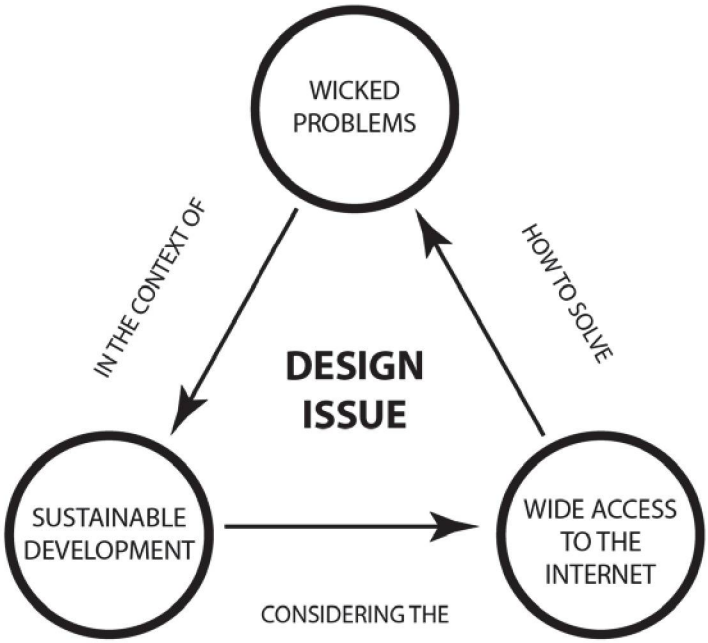


Figure 1.1 – Synthesis of the research context.
Source: The thesis' author (2018).

Crowd-design is a derivative process of 'crowdsourcing' – a term coined by Jeff Howe in 2006 referring to the possibility of outsourcing jobs, a task so far performed by the employees of a company (Alonso & Mizzaro, 2012; Estelles-Arola & Ladron Gonzales-de-Guevara, 2012; Zaho & Zhu, 2012; Bannerman, 2013; Djelassi & Decoopman, 2013). Outsourcing occurs over the Internet, through an open call for participation of users in so-called 'challenges'. The challenges consist of the explanation of a problem to be solved and usually state how the participants should proceed and give their contributions. Where applicable, the challenges also provide information about what will be the reward for the participants who provided the winner solution (Shoyama *et al.*, 2014).

With the definition and use of the term crowdsourcing also comes the use of the 'crowd' prefix to indicate specific processes occurring on the Internet with crowd participation. Generally, the 'crowd' prefix is used to indicate and classify actions based on collective construction performed by a large number of people. Other examples of terms that are using the 'crowd' prefix include 'crowdvoting' and 'crowdfunding', whereupon the first refers to the chosen process of a topic or solution, and the second to the collaborative funding; both occur over the Internet.

Given the characteristics of these crowd-based processes, authors have pointed it as an option for companies that want to promote Open Innovation (OI) (Lima, 2011; Ribeiro, 2011; Frey *et al.*, 2011). The definition of Open Innovation is:

> [...] the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. [This paradigm] assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology. (Chesbrough, 2006).

Figure 1.2 shows the relationship between Open Innovation, crowd-based processes and crowd-design. A crowd-based process has the advantage of recruiting a crowd over the Internet, opening the company boundaries to foster Open Innovation.

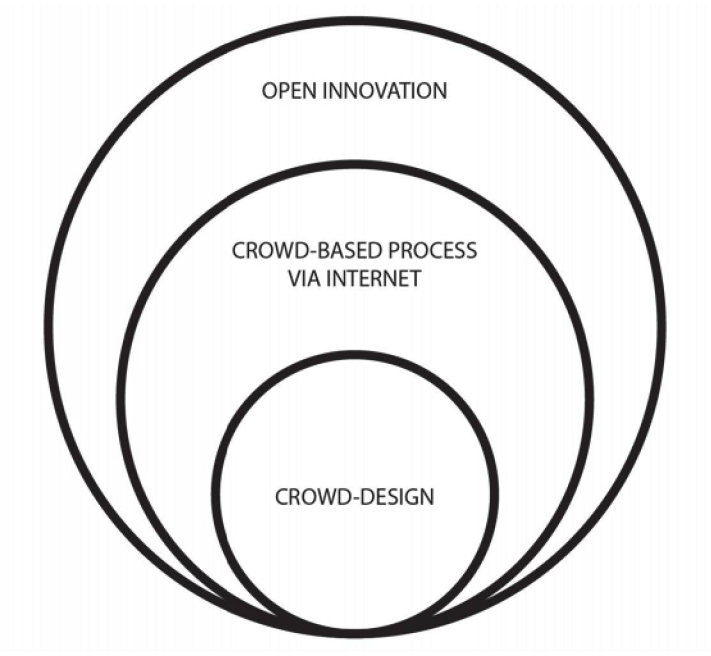


Figure 1.2 – Relationship between Open Innovation, crowd-based processes and crowd-design.
Source: This thesis' author (2018).

Since there are many types of crowd-based processes, and many possibilities of interaction and participation in a crowd-design process, the question that motivates this research is **how to develop sustainable solutions in design by involving the crowd over the Internet**?

1.3 OBJECTIVES

1.3.1 General objective

To propose a reference model of a design process for the development of sustainable solutions with the involvement of the crowd over the Internet. In other words, **to obtain a reference model of crowd-design for sustainability purposes**.

1.3.2 Secondary objectives

The secondary objectives of this thesis include:

- To identify, based on a literature review, (i) the origins and characteristics of crowdsourcing; (ii) the origins and characteristics of crowd-design; and (iii) the linkage between the crowd-design process/initiatives/outcomes and the implications to sustainability;
- To understand alternative approaches to enable the implementation of the crowd-design process in an emerging context;
- To understand the necessary changes in the crowd-design process to enable its implementation in a 'closed challenge', internal to an orgnization context;
- To gather key guidelines for those involved in the development of crowd-design platforms directed to sustainability purposes.

1.4 ASSUMPTIONS

This thesis assumptions are in line with the general and secondary objectives, as presented below.

For the general objective:

- The nature of crowd-design is embedded with some key sustainability principles. Whereas the process of crowd-design promotes the involvement and sharing of information and knowledge of people from different parts of the world and with different skills to solve a common problem, it presupposes, for instance, its potential for the development of governance and social equity. However, it is also assumed that the relation of the nature of crowd-design with the principles of sustainability are not only related to socio-ethical dimension, but also to the economic and environmental dimensions.

For the secondary objectives:

- The review of the state of the art will show that the nature of crowd-design does have direct connections with sustainability principles, and what they are, specifically;
- The precarious access to web platforms, the level of illiteracy among poor people in developing countries will require new approaches to enable crowd-design in these contexts;
- Crowd-design can be applied with the crowd of an organization and still respect its key principles;
- Plataforms of crowd-design for sustainability should adapt their tools and functionalities in order to find mechanisms to evaluate the impacts (social, environmental and economic) generated by the developed solutions.

1.5 RESEARCH SCOPE

The thesis theoretical scope focuses on the themes 'Product Development Process (PDP)', 'crowd-design' and 'Design for Sustainability (DfS)'.

Regarding the PDP, its classic definition found in Pugh (1990) will be adopted. According to the author, PDP refers to:

> [...] Necessary systematic activity, from the identification of the market/user needs to the sale of the product that meets with success to that need – an activity that encompasses product, process, people and organization. (Pugh, 1990, p. XX)

According to this, the PDP is linked to the identification of market needs and the process of fulfilling it. Indeed, according to Clark & Fujimoto (1991), PDP is the process used by organizations to transform data on market opportunities and technical possibilities into valued information for commercial production. In the context of sustainability, however, PDP is concerned with the development of sustainable solutions, balanced regarding the requirements of economic, social, as well as environmental issues. Therefore, a PDP towards sustainability might consider even changes on the market needs instead of accepting them as given.

An example of systematization of the PDP is the reference model proposed by Rozenfeld *et al.* (2006), presented in figure 1.3 (next page).

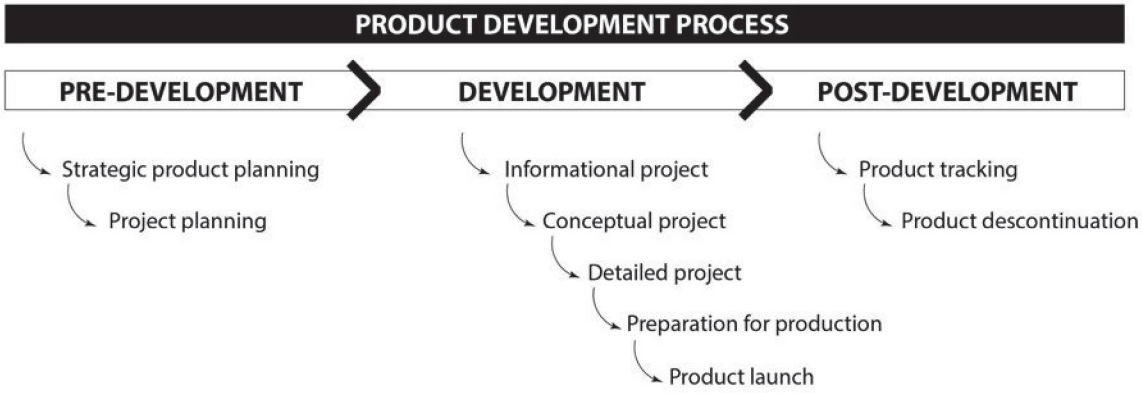


Figure 1.3 – PDP Reference Model.
Source: Adapted from Rozenfeld *et al.* (2006).

The PDP model proposed by Rozenfeld *et al.* (2006) is divided in three macro-phases: 'pre-development', 'development' and 'post-development'. These macro-phases have their own micro-phases, and are independent from each other. Each macro-phase works as sequential and complementary module. According to the authors, this PDP model highlights the integration with the company's strategic planning; integrates the concepts of body of knowledge guide of project management (PMI, 2015) in the project planning phase; defines integrated cycles of detail, acquisition and optimization of products in the detailed design phase; include optimization activities and validation of the production processes and techniques directed to ergonomics and environment; proposes the integrated product launch phase in which technical assistance and sales processes are designed and implemented.

The reference model of crowd-design for sustainability proposed in this thesis uses the Rozenfeld's *et al.* (2006) PDP reference model as its guidance for the analysis of phases and procedures of the process.

Regarding the crowd-design, this thesis seeks to understand its origins, its nature and its fundamental characteristics. Therefore, despite the thesis presenting and citing studies regarding the importance of motivation for participation as a factor of success of crowd-design initiatives, this issue is not the focus. Instead, this thesis presents information regarding the crowd-design process acrchitecture, its main stakeholders and their related activities (tasks), and some studies regarding the benefits and barriers in applying the process. So, to be able to arrive at the reference model proposed, the thesis will dwell on its origins, nature and fundamental characteriscs.

Finally, regarding the Design for Sustainability (DfS), the thesis analyses which ethos are already embedded into crowd-design, and which could be incorporated to the crowd-design for sustainability. This incorporation is suggested after the case analysis.

1.6 BACKGROUND

Crowd-based and open approaches for product development – i.e. crowd-design processes – have brought many new challenges that require scientific investigation. One of such challenges is the new stakeholders' roles in the development of products and services. Indeed, the user is no longer just a consumer but someone that can act as a quality controller, co-producer and/or co-trader. These new roles are not just currently aspired by many stakeholders but interfere directly on their satisfaction (Hara & Arai, 2012; Hara *et al.*, 2013; Djelassi & Decoopman, 2013).

At the same time, crowd-based PDPs bring benefits from stakeholders involvement. Djelassi and Decoopman (2013) call attention to the fact that crowd-based practices tend to become a major management concern because it demands a new set of skills. Managers should be aware that a crowd-based process is not just a promotional marketing tool, but rather a complex process and an Open Innovation engine that provides access to a wide range of innovative capacities. Indeed, as underlined in the cases studied by von Hippel (2005), stakeholders' participation affects the different components of the business model, requiring changes to be made in the current design practices within organizations.

The discussion about the collaboration between stakeholders such as users and suppliers in the PDP is not new. However, due to the emergence of new technologies – primarily Internet-based interaction – the opening of the innovation and product development processes has gained new possibilities for interaction among all parties. This is particularly relevant when dealing with large geographical areas in countries such as Brazil, where a wide involvement of the affected stakeholders is not economically viable through an offline process.

Snow *et al.* (2010) state that there is a growing literature on how companies can benefit from open communities, both online and offline, to develop physical products. The author cites as examples the Franke & Shah's (2003), Baldwin's *et al.* (2006), Fueller's *et al.* (2006) and Hienerth & Lettl's (2011) studies. However, these studies address the practical aspects of crowd-based processes solely from a management

perspective. They do not address the detailed protocols required to develop a crowd-process, as proposed by this thesis. Furthermore, these studies do not address how to integrate sustainability and at the same time maintain the design process ethos.

Some of the arguments in favor of opening up the PDP for crowd participation include the increase on transparency, enabling users and other stakeholders to have a voice in the decision-making and creative process. The case of Procter & Gamble (P&G), cited by Albors *et al.* (2008) and Enkel *et al.* (2009), is an example in which the internal processes of innovation in products were opened through a crowd-design approach. This practice enabled a change in the intellectual property policy of the company, starting to patent their products to the participants of the open processes of product development. A significant change perceived by the company was the fact that, with the opening of proceedings to the crowd, the company increased by 50% the rate of satisfaction of custommers with their products. However, according to Djelassi & Decoopman (2013), despite the growing implementation of crowdsourcing practices in many organizations from different sectors (the authors cite companies such as Lego, Nike, IdeaStorm, among others), this practice is still poorly understood and disseminate.

The adoption of crowdsourcing approaches by the organizations are often time and cost motivated. However, another important motivation that should be considered by the organizations is the fact that when many users are involved in the search for solutions, the chances of a market success of the resulted solution is also more likely. Indeed, Brabham (2010) argues that the involvement of non-experts in problem solving can bring superior solutions and more profitability for organizations. The author believes, furthermore, that the solution development process used in crowd-based processes generates a wealth of data, and the winning ideas contribute significantly to improve the organization's understanding on how people solve a particular problem and such knowledge can be a source of inspiration for further innovation initiatives. From a sustainable perspective, an open PDP could benefit the socio-ethical, economical and environmental issues.

The case of P&G illustrates the advantages of using crowdsourcing for innovation: before the proceedings were open, the company used only 10% of its innovative capacity (Albors *et al.*, 2008). However, the authors emphasize that, for this process to provide sustainable results, it depends on the encouragement and motivation offered to participants. Enkel *et al.* (2009) point to the occurrence of competitive

disadvantage for companies that do not take the opportunity to innovate with crowd participation because, "the greatest innovation is based on a recombination of existing knowledge, concepts and technology" (Enkel *et al.*, 2009, p. 314).

In spite of its many advantages in fostering potencial innovation towards sustainability, crowd-based approaches also carry potential risks of generating conflict with sustainability principles and ethos. One such risk is the adoption of crowd-based approaches in order to merely reduce costs for designing and production. Massanari (2012) analyzed five crowdsorucing platfoms which focus on graphic design projects with the aim of claryfying changes taking place in what he called "crowdlabor", i.e., desing by professional designers through a crowd-process. What he found was that designers participating in such processes were more likely to receive reduced wages as compared to US market values. Bannerman's (2013) study with design organizations showed that they are already taking action against such practices that contemplate only cost reduction by cutting on labor wages for designers. One exemple is the SPEC NO! organization, formed by designers to protest against unfair competition in the labor market, specially in ofter recurring situations in which designers present projects without a garantee of payment. Massanari (2012) is right when he concludes that companies using crowdsourcing platfores are often unaware of the full potential of desing on the creation of value.

With the global shift to Open Innovation, crowd-based practices are growing in importance. While it is an interesting resource for companies, it is still a complex proceedure and gives rise to many questions (Hopkins, 2011). The consulted literature during the development of this thesis has not pointed to other research study that consider the question of how and why an open model of development of products over the Internet – as is the case with crowd-design – can be directed to tackled sustainability issues.

In this context, the present study aims at contributing to our understanding of the barriers and opportunities for sustainability in implementing crowd-design processes in organizations where a closed PDP is more widespread. Despite the verified existence of crowdsourcing practices, until the submission of the present document no studies that explain the effectiveness of these processes for sustainable design have been identified. Nor studies on these practices have been found that address the issue of product development in a model that can be customized and that reflect the phases of

questioning, ideation and implementation through an open and web-based design process.

1.7 RESEARCH STRATEGY OVERVIEW

1.7.1 Main phases of the research strategy

In order to accomplish the research objectives, the thesis follows three main phases: (i) the preparation phase; (ii) the main data collection phase and (iii) the completion phase, as illustrated on figure 1.4.

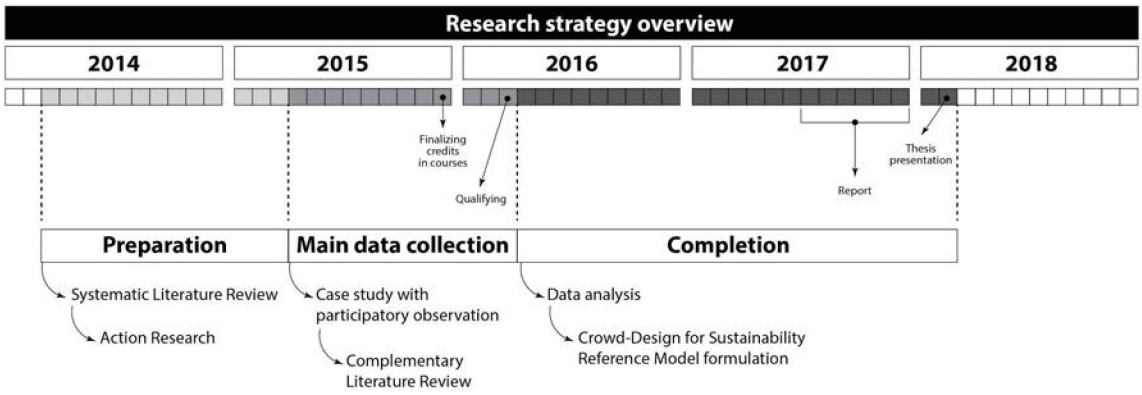


Figure 1.4 – Research Strategy Overview.
Source: This thesis' author (2018).

According to figure 1.4, the work started in March of 2014 and was completed in February of 2018. Thus, the preparation phase went from March of 2014 to March of 2015, and corresponded to the development of the first Systematic Literature Review (SLR) and the application of the Action Research method. The main data collection phase was carried out from April of 2015 to March of 2017 and corresponded to the development of the case study and the second Systematic Literature Review (SLR). Thus, from April of 2017 to February of 2018 the preparation of the reference model and of this document was done. The following subtopics present the detailed content of each phase of the thesis' development.

1.7.2 The preparation phase

In the preparation phase it was necessary to carry out a Systematic Literature Review (SLR) in search for the state the art on topics such as crowdsourcing, crowd-design and Design for Sustainability (DfS). This review has focused not only on

understanding the design process associated with these three topics but, more particularly, the relationship between the principles of DfS and crowd-design.

In order to enable a better understanding of the research problem, the field research included the development of a pilot study on crowd-design. This pilot study was carried out through an Action Research method to apply the first open challenge[2] at the innonatives.com platform. As mentioned before, the platform was one of the results of the Sustainability Maker Project (SuM). Because of it, the crowd-design process adopted the general method embedded in the innonatives.com platform. Given the acquired knowledge gathered on this pilot study, it has been possible to plan the development of a participatory case study, which was a central activity of the 'main data collection phase', as described on the next subsection.

1.7.3 The main data collection phase

This phase referred to a case study with participant observation that included the planning, development and implementation of a crowd-design process within a large-scale organization. It intended to verify the changes needed in the crowd-design process when applied in a different context from the pilot study. The partner organization consisted of a large-scale manufacturing company, located in Joinville, in the state of Santa Catarina, in the Southern Region of Brazil. The crowd on this case study consisted of all 500 employees working on the administrative area of this company. Thus, during an entire year, the internal crowd-design process was planned and carried out. The crowd-design process used as reference was the SuM Project process and the innonatives.com platform. Along this phase, a complementary Systematic Literature Review (SLR) has been conducted in order to verify newer studies mainly regarding crowd-design and DfS subjects.

1.7.4 The completion phase

This phase started in early 2017, when all results from the literature review and field studies has been compiled to form the reference model of crowd-design for sustainability. The analytical strategy consisted of a comparative analysis of the two cases. This analysis focuses on information about the content and sequence of phases of

[2] The pilot study carried out for this research was the first challenge to be completed at the innonatives platform (Sustainability Maker, 2015, web).

the process and its duration, as well as who were the people (stakeholders) involved and what were their main roles. Most importantly, on this phase the analysis focused on the integration of sustainability principles with the design process and the end results.

1.8 KNOWLEDGE CONTRIBUTION

Bonsiepe (2012, p. 19) argues that the intensity of the current scientific, technological and industrial flow of innovations demands the generation of new knowledge from the perspective of design, particularly that knowledge that relates to the development of solutions for complex problems. When considering the advancement of Information and Communication Technology and web technology, Vancza *et al.* (2011) argues that dealing with the real world complexity it is not a choice anymore, but a necessity. Hence, the present thesis intends to contribute to the theoretical-methodological advancement of the design field regarding this complexity, particularly regarding the development of solutions towards sustainability.

Whilst crowd-based approaches do offer great opportunities to develop sustainable solutions, the theme is still an evolving issue, with many unanswered questions (Hopkins, 2011). There is still little understanding on how to enable the crowd to get involved in the design process of a crowd-based process and getting a sustainable solution as a result. The freedom and voluntary nature of crowd-design and the intrinsic diversity present in the crowd does not necessarily guarantee that resulting solutions will be guided by sustainable principles. Hence, the challenge tackled on this thesis is to devise an alternative approach to use crowd-design that will avoid the negative social, environmental and economic impacts observed on conventional design processes. With this statement, one is not saying that the conventional design process is all bad. The argument here is based on the necessity to adapt to the rapid changes occurring in social behaviour influenced by the impact of the ICTs advances.

This way, this research also contributes to update and improve the design process when dealing with the complexity that characterize sustainability challenges (Cardoso, 2012; Bonsiepe, 2012; De Moraes, 2010). A Systematic Literature Review has shown so far no studies that propose a reference model or taxonomy of PDP to be applied through the Internet – as in the case of crowd-design. Most reference models for the PDP, such as the one proposed by Rozenfeld *et al.* (2006), have not considered the peculiarities of crowd-based approaches. The thesis presents a contribution to enhance

the validity of such models by identifying areas for improvement and adjustment, thus enabling the development of a structure for a teaching syllabus that integrates those existing on PDP and new knowledge coming out of crowd-led approaches.

1.9 THESIS STRUCTURE

The thesis is organized in five chapters:

Chapter 01 (the presented chapter) contextualizes and delimits its scope as well as presents the objectives and an overview of the research strategies that have been used. It also presents the knowledge's contribution proposal based on the results obtained, and guides the understanding of the subjects that are presented and discussed in the second chapter.

Chapter 02 presents the theorectical framework which is divided in three main topics: (i) crowdsourcing, (ii) crowd-design; and (iii) the sustainability ethos embedded in crowd-design. This is the theoretical background which provided the criteria and parameters for the analysis of the studied cases.

Chapter 03 presents this research philosophical approach, which guides the choice of the applied research methods: (i) Systematic Literature Review, (ii) Action Research, and (iii) Case Study with Participant Observation; and the data analysis strategy.

The results obtained on the field study – i.e. the Action Research and Case Study with Participant Observation results - and its analysis are presented in chapter 04.

Chapter 05 presents the main conclusions regarding the research question and objectives, as well as considerations associated with the applied research method and the crowd-design reference model as its result.

2. THE CROWD-BASED PRODUCT DEVELOPMENT PROCESS IN THE CONTEXT OF SUSTAINABILITY

This chapter is divided in three main subsections: the first, **2.1 Crowdsourcing**, addresses the origins, definitions and characteristics of the crowd-based processes; the second, **2.2 Crowd-design**, reviews the key characteristics of the crowd-based product development process. Finally, the third section, **2.3 Sustainability ethos embedded into crowd-design**, places crowd-design into the context of sustainability.

2.1 CROWDSOURCING

2.1.1 Definitions

A crowd could be defined as a set of people who organizes itself around a common purpose, emotion, or experience (Prpic *et al.*, 2015). The size of the crowd is important for a collective action, but the size also depends of the purpose of the action (Lee *et al.*, 2015). As such, a crowd-based process is not always seen as a positive occurrence but more often associated negatively with riots, a mob mentality, or looting, for instance. However, nowadays, the crowd has been seen in a more positive manner (Wexler, 2011), because it has become useful and viable to work with large amounts of people after the advent of the Internet.

The combination of the terms 'crowd' and 'outsourcing' brought the concept of crowdsourcing – where the crowd can contribute for the development of a particular task. On the crowdsourcing approach the wisdom and work power required to perform a given activity can be gleaned from crowds (Surowiecki, 2004) leading to superior results than isolated individual work (Majchrzak & Malhotra, 2013).

There have been many attempts to define crowdsourcing. However, to date, there is no commonly accepted definition or taxonomy (Simula & Vuori, 2012; Simula & Ahola, 2014). Howe (2006) popularized the term crowdsourcing and defines it as the act of a company or institution to outsource a function, usually performed by its employees, to an undefined network (and generally large) of people in the form of an open call. A more generic definition is presented by Estellés-Arolas & González Ladrón-de-Guevara (2012, p. 355), referring to it as the "act of outsourcing a task to a 'crowd', rather than an 'agent' designated as contractor, in the form of an open invitation". A crowdsourcing initiative can be done collaboratively or by single individuals (expert or novice). The fundamental prerequisite is the use of an open and wide call (Djelassi & Decoopman, 2013).

According to Prpic *et al.* (2015), crowdsourcing happens mostly online, but not exclusively so. When it happens online, it can be understood as an approach for distributed problem-solving (Brabham, 2008), asking the crowd for contributions that can help organizations develop solutions to a variety of business challenges. On this context, Geiger *et al.* (2011) and Geiger & Schader (2014, p. 01) consider the term as an umbrella for approaches that "harness the diverse potential of large group of people via an open call for contribution over the web". Considering what type of contributions is required from members of the crowd and how these contributions will collectively help find a solution to the problem (Prpic *et al.*, 2015). Crowdsourcing activities could (a) target a specific group (Geiger *et al.,* 2011); (b) be open to anyone; (c) the participation is directed only to those who meet specific qualifications (ex: skills, knowledge, or certain specific contexts).

Due to such characteristics the term crowdsourcing can also be found as similar to 'Internet-based innovation', 'prosumers and lead-user innovation', 'open innovation' (Stanoevska-Slabeva, 2011; Tischner & Beste, 2017) and 'open source software innovation' (Stanoevska-Slabeva, 2011) and 'peer production', 'collaborative systems', 'community systems', 'collective intelligence', and 'mass collaboration' (Simula & Vuori, 2012). These latter authors also cite 'user innovation' and 'customer empowerment' as expressions associated to crowdsourcing.

Stanoevska-Slabeva (2011) argues that there are three main differences between open innovation and crowdsourcing, namely: (i) open innovation is a process initiated only by companies (given problems), while crowdsourcing can also be initiated by the crowd (open problems); (ii) open innovation is always applied to innovation, while crowdsourcing can be applied also within other organization processes such as marketing; and (iii) open innovation is based on conventional means of communication (but not only) while crowdsourcing is dependent on Information and Communications Technology (ICT) as a necessary mean for attracting and hosting the activities of the crowd. Stanoevska-Slabeva (2011) presents a figure that shows the relationship among different approaches of Internet-based innovations. According to the scheme presented on figure 2.1 (next page), crowdsourcing appears as a process that only occurs in an online way and is associated to the open source communities – that is why it is also associated to the ICT. Crowdsourcing is also linked to "user lead innovation" – which corresponds to the innovation process started by the user.

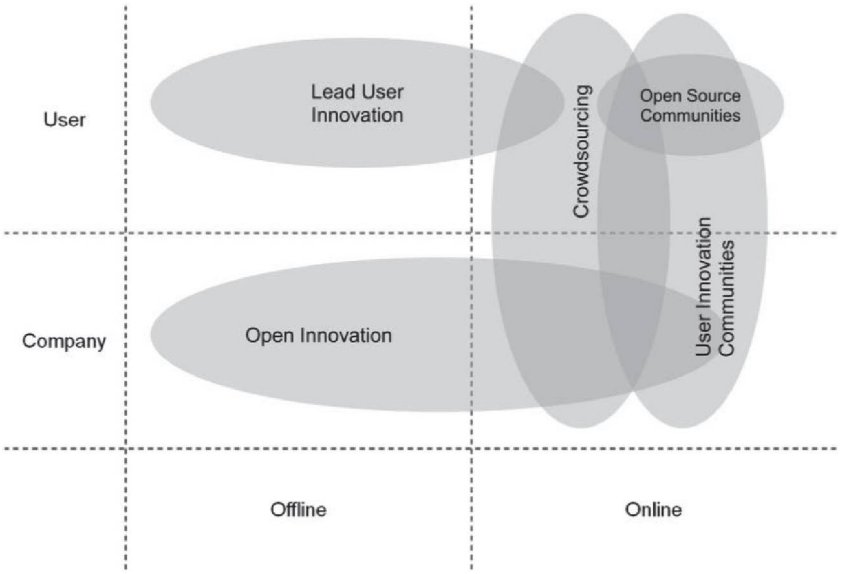


Figure 2.1 - Interrelationships among different approaches for Internet-based innovation. Source: Stanoevska-Slabeva (2011, p. 11).

According to the generic definition of crowdsourcing, its main initiators are organizations. However, online platforms, which support the sharing and collaborative creation of user-generated content, in many cases, provide suitable environments where users can become the initiators of crowdsourcing as well. This is the case with the Social Media platforms, such as Facebook. On the other hand, crowdsourcing can also be a tool to the open innovation process led by organizations, when it occurs over the Internet.

Considering that the definitions of crowdsourcing presented do not cover all crowdsourcing characteristics and possibilities, this thesis will adopt the following generic definition: **crowdsourcing refers to the Internet-based process which occurs in an online environment, that aims to optimize the use of knowledge and skills of the crowd to accomplish tasks to meet innovation/market/social demands** (where '/' means 'and/or').

2.1.2 General issues regarding the application of crowdsourcing

On a recent study, Thuan *et al.* (2016) present a theoretical framework to support the decisions to be taken by an organization to undertake a crowdsourcing project, after the decision of what kind of solutions is needed (information, products, services, among others). According to the authors, the decision is based on four codependent aspects: (i) the **online environment,** where the crowdsourcing process happens; (ii) the viability to

manage the crowdsourcing project, i.e. to plan and to coordinate the task and the crowd's participation; (iii) the characteristics of the **crowd** that may be working on the task; (iv) the **task** to be crowdsourced. The relationships between these aspects suggests that the decision-making process to carry out a crowdsourcing project is based on a predetermined sequence, in which the first decision to be made is of which crowd's contributions are desired.

Further in this section, there is a topic-section that covers the crowdsourcing tasks in detail. For now, and according to the aspects pointed by Thuan *et al.* (2016), there are six **tasks'** properties related to the decision of an organization to crowdsource:

(I) Online *vs.* Offline: it is related to how the task delivery will occur. In most cases analyzed by Thuan *et al.* (2016), the delivery occurred through the Internet. But in one case, a crowdsourcing task was not done over the Internet, but deployed through physical structures;

(II) Integration with existing Business Process: since crowdsourcing is being used to also solve complex tasks, such as in product development, to integrate the task with existing business processes became extremely important;

(III) Interactive vs. Independent: some tasks do not need interaction of the crowd, in other words, the tasks are simpler from the involved crowd's point of view. Whereas other tasks may need direct interaction in order to be completed;

(IV) Delineation (Easy *vs.* Hard): a clear delineation helps the crowd understand and approach the task on an easier manner, which maximizes the potential number of contributions;

(V) Confidential *vs.* Non-Confidential: if the task involves some confidential issues, then there are two possibilities: to carry out an 'internal crowdsourcing', or to decompose the task into other small tasks to conceal the overall picture, thus decreasing the likelihood of privacy breaches and claims regarding intellectual property;

(VI) Partitionable *vs.* Non-Partitionable: if a task is partitionable than it is easier to delineate and protect it in legal terms (as presented on item V). That means, a complex problem can be divided into small tasks in order to enable its complete solution and avoiding unveiling confidential issues.

The **crowd** is one of the key stakeholders in a crowdsourcing process (Geiger *et al.*, 2011). On this way, as of the decision-making of carrying out a crowdsourcing project, the organization has to know what kind of users it wants to involve in it, and

also that this crowd has to have Internet access (directly or mediated) (Thuan *et al.*, 2016). Those aspects, in addition to the task to be crowdsourced, may also influence the possibilities of the crowd's participation.

Thuan *et al.* (2016)´s management framework focuses on four main factors: (i) the project budget, (ii) the availability of expertise to manage the crowdsourcing activity, (iii) level of acceptance, and (iv) commitment of the organization's employees. As of the budget factor, it is important to consider not only the amount to be paid to the crowd (as a reward for accomplishing the task) but also the costs with coordination and transactions. This coordination, however, has to be made by experts on this subject (crowdsourcing). Hence, a well-planned and developed crowdsourcing project leads to higher level of acceptance by the crowd and, also, a higher level of employees' commitment.

Finally, Thuan *et al.* (2016) present the issues regarding the **online environment**, in other words, the kind of Internet-based platform to carry out the crowdsourcing project. The authors point out that using an agent platform rather than having their own, could decrease the development costs, which makes the decision to crowdsource become more attractive.

Summarizing this content, figure 2.2 presents a review of the framework presented by Thuan *et al.* (2016), relating the crowdsourcing management aspects to its key stakeholders (i.e. crowd and online environment) and the crowdsourcing tasks.

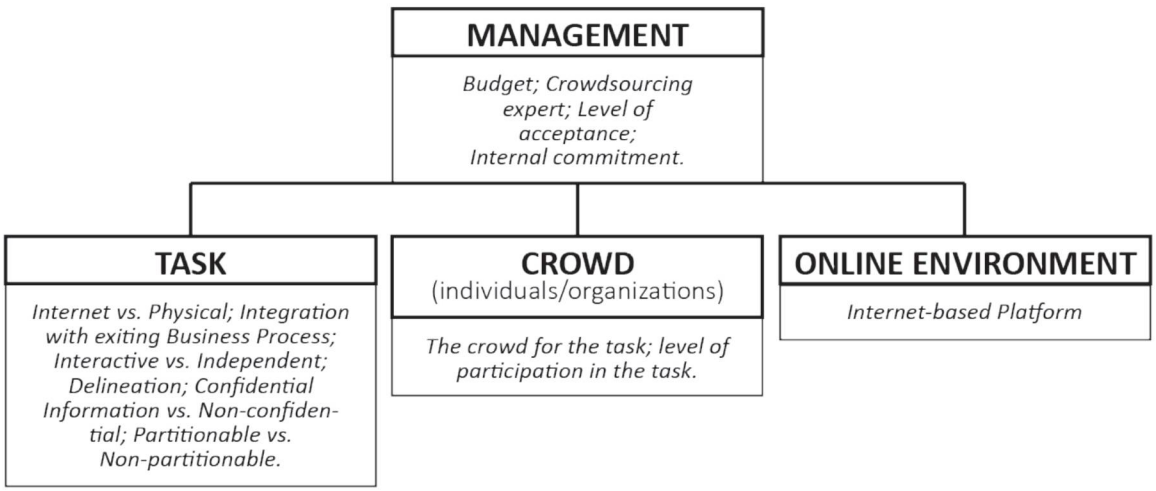


Figure 2.2 – Aspects related to the decision on running a crowdsourcing project
Source: Based on Thuan *et al.* (2016).

As earlier mentioned, the studies about the crowd approach mainly focused on offline modes of participation (Prpic *et al.*, 2015). Research on Internet-based participatory processes showed a sharp to increase after 2008. Since then it has been found that crowdsourcing can be applied in many different areas, such as industry (Bjelland & Wood, 2008; Berthon *et al.*, 2008; Friesike *et al.*, 2010; Dubach *et al.*, 2011; Geiger *et al.*, 2011; Choi & Lee, 2015, Evans *et al.*, 2015), service-based companies (Vukovic, 2009, La Vecchia *et al.*, 2010, Osamuyimen *et al.*, 2010) and the public sector (Brabham, 2009; Goodchild & Glennon, 2010; Zook *et al.*, 2010).

Choi & Lee (2015) present crowdsourcing as the main type of contemporaneous approach for user participation in the innovation process. As a matter of fact, from a total of 149 publications they found on user innovation literature, 78 are related to the use of crowdsourcing practices. In this type of innovation, organizations are using non-expert crowd in the open innovation process. Firms in manufacturing, such as the computer, automotive, and information and communication industries, prefer to use crowdsourcing or idea competition as a strategy for achieving user involvement in the innovation process. The same happens for the design of products (see table 2.1). The authors also point out that just a few firms in service industries have adopted ideas from users through crowdsourcing processes.

Table 2.1 – Part of the results of a Systematic Literature Review on User Innovation.

	The number of cases
Types of Users	
General Users	11 (50,0%)
User Community	6 (27,3%)
Innovative Users	2 (9,1%)
Lead Users	1 (4,5%)
Expert Users	1 (4,5%)
Types of Industry	
Manufacturing	13 (59,1%)
Information and Communication	6 (27,3%)
Financial and Insurance activities	1 (4,5%)
Construction	1 (4,5%)
Type of Tools	
Crowdsourcing	9 (83,3%)
Competitions (idea contest, idea competition)	8 (16,7%)
Open Platform	1 (4,5%)
Lead Users Method	1 (4,5%)

Source: Adapted from Choi & Lee (2015).

Evans *et al.* (2015) also cite industrial applications of crowdsourcing including the field of astronomy – Galaxy Zoo (www.galaxyzoo.org), which aims for participants to

help understand how galaxies are formed and how they may be classified by shape; and, in the field of internet maps – OpenStreetMap (www.openstreetmap.org), which provides user-generated mapping applications that are maintained by web contributors from around the world. In the Academy, one success story is in the University of Washington, where researchers spent over a decade attempting to decipher protein data. Within three weeks of crowdsourcing user-contributed ideas, they had solved their specific problem, as a result of receiving over 57,000 contributions from members of the crowd.

In the service industry, Vukovic *et al.* (2013) developed a crowdsourcing methodology, based on electronic questionnaires, which were circulated to disperse respondents to assist the researchers in solving service-related problems. Within the civil engineering field, Sonnleitner *et al.* (2013) proposed a centralized Internet-based application to allow employees to contribute and access assessment records relating to buildings and structures.

In the field of product development, Yu & Nickerson (2011) proposed a sketch combination system, which was tested by 1047 participants. Each member of the crowd submitted sketched designs of chairs for children whilst other crowd members evaluated the contributions; this allowed the problem owner to develop a new product entirely through interactive crowd-based process.

The application of crowdsourcing can also be characterized according to the **initiator of the crowdsourcing project**. Gassmann's *et al.* (2010) and Stanoevska-Slabeva's (2011) studies mention many categories, among which are the 'organization initiated crowdsourcing' and 'user initiated crowdsourcing'. The other categories mentioned by the authors, however, are related to the kind of online environment, and can be 'intermediary platforms' and 'idea marketplaces'. Due to these latter two categories being more related to the online environment where the crowdsourcing process occurs, they will be covered in the next subsection, *2.1.3 Typology of crowdsourcing strategies*. Still, it is possible to infer that there are three possibilities for the crowdsourcing initiator, as shown on table 2.2 (next page).

Table 2.2 – The different possibilities of initiator of the crowdsourcing process.

INITIATOR OF THE CROWDSOURCING PROJECT	
ORGANIZATION	An organization (including organizations from several sectors and also the Government), which creates and maintains its own crowdsourcing platform, initiates the crowdsourcing project.
AGENT	Crowdsourcing platforms that initiate the crowdsourcing project and manage its process.
INDIVIDUAL	Individuals from the crowd can initiate a crowdsourcing project and manage its process. This approach is commonly found in user websites and open source communities.

Source: Based on Gassmann *et al.* (2010) and Stanoevska-Slabeva (2011).

Those categories, however, are related to the kinds of tasks prompted by the crowdsourcing initiative and also to the characteristics of the crowd. Different categories imply usage of different crowdsourcing typologies. This content is addressed in the next subsection.

2.1.3 Typology of crowdsourcing strategies

Considering an organization as the crowdsourcing initiator, Simula & Ahola (2014) present a study that classifies the crowdsourcing approaches as **internal** or **external**. The authors call attention to the fact that if an organization is sufficiently large and heterogeneous, its pool of employees can also act as a crowd. In this sense, large multinational corporations like IBM frequently and systematically involve large amounts of employees to generate innovative ideas (Bjelland & Wood, 2008). Thus, the 'internal outsourcing' cited by Afuah & Tucci (2012) can be called as internal crowdsourcing (Villarroel & Reis, 2010; Vukovic, 2009, Simula & Ahola, 2014).

Internal crowdsourcing leverages the potential of a heterogeneous crowd of employees since they have tacit knowledge about the customer's, product and service, production processes, and many other areas that are vital to the organization's competitiveness. On this approach each employee has potential to contribute to the innovation process and help solve business and technical problems that are converted into crowdsourcing tasks (Villarroel & Reis, 2010; Vukovic, 2009; Simula & Ahola, 2014). Yet, when an organization is the initiator of the challenge, external crowdsourcing happens when external participants accomplished the tasks (i.e. individuals and organizations). Therefore, according to the characteristics of the external participants, a crowdsourcing initiative can be classified either as 'open' or as 'community-based' (Simula & Ahola, 2014).

While on the community-based crowdsourcing the participants are chosen according to their specific skills and knowledge, in the open crowdsourcing there is no pre-selection and the call is open to anyone who wants to participate (Geiger *et al.,* 2011; Simula & Ahola, 2014). Nevertheless, even in an open crowdsourcing initiative, it is possible to include a minimum criterion for allow participation, , for example, having a formal design degree or having design skills.

Since the employees of an organization can also be considered a crowd (Simula & Ahola, 2014), it can be said that the internal crowdsourcing can also be classified according to the employee's' specific knowledge and skills, or even the role each employee plays in the organization. Figure 2.3 shows a proposition of Simula & Ahola's (2014) for a classification of crowdsourcing initiatives when an organization is the crowdsourcing initiator.

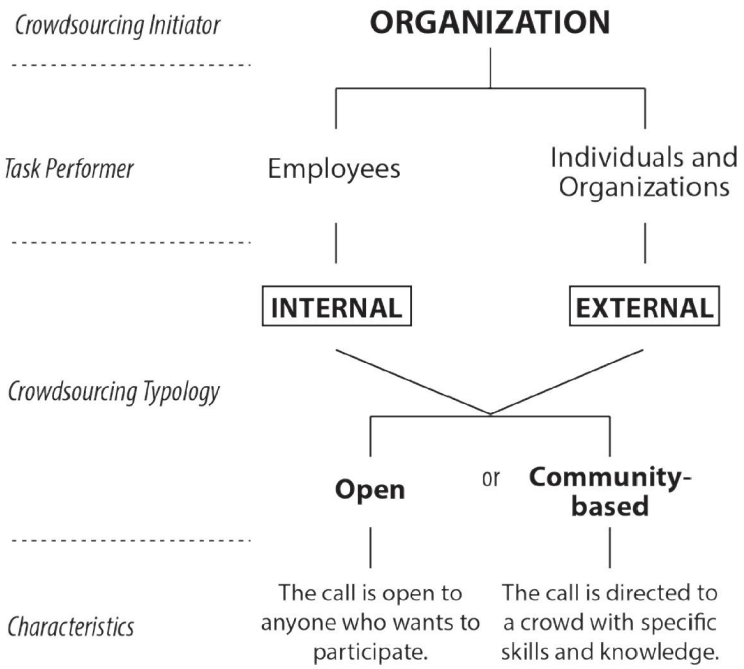


Figure 2.3 – Possibilities of crowdsourcing when an organization is its initiator.
Source: Based on Simula & Ahola (2014).

Simula & Vuori (2012) investigated the benefits of carrying out internal crowdsourcing, concluding that it can (i) engage a large group of participants to engender transparency and to increase knowledge flow between the company's internal functions; (ii) increased proximity among employees located in different parts of the world; (iii) less time consumed with issues associated with intellectual property rights;

and (iv) less issues involving business secrets. The barriers are related to the importance of having a clear communication process regarding the task, and taking time from other everyday tasks that are perceived as more critical, i.e. the risk of crowdsourcing being labeled as an extra activity (Simula & Vuori, 2012).

Due to the fact that the crowdsourcing interactions happen mainly through the Internet, its classification can also be given regarding the characteristics of the online environment where the crowdsourcing initiative is carried out (Stanoevska-Slabeva, 2011; Simula & Ahola, 2014). The crowdsourcing initiator can decide if the process will occur on its own Internet-based platform, or via 'intermediary platform' and 'idea marketplace' (Simula & Ahola, 2014). In this case, a particular type of organization connects, through a virtual community, potential problem solvers with organizations that look for new ideas or specific solutions to their problems. Simula & Ahola (2014) call attention to the fact that this type of crowdsourcing avoids risks like revealing future plans, and potentially compromising intellectual property positions, because the agent can hide the identity of the crowdsourcing initiator.

Crowdsourcing initiatives have gained increasing interest among the professional and academic community, with further developments occurring over time and specific applications being developed according to the intended purpose with the crowd. Due to the different possibilities of using crowdsourcing such as generating knowledge, market research, idea development, brand creation, solving problems or fund raising (Stanoevska-Slabeva, 2011; Simula & Vuori, 2012), table 2.3 presents the different typologies of crowdsourcing found not only in the scientific literature, but also found in some platforms on the web.

Table 2.3 - Typologies and characteristics of the crowdsourcing process.

TYPOLOGY	CHARACTERISTICS	AUTORS
Crowdfunding	Is basically a process where gets the financing of a given project through small contributions from individuals, which together contribute to enable the execution of this project.	Bannerman (2013); Djelassi & Decoopman (2013).
Crowdvoting	Vote that usually occurs through websites that seek to obtain the opinion of a large number of people about a particular topic.	Beherend *et al.* (2011); Bannerman (2013); Djelassi & Decoopman (2013).
Crowdopinion	These initiatives try to get the feedback from users about a topic or product.	Estellés-Arolas (2016).
Crowdlabor or Crowdwork	Process that takes advantage of the wide distribution of online works available to fulfil a number of tasks, from simple	Crowdsourcing.org (2014);

	to the most complex.	Ross *et al.* (2010); De Toni *et al.* (2012).
Crowdcreativity or Crowdcreation	Process that takes advantage of the large number of creative talents to design and develop original art, media or content. This is used to play in online communities of thousands of creative products and to develop original concepts, including photography, advertising, cinema, video production, graphic design, clothing, household goods and branding concepts.	Crowdsourcing.org (2014).
Crowdlearning	Often associate to the Massive Open Online Course (MOOC), this kind of crowdsourcing aim to offer a large number of students the opportunity to expand their knowledge in a co-production process.	Jaaman *et al.* (2013); Llorente *et al.* (2015).
Crowdsharing	A task that involves the sharing of a resource from others in an online community rather than the renting or purchasing of it from another company.	Nakatsu *et al.* (2014).
Crowdwisdom	Crowdsourcing which refers to collective intelligence.	Howe (2006); Geiger *et al.* (2011).
Crowdcasting	The neologism created from 'crowdsourcing' with 'broadcasting'. It proposes the crowd a problem or a specific task to be done, being rewarded that who solves it first or do it better. It is a competition-like event.	Eboli (2011); Estellés-Arolas (2016).
Crowdteaching	The lecturing staff share and put together lecturing material in an online platform.	Llorente *et al.* (2015).
Crowdcollaboration	In this crowdsourcing type, unlike crowdcasting, there is a communication among the participants of the crowd, whereas the crowdsourcer (the initiator of the process) does not get too involved. The crowd brings its knowledge to solve problems or raise ideas collaboratively. Normally, there is no financial reward, being the intrinsic motivation the key. Two different subtypes can be found, which differ in the ultimate goal to achieve.	Estellés-Arolas (2016).
Crowdstorm	It is one of the Crowdcollaboration type. Refers to the process used to generate ideas. Unlike the brainstorming process, crowdstorm is conducted online and made by the crowd. And it may be simple, that only demand solutions to a given problem, and more complex where people can interfere with the solutions given by others, building bigger and better ideas. Different ideas are proposed and the crowd participates with their comments and votes.	Abrahamson *et al.* (2013); Estellés-Arolas (2016).
Crowdsupport	It is the other one of the Crowdcollaboration type. In this kind of initiatives, customers themselves solve the problems or doubts of other customers. Therefore, they don't have to resort to after-sales services. The main difference in these initiatives is that they seek help.	Estellés-Arolas (2016).

Source: This thesis' author (2018).

Since crowdsourcing is a contemporaneous phenomenon, its application fields may not be exhausted yet. Hence, it can be inferred that many other 'crowd' terms may appear in the future. However, for the purposes of this thesis, those types of crowdsourcing can be held separately or combined; it depends on the objective of the

task (Prpic *et al.*, 2015). Thus, it is considered hybrid the process that uses more than one crowdsourcing typology.

Next subsection presents a generic crowdsourcing architecture and process, including the possibilities of tasks and stakeholder configuration.

2.1.4 Generic architecture of a crowdsourcing process

2.1.4.1 The generic process of crowdsourcing

From the generic crowdsourcing definition adopted in this thesis (earlier presented in subsection 2.1.1), in addition to the content presented so far, it is possible to identify five key elements on which a crowdsourcing process is based: (i) the crowdsourcing initiator; (ii) the online environment; (iii) the task; (iv) the solution and (v) the task performer. In addition to these elements, Hosseini's *et al.* (2015) and Oliveira's (2017) studies proposes an additional element: (vi) the reward. Figure 2.4 illustrates the relationship among these six elements.

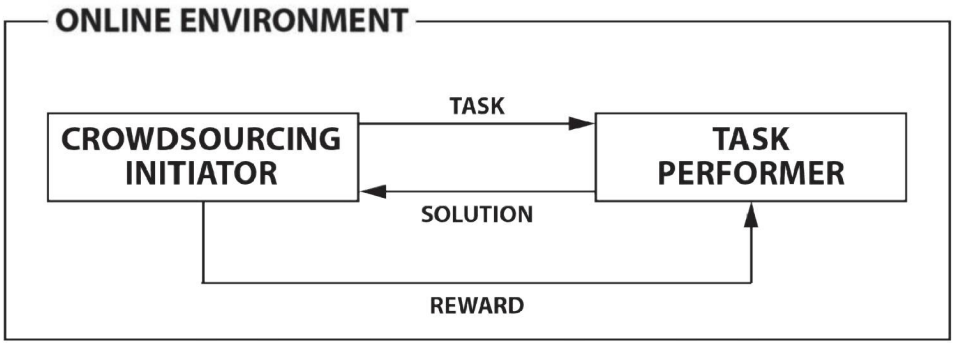


Figure 2.4 - Relationship between the crowdsourcing elements.
Source: This thesis' author (2018).

According to the scheme presented in figure 2.4, this generic crowdsourcing process happens in four basic steps and can be applied to all crowdsourcing types (Nakatsu *et al.*, 2014; Choi & Lee, 2015):

- **Step 1 - THE DEMAND/THE NEED:** the crowdsourcing initiator identifies a specific task to be performed or problem to be solved. As seen earlier, the crowdsourcing initiator can be an organization, an individual or an agent that represents a client (Gassmann *et al.*, 2010; Stanoevska-Slabeva, 2011);

- **Step 2 - THE CALL:** the crowdsourcing initiator broadcasts the task or problem through an online environment (Internet-based platform). As seen earlier, this call can either happen internally or externally in an organization. In both options, however, the call can be open or directed to an specific crowd (Simula & Ahola, 2014);
- **Step 3 - THE TASK COMPLETION:** the crowd performs the task through the online environment. The tasks are related to the crowdsourcing typologies and can also depend on the nature of the task (a further topic addresses the tasks' issues). Once the task is accomplished, the crowdsourcing initiator can either: sift through the solutions and select the best solution, or aggregate/synthesize the crowd's submissions in a meaningful way;
- **Step 4 - THE REWARD:** as Geiger *et al.* (2011) and Hetmank (2014) argue, the participation in a crowdsourcing process is voluntary in its nature but it doesn't mean that there isn't a monetary reward or payment that motivates such participation.

This generic process can be detailed according to four dimensions, as pointed by Geiger *et al.* (2011), namely: (a) characteristics of the task performer, (b) possibilities of participation of the task performer, (c) characteristics of task accomplishment, and (d) characteristics of the reward, as detailed on figure 2.5.

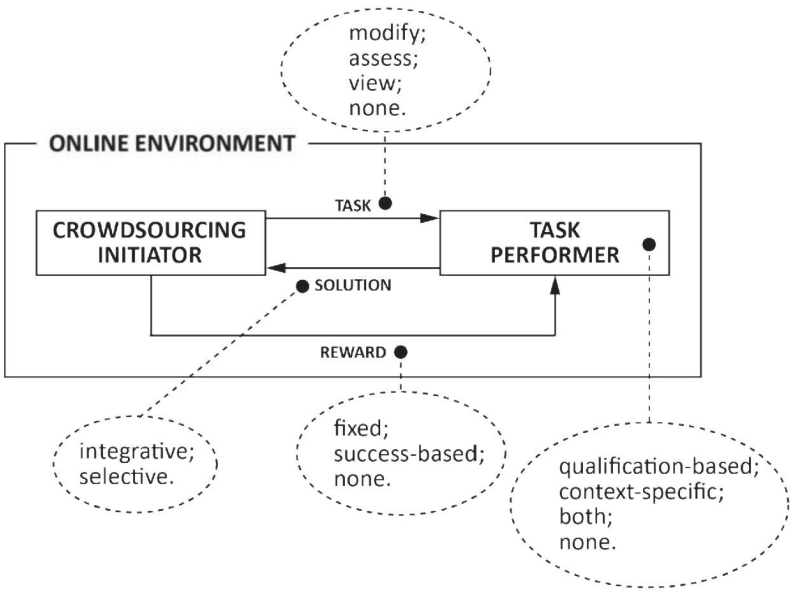


Figure 2.5 – The he crowdsourcing and its variables.
Source: Based on Geiger *et al.* (2011).

According to Geiger *et al.* (2011), there are four possibilities for the first dimension – characteristics of the task performer. One of which is (i) selecting the participants, the other one is (ii) not performing selection, and the third one is the (iii) combination of the other two. Thus, on the 'qualification-based' approach, the crowdsourcing process requires their participants to demonstrate certain knowledge or skills before being allowed to accomplish the task. When some organizations restrict the crowd that is allowed to contribute to their own employees or to their customers, then the 'context-specific' approach happens – this is associated to available implicit knowledge or privacy concerns and also to get their customers' opinions only. Thus, the 'qualification-based' type can be associated with the Simula & Ahola (2014) proposition of the crowdsourcing community-based type. Also, the 'context-specific' can be associated to the internal crowdsourcing (when the participation is restricted to the organization employees) and to the community-based type, too (when the crowdsourcing process is directed to a specific group such as the organization´s customers).

According to Djelassi & Decoopman (2013), each crowdsourcing operation formally specifies the scale and nature of the crowd participation. This formal process helps to guide the crowd recruitment, focusing on the individuals that are motivated and have the necessary skills to participate. The level of information that will be provided to them directly affects the possibilities of participation of the task performers. The four main possibilities are 'none', 'view', 'access' and 'modify'. Contributions are only visible to the crowdsourcing initiator, though they may be revealed after the process is over. In other cases, the participants can see the contributions from each other. However, if a crowdsourcing process uses a means of rating or commenting on other contributions, the accessibility of peer contributions is characterized as 'assess'. "Modify" is the highest level of participation for a task performer because contributors can alter or even delete each other's contributions in order to correct, update, or otherwise improve them (Geiger *et al.* 2011).

"Characteristics of task completion", according to Geiger *et al.* (2011, p. 07), "describes how the crowd contributions within a crowdsourcing process are used by the crowdsourcing organization to achieve the desired outcome". Thus, an "integrative" contribution occurs when the tasks performed are used to start the innovation process, i.e. the final product can be extracted from the combination of contributions. Likewise,

on a "selective" contribution the tasks are chosen in an independent way, which might result on contributors selecting parts of the task. In such case there might be no integration among the ideas proposed by task performers (Schenk & Gittard, 2011).

Finally, the last dimension of Geiger's *et al.* (2011) proposition is about the 'reward' for task performers. There are three possibilities in this case: 'fixed', 'success-based', and 'no reward' (intangible reward). In the case of 'fixed reward', all contributions generate a fixed payment and it's more common on integrative crowdsourcing processes. A 'success-based' reward happens according to the individual value provided by the task performer to the crowdsourcing goal. 'No reward' occurs when contributors participate on a volunteer basis. An example of the later type of reward is the 'My Starbucks Idea', which invited its customers to suggest improvements for anything from new flavors for drinks to the music it plays in its stores. There was no monetary reward or financial compensation, yet Starbucks received over 100,000 ideas in total on the website (Ferrari & Fidanboylu, 2013).

Geiger & Schader's (2014) study add the following classification for rewards: (a) homogeneous vs. heterogeneous contributions, and (b) a non-emergent vs. an emergent value from contributions. From their combination, these authors classified crowdsourcing process in four systems, as shown in figure 2.6.

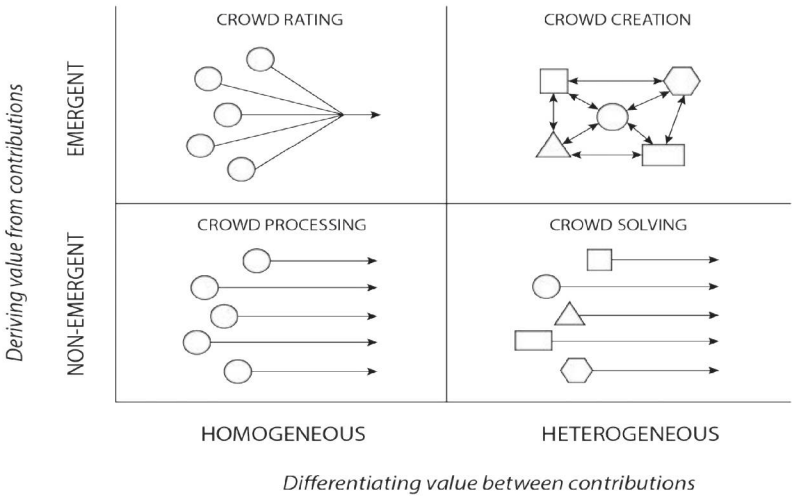


Figure 2.6 – The four systems of crowdsourcing process.
Source: Adapted from Geiger & Schader (2014).

The value of contributions is considered as emergent when it is derived from the entirety of contributions; and it is non-emergent when is derived directly from individual contribution. Homogeneous contributions are qualitatively identical and thus

valued equally while the evaluation of heterogeneous contributions is given according to their individual qualities. Thus, the four systems of crowdsourcing according to Geiger & Schader (2014) are:

Crowd Processing Systems – *Homogeneous and non-emergent*. In this case, the tasks are often easy, requiring basic abilities of the human brain. And the diversity of interests within the crowd is the key to recruit sufficient contributors for a variety of tasks;

Crowd Solve Systems – *Heterogeneous and non-emergent*. In this case, the contributions are considered of higher quality, because the system seeks alternative perspectives or specific skills from the crowd;

Crowd Rating Systems – *Homogeneous and emergent*. These system outcomes reflect opinions or collective assessments and prediction. So, it relies on a large number of diverse contributors to generate representative results;

Crowd Creation Systems – *Heterogeneous and emergent*. This kind of system also relies on large numbers of diverse contributors. The difference, however, is that this approach enables these systems to aggregate truly comprehensive artifacts that feature a variety of aspects reflecting the individual diversity of their contributors.

Some other possible variations of the crowdsourcing process delineation are, basically, directly related to the task complexity (Thuan *et al.*, 2016) and the characteristics of the crowd (Simula & Vuori, 2012; Simula & Ahola, 2014; Geiger & Schader, 2014). Yet, both are directly related to the level of motivation for participation and commitment of the members of the crowd in accomplish the task or suggest a solution (Battistella & Nonino, 2012).

In some cases, the task execution is divided into stages, where contributions are evaluated. The task evaluation mechanism includes two elements: the task performer and the contribution. There are cases where the task performer is evaluated even before starting to accomplish a task (the Mechanical Turk Platform is an example – the participant has to fulfill a questionnaire before apply to a task[1] and wait for the platform response). Also, there are cases where the crowdsourcing initiator wants to form a closed group, then the participant has to apply before the task starts[2]. The participants

[1] This thesis author intended to participate in a crowdsourcing task at the Mechanical Turk platform in 2014. The communication received by e-mail is available on annex 1.

[2] This thesis author also participates in a closed group of a crowdsourcing task promoted by the *Cocriando Natura* platform. The report regarding this participation is available on annex 2.

may also get or give feedback on the quality of the contribution during the work in progress. Thus, according to Hetmank (2014), the evaluation mechanism differ among:

Evaluation time: It will depend of the task stages and duration, also of the task latency type. Thus, the evaluation can occur before, simultaneously or after a task completion.

Evaluation source: It refers to the choice of a source, which can vary among crowdsourcing initiator, self, expert, peer workers, third party, and algorithm. Zhao & Zhu (2012) note that the quality of contributions may either be checked manually by experts or peer workers, often by using a voting and rating mechanism, or automatically by the crowdsourcing system itself, using a specific data processing technique, such as a data mining or machine learning algorithm. In addition, Dow *et al.* (2012) mention two further sources of evaluation: the contributors may assess their own work or the crowdsourcing initiator may make the evaluation itself.

Evaluation method: According to Hirth *et al.* (2013), there are two main types of evaluation. The first refers to an open evaluation, or crowdvoting process, where the majority decides. In these cases, the call is open and many participants can accomplish the tasks. A control group makes the second type of evaluation, i.e. the control group approach assigns the task to one worker who completes the task. Afterwards, the crowdsourcing system sends the control group multiple validation tasks with the request to rate the submitted solutions. The solution will be accepted if the majority of the control group members decide it is correct (Hetmank, 2014).

Evaluation specificity: It refers to how the contributions are evaluated: accept or reject, rating, assessment form, free form, etc.

Considering the content presented so far, it is possible to infer that crowdsourcing can be characterized as a process which: occurs over the Internet, in parts or in its totality; can be used to generate innovation (as an open innovation process), but not mandatorily; through an Internet-based platform, calls the crowd's participation to attend business, marketing and/or social demands; can be initiated by organizations or by individuals from the crowd. Figure 2.7 (next page) represents the crowdsourcing generic process.

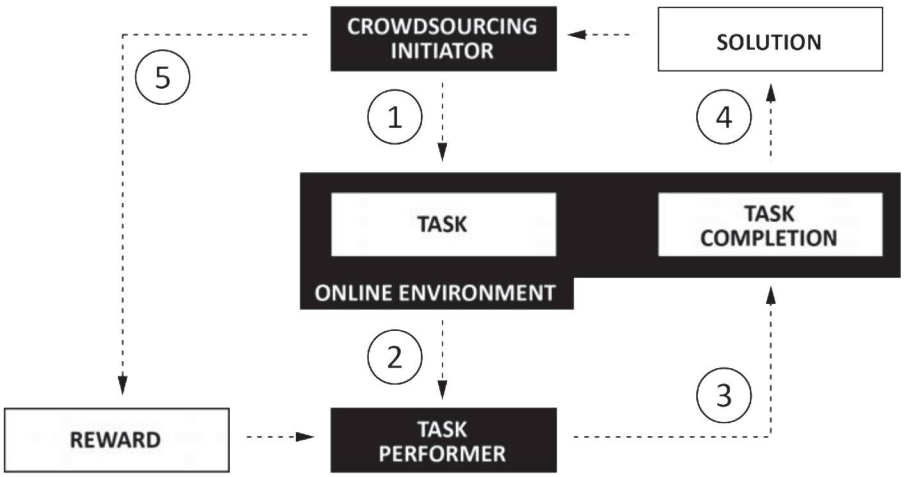


Figure 2.7 - Crowdsourcing generic process.
Source: This thesis' author (2018).

In fact, the process presented in figure 2.7 is actually a review of the process suggested by Nakatsu *et al.* (2014) and Choi & Lee (2015). Thus, with the addition of one more step, the crowdsourcing generic process happens as following: (1) the crowdsourcing initiator, after planning its project which includes the choice of both online environment and the target crowd, makes a call to the task performers. (2) The task performers, i.e. organizations and/or individuals, find a task they are motivated to contribute with. (3) The task, then, is completed. (4) Depending on the characteristics of the task, the solution is composed after the accomplishment of one or more tasks. (5) The crowdsourcing initiator, then, rewards the task performer. In the black rectangles there are the fixed stakeholders involved in a crowdsourcing process. The next subsection addresses the content regarding stakeholders.

2.1.4.2 The stakeholders

Regardless the type of crowdsourcing process there are three fixed stakeholders involved: (i) the crowdsourcing project initiator, (ii) the task performer and (iii) the online environment (Peng & Ruoyu, 2011). Reviewing the previously presented content, online environment represents the Internet-based platform in which the crowdsourcing process occurs. This platform can pertain and be managed by the crowdsourcing initiator, i.e. an organization/ an individual/ an agent (Gassmann *et al.*, 2010; Stanoevska-Slabeva, 2011; Battistella & Nonino, 2012; Thuan *et al.*, 2016). Table 2.4 (next page) shows some examples of each kind of platform.

Table 2.4 - Examples of online environment of crowdsourcing initiatives.

	CROWDSOURCING INITIATOR		
	ORGANIZATION	**INDIVIDUAL**	**AGENT**
OWN PLATFORM	ideaslego.com cambia.org	Blogs and Open Source Communities.	openideo.com innonatives.com
INTERMEDIATE PLATFORM/ AGENT PLATFORM	openideo.com innonatives.com mturk.com	innonatives.com wikipedia.com kikstarter.com	-X-

Source: This thesis' author (2018).

Therefore, variations on the number of stakeholders can occur according to the crowdsourcing process initiator (Stanoevska-Slabeva, 2011). For example, when the demand comes from or/and is initiated by individuals from the crowd, then it may not be necessary to have an organization supporting the initiative - especially because a crowdfunding initiative could be started in order to raise funds to implement a project that came from the crowd. On the other hand, despite this information not being explicitly found on literature[3], only an empiric observation and analysis of crowdsourcing platforms, in some cases, organizations could also be considered as part of the crowd invited to accomplish the tasks. It is the case of platforms like Open IDEO (openideo.com) and The Unilever Foundry (foundry.unilever.com). According to this latter platform description, "The Unilever Foundry is for **start-ups** [my highlight], creatives, designs, innovators and inventors who want to partner with Unilever brands and functions and help them solve some exciting challenges." (UNILEVER, web, 2017). Considering those information, figure 2.8 (next page) presents the possibilities of relationships between the stakeholders of a crowdsourcing initiative.

[3] Battistella & Nanino (2012) only mention the organizations as users of Open Innovation Platforms, not as executors of the tasks.

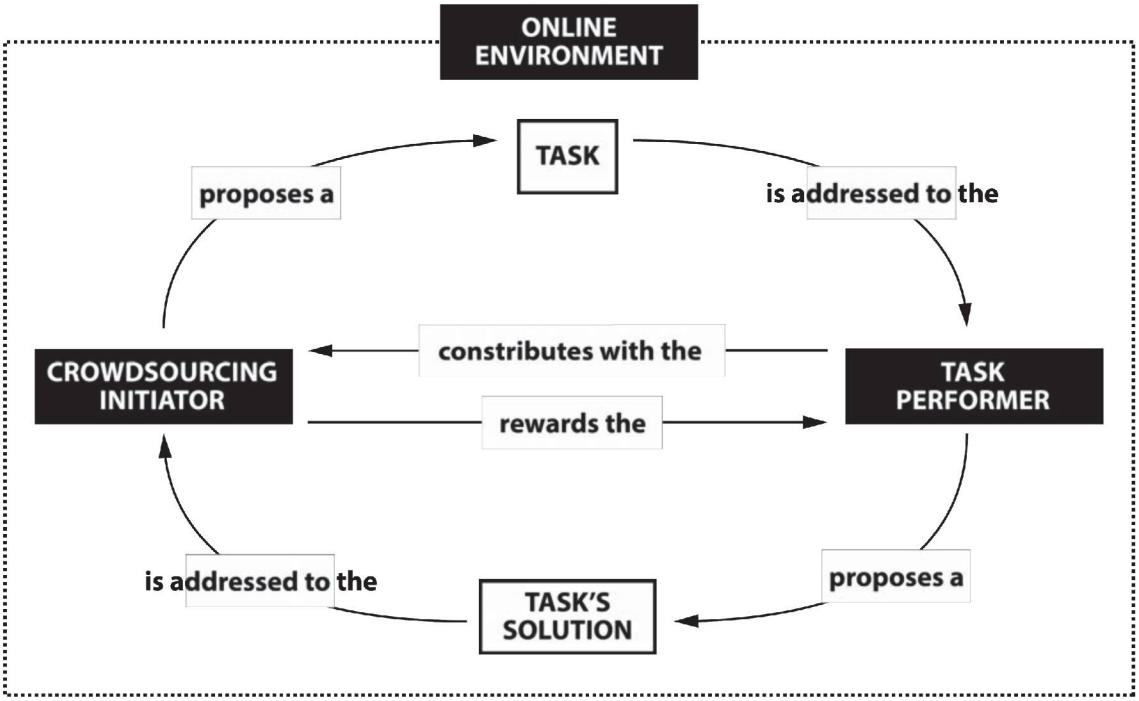


Figure 2.8 - Relationship between the stakeholders in a crowdsourcing process.
Source: Based on Peng & Ruoyu (2011), Stanoevska-Slabeva (2011) and Choi & Lee (2015).

Due to the characteristic of gathering many people in order to solve problems and generating innovations, crowdsourcing can also be understood as a large-scale social networking. According to Son *et al.* (2012), the social networking generated by crowdsourcing could facilitate the design process. For these authors, an online community facilitates interaction among customers and organizations by supporting the exchange of ideas among users and consultation of their needs.

Finally, since crowdsourcing is a process with many possibilities of application, the possibilities of roles a stakeholder can take on varies according to the intended outcome (Battistella & Nonino, 2012), which depends on the characteristics of the tasks. This content is addressed on the next subsection.

2.1.4.3 The tasks

The three main **kinds of tasks**, according to Howe (2006), are: (a) 'idea game', (b) problem solving or crowdcasting network, and (c) prediction market or gathering market information.

(a) 'Idea game': It is essentially an open massive call for ideas. The main example quoted on literature is the case of IBM Jam (Bjelland & Wood, 2008; Stanoevska-Slabeva, 2011, Chiu *et al.*, 2014), which the task consisted in a huge brainstorm to find potential

new ways of how technology developed at IBM might be applied to enhance existing or develop new products. On this kind of crowdsourcing, the company starts the challenge and a 'winner takes it all' mechanism is applied. So, this type of crowdsourcing is also called 'selective' crowdsourcing, because just the creator of the winning solution is rewarded.

(b) Problem solving or crowdcasting network: It works also as a selective crowdsourcing. According to Howe (2006), it is also considered as an integrative crowdsourcing due to the fact that organizations can crowdsource for solutions for problems and the goal is to create a complete solution by integrating complementary contributions from the crowd.

(c) Prediction market or gathering market information: It is related to assessment of future scenarios. An example quoted by Stanoevska-Slabeva (2011) is the Hollywood Stock Exchange that consists in an online simulation, where registered users can trade in movie stocks.

There are three different **categories of tasks** for a given crowdsourcing initiative, according to the purpose of the crowdsourcing process (Schenk & Guittard, 2011; Stanoevska-Slabeva, 2011; Djelassi & Decoopman, 2011; Hirth *et al.*, 2013). Based on the required competences of the individuals in the crowd, the tasks can be (i) simple or routine task, (ii) complex task, and (iii) creative task. Their characteristics are described on table 2.5.

Table 2.5 – The three categories of tasks and their characteristics.

TASK	CHARACTERISTICS
Simple or routine	- Easy to describe; - Does not require a high cognitive effort and expertise to be understood by a crowd; - Requires a relatively low involvement from individuals; - Financial incentives do not go beyond micro payments.
Complex	- Multiple potential outcomes; - Multiple potential solution path; - Presence of uncertainty; - Their understanding and performance requires special expertise, problem-solving abilities and involves knowledge and intensive activities.
Creative	- Creativity and uniqueness have the highest priority; - The main goal of a company is not to have a problem solved but to rather benefit from the creative power of the interdisciplinary crowd; - Incentives can be very heterogeneous, ranging from monetary to passion-driven involvement.

Source: Based on Schenk & Guittard (2011), Stanoevska-Slabeva (2011), Djelassi & Decoopman (2011) and Hirth *et al.* (2013).

The simple or routine tasks are related mostly to the crowdlabor process, and an example of platform that uses them is the Amazon Mechanical Turk platform

(www.mturk.com). In this platform, a type of task is the translation of a part of a text, or simply the location of the contact information of a particular website. Usually, these tasks are performed individually, and the remuneration, in these cases, is low, equivalent to cents of dollar. Examples of complex task can be writing a short article about a locale for a public relationship campaign, a newspaper, a travel guide or an encyclopedia (Kittur *et al.*, 2011). In these cases, the tasks are not accomplish individually but decompose into smaller simple tasks and solved by more than one person. And examples of creative tasks are the product development that range from developing an engraving to a T-shirt or generating ideas for developing new products.

Nakatsu *et al.* (2014) propose a crowdsourcing taxonomy based on four **task characteristics**: (i) well-structured tasks, or the solution to the problem is well defined; (ii) unstructured tasks, or when there is no known or well-defined solution to the problem; (iii) independent tasks, solved by individuals; and (iv) interdependent tasks, solved by virtual communities. By the combination of these four task characteristics, the authors found four possibilities: (a) contractual hiring; (b) distributed problem solving; (c) new idea generation; and (d) collaboration. Table 2.6 (next page) presents these relations.

Examples of **(a) contractual hiring** can be found in many platforms, such as Amazon Mechanical Turk (www.mturk.com; the most quoted on literature); Crowdspring (www.crowdspring.com), Hire the World (www.hiretheworld.com), Innocentive (www.innocentive.com), 99 designs (99designs.com), Idea Connection (www.ideaconnection.com), among others. These platforms are also referred to as "distributed labor network" (Nakatsu *et al.*, 2015, p.830), or crowdlabor process (according to the content presented previously).

Examples of **(b) distributed problem-solving**, i.e. when individual crowd outputs are pooled and combined in some way, can be commonly found in crowdfunding platforms, such as Kickstarter (www.kickstarter.com); Indie Go Go (www.indiegogo.com); Crowd Rise (www.crowdrise.com), among others; and crowdlearning platforms, such as Fold it (fold.it); Cinese (www.cinese.me), among others.

Table 2.6 – Task characteristics.

	(iii) **Independent tasks** (Individuals)	(iv) **Interdependent tasks** (Virtual communities)
(i) **Well-structured tasks**	(a) **Contractual Hiring** *Low Commitment:* • Human intelligence tasks; • Crowdsharing marketplaces. *High Commitment:* • Online employment platforms.	(b) **Distributed Problem-solving** (Additive/Pooled Coordination) *Low Commitment:* • Geo-located data collection; • Distributed knowledge gathering; • Crowdfunding.
(ii) **Unstructured tasks**	(c) **New Idea Generation** – Solo *Low Commitment:* • Consumer-driven innovation. *High Commitment:* • Online problem-solving platforms; • Contests.	(d) **Collaboration** (Reciprocal Coordination) *Low Commitment:* • Real-time idea jams. *High Commitment:* • Open source software development; • Open source design of hardware; • Open content projects.

Source: Adapted from Nakatsu *et al.* (2014).

The **(c) new idea generation** is associated to Open Innovation (Nakatsu *et al.*, 2014). In this case, a lot of examples can be given – not only of platforms that belong to the companies that want to promote innovation, but also the so-called agent platforms (as seen previously). They are: Lego Ideas (ideas.lego.com); Dell Idea Storm (www.ideastorm.com); Open IDEO (www.openideo.com); Ideaken (www.ideaken.com); One Billion Minds (www.onebillionminds.com), among others.

The last quadrant, **(d) Collaboration**, require the individuals in the crowd to cooperate at some level – to share information and problem-solve together. The examples of this kind of crowdsourcing can be found in the IBM's 2006 Innovation Jam (www.collaborationjam.com), where more than 150,000 people from 104 countries and 67 companies had participated.

The information required for setting up a task, according to Hetmank (2014), are:

(a) Target audience: Identify the target audience means to set an initial general restriction of the size of the crowd. As already known, the crowdsourcing task can be addressed either to the employees of the company, to the crowd, or to both the employees and the public community. Thus, the target audience can be set as an

internal, external (Vukovic & Bartolini, 2010; Simula & Ahola, 2014), or hybrid crowd (Vukovic & Bartolini, 2010). The importance of setting the target audience relies on the level of confidentiality of the task; i.e. informs the participants whether technical documents or additional data can be passed on to third parties.

(b) Action type: The participants in a crowdsourcing activity can evaluate, share, network, build artifacts, or execute tasks. Because of that, the specification of an action type that has to be performed can support the participant in searching a suitable task.

(c) Aggregation type: This label refers to the classification in selective or integrative task (Geiger *et al.*, 2011; Schenk & Gittard, 2011; Stanoevska-Slabeva, 2011; Djelassi & Decoopman, 2013). On the integrative task the purpose is to assemble complementary data from the crowd. In contrast, selective task is about selecting the best solution among those suggested by the crowd. Other denominations can be found on Prpic *et al.* (2015), which classify the contributions in aggregate or filtered.

(d) Latency type: For Hetmank (2014, p. 1093), "Three semantic elements focus on the task significance, urgency, and effort." The significance is directed related to the attention the crowd would give to the task – which means also the priority level of the task. There are tasks considered as untimed; i.e. "the latency between issuing a task and getting an answer to the task does not matter" (*Id. Ibid.*). In other cases, a real-time crowdsourcing matters; when the task refers to an instant translation during a meeting.

Chiu *et al.* (2014) point out the three **dimensions** involved in the task: (i) managerial; (ii) behavioral; and (iii) technological. Table 2.7 presents the main metrics involved in the task's dimensions.

Table 2.7 – The three dimensions of a crowdsourcing task.

Dimensions	Metrics
Managerial	Task suitability; Task feasibility; Task presentation; Key capabilities involved; Task variety; Task complexity; Task decomposition.
Behavioral	Impact of crowdsourcing on employees; Employees' attitudes toward crowdsourcing; Impact of task features on participants' outputs.
Technological	Platform selection; System functionalities.

Source: Adapted from Chiu *et al.* (2014).

According to the presented in table 2.7, the managerial dimension helps understand the task content and how it has to be presented. The behavioral dimension is regarding how the tasks could impact the task performer and the crowdsourcing initiator employees - in case the crowdsourcing initiator is a company, for instance. The technological dimension is about the online environment and its possibilities of interaction of the participants.

Crowdsourcing tasks can vary depending on their possibilities of participation (Prpic *et al.*, 2015). Contributions required from the crowd could either be defined as objective or subjective content. Objective contributions help achieve an impartial and unbiased result; here, bare facts matter and crowds can help find or create them. Subjective content contributions revolve around the judgments, opinions, perceptions, and beliefs of individuals in a crowd that are sought to collectively help solve a problem that calls for a subjective result.

Contributions need to be processed collectively to add value (Prpic *et al.*, 2015). Depending on the task, the contributions must either be aggregated or filtered. Under aggregation, contributions collectively yield value when they are simply combined to inform a decision, without requiring any prior validation; i.e. the reasons for their choices are not important at this stage. Other tasks, however, are more complex and require crowd contributions to be qualitatively evaluated and filtered before being considered on their relative merits. This way, figure 2.9 (next page) represents the four-quadrants matrix where the tasks can be positioned according to these characteristics. This matrix will be helpful in visualizing the possibilities of participation required to accomplish the task and also to choose the alternative(s) that better fits to the goals and expected outcomes of a crowdsourcing project.

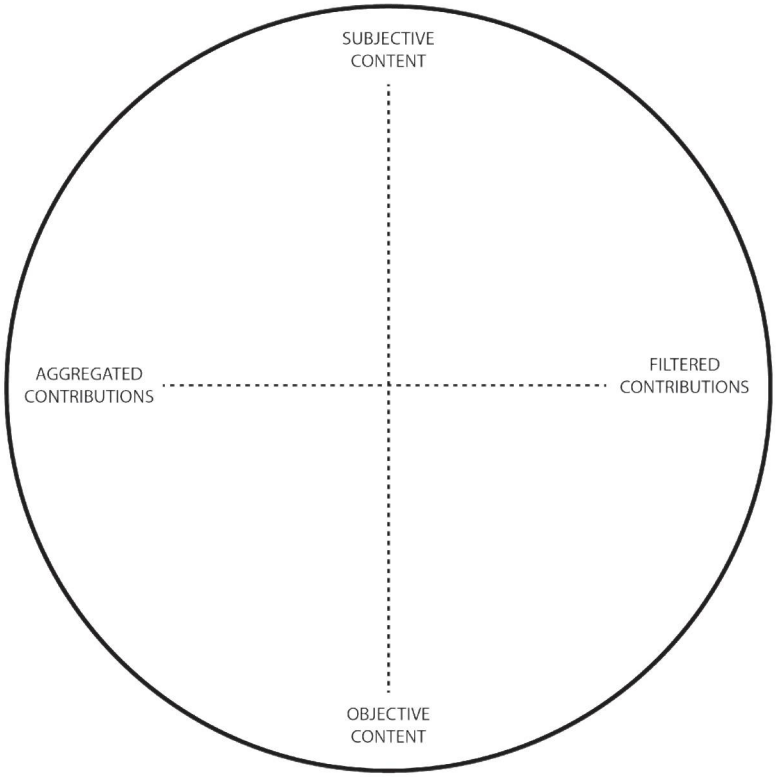


Figure 2.9 – Ordination of task characteristics and possibilities of participation.
Source: Based on Nakatsu *et al.* (2014) and Prpic *et al.* (2015).

Finally, related to the task, there is the reward. Usually, the reward means incentives representing different types of direct compensation and it is also a way to keep the participant motivated to accomplish the task. This way, the reward will depend on the task complexity and possibilities of participation. There are three main types: fixed, proportional or performance-based (Hetmank, 2014). The reward type can vary as the following: none (in case of voluntary participation), virtual points, money, discount, coupon, lottery, goods, resource access (*Id. Ibid.*). The 'pay-out method' refers to the amount of participants that will be rewarded: all, winner, top 10, etc.

This way, there are six important issues regarding the crowdsourcing tasks: (1) the kind of result that is expected or, in other words, the kind of problem that needs to be solved; (2) the level of complexity of the task; (3) the task structuring level; (4) the task required information; (5) the dimensions involved in a task planning; and (6) the possibilities of participation on a task. Therefore, on a crowdsourcing process, there are many variables: the purpose of its application, the stakeholders' participation, the demands, and the task delineation, among others. Because of that, next subsection addresses the business implication of adopting a crowdsourcing process.

2.1.5 Business implications of adopting a crowdsourcing process

Crowdsourcing is an alternative way to gather people from different parts of the world that can talk to each other, work and accomplish tasks around a common objective. In the business world, those processes are considered as a way to foster customer-orientated innovation and co-creation, since they are an alternative to access the crowd intelligence (Shenk & Guittard, 2011). However, like any process involving stakeholder integration, there are advantages and disadvantages to its application. Figure 2.10 presents, briefly, the content that will be addressed in the following subsections.

POTENTIAL ADVANTAGES	DISAVANTAGES
- Lower costs associated to the PDP and the innovation process; - Better quality of products; - Reinforced relationship between organizations and its public.	- Necessity to adapt the key-activities to the customer presence; - Crowd's feeling of being explored.
DRIVERS	**BARRIERS**
- Transparency; - Quality of interactions; - Motivation, incentive and reward of task performers; - Ethics.	- Difficulties of finding the right crowd; - Complexity of tasks; - Motivation to participate; - Negative feedback.

Figure 2.10 - Synthesis of the implications of using a crowdsourcing process.
Source: This thesis' author (2018).

Among the implications, are issues related to the task, the online environment and the motivation of the participants. According to Alonso (2013), tasks have to be designed carefully with special emphasis on the interface and instructions, because quality control is crucial. Due to the nature of Internet-based platforms, the pool of workers may vary any given day.

The members of an OIP participate in these activities because of specific motivations (Battistella & Nonino, 2012). Some qualitative and quantitative studies explain why members participate and collaborate in crowdsourcing initiatives, but their results are conflicting, especially when considering the importance of the monetary rewards as a motivation (Martinez, 2017).

2.1.5.1 Potential advantages and drivers

The management literature highlights the innovation effects on business models derived from the possibilities opened by crowdsourcing approaches. Tracey (2004, p. 39) points out that participative new product development processes "can result in lower costs, better quality and short time to market in the short term as well as being competitively advantageous in the long term." The costs related to crowdsourcing activities are generally low. The company can choose to release challenges in specialized platforms, or develop their own. In this case, the costs can be higher in the beginning. Djelassi & Decoopman (2013) states that financial viability refers to both the structure cost and activity generated by the structure maintenance. Organizations that manage the crowdsourcing activities internally have less additional costs.

Djelassi & Decoopman (2013) studies reveal that crowdsourcing could reinforce, in several ways, the relationship between companies and its customers. First of all, the authors found that the customers perceive crowdsourcing as a new and original marketing practice. It might represent to customer a different and significant experience. Because of that, the outcomes of a crowdsourcing process could be broadened instead of only finding the best solution to a task: it can mean many people talking about not only the company initiative, but also about the company itself. Thus, crowdsourcing can also be considered as a communication campaign that legitimates the products developed through it.

Behrends' *et al.* (2011) studies regarding the benefits of including external designers in product design process of small manufacturing firms point to the opportunity of bringing complementary expertise to the company existent expertise. Thus, crowdsourcing initiatives that include the participation of designers from the crowd can also mean the recognition of the importance of design for small businesses. It matches the perspective presented by Simula & Vuori (2012), which is presented in table 2.8 (next page).

According to Djelassi & Decoopman (2013, p. 688), to be a successful operation, crowdsourcing requires a good match "between the expected benefits for consumers and the behavior of companies in terms of transparency, quality of interaction, recognition of participants and ethics." These expectations are directly related to the crowdsourcing process planning.

Table 2.8 – Potential advantages according to the crowdsourcing participants.

Participants	Potential advantages
Internal (employees)	• Increased innovativeness and a business culture where ideas are shared; • The increased reach of employees located in different parts of the world; • No Intellectual Properties Rights issues involved; • Less issues involving business secrets.
Trusted Partners	• Can enhance collaboration; • Partners are motivated to maintain the partnership, and thus they are willing to contribute; • A new way of working and exchange information.
Pre-qualified participants and communities	• The community can provide services, e.g. monitoring and evaluating ideas; • Certain problems are too difficult for a general crowd and, thus, it is easier to manage a restricted audience that can focus on relevant topics; • A new way of reaching and engaging stakeholders in the manner of an 'extended enterprise'.
General crowd	• Plenty of chances for serendipity; • Many possibilities for unlikely solution providers; • Additional pros, such as brand goodwill (which can help benefit marketing and recruitment); • Can be a way to get truly new and innovative ideas into the organization, facilitating 'out of the box' thinking; • A novel way to engage the general public.

Source: Adapted from Simula & Vuori (2012, p. 13).

The users use their resources and competencies to create a new value; the relevance of this value proposition, however, is directly related to its alignment to users' requirements. So, the success of a crowdsourcing initiative is directly conditioned by a clear understanding of user´s needs as well as the participants' motivation (Djelassi & Decoopman, 2013). These authors also point out the motivation and incentives as other important benefits of crowdsourcing; not only the financial but also the satisfaction with the activity itself (that the authors call "enjoyment-based motivation") and its social dimension (or "pro-social motivation") (*Id. Ibid*, p. 101).

Regarding the crowd motivation, Sharma (2010) presents five critical success factors for crowdsourcing initiatives: (i) vision & strategy; (ii) human capital; (iii) infrastructure; (iv) linkages & trust; (v) external environment, as illustrated on figure 2.11 (next page).

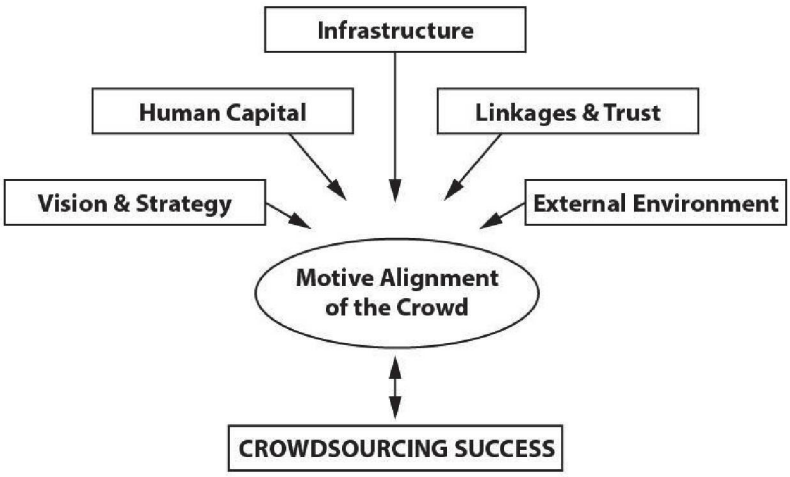


Figure 2.11 – The five critical success factors of crowdsourcing initiatives.
Source: Adapted from Sharma (2010).

Vision is a business strategy component that guides the decision making process of the companies. So, according to Sharma (2010), a crowdsourcing initiative has to be aligned to the company's vision and also has to have well defined set of ideals, goals and objectives. On this way, the crowd could perceive the initiative as valuable and consistent.

The **human capital** is another important issue to the success of the crowdsourcing once it depends of the involvement of the people that have the proper skills, abilities and expertise. However, the author points that "the skills and the abilities of the crowd to participate in the crowdsourcing initiative can be generated by providing education and vocational training" associated with its activities (Sharma, 2010, p. 12).

Considering that most of the crowdsourcing initiatives are Internet-based, the **technology infrastructure**, i.e. ease of accessibility, reliability and quality of communication technologies, is also a critical factor of success. However, the infrastructure specification has direct implications on the cost associated to the development of the crowdsourcing initiative.

Finally, the **external environment** refers to the macroeconomic environment and comprising of the governance support, the business environment, the economic environment, the living environment and the risk profiles (Sharma, 2010).

It may also occur that the same issues considered as advantages may have disadvantages. It all depends, therefore, on how this issue is handled by the organization in planning and during a crowdsourcing initiative.

2.1.5.2 Disadvantages and barriers

According to Cummings *et al.* (2013), resistance to crowdsourcing initiatives is perhaps most evident when the crowd subverts the process for different means, potentially including being critical of the organization (Brabham, 2008). In particular, crowdsourcing initiatives may face issues such as project delays; solution quality; ambiguous liability; temporary relationship; professionalism challenge; identity clash; exploitation and reputation effects; losers disenfranchised (Cummings *et al.*, 2013).

The customer integration in the product development process affects the key-activities of the business model. Djelassi & Decoopman (2013) point that some of the companies sampled on their study had to adapt the company activities to the 'customers presence'. To structure the company for collaborative and open processes is a job that does not suddenly happen. The company needs to plan how the customer participation will be by defining what kind of contributions they need, and also by defining what kind of interaction will be necessary. Also, the company has to predict how the outcomes of the crowdsourcing process will influence on the company's performance (*Id. Ibid.*).

A big challenge quoted by many authors (Frey *et al.*, 2011; Djelassi & Decoopman, 2013; Simula & Ahola, 2014) is regarding the customers' feeling of being explored. This feeling is directly related to the transparency of the crowdsourcing process, such as the criteria to evaluate the contribution in case of complex and creative tasks.

In the study of Djelassi & Decoopman (2013), participant's expectations in crowdvoting seem to be lower than in selective crowdsourcing operations. According to the authors, the complexity of the task calls for major investments on behalf of participants (in terms of knowledge, skills and time), who expect to be rewarded in proportion to their contribution, whether economically, hedonically or symbolically. In one of the four cases analyzed by the authors, the tasks consumed considerable time and energy of the participants.

On the other hand, according to Hirth *et al.* (2013), detecting cheating workers is more difficult for complex tasks than for routine tasks. A routine task, as creating a new YouTube account, requires that the worker to submit the login data in order to prove that the task is completed. In this case, it is easy to check automatically whether the login data is valid or not. So, routine tasks' verification is often simple and easy to automatize. This not happens in the case of complex or creative tasks. A complex task can be, e.g. to rewrite a given text and a creative task, to write a text on a given topic. In

both cases, there is the necessity to have someone to read and rate them according to their content and their style. Once this cannot be automatized, and especially for the complex task, the reviewer also needs some background knowledge to judge the relevance of the worker's text. Added to this, the authors also point that one of the major problems are untrustworthy workers trying to maximize their income by submitting as many tasks as possible even if they did not complete the task or only make it sloppy. This can be avoided, however, if there is a team, besides the crowd, that can evaluate the contributions.

Another challenge to achieve a successful crowdsourcing initiative is how to motivate participants to share their innovative ideas (Battistella & Nonino, 2012; Martini *et al.*, 2014; Simula & Ahola, 2014). According to Martini *et al.* (2014, p. 462), "companies often provide rewards or recognition only to the best submissions, thus employing a competitive mechanism to foster and encourage user innovation". However, not only the economical rewards are sufficient reasons to engage people in crowdsourcing initiatives. Lateral collaboration can also be used as a motivation strategy.

Indeed, there are two different categories to describe participants' motivation: (i) extrinsic (i.e. monetary, increasing knowledge and skill level and building personal reputation); and (ii) intrinsic (i.e. enjoyment, intellectual stimulation; as part as the common good). According to Martini *et al.* (2014), some companies promise cash rewards or licensing contracts for innovative ideas, while others build non-monetary acknowledgements, peer or company recognition and a pride-of-authorship effect.

Lettl (2007) cites two barriers in involving users in crowd-based processes: (i) cognitive limitations, and (ii) not wanting to participate. The cognitive limitations are about the capability of develop new ideas. According to the author, in the idea generation phase the participants can be "functionally fixed" to their current context and, because of that, unable to develop radically new ideas and also to evaluate concepts and prototypes of radical innovation (in case of crowdvoting process) (Lettl, 2007, p. 54).

According to Son *et al.* (2012, p. 192), various guidelines can be used to reduce social risk regarding peer contributions: (i) assure participants that contributions are anonymous; (ii) be certain that contributors can see others' contributions; (iii) allow contributors to rate or comment regarding others' contributions; and (iv) allow a

contributor to modify or even delete others' contributions. These guidelines could help to avoid that participants give up once "...receive negative feedback toward their designs (e.g. harsh comments or baseless plagiarism accusation). They may be also discouraged to continue their involvement due to negative feedback from other participants." (Son *et al.*, 2012, p. 193).

This way, knowing the disadvantages and barriers related to a crowdsourcing initiative, the decisions for undertake it should be planned in order to avoid some of these issues. It also can be said that the planning of a crowdsourcing initiative should try to follow the rapid changes in the context where it is inserted in.

2.1.6 Discussion

As seen so far, the Internet has been influencing the manner people are connected and how they are creating and sharing content, interacting in an even more active way. From this interaction, very often stimulated by the social medias, organizations had perceived opportunities (which are becoming necessities already) not only to help solving business demands but also growing social demands. This way, crowdsourcing has been used to designate processes that use the potential of the crowd for different purposes: from the completion of many little simple tasks (such as translate part of a text, see www.mturk.com), to the development of innovative solutions.

One of the characteristics of the crowdsourcing initiatives is that they occur through the Internet (Howe, 2006; Brabham, 2011; Estellés-Arolas and González Ladron-de-Guevara, 2012; Djelassi & Decoopman, 2013). Although some process activities could be developed offline (Prpic *et al.*, 2015), most of the contributions are executed and/or shared in a virtual environment, through which other eventual interactions between organizations and the crowd - such as communication - could also occur.

For instance, as a consequence of the opening of innovation processes, crowdsourcing has been used by many companies as an alternative approach to involve their customers, including in the decision-making process (Sharma, 2010; Brabham, 2011, De Toni *et al.*, 2012; Chiu *et al.,* 2014). On the other hand, based on Schenk & Guittard (2011), Stanoevska-Slabeva (2011), Djelassi & Decoopman (2011), Alonso (2013) and Hirth *et al.* (2013) studies, it is also known that organizations apply crowdsourcing as a way to outsource some more operational and less strategic tasks.

The scheme presented on figure 2.12 is an adaptation of the Hetmank's (2014) crowdsourcing process ontology and allows an extended view of the several issues involved in the crowdsourcing initiatives. This scheme also helps to summarize the content seen so far.

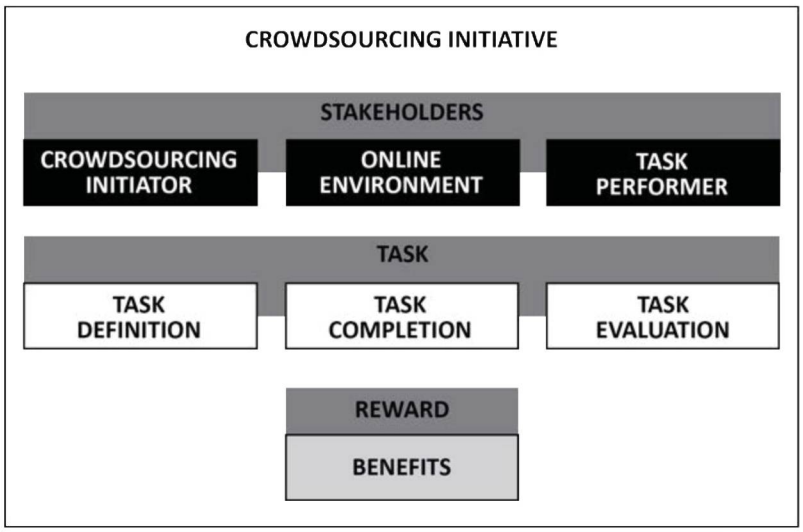


Figure 2.12 – Classes, object and datatype properties of the crowdsourcing initiative.
Source: Based on Hetmank (2014).

As already presented, the initiator of a crowdsourcing project is any individual, organization, or a crowdsourcing intermediary (agent). The task performer is any organization or individual from the crowd that accomplishes the task. In this case, each crowdsourcing initiative consists in one or more crowdsourcing tasks and requires a well-defined goal to lead the crowd to the right direction. Moreover, the kind of task describes the general crowdsourcing application, as idea generation, problem-solving, or content creation. (Stanoevska-Slabeva, 2011; Geiger *et al.*, 2011; Simula & Ahola, 2014). Peng & Rouyu (2011), however, include the Internet-based platform as the third part involved in a crowdsourcing process. Nevertheless, Hetmank (2014) relates the Internet-based platform to the 'technical requirements' of the task.

Shortly, the task "is the smallest indivisible unit of work that is clearly described by a single instruction [...], such as rating a new product idea, labeling a picture, translating text, or finding an advertising slogan." (Hetmank, 2014, p. 1093). Sometimes, the tasks require some additional data as external resources such as web applications, documents, or datasets. Once this thesis is focused in the crowdsourcing process applied to the product development process context - crowd-design, and its implications to sustainability, further sections address the specific content regarding these subjects.

2.2 CROWD-DESIGN

This subchapter presents the content directly related to the crowdsourcing process applied to the product development context, the crowd-design proper: its definition and its generic process, how it can be applied to a reference model of traditional Product Development Process (PDP), as well as participatory approaches related to this process.

2.2.1 Definition

As seen previously, the emergence of the term crowdsourcing in 2006 brought about many other crowd terms. However, it is not possible to define when exactly crowdsourcing processes started to be systematically used in product development. The first and most famous case quoted in literature is the Fiat MIO (Fiat Concept Car III) (Bueno & Ballestrin, 2012; Saldanha *et al.*, 2014; Saldanha & Pozzebon, 2015; Rayna *et al.*, 2015). In 2006, as part of their celebration of a 30-year presence in Brazil, Fiat Company began a discussion on its website, inviting people to freely imagine the future of cars, by posting photos, videos, comments, etc. But only in 2010, after the presentation of the Fiat Concept Car I and II, developed by the innovation team of Fiat Company in Brazil, the company brought public the Fiat MIO: an innovative car not only in its concept but in its PDP. What characterized the PDP was the open call to customers' participation, through an Internet-based platform.

However, only in 2012 a term to designate the crowdsourcing processes used to develop products started appearing. Dawson & Bynghall (2012) presented the term 'crowd-design' as a crowdsourcing category for product design, selection, development, and marketing. Engel (2012) used the term 'crowd-sourcing design' to refer to the crowdsourcing application into a system that can optimize visual designs. In 2014, Schmidt (2014) called 'crowdsourcing design' the crowdsourcing of design that is characteristically organized through contests. Nevertheless, none of these authors, in fact, defined the term. Only in Wu *et al.* (2015) it is possible to find an approximate definition to the term, where the authors refers to 'crowd-sourcing design' as the creative process involving the crowd through the Internet.

Due to the fact there is no common term to designate the crowdsourcing processes applied to the product development, the thesis adopts the term crowd-design. A definition for this term found in the literature was proposed by Dickie & Santos

(2014), and refers to an emerging model to carry out the design process using the knowledge and resources available in the crowd, usually via the Internet, in order to solve problems and/or to create content. Participants can take part on its activity both through a volunteer basis as well as through the provision of direct economic benefits (Dickie & Santos, 2014; Dickie *et al.*, 2014).

The crowd-design process, thus, is associated to the use of online crowd-based processes that aim to solve problems in a creative way[4] (Shoyama *et al.*, 2014). As one of the crowdsourcing typologies it can enable organizations to yield solutions for both incremental as well as breakthrough innovations (von Hippel, 2005; Bogers *et al.*, 2010 *apud* Frey *et al.*, 2011). The use of such approach is in line with the growth of organizations around the world that are increasingly outsourcing design activities to partnering organizations and the crowd (Fathianathan & Panchal, 2009).

Other associated constructs include 'Open Source Innovation' (OSI) and 'Open Design' (OD), both derived from the field of 'Open Source Software' (OSS) (Raasch *et al.*, 2009; Raasch, 2011). In general terms, OSI uses the same principles and strategies of OSS initiatives. According to Raasch *et al.* (2009, p. 383), the focus of OSI is on "a collaborative development process involving several contributing actors and therefore requiring organizational mechanisms to coordinate the efforts expended by different actors."

Also linked to crowd-design and by direct association with OSI is the term 'Open Design' which is used for the final phase of the product development process (Howard *et al.*, 2012; Macul & Rozenfeld, 2015). Typically, it offers the possibility to share with the crowd an idea of a product that is already developed, and the crowd can decide if it wants to modify it or not, forming a value chain characterized by co-creation and continuous communication (Macul & Rozenfeld, 2015). This kind of process is related to do-it-yourself processes because the idea and the concept of the product are already developed. Therefore, the product is ready to be produced through a FabLab, for instance[5]. What the Open Design platforms have in common is the possibility of a free instruction or downloadable files that enable users to manufacture locally through

[4] A close concept is used on Design Marketplace platforms, which connect designers with companies or people that need their work. However, such platforms are on this thesis considered as more closely related to Crowdlabor.

[5] Examples of Open Design platforms: Instructables (http://www.instructables.com/); Arduino (https://www.arduino.cc/); RepRap (https://reprappro.com/); Williow Garage (http://www.willowgarage.com/); and Cunicode (https://www.cunicode.com/).

digital fabrication technologies (Howard *et al.*, 2012; Neves, 2014; Macul & Rozenfeld, 2015).

Open Design is based on an ecosystem of individuals, users, designers, manufacturers, makers or communities often associated to produce products, systems and services that offer solutions to its own community or interests, by merging and creating, their ideas and ideas from others in tangible objects and tools of production and digital manufacturing (Cabeza & Moura, 2014). The information and knowledge produced is shared through the Internet through social networks, blogs, virtual groups, websites and specialized platforms, so it can be shared, modified, distributed, visualized, etc. (Cabeza & Moura, 2014). This activity, according to Hicks & Pachamanova (2007, p. 323), "[is] often based on the digital development and sharing of designs and instructions to create physical objects."

Still, there are solutions that could be developed by the crowd only, even in the creation phase. An example is the Open Source Ecology that refers to a "movement for healthy interaction of human and natural ecosystems, based on land stewardship, regenerative use of resources, open access to information, and distributive economics." (OSE, web, 2017). According to Vezzoli (2010), the term 'distributive' adds the idea that one should consider an interconnected network of autonomous elements, that is, elements capable of acting autonomously, at the same time as highly connected to other elements of the system. Thus, 'distributive economics' is considered a favorable economic model for contributing to the socio-ethics and environmental dimensions of sustainability (IIIEE, 2006; Crul & Diehl, 2006).

Given all these constructs - crowd-design, Open Source Innovation, Open Design and Open Source Economy -, it's important to highlight which are their differences and their common points. Figure 2.13 (next page) shows these relationships, based on the presented definitions.

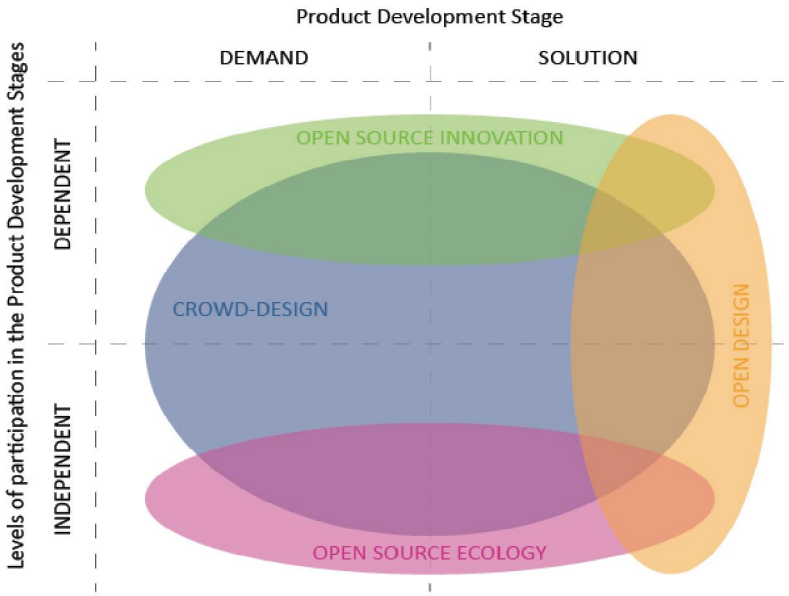


Figure 2.13 - Relationship among crowd-design and the other constructs.
Source: This thesis' author (2018).

According to figure 2.13, crowd-design and Open Source Innovation's interface reveals that not all crowd-design initiatives seeks for - or result in - an innovation. Also, not all Open Source Innovation occurs through a crowd-design process. It also shows that both initiatives could occur from the demand to the solution stages of the PDP.

The main difference between the OSI and OSE, however, is the level of the requested stakeholders' participation. The online-participation approach is just one of many aspects that characterize a crowd-design process. Participation is given by how the crowd relates with itself and with the other stakeholders, during the crowd-design process. Thus, based on the previously given definition of 'distributive', Open Source Ecology could happen independent of the existence of a relationship among the crowd and the other stakeholders.

Finally, such as crowd-design, Open Design is directly related to all constructs. The main difference between crowd- and Open Design is the fact that the latter generally occurs in the end of the product development process and is directly related to physical objects.

This way, the definition of crowd-design adopted in the thesis is the following: **Crowd-Design refers to crowdsourcing processes used to involve crowd's participation in different phases of the PDP, from solving creative tasks to decision-making tasks.**

2.2.2 Generic architecture of a crowd-design process

2.2.2.1 The generic process of crowd-design

The crowd-design definition stated above is represented in figure 2.14. This representation is based both on the generic product development phases and the crowdsourcing generic process, once crowd-design refers to product development. According to the crowdsourcing generic process, the relationship between the crowdsourcing initiator and the task performer is given by the task completion through an online environment (Oliveira, 2017).

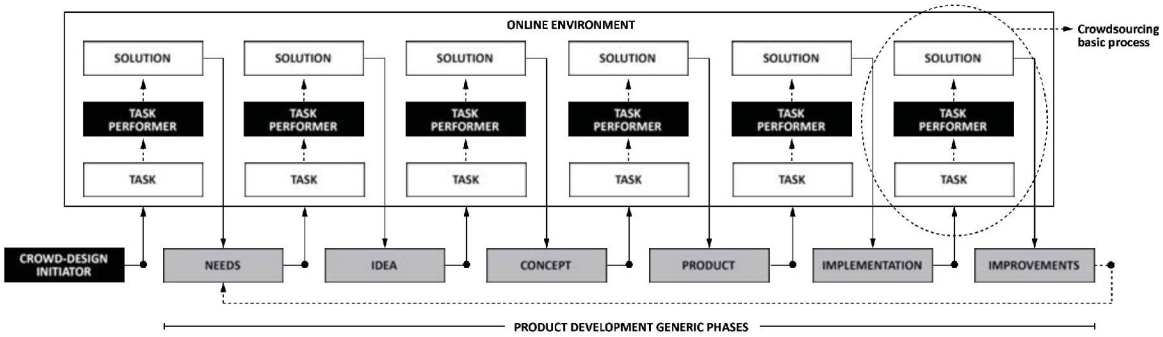


Figure 2.14 - Representation of the crowd-design definition.
Source: This thesis' author (2018).

Despite the lack of an explicit model for crowd-design process in literature (Wu *et al.*, 2015), it can be said, based on figure 2.14, that the crowd-design generic process is similar to the crowdsourcing generic process. However, the amount of phases involved in crowd-design can vary according to the type of crowdsourcing process incorporated to it, as well as the type of task requested and the amount of product development phases. As a characteristic of this process, faster and more efficient processes are replacing sequential phases, where many individuals from the crowd develop tasks simultaneously (Badin, 2005; Wu *et al.*, 2015).

Indeed, there are some issues that influence the crowd-design process delineation. Wu *et al.* (2015) suggest a four-stage process to delineate a crowd-design process, namely: (stage 1) Specification; (stage 2) Validation; (stage 3) Execution; and (stage 4) Evaluation. Each of these stages was expanded into a specific checklist of issues and options.

Stage 1 - Specification: This stage refers to the crowd-design planning initiative. Decisions to be taken are mainly related to the online environment, necessary tools to

accomplish the task, and the characteristics of the crowd (i.e. the task performer). According to Wu *et al.*, (2015), the choice of the type of Internet-based platform will reflect the nature of the task, because some design work can be attempted by anyone regardless of education or background, whereas other tasks required specific experience or education. This way, if the initiative occurs through an intermediary platform it is necessary that the platform be adequate to the accessing crowd. The definition of how the task solution must be presented (and its associated execution tool) is important because it needs to be known by task performers for the execution (i.e. 2D design task – 2D design tools or 3D design task – 3D design tools). In this case, the skills of the task performer also need to be considered (Wu *et al.*, 2015). Finally, the design workflow needs to be delineated (i.e. results' file transfer, shared access to a representation held in the cloud, etc.).

Stage 2 - Validation: Considering it as a first initiative implemented by an organization, without prior experience of running similar tasks, stage 2 validates the choice made in stage 1 by trialing prototype versions of the task. According to Wu *et al.* (2015), there are five implementation decisions that need to be specified and validated in stage 2: (1) the payment for participants (per person/per task); (2) time to undertake the task; (3) clarity of the task instruction; (4) results submission method and (5) the manner in which the crowd who attempt to scam, or cheat, the system should be handled. After the validation, the crowd-design process could be refined. In this case, Shoyama *et al.* (2014) concluded that running a test of the crowd-design initiative was useful in assessing whether the information provided was clear and sufficient, as well as in determining the period to perform the task and the task complexity.

Stage 3 & 4 - Execution & Evaluation: The process set in stage 1 will determine the length of the execution stage. Regardless of the used mechanism, the process ends with the evaluation task, which reviews the crowd's work and selects the best outputs.

In this manner, according to Wu *et al.* (2015) there are four variables that determine the specificities in a crowd-design process with six important issues to be considered in the validation of the initiative (before launching it). These variables and issues are summarized in figure 2.15 (next page).

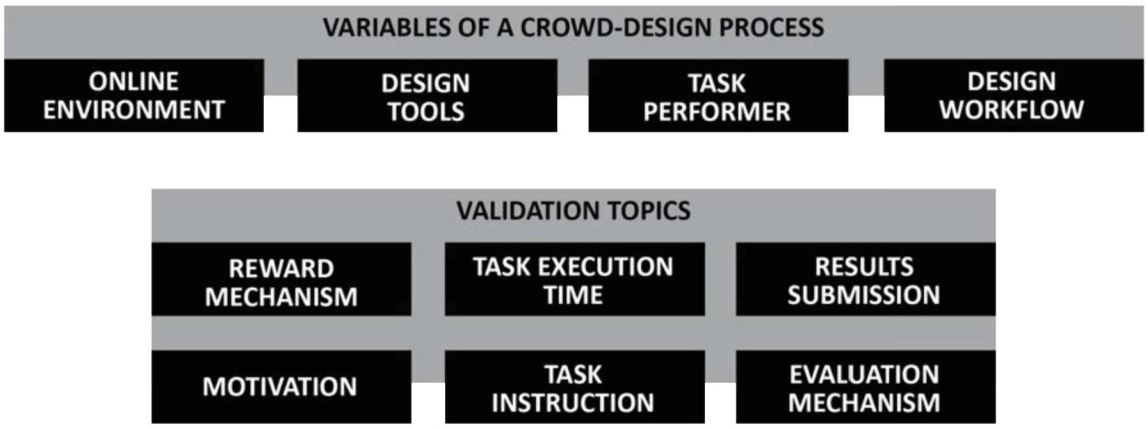


Figure 2.15 - Variables and important issues regarding a crowd-design process.
Source: Based on Wu *et al.* (2015).

It is clear, then, that stakeholders involved in the activity are directly related to the possibilities of delineating a crowd-design process. Considering the importance of their participation, the following topic addresses this issue.

2.2.2.2 Key stakeholders

According to the crowdsourcing generic model earlier presented on figure 2.7, there are three fixed stakeholders involved in the process: (i) the process initiator, (ii) the task performer and (iii) the online environment.

It is already known that the online environment corresponds to the Internet-based platform, where the process occurs. Commonly, the crowd-design process occurs in 'open innovation platforms', which are defined as virtual environments that offers digital services, which aim to allow the creation of innovation by facilitating time and independence in voluntary interactions of innovators (Hallerstede, 2013).

The platform can belong to a specific organization, such as a company, or be an independent organization that works as a facilitator for the other organizations that do not have their own platform (Gassmann *et al.*, 2010; Battistella & Nonino, 2012). Platforms that belong to companies, e.g. Lego Ideas (www.legoideas.com), use the crowd-design process in order to obtain new ideas for the company's products. In this case, the Lego Company is considered, at the same time, the initiator of the crowd-design initiative and the sponsor of the product implementation.

On the other hand, platforms that work as agents assume the role of manager of the crowd-design process. In this case, the initiative can be proposed by a specific organization or by an individual from the crowd. The initiator and the sponsor do not

necessary need to be the same stakeholder. Thus, the initiator can be an organization or individual from the crowd, and the sponsor can be another organization or even the individuals from the crowd.

Thus, in addition to the kind of Internet-based platform the crowd-design process has been developed in, in general terms, the roles of the key stakeholders of a crowd-design process can also be defined according to:

- **The types of crowdsourcing processes involved in it**. For instance, to choose the best solution, the crowd has to accomplish the task of voting. The crowdsourcing type involved in this case is crowdvoting. This way, the task performer is considered as a voter. In a crowdfunding case, the crowd's contribution could help to implement the best solution. Thus, the crowd could also be called 'funder', taking on a role similar to a 'sponsor'.
- **The specific skills of the task performer.** According to what has previously been discussed, crowdsourcing initiatives can be classified according to the necessary crowd's skills to execute a task. Thus, considering the previous example about the participant who votes, the voter can be a person from the crowd or a specialist in a particular subject. In this case, the voter could also assume the 'expert' role (innonatives.com, web, 2015).

That is why the key stakeholders can assume different roles in a crowd-design process, among which are: (i) crowd-design initiator; (ii) sponsor; (iii) expert; (iv) creative; (v) voter; (vi) commentator; and (vii) manager. However, in addition to these roles, it is important to foresee another one: the regulator. According to Bannerman (2013) and Brabham (2013), not only because issues regarding Intellectual Properties but also 'spec works'[6], some initiatives are helping the promotion of professional and ethical business practices in participation in crowd-design initiatives. So far these are initiatives that have helped promote policies of good practices related to crowd-design processes. The relationship between these key stakeholders is represented on figure 2.16 (next page).

[6] In this context, spec work is any kind of creative work, either partial or completed, submitted by designers to prospective clients before designers secure both their work and equitable fees (NO!SPEC, web, 2017).

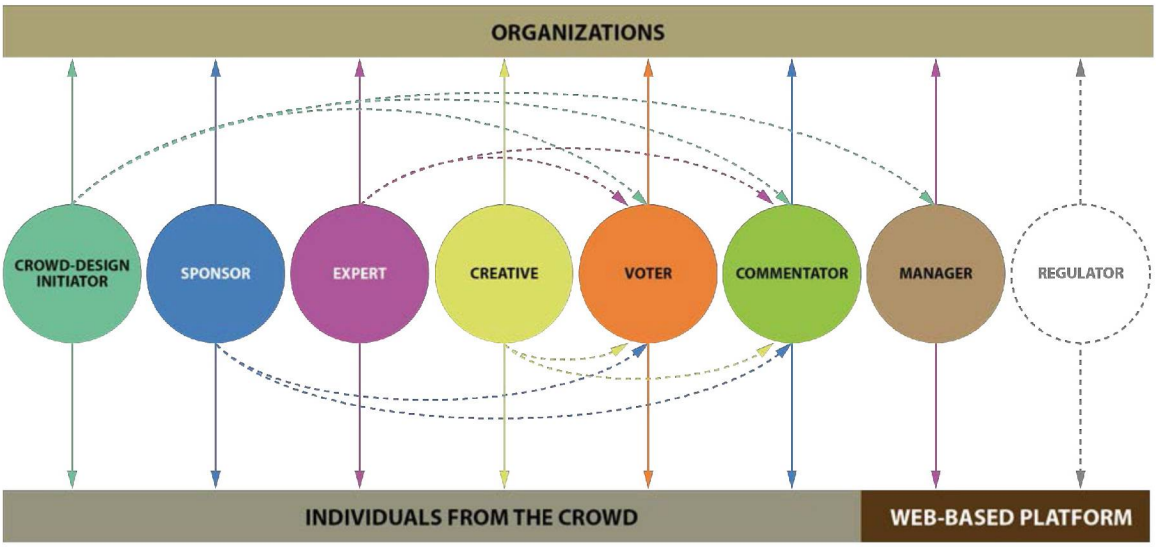


Figure 2.16 - Key stakeholders' roles' possibilities in a crowd-design process.
Source: This thesis' author (2018).

As shown on figure 2.16, the organization and the crowd could perform more than one role during the crowd-design process. At the same time, an organization as well as an individual from the crowd can perform almost all roles. Except the 'manager' and the 'regulator' roles, the crowd could perform all the other, including being a crowd-design initiator and/or a sponsor. However, according to Battistella & Nonino (2012), the crowd can be involved in all phases of the product development process, beginning with the acquisition of weak signals of a certain product and future needs and continuing up to sharing user experiences and developing further ideas and concepts when using the final products and services.

To help understand what exactly each role is about, table 2.9 presents an explanation by answering 'who, what, when, how' questions, and points out the types of crowdsourcing processes related to these roles.

Table 2.9 - The key Stakeholders of a crowd-design process and its roles.

	Role in the crowd-design process							
	PROPONENT	**SPONSOR**	**EXPERT**	**CREATIVE**	**VOTER**	**COMMEN-TATOR**	**MANAGER**	**REGULATOR**
Who?	Organization or individual from the crowd.	Organization or individual from the crowd.	Individual from the crowd or on behalf an organization, including the platforms.	Individual from the crowd or from the pool of employees of an company.	Individual from the crowd or on behalf a organization, including the platforms.	Individual from the crowd or on behalf a organization, including the platforms..	Organization that has its own platform, or a platform that works as an agent (Gassmann *et al.* (2010).	Regulators are expected to be government organizations, or even platforms committed to ethics.

What?	Identifies and shares a problem and starts the open call for contributions of solutions.	Invests financial or non-financial resources to help implementing the solution.	Helps the CREATIVE during the process, by giving information related to technical knowledge. It also helps to choose the best solutions, following the expert criteria.	Sends ideas for solution. In some cases, it could be needed specifics skills, e. g., design skills. Refers to the individual or groups of people that perform the creative tasks.	Helps to choose the best idea for solution.	Comments in the sent ideas for solutions. This task is related to give feedbacks, suggesting improvements to the sent idea for solution.	Manages the Crowd-Design process.	Supports participants of Crowd-Design initiatives, regarded to professional, and ethical business practices.
When?	In the beginning of the Crowd-Design process.	In the end of the Crowd-Design process.	During all the creative phases of the process.	During all the creative phases of the process.	During all the creative phases of the process.	During all the creative phases of the process.	During all phases of the process.	During all phases of the process.
How?	By defining the briefing of the demand. It also determines the phases and duration of the initiative.	By establishing the budget available to implement the solution.	By commenting and voting on the sent ideas for solutions.	By sending ideas for solutions.	By voting in the proposals of solution.	By commenting in the proposals of solution.	By providing technical support, by giving information regarding the platform or the initiative operation (such as FAQ). By promoting the initiative and the platform.	By inspecting the initiatives.
Crowdsourcing types	Crowdcasting (Eboli, 2011).	Crowdfunding	Crowd-learning and crowdvoting	crowd-creativity (Thuan *et al.*, 2016)	Crowdvoting	Crowd-learning; Crowdopinion.	N/A	Crowdsupport.

Source: This thesis' author (2018).

Generally, each crowd-design platform names the stakeholders' roles differently. For example, the 'proposer' is denominated 'seeker' at the innonatives platform and 'sponsor' at the Open IDEO platform. In this last platform, the individuals from the crowd are not allowed to propose a 'challenge' [the given name to the crowd-design initiative (Shoyama *et al.*, 2014)], only companies and organizations are allowed to start a crowd-design project. This is why the 'proposer' is also called 'sponsor'. In other cases, such as in the Lego Idea platform, the 'voter' is denominated 'supporter'. In this platform, the idea sent for consideration has to receive over 10 thousand supports in order to be qualified and then reviewed by the company's experts (www. ideas.lego.com).

In addition to these differences, there are other specific roles in the platforms or in the specific needs of the crowd-design initiative. The innonatives.com platform, for instance, includes in the final stage of its crowd-design process, the possibility of an organization or individual to propose to buy products, services or solutions derived

from the same or other crowd-design initiatives of the platform. In this case, this role is named 'trader' (innonatives.com, 2017).

Specific for the Open IDEO platform, there are actors that could be considered as indirect stakeholders. These so-called 'personas' refer to the people for whom the solution is intended (www.openideo.com, 2017). In this case, the participation of this stakeholder happens in an indirect way because it represents the specific public for whom the crowd will develop the solutions.

The stakeholders participation and the roles played by them in a crowd-design process can vary according to the crowdsourcing types employed as well as to the tasks to be performed. The next subsection addresses the possible tasks involved in a crowd-design process.

2.2.2.3 The tasks

Problem solving is the type of task associated to the crowd-design initiatives (Howe, 2006). However, Shoyama *et al.* (2014) suggest the crowd-design process can have many possibilities of contributions from the task performers. Indeed, as shown on previous subsections, the contributions can vary according to the role of the participants. These contributions are related to the crowdsourcing types involved in the process, e.g. crowdvoting (where the task is to vote), crowdopinion (where the task is to give feedback of an idea/product/service) and crowdfunding (where the task is to give monetary contribution).

According to Battistella & Nonino (2012), the tasks involved in crowd-design processes are also related to the phase of the product development process it is being applied in. These authors, therefore, characterize the crowd-design tasks as: (i) foresight tasks; (ii) creativity tasks; and (iii) design tasks. Figure 2.17 (next page) shows the purpose of each of these task types and to which stage of PDP they are related (i.e. from demand to solution).

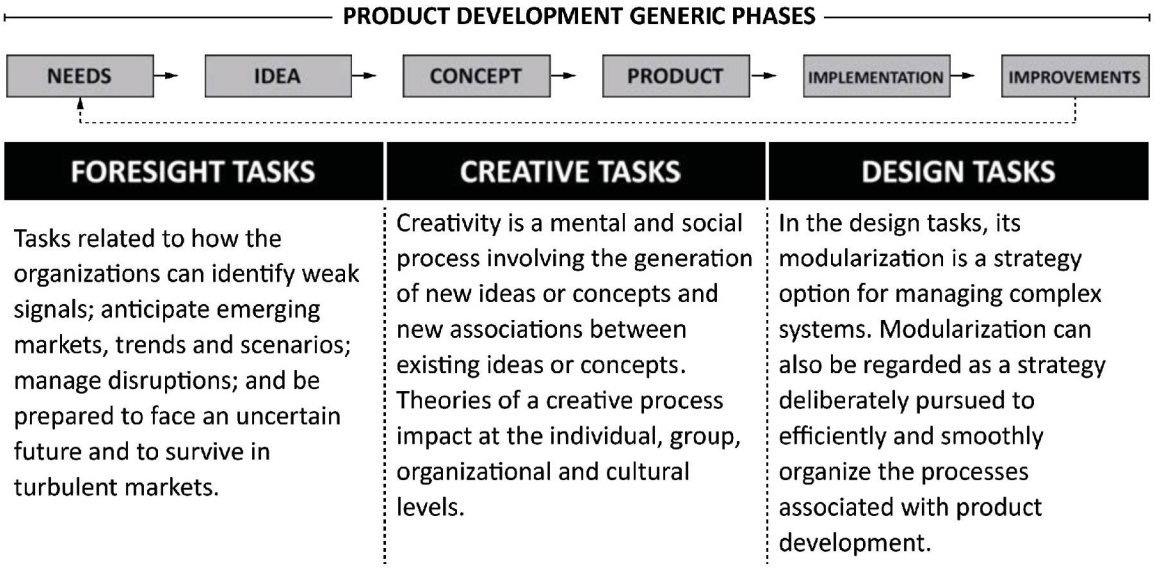


Figure 2.17 - Task types and the stage of PDP.
Source: This thesis' author (2018), based in Battistella & Nonino (2012).

However, Wu *et al.*, (2015) suggest another two different crowd-design approaches that characterize the tasks. These approaches are: (i) the human-based generic algorithms (HBGA), and (ii) the public design competitions (PDC). Initiatives of HBGA have been used for generate innovation tasks (Yu & Nickerson, 2011; Yu & Sakamoto, 2011) while PDC has been used mainly as graphic design competition tasks that are frequently posted by commercial organizations (Wu *et al.*, 2015). The PDC approach, however, is similar to the 'idea game' task suggested by Howe (2006).

The tasks involved in a crowd-design process, thus, can vary not only regarding the type of participation but also the phase of the product development. The next subsection addresses the association of these two aspects.

2.2.3 Crowd-design as a participatory product development process

2.2.3.1 Participatory approaches in the product development process

Although often treated in the literature as a recent phenomenon, user participation in the development of products and services can be traced throughout the history of mankind itself (Reich *et al.*, 1996; Kambil *et al.*, 1999; Martini *et al.*, 2014). The relevance of participatory practices in the process of product development is already mentioned in literature of the eighteenth and nineteenth centuries (Sanders & Stappers, 2008; Ferrari & Fidanboylu, 2013). Nowadays, the practice has been renewed and revisited, fostered by a society that increasingly demands higher levels of

transparency and governance and by technologies that open new possibilities for participation.

Currently, there is a wide range of terms referring to ways of working together in product development and value creation, with a wide range of possibilities for stakeholder involvements in the design process. The most disseminated terms include: **co-creation** (Kambil *et al.*, 1999; Prahalad & Ramaswamy, 2004; Frow *et al.*, 2011; Martini *et al.*, 2014), **co-participation**; **customer integration** (Martini *et al.*, 2014), **co-development** (Harhoff *et al.*, 2003; Raasch *et al.*, 2009), and **co-design** (Reich *et al.*, 1996; Lahti *et al.,* 2004, Moritz, 2005; Détienne, 2006; Mukaze & Velásquez, 2012). According to Mulder (2009), the term co-design is also known as 'community-driven open innovation'. It is the closest definition to the approach effectively adopted here. Hence, the thesis adopts the term co-design to refer to user and other stakeholders' involvement in the product development process.

At one extreme, in the so-called 'design to', products are designed on behalf of users who are represented by designers or marketers; at the other extreme, in the so-called 'design by' users are the designers who are developing products themselves. Between these two possibilities, there is "design with", characterized by user consultation and user participation (Kaulio, 1998; Sanders, 2015; Tischner, 2015).

Figure 2.18 illustrates these different levels of user involvement, based on the model proposed by Norman (2002). In this model, the interactions and relationships among the designer, the user, and the system, are given by the designers and users' mental models.

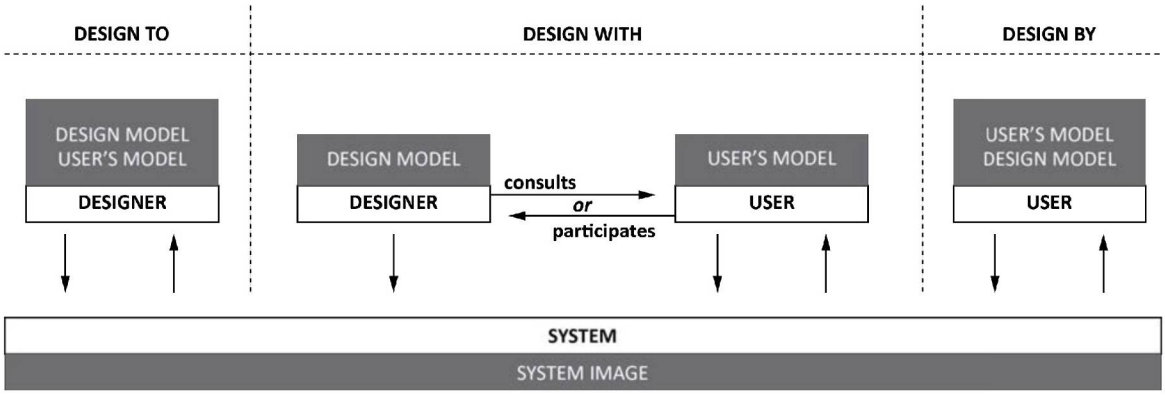


Figure 2.18 - User involvement in each participatory approach.
Source: Based on Kaulio (1998) and Norman (2002).

The 'design model' means the conceptualization that the designer has in his/her

mind; the user's model is what the user develops to explain the operation of the system. The system is the only means by which designers and users communicate with each other; it often has an interface for operation and conversation, and the associated manuals and instructions (Norman, 2002).

'Design to', in this case, is an approach that resembles the conventional design process, where designers often consider the user just as a consumer of a given product. On such paradigm users have "very little or no direct role on creating the products themselves or even communicating their own needs" (Reich *et al.*, 1996, p. 167). Example of practices using this approach is 'contact us' links on webpages via which visitors are invited to share feedback with the organization regarding their thoughts, ideas, and questions.

When there is moderate involvement ('design with') organizations systematically collect external information about themselves and their products or services. Such incursions include organizational requests for feedback through customer focus groups, surveys, and interviews.

The substantial involvement occurs on the 'Design By' approach, when the organization has users co-producing tasks and co-creating value. These situations are often found in the service sector where an organization providing a service experience to a customer requires that the customer do something to obtain the service.

The relationship between the levels of user involvement in the product development process in comparison with conventional as well as novel participatory approaches is illustrated on figure 2.19 (next page).

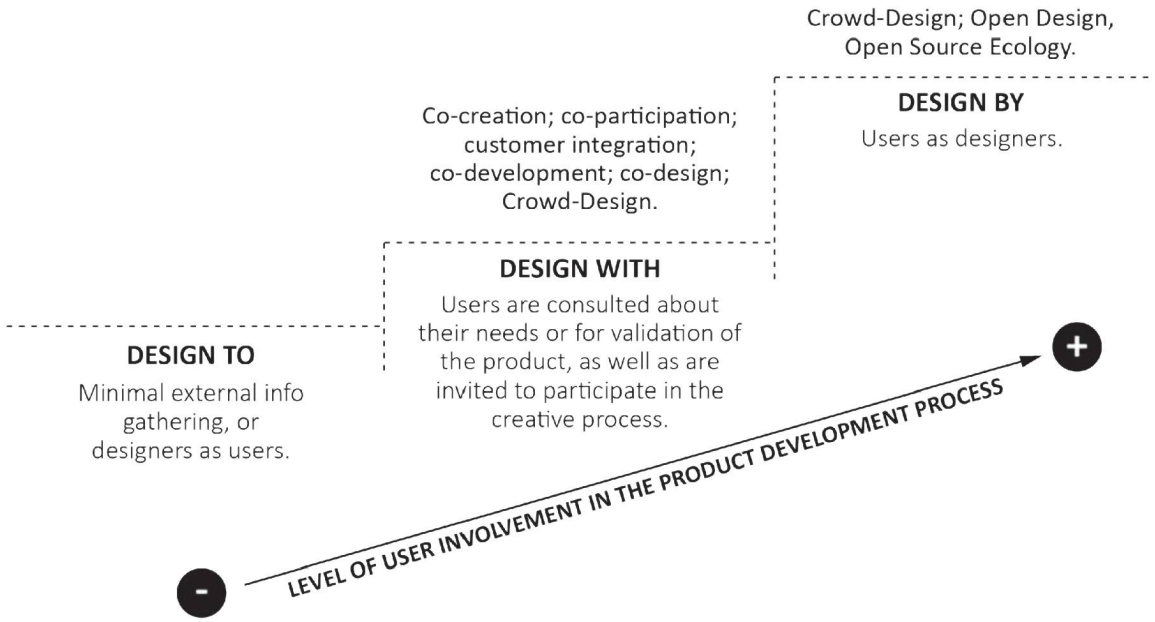


Figure 2.19 - Level of user involvement in participatory approaches in product development process. Source: Based on Ford *et al.* (2015).

Considering that crowd-design process can be applied to all phases of product development (see figures 2.14 and 2.17), which includes the implementation phase, and considering its interrelation with the Open Design and Open Source Ecology constructs (shown on figure 2.13), it is possible to infer that crowd-design process allows for the 'design to' to 'design by' participatory approaches.

Mulder (2009), Sanders (2015) and Tischner (2015) emphasize the importance of involving the stakeholders from the beginning of the PDP ensuring that the design solution will fit into their requirements and needs contexts.

Thus, it can be said that crowd-design and co-design are completely integrated and mutually complementary design approaches, because: (i) participation is a central point to enroll the stakeholders in all the design process; (ii) obtaining feedback, dynamic listening and sharing a common language are key factors for a good communication and the development of reciprocal solutions; (iii) engaging participation through idea ownership; and (iv) sharing ideas and solutions as a value co-creation (Mukase & Velásquez, 2012).

Fontana's *et al.* (2012) study presents a comprehensive perspective on participatory approaches in the design process, based on a literature review of definitions. After analysis of more than ten definitions, the authors concluded that participation in design refers to: "[...] a reciprocal effort between people from equal or

different areas of knowledge, physically separated or not, with the common aim which is to find solutions that make all involved satisfied [...]" (Fontana *et al.*, 2012, p. 05). Participation in design could also mean to develop products and/or services "[...] consistent and complete, through a variety of information sources and activities' coordination." (Fontana *et al.*, 2012, p. 05).

Participatory practices in design, however, depend on the relationship between the actors, their level of mutual trust and their level of dedication to the project. In this sense, some authors give emphasis to the difference between coordination and collaboration. Lahti *et al.* (2004) propose a distinction between these two concepts by saying that coordination happens when actors are performing different tasks with different objectives. To Détienne (2006), coordination has the purpose of managing design tasks' interdependencies. Collaboration, on the other hand, can be defined as "the cooperation between actors that concentrate in a common problem and try to mutually negotiate an acceptable way to solve it." (Lahti *et al.*, 2004, p. 353). Collaboration is embedded on the concept of co-design, as the actors or teams work with the same goal and do that through direct cooperation (Détienne, 2006).

Felekoglu *et al.* (2013) analyzed the interactions in conventional product development process and proposed to classify them as intra-functional, inter-functional or hierarchical. According to these authors, in general, intra-functional interaction happens among the design team, with most interaction occurring at the technical level, to discuss engineering solutions and interfaces. In the crowd-design process, however, this intra-functional interaction may occur among the crowd through the sharing of information and ideas when devising solutions for a given challenge.

Inter-functional interaction is common at a middle-management level, between project managers, development managers, marketing managers and production managers (Felekoglu *et al.*, 2013). In the crowd-design process, similar interaction may occur between the crowd and the crowd-design initiator. Indeed, the initiator might assume the role of moderator, assisting in the process of evaluating the proposed solutions.

Hierarchical interactions refer to the top management involvement. Generally, top management is involved in the formulation and implementation of a new product strategy (Felekoglu *et al.*, 2013). Richtner & Ahlstrom (2010) corroborate this view by suggesting that top managers should not exercise detailed control in the early phases of

the product development, and instead offer facilitation. In a crowd-design process, this implies that hierarchical interactions may occur during the crowd-design process planning.

On the other hand, participatory approaches of PDP based on local interactions without centralized control is considered bottom-up dynamics (Volberda & Lewin, 2003; Geels, 2005). Such dynamics permits that, in a complex context, stakeholders recognize its basic components and form a new configuration that, in turn, is constituted of basic components and emergent properties. According to De Toni *et al.* (2012), a bottom-up system is characterized by its structure, dynamics and context, as shown on figure 2.26.

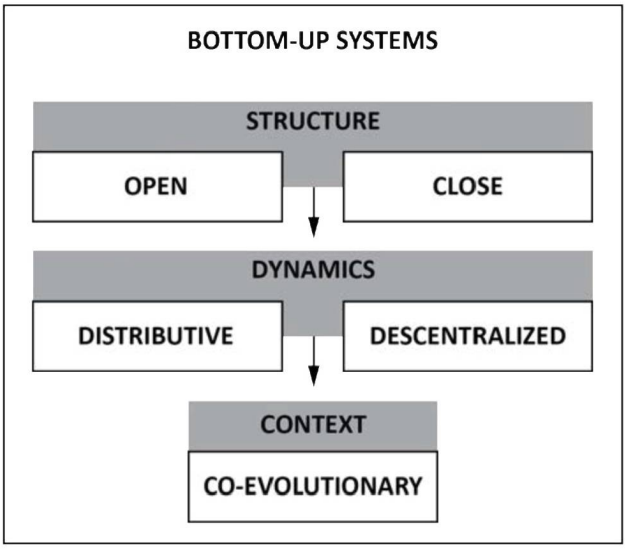


Figure 2.26 - Characteristic aspects of a bottom-up system.
Source: Adapted from De Toni *et al.* (2012).

According to De Toni *et al.* (2012), bottom-up systems are intrinsically both open and closed system. That is, they are open systems because the environment can influence them, and its evolution is determined by internal processes and external fluxes of material, energy and information (Schrödinger, 1945 *apud* De Toni *et al.*, 2012). They are closed systems because they autonomously build internal models in order to maintain their stability (Maturana & Varela, 1985, *apud* De Toni *et al.*, 2012). The interactions of bottom-up systems happen at a local level, in the sense that the stakeholders communicate with few and simple basic rules without a direction from a central unit (local interactions and emergence). That is why the dynamics is distributed and decentralized, and the participation is contemporaneously cooperative and competitive. The relative properties are resilience and robustness. The emergence gives

rise to an evolution based on successive bifurcation points, where the historical dimension is given by the path dependence. The changes of configuration and the emergent properties are the response of the bottom-up system to the mutation of the external conditions (co-evolution). An important element is the learning capability that gives meaning to the external signals. Thus, the principles of bottom-up systems given by De Toni *et al.* (2012) are summarized in table 2.10.

Table 2.10 - Principles of bottom-up systems.

	Bottom-up principles
PDP Process	From mechanical process to organic process.
Participatory Approach	From competence differentiation to competences integration.
Decision-making Process	From centralization to decentralization.
Business Model	From standardization of procedures to reciprocal adaptation of values.

Source: Adapted from De Toni *et al.* (2012).

Once participatory approaches help turn the PDP following bottom-up processes (De Toni *et al.*, 2012), they directly interfere on the value proposition, on the information and communication flows throughout the supply chain, on customer interface and on the financial model of organizations (Alblas *et al.*, 2013; Boons & Lüdeke-Freund, 2013).

Participation in the value proposition provides measurable ecological and/or social value in concert with economic value because it reflects a business-society dialog concerning the balance of economic, ecological and social needs, as such values are temporally and spatially determined. For existing products, a particular balance is embedded in existing practices of stakeholders in the production and consumption system. For new products or services, such a balance is actively being stimulated among participants in the evolving alternative network of producers, consumers, and other associated stakeholders (Boons & Lüdeke-Freund, 2013).

Participation throughout the supply chain might involve suppliers who take responsibility towards their own as well as the focal organization's stakeholders. The focal organization does not shift its own socio-ecological burdens to its suppliers. This condition requires that an organization actively engage suppliers into sustainable supply chain managements, which include, for instance, form of social issue management and materials cycles that avoid/reuse waste (Boons & Lüdeke-Freund, 2013). Participation

also motivates users to take responsibility for their consumption as well as for the organization's stakeholders. The focal organization does not shift its own socio-ecological burdens to its customers. Customer relationships are set up with recognition of the respective sustainability challenges of differently developed markets as well as organization specific challenges resulting from its individual supply chain configuration (Boons & Lüdeke-Freund, 2013).

Finally, participatory approaches on the PDP may reflect an appropriate distribution of economic costs and benefits among stakeholders involved in the business model and accounts for the organization's ecological and social impacts (Maas & Boons, 2010).

However, these conditions do not intrinsically specify a sustainable business model, nor do they explain how specific innovations are implemented. Such question can only be answered for specific organizations operating in specified contexts (Boons & Lüdeke-Freund, 2013).

2.2.3.2 The crowd-design process applied on a PDP's reference model

Product development requires knowledge of user needs and the technological possibilities and constraints of the organization, taking into account the business and product strategies (Bornia & Lorandi, 2008). Using crowd-based processes in the PDP facilitates users' participation in the development of products and services, enabling the organization to follow users' views, needs, and ideas. Organizations can integrate the crowd-design process in any stage of the PDP, giving participants different roles and tasks depending on which stage they enroll (Mladenow *et al.*, 2014).

Several authors propose PDP models structured in many ways, but generally these models are structured as a sequence of steps, phases and stages. A modular and sequential structured is the most common way to visualize the development process and to organize the flow of activities and information.

The PDP reference model proposed by Rozenfeld *et al.* (2006) is the most embracing approach, including the process of continuous improvement as a process to support the PDP. It is a modular model, designed to be adaptable to different contexts. Oliveira's (2017) argues that the PDP model proposed by Rozenfeld *et al.* (2006) proved to be flexible enough to receive adaptations to allow the use of a crowd-design process. Based on such conclusion the thesis adopts Rozenfeld´s *et al.* (2006) model to

contextualize the crowd-design process within the PDP.

2.2.3.2.1 A general view of Rozenfeld´s et al. *(2006) PDP model*

The Rozenfeld's *et al.* (2006) PDP reference model is divided in three macro-phases, namely: pre-development, development and post-development (see figure 2.20). These macro-phases are divided in phases. In each macro-phase and phase there are inputs, i.e. the subsidies and resources used to carry out the process, and outputs, i.e. the results that continue the process or are reformulated (Rozenfeld *et al.*, 2006).

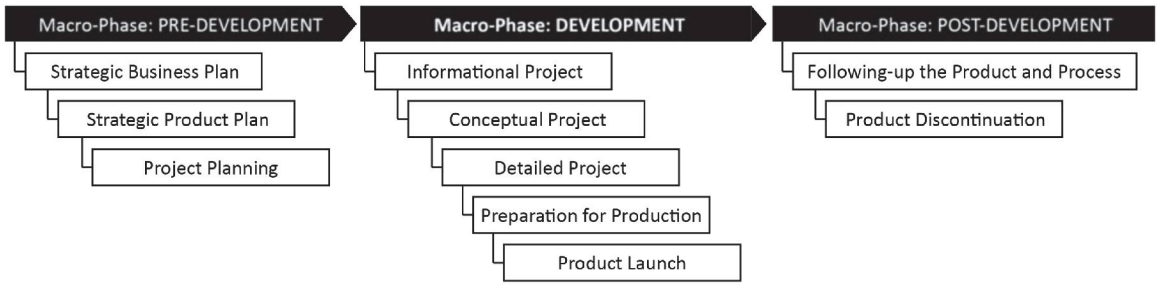


Figure 2.20 - General view of Rozenfeld's *et al.* (2006) reference model of PDP.
Source: Adapted from Rozenfeld *et al.* (2006).

Oliveira (2017) has studied how crowd-design can be configured in the PDP reference model given by Rozenfeld *et al.* (2006). This PDP reference model was adopted because it presents a more comprehensive approach, including the process of continuous improvement as a process to support the PDP activities (Oliveira, 2017). This way, crowd-design initiatives are suitable in all of micro- and macro-phases of the PDP, as shown in the next subsections.

2.2.3.2.2 The pre-development macro-phase

The pre-development macro-phase contemplates the strategic planning of the organization and the mapping of its capabilities in order to access the needs for new product development (Rozenfeld *et al.*, 2006). Figure 2.21 (next page) shows the macro-phase pre-development and its requirements to adopt the crowd-design process, according to Oliveira (2017).

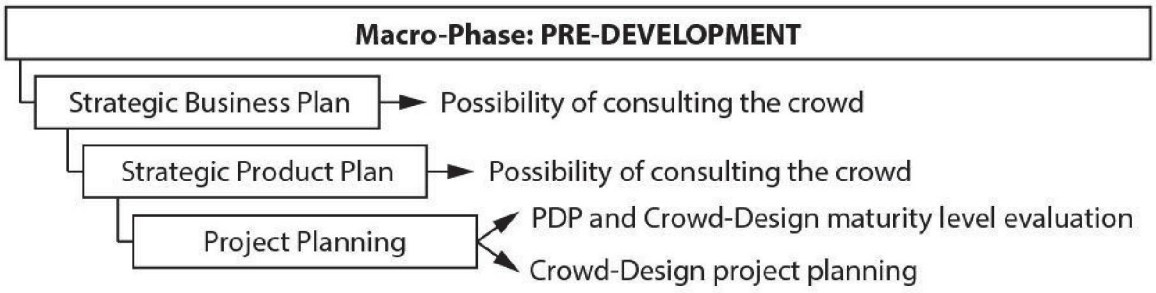


Figure 2.21 – The pre-development macro-phase of the PDP and the crowd-design.
Source: Adapted from Oliveira (2017).

A key aspect on this macro-phase is the company's understanding of its own core competence and the possible scope of activities to be carried out through a crowd-design process. Since it is quite common, particularly in Brazilian cases, the lack of an explicit business strategy, launching a crowd-design initiative is an opportunity for the company to revise its own strategy (Oliveira, 2017).

The crowd's adequate understanding of the essential competence of the company and its business strategic planning is beneficial for an effective crowd-design process. It demands careful handling of information, particularly regarding confidential information (Djelassi & Decoopman, 2013). This phase involves an alignment of the crowd-design initiative with the company's strategic product planning.

Rozenfeld *et al.* (2006) point that several projects can follow the macro-phases of 'development' and 'post-development' concomitantly. Thus, it is suggested here that crowd-design initiatives may be these developments. However, according to Palacios *et al.* (2016), the integration of crowd-based processes on the PDP requires new thinking, new resources, and new capabilities to effectively navigate the creative and unpredictable processes of engaging with the crowd, and manage both high-impact results and risks. On this way, the project-planning phase includes the evaluation of the PDP, i.e. the mapping of the activities the organization already executed, including the use of participatory approaches. After that, it is possible to delineate a crowd-design initiative, i.e. the necessary steps and crowd-based processes that will be included on it (Oliveira, 2017).

2.2.3.2.3 The development macro-phase

For Rozenfeld *et al.* (2006), the development macro-phase corresponds to the definitions of the product design itself, its characteristics and how it will be produced. In

addition, besides guiding the solutions generation, this macro-phase provides the basis on which the evaluation and decision-making criteria used in the later stages of the development process will be assembled (Rozenfeld *et al.*, 2006). Figure 2.22 shows its relationship with the crowd-design process, according to Oliveira (2017).

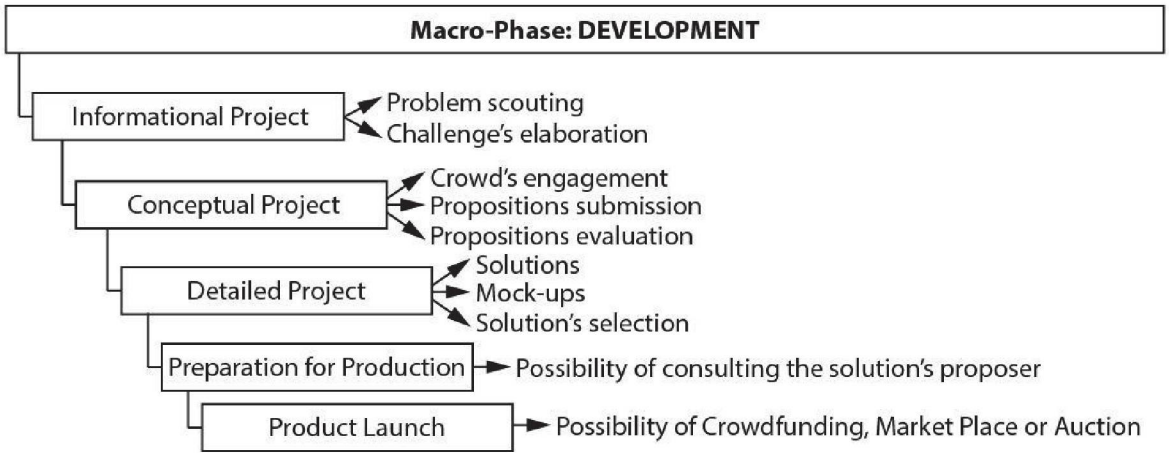


Figure 2.22 – The development macro-phase of the PDP and the crowd-design.
Source: Adapted from Oliveira (2017).

The 'information project' of Rozenfeld´s *et al.* (2006) model corresponds to the crowd design process on two phases: the 'problem scouting' and the 'challenge's elaboration'. In this case, 'problem scouting' means the use of the crowd-design process to achieve the real demand or problem to be solved. This approach can occur directly through an Internet-based platform, as in the Open IDEO case (openideo.com) or via offline procedures (Shoyama *et al.*, 2014; Dickie & Santos, 2014). Thus, after verifying the real need, in the case of problem scouting via crowd-design, the crowd can continue contributing with ideas (or concepts) for solving the problem. In the case of offline problem scouting, the challenge must be drawn up and posted on the platform so the crowd can contribute with ideas (or concepts) of solution (Shoyama *et al.*, 2014).

In the 'conceptual project' phase, the roles between the crowd and the organization merge. In the 'detailed project phase', however, there is the choice of whether or not to keep the crowd within the project as external consultants. Each detail in the project can be transformed into a managerial review for decision making and interaction of these 'consultants' in order to proceed to the next step, i.e., the preparation for the production phase. Here, there is the possibility of applying a crowdfunding process in order to enable manufacturing the product, launching and

distributing it.

When adopting an Open Design and Open Source Ecology approach, it is also possible that the production and implementation to be carry out through FabLabs by the users themselves. Regarding to product launch, some authors (Simula & Vuori, 2012; Djelassi & Decoopman, 2013) state that the use of a crowdvoting process to select the best solution can facilitate product launch, once the crowd is already aware of the product features. Other approaches involving the crowd in the product launch phase is the possibility of selling it in auction or marketplaces, as proposed by the innonatives platform (innonatives.com, 2017).

2.2.3.2.4 The post-development macro-phase

This macro-phase, in the Rozenfeld's *et al.* (2006) PDP reference model, refers to the monitoring of the product in the market and management of the end of the product's life cycle. Figure 2.23 brings the relation between the PDP´s post-development macro-phase and the crowd-design possibilities.

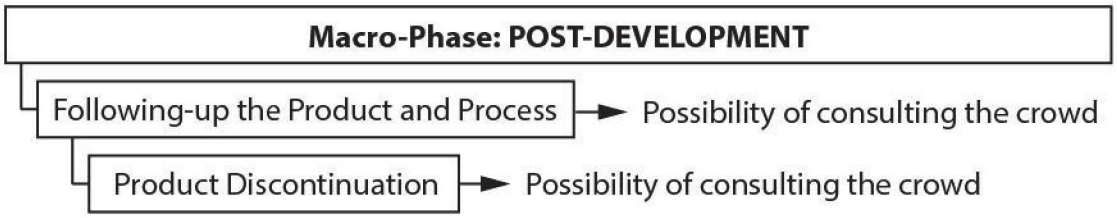


Figure 2.23 – The Post-Development macro-phase of the PDP and the Crowd-Design.
Source: Adapted from Oliveira (2017).

By knowing that any consumer, through crowd-based processes involvement, is a potential 'developer' (Djelassi & Decoopman, 2013), it is desirable that the organization maintain a constant monitoring of the product performance even after the development phase (Rozenfeld *et al.*, 2006). Indeed, the crowd can be stimulated to present proposals and suggestions for product improvement through social networks or dedicated platforms. Based on feedbacks gathered from comments or through a formal consultation via a crowdvoting process, the organization can decide to set up a new challenge for the crowd or to propose only smaller tasks (internally or with the crowd) for continuous improvement. However, the choice in proceeding with a crowd-design process in this macro-phase is not an obligation; instead, the organization might decide to follow a conventional process of product monitoring and discontinuation.

2.2.3.3 General issues regarding participation via crowd-design

As seen so far, participation in crowd-design process can occur in different ways, not only because of the different types of tasks involved in the process, but also because of the feasibility of applying it in different phases of the PDP. Figure 2.24 summarizes the identified practices for creating superior value for the crowd and capturing value from the crowd more effectively (Täuscher, 2017).

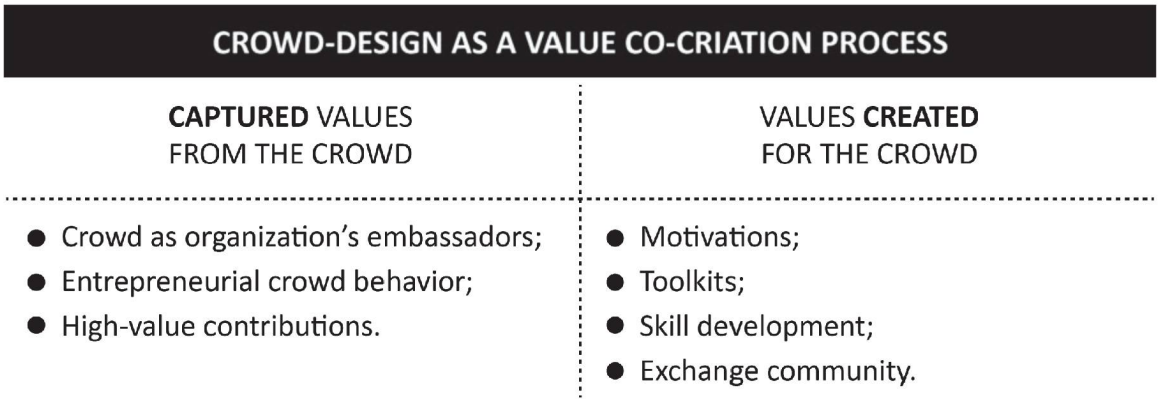


Figure 2.24 - Crowd-Design as a value co-creation process.
Source: Based on Täuscher (2017).

The focus on sharing through collaboration and participation may have life-changing implications, not only for the advancement of technology, knowledge and innovation, but also for the social and political aspects when the collaboration of global communities for a common cause can result in cooperation and unity. In this context, crowd-design initiatives are becoming strategic to cut operational costs, increase both efficiency and effectiveness of projects, and in accelerating innovation diffusion for sustainable development (Zelenika & Pearce, 2012). Thus, the general philosophy of participation in PDP via crowd-design process can be understood as a participatory culture model (Brabham, 2011), with a greater sustainability potential (Tukker & Tischner, 2006).

However, crowd's participation has its drivers and barriers, as well as aspects related to either advantages or disadvantages brought to the PDP (see figure 2.25).



Figure 2.25 - Aspects related to the participation via crowd-design.
Source: This thesis' author (2018).

In addition to these aspects, organizations need to develop trust-building strategies, with clear value proposition, to positively influence the participation of the crowd (Terwiesch & Ulrich, 2009, Quigley *et al.*, 2007; Kohler, 2015).

2.2.3.3.1 Potential advantages and drivers

The creative tasks are the main characteristic of crowd-design initiatives. However, the overall crowd-design process integrates many other tasks, considered simpler than the creatives ones, e.g. voting.

According to Engel *et al.* (2012), creative tasks are usually left to individuals or groups that are highly specialized and trained. The kind of tasks involved in a crowd-design process are the first key factors in determining the kind of contributions that could be expected from the crowd (Täuscher, 2017). According to Macul & Rozenfeld (2015), only few projects can attract enough active participants with different backgrounds to build a community and advance rapidly in the PDP phases. Their study indicates that there is a positive relationship between the number of participants and the reliability in the crowd-design initiative.

Procter & Gamble (P&G) experience with crowd-design integrated into the PDP has resulted in an increase in product innovation; in 2011 alone, 35% of the innovations already came from the crowd (Bornia & Lorandi, 2008).

The participation of users is a natural necessity of the PDP, due to the fact that it is an inherently multi-functional and multi-stakeholder activity. Nowadays, involving not only suppliers but also users is consistently regarded as one of the most important success factors of a PDP (Bornia & Lorandi, 2008; Felekoglu *et al.*, 2013).

As with any open and social community, the motivation to participate is the key factor. As to motivations of the crowd to participate in crowd-design initiatives, studies

have shown that these can be both intrinsic and extrinsic and are directly linked with age and gender of individuals from the crowd (Baruch *et al.*, 2016). Table 2.9 shows the aspects that could motivate the crowd, according to Battistella & Nonino (2012, 2013).

Table 2.9 - Types of crowd's motivation.

Aspects of INTRINSIC MOTIVATION	Individual	Concern the psychological-emotional sphere of the participant, and the participation collaborate for the personal learning and knowledge exchange.
	Social	Refer to the collective sphere of the individual who joins a crowd-design process.
Aspects of EXTRINSIC MOTIVATION	Economic	Concern all the actions that lead, directly or indirectly, to economic advantages for the participant.
	Individual	Consist of all the actions that lead to advantages for the participant as, for example, reputation.
	Social	Concern all the obligations and responsibilities that arise from the social sphere of contributions and that have effects on the community.

Source: Based on Battistella & Nonino (2012, 2013).

Baruch *et al.* (2015) found that motivations to participate in crowd-design initiatives are largely altruistic: many participants are more interested in exploring the world. Participants also expect well-communicated, tangible results and a greater degree of communication with those behind the crowd-design platform.

The participation also means to share with the crowd the inherent risks of the PDP activities. According to Macul & Rozenfeld (2015), the risks related to the product quality are smaller in crowd-design initiatives because the evaluation of the contributions is shared among the users. In turn, it allows the organization to be more agile and release community versions of its products, even in the early stages of the PDP. Thus, the risks related to product acceptance are also lower (Macul & Rozenfeld, 2015). However, the participation is also dependent on the feedback given to the tasks performer, as well as the interface of the web-platform (Baruch *et al.*, 2015). Kornberger (2017) highlights the necessity of re-thinking the communication, coordination, and control of the crowd-design process.

Internet access can be both driver and barrier of participation in the crowd-design process. As a driver, Internet is a technology that connects society and, hence, reduces communication, information, and search costs (Altman *et al.*, 2015; Langlois, 2003; Langlois & Garzarelli, 2008). Cases of crowd-design initiatives demonstrate that

Internet access not only helps to reduce related communication, information, and search costs but also provides a superior mechanism to access talent and identify resources. Internet access is an important driver for participation in PDP (Kornberger, 2017), but the crowd-design initiator has to be aware of possible limitations with Internet access in many areas of the world, especially for those for whom the development is intended (Buitenhuis *et al.*, 2010). Therefore, crowd-design initiatives that include participants with no Internet access (Dickie *et al.*, 2014; Dickie & Santos, 2014; Oliveira *et al.*, 2016; Oliveira, 2017) require adapted offline strategies to involve them.

2.2.3.3.2 Disadvantages and barriers

The fact of sharing the risks of PDP activities with the crowd could also mean a barrier for implementing a crowd-design initiative. According to Macul & Rozenfeld (2015), PDP information and activities via crowd-design processes come from a variety of sources, in a decentralized and self-organized way. Participants can join a project by entering or exiting it at any time (where participation is voluntary), increasing the chance of losing information and the activity be interrupted. This is why "participation brings with it the need to navigate between the expansiveness and dynamism of open systems" (Reich *et al.*, 1996, p. 166). For Bornia & Lorandi (2008), the challenge is the integration of the internal functional areas of PDP with the external members (i.e. the crowd). In crowd-design process, tasks are performed by multiple stakeholders (representing individuals, teams or even entire organizations) in active communication to jointly achieve established the PDP goals (Klein *et al.*, 2003; Lahti *et al.*, 2004). Hence, multiple stakeholders mean multiple languages, diverse interests, as well as different maturity and knowledge regarding the PDP. When the participation of users happens, it is important to avoid their feeling alienated; they have to believe they have been effective participants on the PDP (Reich *et al.*, 1996; Mukaze & Velásquez, 2012).

Additional crowd members often influence the platform's value for the existing crowd. Some studies have revealed empirically that an increase in the network sizes produces a negative effect on existing crowd members who perceive it as an external interference (Boudreau & Jeppesen, 2015). The same-side or direct network is particularly negative if the contributions are homogenous; and the added content leads to the substitution of the existing content (Belleflamme & Toulemonde, 2009). This dynamic has been described as crowding-out and identified as a key barrier to further

innovation incentives (Boudreau, 2012). The effect is particularly high in platforms that incentivize crowd participation by sharing part of the organization's revenues with contributors according to the popularity of their contributions. As such, managers should measure the satisfaction, engagement, and performance of their existing crowd members over time to detect dissatisfaction from increased competition in the group. The amount of direct network effects is determined by (1) the heterogeneity of demand from participants, (2) whether the contributions are geographically limited, and (3) whether participants compete for rewards such as attention or money (Täuscher, 2017).

Finally, Horst & Pearce (2010) and Tischner & Best (2017) quote the language as a significant barrier for participation, given the amount of languages and dialects throughout the world. Most crowd-design platforms communicate with their participants in English. However, this represents a barrier for some users. A temporary solution can be found on the integration of an 'online translator' tool, such as google translator (Zelenika & Pearce, 2014; Tischner & Best, 2017). Another possible solution is ensuring that information is present with a diverse array of multimedia, such as drawing, diagrams or videos that do not require too many words (Zelenika & Pearce, 2014). Even so, participation is then partly limited to people speaking the language featured in the proposed initiative, excluding all others.

The success of any process or enterprise depends on the deep engagement of the participants (Watson, 2009; Mukaze & Velásquez, 2012) of which the sense of ownership is a crucial component. This sense of ownership can be facilitated by the existence of a sense of community and the sharing of a common culture and beliefs (Zelenika & Pearce, 2014). This is why community-driven participation and demanded innovation must be the underlying component of crowd-design process to ensure that as many stakeholders as possible are involved in the dialogue process and have access as well as the ability to be active participants.

2.2.4 Discussion

The content presented in this subchapter sheds light on crowd-design, presenting the origin of the term and its related terms, as well as it details the crowd-design process and how it is related to participatory product development approaches.

As already stated, participation is an intrinsic characteristic of the crowd-design process, and what distinguishes it from the conventional design process as well as from

the crowd-design's related constructs lies precisely in the participation approaches and its possibilities. The conventional design process, for instance, adopts the 'design to' approach while crowd-design process includes 'design with' and 'design by'. This is what allows the involvement of individuals from the crowd in creative and decision-making tasks to solve problems. On the other hand, what distinguishes the possibilities of participation in crowd-design from the related terms such as Open Innovation, Open Source Ecology and Open Design is that the crowd-design process is dependent of integrative participation of the crowd.

Similar to the generic crowdsourcing process, the generic crowd-design process is composed by different kinds of tasks in which the participants may assume different roles. Therefore, participation in PDP via crowd-design depends on many issues, including the Internet access, crowd's motivation and process management.

Indeed, the possibilities of participation in a crowd-design process are related to how the advances of TICs are influencing people's behavior. The facilitation of information access as well as the possibilities of creating and sharing content brings about many possibilities of interaction between organizations and their public. Individuals become crowds as communication barriers cross-geographical boundaries in just a few seconds. In this sense, passivity gives way to more active behavior, including generating content and sharing opinions, needs and information that can contribute to solve different kinds of problems. While there seem to be more advantages than disadvantages, crowd participation in the PDP through the Internet may encounter barriers in cultural and language issues. In relation to this last issue, the literature has already signaled some attempts of solution, that point to factors directly involved in the motivation to participate.

Motivating the crowd participation on PDP via crowd-design can be considered as a challenging issue. First, because the crowd can be involved in all PDP phases and that is why the crowd-design initiative has to be carefully planned and managed besides being aligned to the organization strategy. As already stated, the crowd can also contribute to the organization strategy adjustment, helping in its market repositioning. But for this to happen, the relationship between the crowd and the organization has to be based on trust and transparency. This is the second challenging issue regarding motivation because the crowd will be more motivated if it can trust in the organization behind the crowd-design initiative.

Based on the assumption that the crowd will be motivated to participate in crowd-design initiatives, PDP via crowd-design can contribute to many aspects of sustainability, as will be seen in the next and final subchapter of this theoretical background.

2.3 THE SUSTAINABILITY ETHOS EMBEDDED INTO CROWD-DESIGN

This subchapter addresses the content that connects the thesis' fundamental constructs, **crowd-design** and **sustainability.** As earlier presented in this chapter, crowd-design is a type of crowdsourcing associated with the Product Development Process (PDP). As such, a crowd-design process implies the adoption of participatory approaches, with a variety of relationships with design and designers, mainly over an online environment, i.e. Internet-based platforms. Also according to the literature presented so far, a crowd-design initiative can be associated as a type of open innovation process of a given organization. Indeed, even the case of the so called 'internal crowdsourcing' [or 'internal crowd-design'], where employees are treated as a 'crowd', crowd-design could be considered an open innovation process due to the fact that employees may be regarded as a crowd, though confined within the organization borders.

Regardless of the type of approach [open or closed], innovation within a crowd-design process may occur in its four dimensions: (i) product (including services), (ii) process, (iii) organizational and (iv) marketing (OECD, 2011). From a sustainability perspective, the concept of innovation encapsulates three main themes: green economy, the eco-innovation and the social innovation, each one of these themes corresponding to the three dimensions of sustainability (economical, environmental and socio-ethical). Figure 2.26 (next page) shows the connections of these subjects.

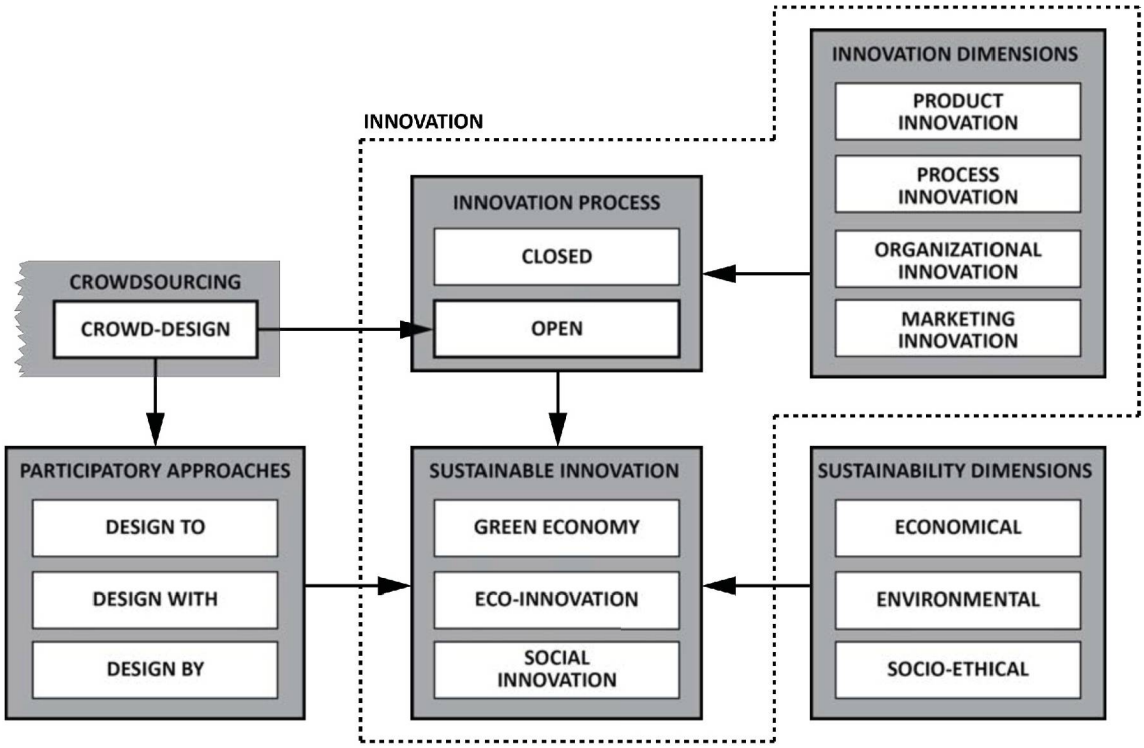


Figure 2.26 - Connections among fundamental constructs.
Source: This thesis' author (2018).

On this context, this subchapter is thus organized in order to present the concepts, dimensions and principles of sustainability before introducing its relation to innovation and participatory approaches in PDP. Finally, it presents the specific advantages of crowd-design regarding the ethos of sustainability and the characteristics of problems that could be considered as 'suitable' for a crowd-design intended to contribute to sustainability.

2.3.1 Sustainability concepts, dimensions and principles

2.3.1.1 Defining sustainable development and sustainability

The most widely accepted **definition of sustainable development** was given by the Brundtland Commission, in 1987, and refers to a "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 43). According to this definition, the concept of 'development' leads to different scenarios when compared to the conventional 'growth' paradigm since it contemplates the intergeracional impacts of consumption and production. The achievement of wellbeing in harmony with nature surpasses the strive for material accumulation.

The growth paradigms requires a continuous increase on production levels, which in turn pushes the level of consumption of material resources and energy (Vezzoli *et al.*, 2014; Ceschin, 2014; Ceschin & Gaziulusoy, 2016; Tischner, 2015). Progress, according to the growth paradigm, can be measured according to the ratio of income per capita (Gross Domestic Product-GDP/Population) of a given society (Bhamra & Lofthouse, 2007; Vezzoli *et al.*, 2014; Tukker, 2015). A focus on growth undeniably brings transformations on the wellbeing of people in those countries or regions with populations living below poverty level. Indeed, such growth should provide an expansion on the availability of the school facilities and health system, greater access to the means of transportation, better communication infrastructure, among other benefits.

However, economic growth does not necessarily mean an improvement in the conditions and quality of life of the population. This happens because growth is associated, among other issues, with the concept of competition where the most capable and qualified has gets more benefits, which often results on the exclusion of others (Vezzoli *et al.*, 2014; Tukker, 2015; Shiva, 2015; Rockström, 2015; Stebbing, 2015; Ceschin & Gaziulusoy, 2016). Such view is in sharp contrast with the perspective of sustainability, more guided towards collaboration, sharing and a continuous search for social, economical and environmental equity.

The term 'development' is often misunderstood as having a direct association with 'growth'. A search for growth via the provisions of solutions for products and services that are more eco-efficient or focused on poverty reduction is becoming a widespread practice, particularly focused in developing solutions for people at the base of the social pyramid (BoP) (Abramovay, 2012; Tischner, 2015). This development policy focused only on growth can, for instance, promote equity of consumption patterns between those at the top and those at the base of the pyramid, incurring on risk of overcoming the resilience limits of the planet (Shiva, 2015; Tischner, 2015; Tukker, 2015).

The previously presented sustainable development concept underlines the importance of protecting the natural ecosystems, with a lens that includes not only human beings but also all living creatures. Under such paradigm the achievement of wellbeing cannot occur at the expense of damages to the economic, social and environmental dimensions. Intergenerational solidarity is also crucial: all development

must consider its impact on the opportunities for future generations (WCED, 1987; Alblas *et al.*, 2013; Vezzoli *et al.*, 2014; Shiva, 2015; Stebbing, 2015; Ceschin & Gaziulusoy, 2016).

In 1972, the 'Limits to Growth' report already drew attention to the limits of conventional growth and the irreversible effects of the impacts it causes. In this context, sustainable development does not denote a specific content, but rather a process where ecological, economic and social values are balanced in continuous action. Sustainable development requires significant transformation and innovation of larger parts of the production and consumption systems (Manzini & Vezzoli, 2008; Boons, 2013; Tukker, 2015; Manzini, 2015; Shiva, 2015). Here, the search is for a socially cohesive and equitable society, challenging the trade-off of improving wellbeing as increase of material consumption.

Within the paradigm of sustainable development the provision of 'satisfaction' or 'wellbeing' replaces the search for 'product acquisition'. Such shift is a radical change in relation to the characteristics of orthodox growth paradigm. In fact, Daly (2010) argues that from a certain level, economic growth and increased consumption and accumulation of physical artifacts are dissociated from happiness and wellbeing. Therefore, achieving this wellbeing may be unrelated to the supply of new physical artifacts (Tukker, 2015; Ceschin & Gaziulusoy, 2016).

Redirecting the focus from artifacts to the provision of satisfaction does not mean that there will be no need for artifact production. A condition for a sustainable society and ecosystem is that our fundamental needs should be met worldwide on an equitable manner. Many of those needs do require the provision of artifacts. Therefore, the implementation of a crowd-design process effectively aligned to sustainability requires careful reflection on the effective intent of the initiative since the development of a new product might result on rebound effects that could be detrimental to sustainability.

Avoiding the use of crowd-design as an alternative strategy to push more products into the market requires systemic thinking. The emerging paradigm puts sustainability as a 'system property' and not a property of individual elements of systems (Ceschin & Gaziulusoy, 2016). Hence, achieving sustainability requires a process-based, multi-scale and systematic approach to plan for sustainability guided by a target vision instead of traditional goal-based optimization approaches (Clayton & Radcliffe, 1996; Holling, 2001; Walker *et al.*, 2004; Bagheri & Hjorth, 2007).

Sustainability is intrinsically a wicked-problem, as it demands to deal with three interlinked complex dimensions, the Triple Bottom-Line (TBL) (Elkington, 1997), namely: (i) the socio-ethical dimension; (ii) the economical dimension; and (iii) the environmental dimension.

There are other models of the sustainability dimensions, e.g. Sachs (1993; 2002) and Passet (1996), but the TBL is the one widely adopted in the Design for Sustainability literature (Vezzoli *et al.*, 2014). In essence, TBL is a construct that expresses the expansion of the environmental agenda in a way that it integrates the economic and social perspectives (Elkington, 1997). TBL has also been referred to as the practical framework of sustainability (Rogers & Hudson, 2011), alternatively described as 'people, profit and planet' (Bhamra & Lofthouse, 2007). Figure 2.27 presents the TBL model based on Elkington (1997), with the addition of the issues presented by Stebbing & Tischner (2015) and Vezzoli *et al.* (2014).

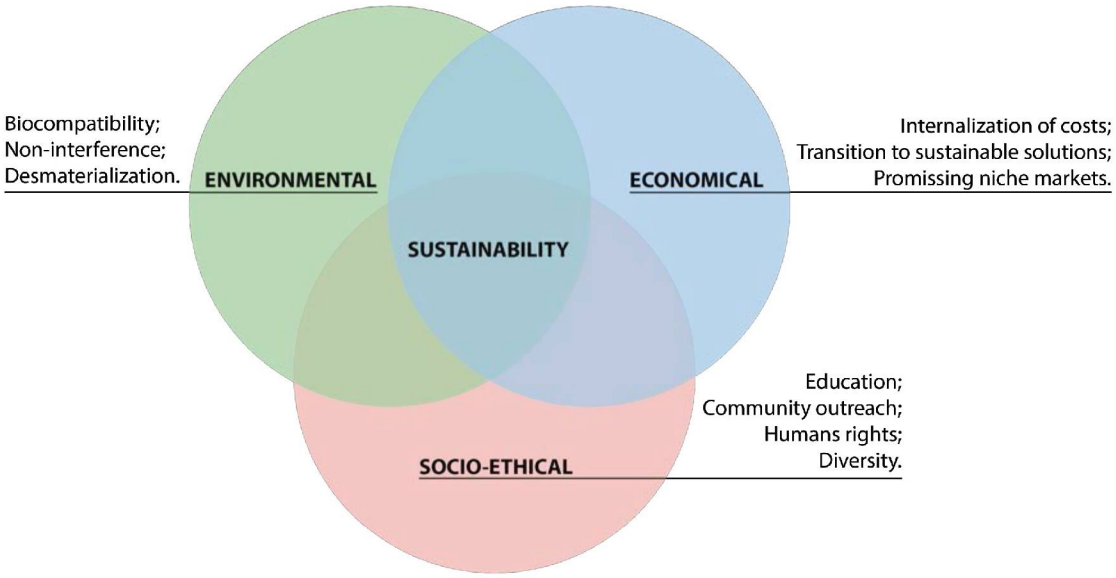


Figure 2.27 - Triple Bottom-Line model.
Source: Based on Elkington (1997), Stebbing & Tischner (2015) and Vezzoli *et al.* (2014).

The characterizing features of each dimension, as well as their principles, are described in the following subsections. In a subsequent subsection, however, this description will be revisited to emphasize its connection to crowd-design.

2.3.1.2 Economical dimension and its principles

This dimension refers to economically practicable solutions, which includes a

spectrum of possibilities that range from conventional norm-oriented market (Vezzoli *et al.*, 2014) to the emerging axioms of green economy (Rosa, 2013). The underlying key axiom is that an environmentally and socio-ethically sustainable model of production and consumption should also be economically feasible. In other words, it focuses on the economic value provided by the organization to the surrounding system in a way that it prospers and promotes the resilience and the capability to support future generations (Alhaddi, 2015).

In recent publications, however, the usage of the term 'green growth' has expanded and now applies in many cases to the growth of the entire economy (Janicke, 2012). 'Green growth' not only affects the quality of growth, but the overall production system. In this case, growth results from the investment in the upgrading of the entire production system to environmental and resource-saving processes and products. The definition given by OECD (2011), states that "Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our wellbeing relies" (OECD, 2011). The OECD's (2011) 'Green Growth Strategy' explicitly refers to the Rio +20 summit, stressing that the strategy only covers the common intersection of ecology and economics. On the 'Green Economy Report,' submitted by the UNEP (2011), the focus is not only on 'growth' but also on 'development.' The social dimension includes not only employment but also equity and poverty reduction. UNEP (2011) defines a 'green economy' "as one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP, 2011).

Based on principles of the economic dimension of sustainability raised by Ribeiro (2011), Rosa (2013) carried out a literature review in order to understand the universe of possibilities for the practice of design in this dimension. Thus, based on many others authors, she has found five economic principles of Design for Sustainability, as shown on table 2.10.

Table 2.10 - The economic principles.

Principles	Description
Promoting the local economy	Promoting the local economy means involving as much local actors as possible in the business process, contributing to the expansion of income opportunities and strengthening local entrepreneurship.
Strengthen and valorize	This principle suggests that renewable local materials and energy

material inputs and local productive structures	should be used wherever possible and that these resources should have a greater competitive advantage over resources exogenous to the region.
Respect and value local culture	This principle suggests reducing the material and capital demands for the development of a product or service as well as improving the dissemination of the economic benefit to an expanded number of people and organizations through networking.
Valorizing the reintegration of waste to promote their reduction	This principle deals with the implementation of strategies that transform waste into sources of income when producing goods and services, in order to reduce the need to increase environmental impacts, i.e. reducing the volume of capital required for the exploitation of raw materials.
Promoting network organization	In order to respect and value the local culture, it is suggested that the local culture be transformed into an economic good, capable of contributing to the improvement of the economic performance of the local actors, integrating the community in the process of developing products and services. Giving access and empowerment to local communities also contributes to the enhancement of the positive aspects of humanity's cultural diversity.

Source: Based on Rosa (2013).

On a more generic level, economy involves two fundamental principles namely responsibility and precaution. Hans Jones theorized the principle of responsibility in 1979 in retracing the consequences of "irresponsible acting in an exploited and denied nature." Individuals and collectivity must bear the consequences of their actions. An example of this responsibility is the CO_2 quota markets that buy or sell emission allowances. This is a practice that can be called a 'permission to pollute'. While on the one hand there has been a reduction of 50% in sulfur oxide emissions, on the other it is a ploy to the modest objectives set by the Kyoto Protocol that should not undermine international agreements (Kazazian, 2005, p. 32).

The precautionary principle encourages prudence and common sense. Kazazian (2005) describes precaution as the extension of the perception of development to encompass the complexity of the systems that govern nature and our certainties. This principle must be applied to the various forms of structures (political, institutional or industrial), and it presupposes public debate, although the agreement between responsible actors is still far from being achieved. Examples include discussions on foods from genetically modified organisms because of the lack of information on the consequences of their consumption.

Initiatives such as proposed by Rosa (2013) offer pathways to systematically consider this dimension on a crowd-design process.

2.3.1.3 Environmental dimension and its principles

This dimension is related to the resilience of the biosphere-geosphere, that is, its ability to absorb anthropic perturbations without provoking irreversible phenomena of degradation such as global warming, ozone layer depletion, acidification, eutrophication (Vezzoli *et al.*, 2014). Therefore, the environmental dimension is related to the environmental impacts caused by the production/consumption systems.

Among the environmental impacts of production/consumption, there are those caused by substances exchanged between the natural environment and the production/consumption systems. Such impacts occur in two dimensions: as inputs and as outputs (Tischner, 2015; Vezzoli *et al.*, 2014). The inputs refers to the materials and energy used by the production-consumption systems, i.e. the use of nonrenewable or renewable resources; exposure of humans and ecological systems to contaminants; emissions to air, water and soil, which includes effluents and noise; and the generation of waste materials and their accumulation as well as the use of non-renewable sources of energy (Tischner, 2015; Vezzoli *et al.*, 2014).

The extraction and use of nonrenewable resources entails profound effects that include their exhaustion, which also implies negative social and economic effects for future generations (Vezzoli *et al.*, 2014). On the other hand, the outputs are generated throughout the life cycle of a product and fall into several categories: the product itself, intermediates, co-products, by-products (Tischner, 2015).

According to Alhaddi (2015) and Vezzoli *et al.* (2014), the general principles related to the environmental dimension, with direct contributions to reduce the ecological footprint (Goel, 2010), are basically two: (1) promote the preservation and reduction of the use of non-renewable natural resources (input) and (2) prevent pollution by reducing emission (output). These principles have a connection with the Product Life Cycle (PLC), "meaning that the product is analyzed according to its energy, resource and emission flows during its lifetime" (Vezzoli & Manzini, 2008, p. 55). In other words, the life cycle encompasses all stages of the product, starting with mining for necessary resources and manufacturing its components until the last end-of-life treatment. Thus, a PLC is mapped out through a process divided in the following phases: pre-production; production; distribution; use; and disposal. The environmental principles related to the strategies of product life cycle are those described on table 2.11 (next page).

Table 2.11 - The environmental principles.

Principles	Description
Minimise material and energy consumption	The objective is to minimize the burden on the environment associated with the product during its life cycle and related to its functional unit. According to this approach, it is not the product that is under assessment, but the impact of the set of the processes employed to satisfy a certain function. In other words, the goal is to create a systemic idea of the product to minimize the input of raw materials and energy, let alone the impact of all emissions and waste, both quantitatively and qualitatively, calculating the harm of all effects. The greater vision leads the designing process to take into account all activities during its life cycle and relate them to the set of exchanges (the input and output of various processes) they have with nature. For this must be defined, within the design process: a profile of the stages of the product life cycle, starting with extraction of raw materials until the disposal of waste and residues.
Choice of low environmental impact resources	Selecting low-impact resources is an objective for all stages of the life cycle. The selection of low impact resources can be achieved in two conceptually different ways: selection of non-toxic and harmless resources; selection of renewable and biocompatible resources. In the pre-production stage necessary resources and semi-finished products are prepared as components of the manufacturing of the final product. Non-renewable resources are mined from the earth, while renewable resources, from biomass, are normally cultivated and harvested. In both cases raw materials go through a series of treatments. Secondary raw materials are derived from scraps and discards of the production–consumption system. Pre-consumer resources consist of waste and refuse discharged during the production processes. While post-consumer resources are acquired from goods and packages after they have passed the end-user. These resources, especially post-consumer ones, have to be reprocessed before their re-utilisation in new products is rendered possible.
Optimization of product lifespan	A product with a longer life, with possibilities to promote different functions, generally guarantees a less impact to the environment. A product with a shorter life will not only generate waste prematurely (while others are still working), but will also further aggravate the impact due to the need to replace it. The pre-production, production and distribution phases of a new product, which replaces an older one, further induce consumption of resources and emissions. In other words, when the user is provided with a product with a longer life compared to a shorter life, the impact that would occur in the pre-production, production, distribution and disposal phases is avoided.
Extension of material lifespan	As far as the use phase is concerned, extending the useful life does not necessarily lead to a total reduction of impact; on the contrary, there could be a relative increase if new competing products were more environmentally efficient. In other words, for some products that have a greater impact in the use phase, a more adequate prolongation of the useful life is necessary. The categories of products where the life extension approach offers the greatest potential to provide environmental advantage have been those that consume less resources (energy/water and other inputs) during the use phase.
Easy assembly and disassembly	Design for Disassembly (DFD) focuses on how to design easily disassembled products; meaning that the parts and materials can be easily and economically separated. The possibility of easy separation

	of the parts facilitates the maintenance, repairs, updating and re-manufacturing of the products. Meanwhile, the possibility of easy separation of the materials facilitates, on the one hand, their recycling (if they happen to be incompatible with each other) and, on the other, their neutralization (in case they happen to be toxic or dangerous). Therefore, the environmental arguments behind adaptation of design for disassembly are the extension of product lifespan (the maintenance, repairs, updating and re-manufacturing), the extension of the material lifespan (recycling, composting and combustion) and neutralization of the toxic and harmful substances.

Source: Based on Vezzoli & Manzini (2008) and Vezzoli *et al.* (2014).

The design efforts in promoting sustainable development according to these principles can be found in eco-design initiatives (Vezzoli & Manzini, 2008; Tukker, 2015; Tischner, 2015; Vezzoli *et al.*, 2014). Eco-design, also known as Design for Environment (DfE), describes a procedure which aims at integrating environmental aspects in the product planning, development and design process as much as possible and covering the entire product life cycle by improving environmentally properties such as material and energy efficiency, minimization of use and discharge of hazardous substances, emissions and waste (Tischner, 2015). However, according to Alblas *et al.* (2015), the implementation of eco-design methods and tools are no longer efficient to achieve sustainability in product development because impacts of production and consumption have to be assessed also on society, not only on environment. However, initiatives such as the SDO-Mepss (2016) offer pathways to systematically consider this dimension on a crowd-design process.

2.3.1.4 Socio-ethical dimension and its principles

The socio-ethical dimension refers to achievement of a resilient social equity and cohesion in society. From these core concepts derives heuristic principles that are reasonably consolidated on the literature: 'equity among stakeholders'; 'transparency'; 'education for sustainability'; 'working and employment conditions'; 'promotion of social cohesion'; 'integration of milestones' (Vezzoli *et al.*, 2014).

A cohesive society can be understood as a society that strives for social integration and builds up the necessary social capital to create a common sense of belonging.

The problems of social exclusion, spatial segregation and the population living in poverty have been at the center of debates in industrialized countries for decades,

central causes on the reduction of social cohesion. As pointed out by Tischner (2015), the production of products, services and infrastructure can negatively impact society. From the production point of view, products can be produced via the exploitation of workers and other citizens, i.e. unfair wages, discrimination, unhealthy work conditions, etc. The exploitation can also be associated to many other social impacts, such as social diversity reduction, promotion of radical or sexual prejudices.

The equity principle can be understood as the right to the same environmental space by every person, in a fair distribution of resources, i.e. the right to the same availability of global natural resources or better, to the same level of satisfaction. Social equity is widely a matter of facilitating an improvement in quality of life (Vezzoli *et al.*, 2014), by the promotion of a democratic, socially inclusive, cohesive, healthy, safe and just society, with respect for fundamental rights and cultural diversity, one that creates equal opportunities and combats discrimination in all its forms. Hence, it envisages a society where prospects exist for both upward social and economic mobility (OECD, 2011). The socio-ethical principles are summarized in table 2.12.

Table 2.12 - The socio-ethical principles.

Principles	Description
Promoting equity and social cohesion	It deals with practices aimed at building a more harmonious society, approaching neighbors, genders, religions, different ages, etc. The application of this principle aims at a mutually tolerant and shared values society, which creates conditions for significant changes in patterns of consumption and production.
Favoring the integration of the weak and marginalized	This approach deals with practices aimed at greater equity and ethics in society, particularly with those who, for reasons of creed, race, religion, ethnicity, economic situation, among others, are in a situation that is underprivileged or fragile.
Improving fairness and equity in the relationship between stakeholders	This approach deals fundamentally with the search for equitable and fair relations between the actors along the production chain of a given product and also throughout the life cycle of the same product.
Improvement of the conditions of employment and work	This approach addresses the search for healthy and safe conditions of work, as well as employment conditions, which result in effective satisfaction of people, which includes the work-family relationship, time for leisure, among other aspects.
Valorization of local resources	This approach addresses the search for solutions that contribute to the maintenance of the population in their places of origin in a way that contributes to the reduction of forced migrations, the suppression of crops and the resulting economic and environmental consequences.
Enabling responsible	This approach seeks to create solutions that allow the consumer to

consumption	make more informed decisions, which demands actions aimed at greater transparency of the working conditions involved in the production of a given product, to the creation of distribution and sales mechanisms that make possible consumers to support fairer forms of trade.

Source: Based on Vezzoli (2010).

This is perhaps the most complex dimension to properly address on a crowd-design process due to the high level of intangibility of its assessment. However, initiatives such as the Social Life Cycle Assessment method proposed by UNEP (2006) or the more expedite version proposed by Prado (2011) offer pathways to systematically consider this dimension on a crowd-design process.

2.3.2 Participation and sustainable innovation

2.3.2.1 Defining sustainable innovation and its three main approaches

Conventionally innovation refers to "the implementation of a new or significantly improved product (or service), or a process, or a new marketing approach, or a new organizational business practice" (OECD, 2011, p. 55). Based on this broad definition the Oslo Manual (OECD, 2011) does consider that innovation includes, as illustrated on Figure 2.28 (next page):

- **Product innovations**: the introduction of new goods and services, and significant improvements in the functional or use characteristics of existing goods and services;
- **Process innovations**: aim at reducing production or distribution costs, improving quality, producing or distributing new or significantly improved products. Production methods involve the techniques, equipment, and software used to produce goods and services;
- **Marketing innovations**: are geared to better serve the needs of consumers, opening new markets, or repositioning an organization's product in the market, with the goal of increasing the product acceptance;
- **Organizational innovations**: aim at improving an organization's performance by reducing administrative costs or transaction costs, stimulating workplace satisfaction (and thus labor productivity), gaining access to non-tradable assets or reducing the cost of supplies.

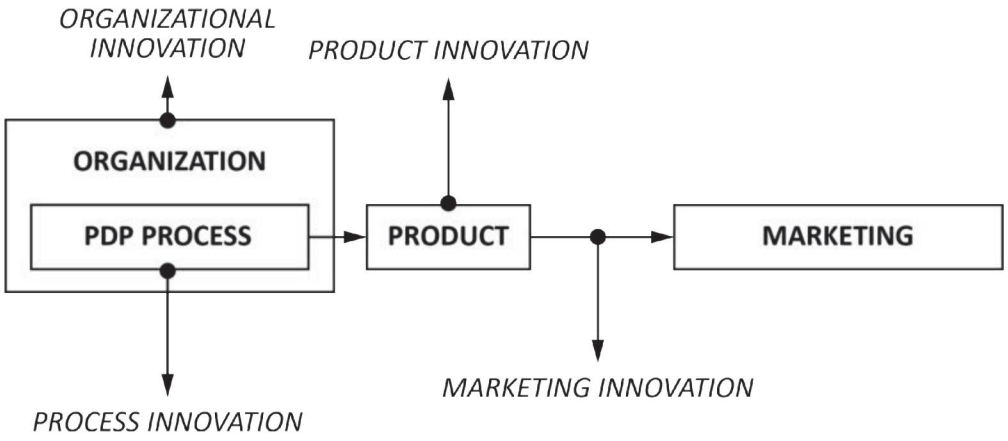


Figure 2.28 - Innovation dimensions.
Source: Based on OECD (1997).

Still, innovations can be classified as incremental and radical or disruptive. Incremental innovation seek for improvements within a given frame of solutions or, in other words, "doing better what we already do" (Donald & Verganti, 2012, p. 05) while radical or disruptive innovation is a change of frame or "doing what we did not do before" (Donald & Verganti, 2012, p. 05). In this context, on the scope of radical or disruptive innovations can be defined as those that have a significant impact on a given market and on the economic activity of organizations. This concept focuses on the impact of innovations, as opposed to their actual novelty. For instance, the impacts may change the structure of the market, create new markets or make existing products obsolete (OECD, 2011). However, such definitions do not address the characteristics of the impacts, which makes possible to overlook, for instance, the negative impacts of a given disruptive innovation on the social cohesion of a given community.

On the other hand, as pointed by Ceschin & Gaziulusoy (2016), the overall evolution of sustainability principles applied on business has changed the view of innovation, as observed in consecutive reports published by the World Business Council for Sustainable Development (WBCSD). In the context of product development, for instance, promoting product innovation and efficiency can be a flourishing channel to address environmental, economical and social problems of out society.

Sustainability scenarios do tackle systemic mega-risks that pose unprecedented challenges to organizations and government alike (WBCSD, 2004); demands innovative visions for transformation (WBCSD, 2010). Currently, there is a sharp increase on studies challenging the traditionally accepted role and responsibilities of organizations

in society and **proposing new models for value generating** (e.g. Parrish, 2007; Metcalf & Benn, 2012). In this context, the way new technologies as well as organizational and social practices enable societies to become more sustainable is what defines sustainable innovation (Boons & Ludeke-Freund, 2013).

Given the challenges posed by the sustainable development, sustainable innovation will often be characterized as naturally directed towards a system wide perspective as well as radicalness (Ayuso *et al.*, 2011; Tonkinwise, 2015). This radical change requires not only technological interventions but, most importantly, social, cultural/behavioral, institutional and organisational change (Geels, 2005; Rotmands & Loorbach, 2010). Thus, radical changes regarding sustainability can be characterized by creating new-to-the-world solutions that are innovative, for both user and organizations. According to Boons *et al.* (2013) the policy discourse that focuses on using sustainable innovation seeks to arrive at win-win situations, where economic performance and sustainable development are advanced simultaneously.

Hall & Vredenburg (2003) affirm that sustainable innovation is more complex that conventional innovation, because it has to consider a wide range of stakeholders and their different demands. It matches Boons & Ludeke-Freund (2013)´s view on sustainable innovation, understood by the authors as a process that involves inter-organizational networks and even wider societal systems. Paralleling the most accepted definitions of innovation, where a creation is only innovation when it is available for effective acquisition by the market, a sustainable innovation is one that is effectively available to the target audience. That is, it is implemented in the real world. While this is not happening, it is not an innovation but a creation.

Sustainable innovation approaches, therefore, can be characterized according to the emphasis given to each of the sustainability dimension: green economy, eco-innovation, and social innovation.

Green economy is the economy that results in "improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP 2011, p. 04). Hence, though it focuses on the economic dimension considers a harmonic balance with the other dimensions of sustainability. In a green economy, growth in income and employment are driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. The key aim for a transition to a

green economy is to enable economic development and investment while increasing environmental quality and social inclusiveness (UNEP, 2011).

As economic development and investment become less dependent on liquidating environmental assets and sacrificing environmental quality, both rich and poor countries can attain more effective sustainable economic development. Hence, it challenges the usual search for economic "growth" as the main measure of economic progress in the orthodox paradigms, which often uses progress indicators such as Gross Domestic Product (GDP). According to Tukker (2015) it would be extremely challenging to eradicate poverty without reducing income (growth) in the existing rich countries and fast growing economies at the same time that the environmental impacts are stabilized.

According to Janicke (2012), the European Commission identified in its economic strategy which are in line with the Green Economy paradigm: (1) Smart growth: developing an economy based on knowledge and innovation; (2) Sustainable growth: promoting a more resource efficient, greener and more competitive economy; (3) Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion. The first two points refer to the driving factors of 'green growth': innovation, knowledge intensity, resource productivity, and investment in environmentally friendly processes and products. The added social dimension leads to a new concept of sustainable growth.

Eco-innovation is defined as all measures of relevant actors (organizations, politicians, unions, associations, churches, private households), which contribute to a reduction or eradication of environmental impacts (Klemmer *et al.*, 1999). Eco-innovation is any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle.

Recently, the understanding of eco-innovation has evolved more and more from a customary understanding of marginal reduction of environmental impacts towards a renewed understanding of innovation that radically minimizes the use of natural resources and the release of harmful substances. It necessarily considers the entire life cycle, i.e. in the design, use, reuse and recycling phases of products, materials and services related to them. New concepts such as sharing, leasing and remanufacturing also contribute to achieve the goals of eco-innovation efforts. The impacts of eco-innovation obviously do affect the other dimensions of sustainability. Indeed, with the

evolution of consumer's awareness regarding climate change, environmental innovations star to make good business sense, with environmental offering further economic benefits as a favorable side-effect for stakeholders.

Social innovation, could, in short, be related to society ability to solve its own problems. However, it is more that that. According to Mulgan (2007), it can be defined as new ideas that meet urgent but still inconsiderate needs while improving people's lives. Although it is commonly associated with non-profit initiatives, social innovation goes wider, dealing with all issues that impact society in general. For Hockers & Wüstenhagen (2010), social innovation means both (i) product and process innovations with a social purpose; and (ii) the sphere of entrepreneurial and managerial activities, where innovation can refer to founding and further developing social enterprises, organizational-internal activities. In this context, social innovations challenge the traditional ways of doing things and introduce new, different and, therefore, more sustainable behavior.

Social innovation initiatives are sustainable when aligned and coherent with fundamental guidelines for sustainability. It entails the capacity in bringing individual interests into line with social and environmental ones. It reinforces the social fabric, and the generation of new and more sustainable ideas of well being where greater value is given to the quality of the social and physical context through collaborative actions. Social innovation, thus, refers to initiatives where, in different ways and for different reasons, people have been able to steer their expectations and individual behavior towards more sustainable ways of living and producing (Manzini, 2015).

Furthermore, the concept of sustainable innovation transcends the idea of 'green production' or the development of 'green products' (Tukker, 2015). Sustainable innovation goes also beyond eco-innovation because "[...] it includes social objectives and is more clearly linked to the holistic and long-term process of sustainable development for the short and long-term objectives of sustainability" (Boons *et al.*, 2013, p. 03).

According to Ayuso *et al.* (2011), De Toni *et al.* (2012) and Tischner (2015), to achieve innovation towards sustainability, today's organizations need to reinvent the way they relate to their stakeholders (employees, customers, suppliers, NGO's/activists, communities, governments, competitors, etc.). Hence, from a social innovation perspective an additional challenge for the creation and further development of

innovation towards sustainability is the co-creation that results not only on economic benefits but also of societal profits. Therefore, organizational models that enable participatory approaches in the PDP activities become a strategic factor for sustainable innovation (De Toni *et al.*, 2012; Alblas *et al.*, 2013). In the context of product and service development, sustainable innovation, therefore, can be understood as a process dependent on participatory approaches to achieve new technologies and social practices, reconfiguring the production and consumption systems in order to protect the natural environment. The next topic addresses the achievement of sustainable innovation by applying the participatory process on the PDP.

2.3.2.2 Achieving sustainable innovation through participatory approaches in the Product Development Process

Design can be a primary function to promote innovation in business, government as well as social organizational units such as local communities (Manzini, 2015). Looking into the recent history it can be said that design has been engaged in different aspects of sustainability discourse and practice sporadically since mid-twentieth century thanks to pioneers like Buckminster Fuller and Victor Papanek (Ceschin & Gaziulusoy, 2016). One of such contributions of design is the search for more inclusive approaches for user engagement and empowerment into PDP.

Investigation on more systematic engagement of communities has particularly evolved in the early 1980s, with active involvement of organizations acting on environmental and social issues. Nowadays, it is becoming regular practice the integration of socio-ethical issues into account during the design process, in addition to the conventional (functional and aesthetics aspects) and eco-design (environmental) aspects (Tischner, 2015). The engagement of the design practice toward the sustainability ethos brought the concept of Design for Sustainability (DfS). The relationship between DfS and innovation goes beyond the development of new concepts for products; it also can result in alternative production techniques, as well as increased employee participation and satisfaction and greater employee creativity (Bhamra & Lofthouse, 2007).

According to Ceschin & Gaziulusoy (2016), DfS is categorized in four different levels, as represented in figure 2.29 (next page).

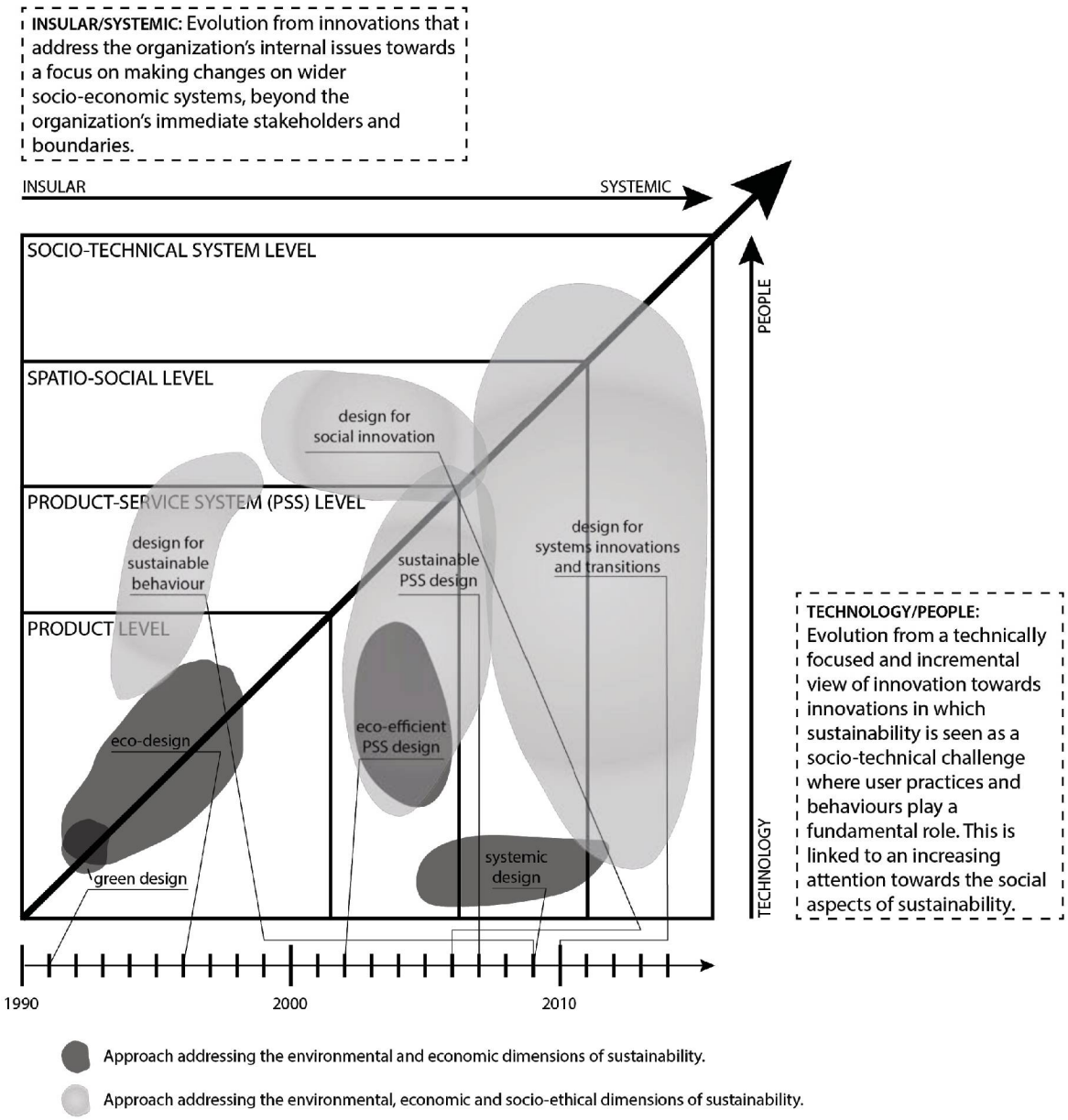


Figure 2.29 - Design for sustainability evolution levels' framework.
Source: Based on Ceschin & Gaziulusoy (2016).

- **Product innovation level**: design approaches focusing on improving existing products or developing completely new products. This the case of product innovation related to eco-design practices (Tischner, 2015);
- **Product-Service System (PSS) innovation level**: here the focus goes beyond individual products, towards integrated combinations of products and services (e.g. development of new business models that shift the product ownership from users to producers);
- **Spatio-Social innovation level**: in which the context of innovation is human

settlements and the spatio-social conditions of their communities. This can be addressed in different scales, from neighborhoods to cities;

- **Socio-Technical System innovation level**: where design approaches are focusing on promoting radical changes on how society fulfill its needs, such as nutrition and transport/mobility, supporting transitions to new socio-technical systems.

Following global changes and challenges over time, the focus of DfS has progressively expanded from single products to complex systems. This approach also brings out aspects related to the skills and knowledge the designers have to have, as well as changes needed in the design process (Tischner, 2015; Ceschin & Gaziulusoy, 2016). Still according to figure 2.29, initial DfS approaches related to the product innovation level (i.e. eco-design) predominantly required technical knowledge (e.g. on materials, production processes, renewable energies, etc.) and know-how (e.g. life cycle assessment tools, eco-design tools, etc.) from designers.

More recent DfS approaches, such as design for sustainable behavior (DfSB), require designers to be provided with a different set of expertise. In particular, human-centered design skills become crucial because designers need to understand consumption dynamics (what users want and why) and behavior dynamics (behavior change models and strategies). Thus, techniques to gather insights from users (such as cultural probes, ethnographic observations, focus groups, etc.), and techniques to co-design with them become essential in the designer's skills. A similar observation can be made on the DfS approaches related to the other innovation levels. For instance, in design for social innovation the understanding and involvement of communities in the co-design process are essential (Meroni, 2008; Manzini, 2015), which means an intensive use of participatory approaches.

In addition, regardless of the DfS approach, the main characteristic of the generic DfS process proposed by Tischner (2015), presented in figure 2.30 (next page), is the necessity of involving the stakeholders in the design process. It provides them with a high sense of ownership of the resulting ideas and increases the possibility of truly integrating the local culture and enabling a higher level of equity among stakeholders, critical principles on DfS. In this case, the 'design with' approach is recommended rather than the 'design to' one (see subchapter 2.2). Thus, the DfS process predicts the

stakeholders' participation in all its phases.

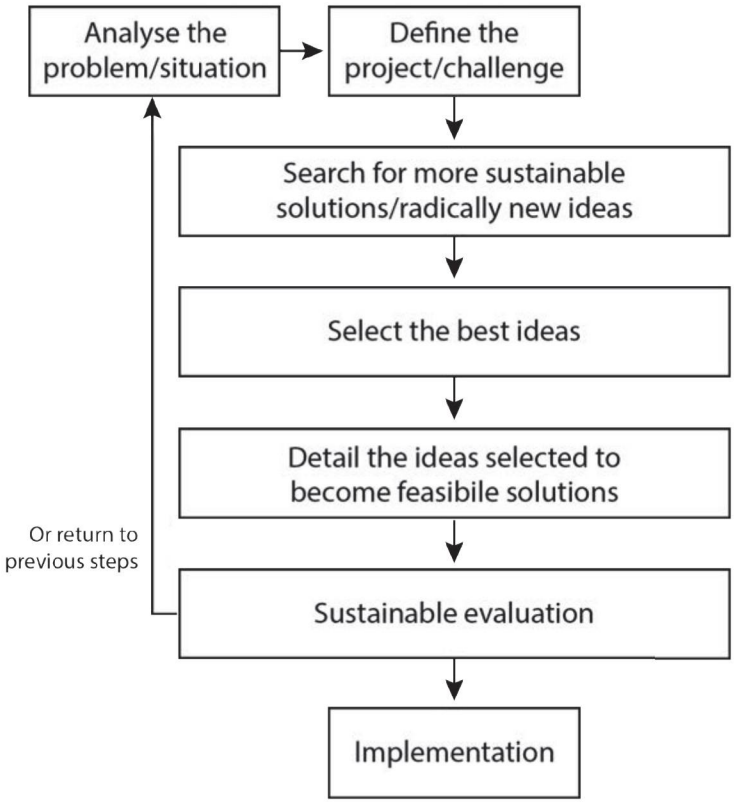


Figure 2.30 - Design for Sustainability model.
Source: Based on Tischner (2015).

This DfS model, according to Tischner (2015), emphasizes the importance of defining the task and analyzing the state of the art in order to elucidate what kind of problem, user's needs, system or product the development process is about, and how fundamental the deliberations can be, i.e. a redesign, a technical/social innovation or a completely new concept/service/system. Still according to Tischner (2015), this DfS model can be implemented in an organization from bottom up, starting from the design and operational departments, or from top down, initiated by the strategic management levels, being the combination of both the most successful.

There are similarities between this DfS process and the crowd-design process (presented on subtopic 2.2.2.1, figure 2.14). First, there are the sequential steps starting by the problem scouting. Despite this step being the fundamental part of the conventional design process the difference, however, is related with where the initiative comes from; i.e. in a conventional design process, the definition of the problem to be tacked is strongly top-down and do not always consider the stakeholder participation on

problem scouting.

Nonetheless, Alblas *et al.* (2013) suggest that the model to achieve sustainable innovation depends both on the PDP's innovation approach (open or closed) as well as the requirements of the organization's context. From this perspective, the sustainable innovation model considers both the internal and external organizational environments, where stakeholders' participation is a fundamental aspect. On this way, by applying an open innovation process to the PDP, such as crowd-design, increases the possibilities for achieving sustainable innovation with a higher level of adherence to the stakeholders' perspective, with a higher chance of success when implementing the initiative.

By innovating products and operations through a participatory approach, organizations can cut costs, improve quality, manage risks, and acquire a green and social image, through which a competitive advantage can be sustained or gained (Alblas *et al.,* 2013). At the same time, the actively managed relationships with stakeholders can become an important source of ideas for innovations that address stakeholders' expectations and ultimately contribute to the welfare of the social and natural environment. Through enabling stakeholder engagement, the organization can anticipate, understand, and respond faster and more easily to changes in the rapidly changing business context. Dialogue with stakeholders can also bring opportunities for generating disruptive solutions, beneficial for both the organization and stakeholders themselves. Organizations that engage in proactive relationship with their stakeholders will also be able to integrate the external and internal insights into their process of organizational innovation towards sustainable development (Ayuso *et al.*, 2006; Boons & Lüdeke-Freund, 2013).

Additionally, PDP often involves design for sustainability ideas in designing sustainable products (Ceschin & Gaziulusoy, 2016). In DfS, sustainability attributes, such as recyclability, energy efficiency, maintainability, and reusability, are treated as design objectives rather than as constraints (Pujari, 2006). Bringing the stakeholders to take part on the PDP activities has, therefore, some embedded relationships with sustainability principles. Participatory approaches in PDP work more efficiently within a socially cohesive environment, turning into a plausible scenario the cooperation among stakeholders (Chou *et al.*, 2015). They can also be the driver to promote social cohesion on a give community. In this case, the social cohesion is not seen as a static status of a given community but a constant goal where participation or knowledge/information

sharing can be seen as drivers or implementation strategies. Thus, to boost sustainable innovation, organizations should build collaborative networks along with users and other stakeholders, a fundamental element to develop and offer robust and effective sustainable solutions to their needs (Hofman & De Bruijn, 2010).

In this context, it is possible to infer that the resulting outcomes of a crowd-design process for sustainability could be a contribution to enhance social cohesion and social equity. Next subsection addresses the specific advantages of the crowd-design process regarding sustainability.

2.3.3 Specific advantages of crowd-design regarding sustainability

Different people may have similar problems, demands and similar topics of concern, as well as many different ideas on how to solve them. Under the Open Source (OS) ethos, their information and innovations should be broadcasted, freely revealed, and brought together to avoid the inefficient use of resources and to serve the community (von Hippel, 2005). This is one of the most significant advantages crowd-design process brings as a participatory approach in PDP (Tischner & Beste, 2017), as crowd-design initiatives facilitate time and voluntary interactions of stakeholders.

As previously seen, only through cooperation and interchange of multicultural knowledge, with multiple perspectives on the same problem, changes can be made toward sustainability on a more effective manner. Crowd-design initiatives allow open access to information and contribute to the distributive economics while creating a **value chain** based on continuous communication and co-creation. In a specific case of many possibilities, distributive economics is an economic model that brings benefits to the socio-ethical and environmental dimensions of sustainability (IIIEE, 2006; Crul & Diehl, 2006; UNEP, 2011). In particular, the design needed for social innovations cannot be designed and implemented without the integration of the relevant stakeholders (Manzini, 2015; Tischner & Beste, 2017).

In addition, when a crowd-design process initiates on a strategic analysis the **value proposition** of the organization should make it explicit that its relationships with its stakeholders is not built around a specific product or even a specific service, but rather by a mutually beneficial exchange of value. In a crowd-design initiative, the definition of the value proposition is often taken for granted as a sole an organization task, can be questioned and refined by the crowd. For sustainability, the advantage is

that the balance between economic, social and environmental value comes into focus with such wider consultation. Also, it calls for a look at the needs that are articulated by users and among stakeholders, i.e. the function that is fulfilled by the products and services offered by organizations and their interactions.

The configuration of **value creation** directly points towards the larger system of which the organization is part, both technically and socially. Its underlying assumption is that the activities of the organizations are embedded into a larger system. Essential parts of this larger system are the users and the supply chain. The distribution costs and benefits points towards the requirement that all actors involved need to have a second balance of costs and rewards. It therefore provides concreteness to the value proposition mentioned before, especially in terms of distribution across all involved actors and communities (Boons *et al.*, 2013). The development of reciprocal solutions can be achieved through crowd-design process because it is organized in order to promote dynamic feedbacks by sharing a common language between the actors involved.

2.3.4 Characteristics of problems suitable for a crowd-design initiative

Even though in different levels, different types of economies [namely developed, emerging and survival (Bhamra & Lofthouse, 2007)] face the impacts caused by their production/consumption systems. The challenges are mainly related to solving complex issues, like pollution, depletion and poverty.

This is why design for sustainability (DfS) problems tends to be large and complex (Tischner & Beste, 2017). They are not generally confined to local problems, and the variables and their inter-relations are too numerous to be divided into independent systems (Détiene, 2006). Just like any complex problem, a typical sustainability problem also has several acceptable solutions. There is no definite criterion for testing any proposed solution: various solutions are acceptable, one being more satisfactory according to one criterion, another according to a different criterion; that is, design problem solutions are not either 'correct' or 'incorrect', they are more or less acceptable. Thus, one consequence of this complexity is also that solving these problems often requires that multiple competences be put together, which in turn leads to development of collaboration between co-designers from various disciplines and thus involves the management of multiple perspectives (Détiene, 2006).

In this context, crowd-design allows stakeholders' participation as co-creators of solutions. The PDP via crowd-design brings together people with different - and complementary - skills and competences that, throughout sharing their knowledge, could solve issues related to sustainability (Lakhani *et al.*, 2013). But, as important as the search for solutions, is the elucidation of the problem the crowd-design initiative will be dealing with. According to the previously presented DfS process proposed by Tischner (2015), the emphasis is placed on the problem definition because sustainable problems may not have a clear initial definition. Thus, crowd-design for sustainability can also be applied to better understand the problems themselves and then find solutions for them.

Furthermore, a special characteristic of crowd-design for sustainability is three-fold: (i) it has to fit from a technical or organizational point of view, (ii) be economical and (iii) contribute to solving sustainability problems (Boons & Lüdeke-Freund, 2013). It is then possible to say that any initiative of DfS seeks solutions that aim at reducing environmental impacts related to products production and consumption, as well as helping to optimize raw material consumption and energy use, and to reduce waste and pollution. Cases of crowd-design for sustainability initiatives found in literature are mainly related to issues such as education, energy, food and beverage, health and wellness, government and public sector, as well as social innovation (Lakhani *et al.*, 2013).

2.3.5 Discussion

The relationship between crowd-design and sustainability, presented by this theoretical background, was built by first addressing the origins of crowd-design because this is a relatively recent subject in design theory. For this reason, the first subchapter aimed at understanding crowdsourcing - its origins, its processes and its relation to open innovation. It was possible to show that the participation bias is intrinsic to both constructs - crowdsourcing and open innovation. The second sub-chapter was dedicated exclusively to the crowd-design, approaching, in a more direct and deep way, the participation issues related to the PDP, including its importance for the sustainable innovation. Thus, in this third and final subchapter it was possible to state that crowd-design can contribute to several aspects of sustainability.

In spite of its potential in supplying mechanisms for sustainability, crowd-design

processes have not yet been the subject of a significant uptake in the institutions, organizations, researchers and policy makers focused on world development. However, the customer demand for sustainable products and their actual performance in the market, as well as the supply chain complexities are some contextual factors that determine how sustainability is perceived and treated as a clear and important target for organizations (Alblas *et al.*, 2013). To consider crowd-design as a process to achieve sustainable innovation, it might help organizations not only to address these contextual factors but also to perceive the level of their influence in the organization's sustainable performance.

As already stated, applying participatory approaches in the PDP requires an integration with the already existing process in organizations in order to better utilize the resources available in the crowd. Involving stakeholders in the earlier stages of PDP, for instance, increases the possibilities of their gaining a systemic view of the organization, of its business, and of its context (Bhamra & Lofthouse, 2007). This systemic view might be maximized by the crowd-design process because it happens through the Internet, as an innovative way to balance the needs of all organization's stakeholders.

Applying the crowd-design process in the earlier stages of PDP is also recommended in order to achieve sustainable innovation given the fact that sustainable issues need careful definition (Tischner, 2015), as they can easily be associated to the 'wicked problems'. Trying to define a 'wicked problem' might be a never-ending task because of the amount of information one could gather is endless, and usual planning techniques are limited in generating new ideas to respond to such problems. Thus, in order to find the relevant problems, the earlier stages of PDP should deal with 'open problems' instead of 'given problems' (Stanoevska-Slabeva, 2011). Therefore, the crowd-design process enhances stakeholder importance, even though it challenges existing PDPs.

The initial stage of the crowd-design process contemplates the definition of its scope and tasks that, in turn, will direct the kind of outcome the process will bring. If the outcome will be a product, a service, a PSS, or a social innovation, it is possible to define it after the problem definition, i.e. after the alignment of the stakeholders needs. The benefits to sustainability will also depend of the maturity level of the PDP regarding sustainability. The characteristics that distinguishes an immature from a mature PDP

regarding sustainability are related to three aspects: (i) PDP scope and targets; (ii) employed processes, tools and methods; and (iii) sustainable design expertise (Alblas *et al.*, 2013).

A clear scope and a set of sustainability targets provide the boundaries of the project and a direction for the kind of desired solution which, in turn, also enables management to steer and monitor the project. This way, in a crowd-design for sustainability initiative, the issues to be solved have to be intrinsically related to the three sustainability dimensions. With regard to the processes, methods, and tools employed on the PDP, maturity is the extent to which a certain process is capable of meeting its targeted goals (Alblas *et al.*, 2013). The final aspects of a mature PDP are design expertise and knowledge of sustainability. Organizations require a viable flow of ideas if they are to successfully design sustainable solutions (Alblas *et al.*, 2013).

Crowd-design initiatives might support sustainability training and learning and also facilitate knowledge creation and knowledge sharing. According to Alblas *et al.* (2013, p. 521), a crowd-design process "includes internal activities such as knowledge creation, interdepartmental knowledge transfer, [...] as well as external activities such as knowledge acquisition [...]." In other words, crowd-design for sustainability initiatives enables improvements in the sustainability knowledge of the organization and in its PDP process.

Finally, focusing on the end product in a complex and largely unknown environment is too narrow a view. Instead, emerging PDPs must consider, besides production, distribution and repair of the product, the capabilities of the communities that will house the solution, and how parts of the design process can help or hinder the solution's implementation. However, literature has shown why organizations face obstacles in participatory approaches, including difficulties for them to find true end-users to design with, how to obtain access to ones who can effectively design with the product developers, and in obtaining user feedback being the main ones. Crowd-design could mean an alternative to open the PDP at the same time it allows matching sustainability goals, once stakeholders' participation happens through an Internet-based platform and there are specific roles the crowd can play.

In order to transform these theoretical findings in instruments to analyze the cases, as well as present the thesis outcomes, the next chapter addresses the methodological approaches adopted.

3. RESEARCH METHOD

3.1 JUSTIFICATION AND CHARACTERIZATION OF THE RESEARCH PROBLEM

This thesis deals with a topic that is still quite exploratory from the point of view of knowledge maturity, a point of view that is reinforced by the amount of researchers working on the topic. Indeed, the Portal of Research Groups subscribed in the Brazilian platform 'Lattes' (lattes.cnpq.br) showed no results in a search carried out both 2014 and 2016 using the keyword 'crowd-design'. Subsequent search in the same database only showed results for the terms 'open innovation' and 'crowdsourcing' – two terms directly related to crowd-design.

In Brazil, the universities UNICAMP and USP were pioneers in the study of open innovation, with research groups set up in 1995 and 2002, respectively. The predominant research area is Social Sciences, with the sub-area of Management leading the amount of researchers. In the search held in 2014, the portal presented 10 research groups, with 47 different research lines. Among those only five lines are related to the study of **open innovation** in the context of: (i) strategic design and open innovation (UNISINOS); (ii) the development of collaborative methods in product development; (iii) legal issues of intellectual property; (iv) new product development models (in the context of Industrial Engineering and Management). For the term **crowdsourcing**, the results have shown four research groups, with 18 different research lines. The four research groups are also from the Social Sciences area: two from the Management sub-area (UNINOVE/SP and UnP/RN), one from the Communication sub-area (USP) and one from the Urban and Regional Planning sub-area (IFS/SE).

In 2016, the searches using **open innovation** and **crowdsourcing** as keywords have shown a rapid evolution on the attention of the Brazilian research community on these themes. Indeed, eight new research groups of open innovation have appeared, while just one from the first search was discontinued. These eight new groups have shown 35 new research lines in total, with only one related to open innovation focusing on circular economy and sustainability. Of the four research groups associated with crowdsourcing in 2014, only one reappeared in 2016 (ATOPOS/USP). The other three groups were discontinued. However, this new search has brought other three different groups that haven't appeared in the first search; this time, the main area of knowledge was Exact and Earth Sciences, being Computer Science the main sub-area. Curiously, two

of those were created before 2014, while other one in 2014 [but hadn't appeared in the first search]. From the new 15 research lines, no one is related to product development.

What is noticeable, however, is that in 2014 only one research group ('network of strategies in design', based at UNISINOS) investigated the relationship between design and open innovation ('strategic thinking in design and open innovation'). It focused on enhancing our understanding of the characteristics of the design process in an online environment. However, this group was discontinued, and did not appear in the second search in 2016.

Crowdsourcing has shown a much smaller amount of related research groups when compared to **open innovation**. More importantly, on the context of this thesis, none of them have shown concern in understanding the connections with sustainability. Such situation reinforces the exploratory nature of the research problem tackled on this research.

Bibliometric searches at CAPES journal database[1] carried out both in 2014 and 2016 confirm the exploratory nature of the problem worldwide (see figure 3.1).

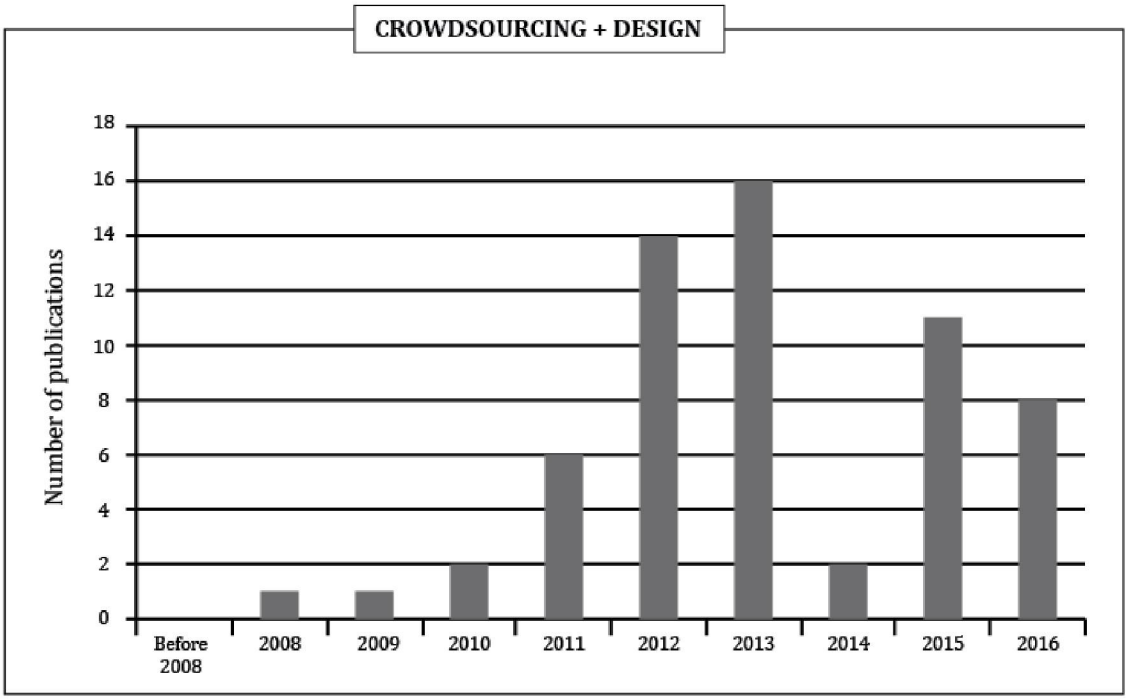


Figure 3.1 - Number of publications per year using the keywords 'crowdsourcing' and 'design'. Source: This thesis' author (2018).

[1] This portal allows the access to world literature.

In 2014 the search resulted on 41 papers for the term **crowdsourcing** associated with **design**. The majority of the related journals belong to the areas of Computing and Information Technology. Nevertheless, publications in journals of areas related to Marketing, Business Management, Knowledge and Process and Social Psychology were also found. No paper was found prior to 2008; one paper per year in 2008 and 2009; two papers in 2010; six papers in 2011; 14 papers in 2012; 16 papers in 2013; and two papers in 2014 (up to April). Considering that the term crowdsourcing first appeared in 2008, publications have increased in numbers over the last four years: 38 papers published between 2011 and 2014 (up to April), compared to four papers published between 2008 and 2010. A new search conducted in 2016 brought out 19 papers relating crowdsourcing to design; 11 published in 2015 and eight in 2016.

In conclusion, these findings suggest the need for further research to understand the merge of **crowdsourcing** and **open innovation**, its relationships with sustainability as well as the peculiarities of its adoption within an emerging context. This bibliometric evaluation was important to establish the actual state of the research activities on the topics of design, crowdsourcing, open-innovation and sustainability. It has shown that the subject is still little known and little explored, conditions that typifies a research problem as exploratory, according to Gil (2008).

3.2 PHILOSOPHICAL APPROACH

Following to the current terminology of Applied Social Sciences, the philosophical approach (ontology and epistemology) refers to the theoretical basis of the research (Hay, 2002), as shown on table 3.1.

Table 3.1 – Outline of the theoretical bases of this research.

	TERMINOLOGY	DESCRIPTION	ADOPTED POSITIONING
Theoretical Basis	Ontology	What is out there to know?	Based on Constructivist approaches.
	Epistemology	What and how can we know about the phenomenon?	Based on Interpretivist approaches.

Source: Based on Hay (2002).

This thesis adopts a Constructivist for the conduction of the data collection and analysis. Within the Constructivist perspective the world does not exist independently of the knowledge produced about it (Marsh & Furlong, 2002). On such view the world is

socially and/or discursively constructed. Hence, the research object on this thesis – the process of crowd-design for sustainability – can only be understood taking in account the relationships of the actors involved in it. The practice of the crowd-design process as well as its implications for sustainability were investigated through the knowledge the actors have about it and the understanding they have of the very process.

On this way, following to the Constructivist perspective, the qualitative research assumes that reality is socially constructed, and there is an intimate relationship between the researcher and his object of study. Researchers seek answers to questions that involve the processes from which social experiences are created and experienced, attributing to them certain meanings (Godoy, 2013).

From a epistemological perspective this research follows the Interpretivism approach. It assumes that the actions of the actors involved in and with the phenomenon are interpreted in a specific manner (Schwandt, 2006). The actions do not exist without the actor's interpretation and, as a consequence, their interpretation affects the phenomenon itself. Assuming that the crowd-design process is a contemporary social phenomenon, its process as well as its implications for sustainability are given by the meaning attributed to it by the actors.

3.3 SELECTION OF THE RESEARCH METHOD

The research method refers to the practice basis of the research (Hay, 2002), as shown on table 3.2.

Table 3.2 – Outline of the practice bases of this research.

	TERMINOLOGY	DESCRIPTION	ADOPTED POSITIONING AND TECHNIQUES
Practice Basis	Methodology	How can we go about acquiring knowledge?	Based on Qualitative approaches.
	Methods	Which precise procedures can we use to acquire data?	Systematic Literature Review; Action Research; Case Study.

Source: Based on Hay (2002).

This thesis deals with a contemporary problem, which has an exploratory nature and where the researcher has little control of events, which Yin (2002) advocate as criteria for research method selection. On such context, taking into consideration the

philosophical perspective presented on the previous section, possible research methods include 'Action Research', 'Case Study', 'Ethnography' or 'Grounded Theory'. Given the possibility of access to companies interested on the subject a choice was made for the use of Action Research and Case Study.

Action Research was selected as the research method for the initial phase of the field research which was highly exploratory. It follows Santos *et al.* (2001, p. 126) which argues that Action Research is useful on the exploratory stages of a research project, enabling a direct contact with the research problem, enabling the researcher to refine its research protocol and theoretical framework. Subsequently, the research involves the use of a Case Study with participant observation, with an in depth analysis of a real world situation where crowd-design has been used to tackle a challenge directly related to sustainability. Both stages were preceded by the development of a Systematic Literature Review divided into two cycles, one in 2014 and other in 2016.

3.4 OVERVIEW OF THE RESEARCH STRATEGY

The development of the research was done in three phases: (1) preparation; (2) main data collection; and (3) completion, as shown on figure 3.2 (next page).

The **preparation phase** started with the Systematic Literature Review and, in parallel, with the Action Research method (within the activities of the Design & Sustainability Research Group at UFPR). The Action Research, as earlier stated, allowed a deep contact with the phenomenon in the real world. This study also constituted the first use of the innonatives.com platform, one of the key results of the Sustainability Maker Project (SuM). This real-world experience with crowd-design process implementation enabled a deeper understanding of the key issues associated with the theme, providing lessons that were then applied subsequently on a Case Study.

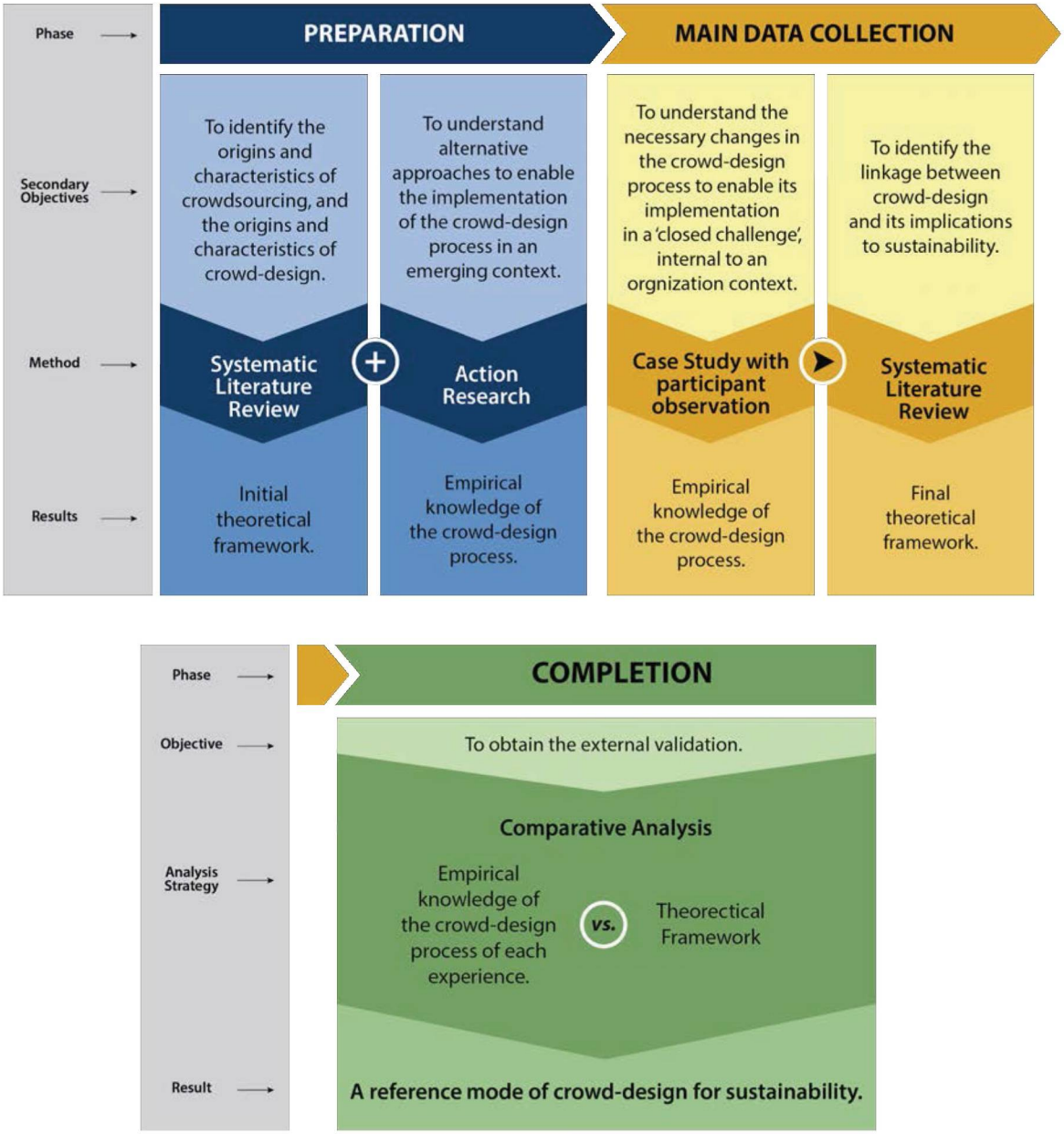


Figure 3.2 – Research Strategy in detail.
Source: This thesis' author (2018).

The **main data collection phase** was the Case Study with participant observation. It was carried out in 2015 on a large-scale company (> 500 employees), involving the adoption of particular type of crowd-design process: the closed-challenge approach (or, in other words, an internal crowd-design, where 'the crowd' corresponded to the company's employees). In this Case Study, the researcher took the role of a participant observer during all steps of the process: planning, testing and implementing of the crowd-design initiative. In 2016, the second systematic literature review was conducted in order to complement the literature reviews previously held in 2014.

Because of the exploratory characteristic of the research, unsystematic literature reviews were also done during all development of the thesis.

Finally, on the **completion phase** the researcher produced a final analysis comparing the results obtained in the two field studies (Action Research and Case Study) with the theoretical framework. Next sections present the specific content of each phase of the research.

3.5 SYSTEMATIC LITERATURE REVIEW (SLR)

The Systematic Literature Review (SLR) protocol followed the model proposed by Conforto *et al.* (2011), whose procedure is illustrated in figure 3.3.

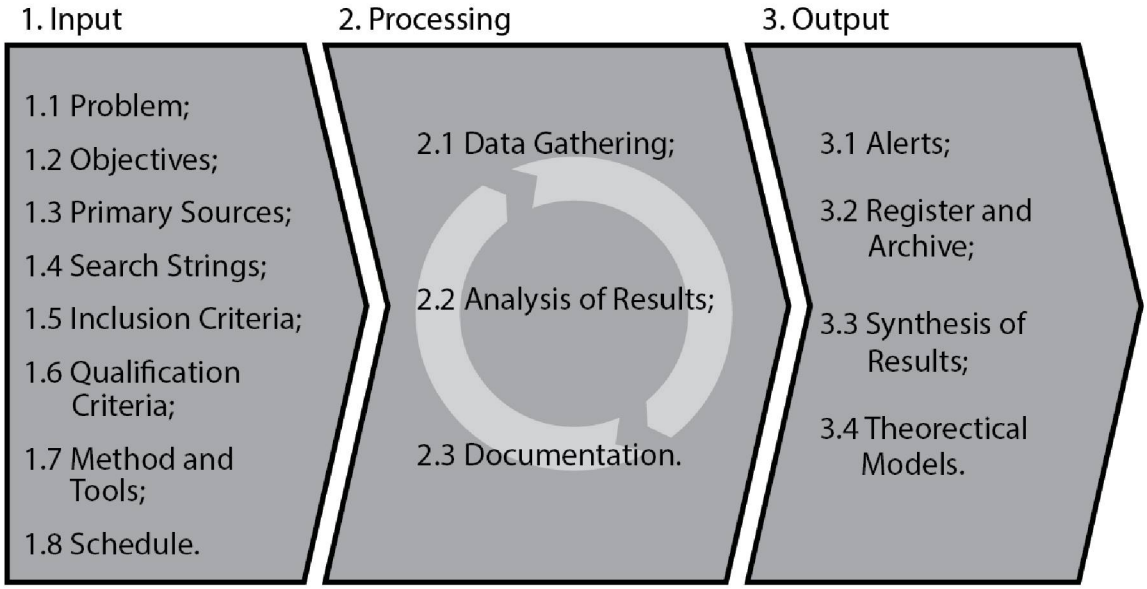


Figure 3.3 – SLR Procedures.
Source: Adapted from Conforto *et al.* (2011).

Three different databases have been used: (i) the CAPES' Portal of Journals, with the purpose of finding peer-review papers; (ii) the CAPES' Bank of Thesis and Dissertations, to find master's and doctoral degrees thesis; and (iii) the Portal of Research Groups of CNPq, to find the Brazilian research community involved directly in the topic of this thesis.

Important to mention an unsystematic literature review contributed to define the initial keywords. In 2014, the searched terms included 'crowd-design', 'crowdsourcing', 'crowd-based processes' and 'open innovation'. In 2016, the term 'sustainability' was added to the keywords.

The systematic literature review's starting point is the problem formulation, i.e. issues for the SLR's results to answer. To do so, the SLR main and secondary objectives were followed and these offered "the base for the analysis of the papers found during the search" (Conforto *et al.,* 2011, p. 6). On this way, the main objective of the SLR was defining and characterizing the origins of the processes involved in the crowd-design process itself. As secondary objectives, it intended: (a) clarifying the crowdsourcing origins and related terms and concepts; (b) listing the journals that address these subjects more often; (c) listing the amount of publications per year; (d) highlighting the main contexts and objectives of the application of crowd-based processes. Alignment to these objectives was the criteria to qualify papers as relevant or not.

The inclusion criteria for papers identified at CAPES' Portal of Journals were: 'only papers'; 'papers in English language'; 'peer-review papers' and 'papers published in the last 10 years' (for the search conducted in 2014) / 'papers published in the last two years' (for the search conducted in 2016).

3.6 DATA COLLECTION PROTOCOL

3.6.1 Unit of analysis

Considering the objectives of the thesis (see chapter 1), the unit of analysis is the crowd-design process itself. The SuM Project crowd-design process has been delineated differently for both the Action Research and the Case Study. However, the focus of the analysis remained the same: (i) the number, characteristics and duration of steps; (ii) the kind of tasks; (iii) the stakeholders and their roles; (iv) the connections of the process and its results with sustainability principles.

3.6.2 Criteria for selecting the companies

The cases were selected based on (i) the characteristics of each applied research method and (ii) the characteristics of the crowd-design initiator.

Action research as a research strategy has been used to explore the situation of a problem, to construct new theories or to improve them (Thiollent, 2011). In an Action Research, the researcher concomitantly assumes the role of observer and observed (Lewin, 1946). In order to bring to light the implications for sustainability of the crowd-design process applied in an emergent context [one of the secondaries objectives of this study], the Action Research consisted of an initiative (i) initiated and coordinated by the

NDS/UFPR in partnership with a small local company and (ii) directed to deal with low-income communities issues, in order to allow a bottom-up participatory approach.

A qualitative Case Study searches for meaning and understanding, having the researcher as the primary instrument of data collection and analysis. The Case Study with participant observation is particularistic, descriptive, and heuristic, which means it focus on a particular phenomenon [in this case, the crowd-design for sustainability process] and allows a complete description and elucidate the researcher's understanding of the phenomenon (Merriam, 2009). Thus, in order to allow subsequent comparisons the crowd-design initiative had to use the same crowd-design process model [i.e. the SuM Project crowd-design model] as well as the same online environment of the Action Research case [i.e. the innonatives.com platform].

While the crowd-design initiative analyzed by the Action Research was lead by the NDS/UFPR, the Case Study has analyzed a crowd-design initiative lead by an organization. The different characteristics of the crowd-design initiator also bring different results and implications for sustainability which could enrich the contributions to knowledge obtained on the study.

In order to increase its external validity, the study has also adopted the criterion of size of companies to evaluate the viability of using crowd-design on diverse settings. Due to this criterion, the study has selected for the Action Research one small company as partner (sponsor), and a large-scale company as the crowd-design initiator for the Case Study. It is important to highlight that both selected companies had never used a crowd-design process as a participatory approach on the PDP.

3.6.3 The Action Research study

3.6.3.1 Overview

Tripp (2005) argues that Action Research is a generic term for any process that follows a cycle in which practice is improved by the systematic oscillation between acting in the field and investigating it. Aligned with such view, the Action Research carried out on this thesis corresponded to the practical experimentation of the crowd-design process of the Sustainability Maker Project (SuM), took here as an initial theoretical model of crowd-design. To do so, a cyclical four steps process has been applied in each stage of the crowd-design process, as shown in figure 3.4. This procedure had to be adopted because the main objective of the Action Research was to

carry out a crowd-design initiative from its planning to its implementation, using the innonatives.com platform as its online environment.

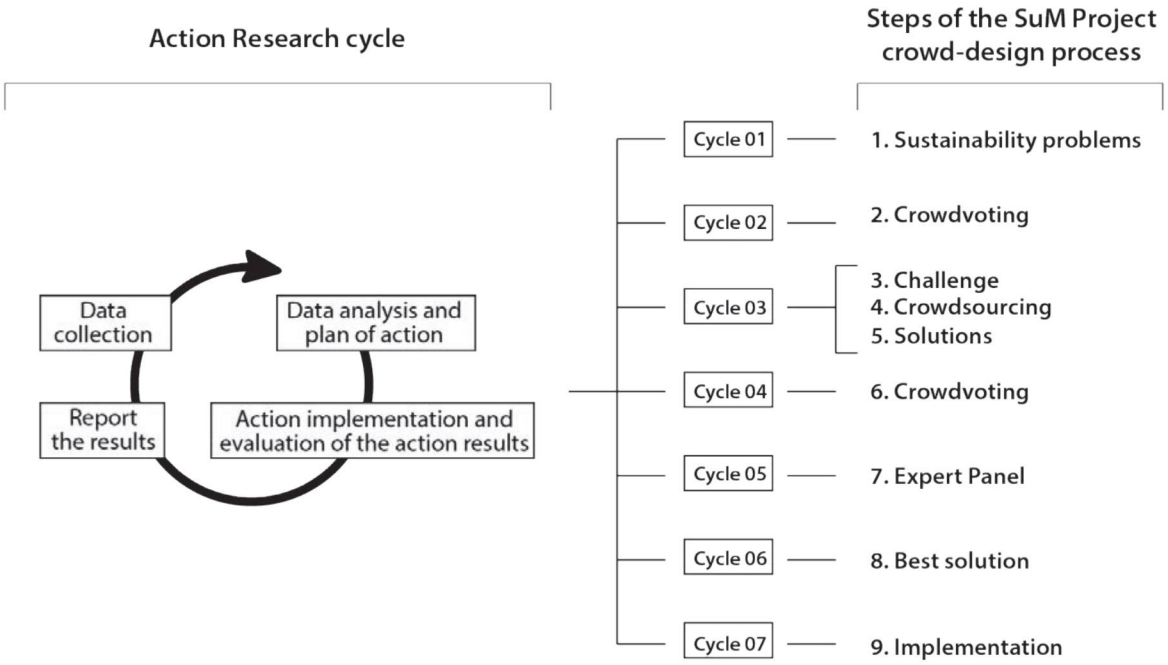


Figure 3.4 – Action Research cycle as applied to each stage of the crowd-design process.
Source: This thesis' author (2018).

Following the Action Research cycle, the first data collection corresponded to the search of the 'sustainability problems' in the context of the low-income community Águas Claras, located in Piraquara, a small town near Curitiba, Paraná state. The second cycle, 'crowdvoting', dealt with the selection of the problem to be dealt on the crowd-design 'challenge', and so on.

3.6.3.2 Step I: Data collection

Table 3.3 (next page) presents the goals and the techniques of the first step of the Action Research cycle, i.e. the **data collection** for each step of the crowd-design process of the SuM Project.

Table 3.3 - Data gathering in each data collection cycle.

Steps of the SuM	Goals	Data collection techniques

crowd-design process			
1. Sustainability Problems	Phase I	Initiating contact with the low-income community.	Semi-structured interview.
	Phase II	Presenting the project, having a general view of the characteristics of the community, creating empathy with the community members.	Demographic survey; video interview, and suggestion box.
	Phase III	Investigating the key household problems.	Direct observation; conversational interview; images' registration; storytelling; and paparazzi.
2. Crowdvoting (by the low-income community members)	Finding the real problem the low-income community inhabitants wanted to solve through the crowd-design initiative.		Online voting and conventional voting on a ballot box.
3. Challenge	Delineating of the challenge's briefing; testing it before its launching at innonatives.com platform.		Benchmark analysis, direct observation during the workshops, and questionnaire (challenge test).
4. Crowdsourcing	Monitoring crowd participation based on its interaction through the innonatives.com platform.		Documental registration.
5. Solutions			
6. Crowdvoting (by the low-income community members, the sponsor and the members of the crowd)			
7. Expert Panel	Evaluating the proposed solutions from the point of view of sustainability.		Form sent by email.
8. Best Solution	Knowing the solution that suits the community needs.		Average between the crowdvoting at innonatives.com platform, the votes from the community members, and the Expert Panel and sponsor evaluation.
9. Crowdfunding/ Marketplace/ Auction	Non-applicable to this case.		
10. Implementation	Knowing the process of implementation as well as how the implemented product is been used by the community.		Interview with the community member who wins the furniture produced by the EcoDesign company (sponsor).

Source: This thesis' author (2018).

Nine of the ten steps of the SuM Project crowd-design process were used in the Action Research because the step 'crowdfunding/marketplace/auction' was not applied in this case. The data collection for the 'crowdsourcing', 'solution' and 'crowdvoting' steps were compiled into one, because it corresponded the steps held in the innonatives.com platform.

The 'sustainability problems' step was conducted offline, i.e. out of the innonatives.com platform, because the crowd-design initiative has involved a low-

income community that had never ever heard about the crowd-design process and was not familiar with its online environment and its interactions. Thus, the data collection for the sustainability problem's scouting was divided into three phases: (i) initial contact with the community; (ii) creating empathy with the community; and (iii) data collection on the key household problems. The same approach should happen if other kind of community had been involved, because it facilitated the empathy with the community members.

The first 'crowdvoting' step aimed to bring the low-income community inhabitants to selected the most relevant problem. Because this procedure has not been carried out through the innonatives.com platform (the module for enabling this was not yet implement on the platform), the voting process occurred in two different ways: through a closed group in Facebook and through a ballot box. The Facebook was chosen as the online involvement because its use was common among the community inhabitants, it allows the use of surveys, and its use is free of charge. However, the ballot box technique had to be used because of the low participation through the Facebook survey.

The 'challenge' step corresponds to the briefing description, as well as the definition of its main phases, deadlines, etc. To do so, the researcher had to carry out a benchmark analysis of crowd-design platforms, as well as document analysis of of the innonatives.com platform procedures.

Before launching the 'challenge' at the innonatives.com platform, a 'challenge test' was conducted in order to assess the briefing as well the level of clarity of the challenge for the crowd. It is important to notice that during this data collection cycle, the researcher was in close contact with the SuM Project team and with the innonatives.com platform developers.

The 'crowdsourcing', 'solution' and 'crowdvoting' steps occurred sequentially in the online environment. In these steps, the data collection occurred by monitoring the interactions among the participants, through weekly access to the platform, from September 15 of 2014 to April 04 of 2015. This period corresponded to the total duration of the three phases of 'crowdsourcing' step (namely: sending ideas, sending concepts and sending solutions). However, crowdvoting process occurred at the end of each one of these crowdsourcing phases, including the one to choose the best solution.

The crowdvoting mechanism of the innonatives.com platform only allows the participant to select from one to five stars (where 'one star' means the lowest grade) to each of the ideas, concept or solution. It is not visualized who has voted, only the rating of each idea, concept, solution, based on the average of grades. There is no way to differ the vote that came from a member of the Expert Panel from the votes from the crowd. Later on the thesis such protocol is discussed, with propositions for its improvement on initiatives directing crowd-design towards sustainability use.

'Expert panel' corresponds to the experts in sustainability whose contribution to the platform is given on a *ad hoc* manner. The expert panel evaluated the solutions through a form sent by email to each member[2]. The form was developed based on the selection criteria present in the initiative briefing which were: (i) compatibility with the sponsor portfolio and manufacturing process; (ii) fulfillment of Sustainable Design principles; (iii) objectivity and clarity; (iv) quality of presentation; (v) alignment with the challenge brief. The same form was then sent to the CEO of the partner company, that is, the sponsor of the crowd-design initiative. However, as stated before, the crowdvoting of the solution had to be carried out offline in the low-income community because of the lack of familiarity with the platform, and because the platform interface was entirely in English.

The data collected in the 'best solution' step corresponded to the votes of the crowd, as well as of the sponsor, the expert panel members and the low-income community members. The choice for the best solution came from the average among those votes.

The 'implementation' step corresponded to the production of the best solution by the sponsor and its implementation in a community member's house. In this step, the collected data brought information regarding the impressions the sponsor and the low-income community members had of the crowd-design initiative.

3.6.3.3 Step II: Data analysis and action plan

[2] The names of the Expert Panel members can be accessed through the link: https://www.innonatives.com/page/the-team.

The data analysis and action plan of each cycle was based on the interpretative analysis carried out by the NDS/UFPR team involved with the initiative and supported by the SuM Project team from Germany.

In the 'sustainability problems' step, the primary and secondary information included: the transcription of the interviews with the community members; photographic material gathered *in loco* by the SuM Project team; audio and video recording of the interviews with participants of the community; photographic material gathered by members of the community (p*aparazzi* strategy). The documents were confronted in cross-analysis through an interpretative approach, where photos were compared with the interviews transcriptions and also with impressions the NDS/UFPR team members had from the field. The interpretative analysis resulted in four problems, and the choice of the problem to be solved through the crowd-design initiative was chosen through a crowdvoting process by the community members.

The 'crowdvoting' planning has included the study of the strategies to be applied with the low-income community in order to allow the participation of its members. On this way, the leader had to be consulted and helped to chose the date of the intervention in the community.

The planning of the crowd-design initiative, i.e. the 'challenge', started with a comparative analysis of the information available in similar crowd-design initiatives of different platforms. This benchmark analysis was helpful to formulate the challenge briefing, as well as to define the 'crowdsourcing phases[3]' duration. Before launching the challenge at the innonatives.com platform, a test was conducted in order to validate the understanding of information by the crowd. This test was conducted in a closed group on Facebook because the development of the innonatives.com platform was not completed yet. The analysis of the data collected during the 'challenge' period led to the planning and implementation of more intense communication actions [disclosure], as well as to the planning and application of workshops with design students from two different universities, UFPR and Univille. The communication included the development of posters, the promotion of SuM Project project on social media [such as a Facebook funpage and a blog page]. The workshops occurred in order to stimulate the students participation in the challenge. Indeed, after the workshops, the number of proposals to solve the challenge increased.

[3] Sending ideas, concepts and solutions.

Regarding the crowdvoting step that occurred through the innonatives.com platform, the mechanisms available at that time did not differentiate the votes from the crowd from the votes from the Expert Panel members. This differentiation was necessary in order to assess the possible differences of opinion between experts and the low income community members. Thus, at the 'solution' step it was applied another strategy to know the Expert Panel members votes, as already described.

Finally, on the 'implementation' step, once the best solution was selected, the sponsor was in charge of manufacture the prototype accordingly, giving it to the community as a retribution for their involvement on the project.

3.6.3.4 Step III: Action implementation and evaluation of the action results

At the end of each action implementation cycle there was the analysis and internal validation of the results, consisting of discussions, work meetings, e-mail exchanges and other communications among the project researchers.

It is important to highlight two work meetings where the researcher and her supervisor presented and discussed with the SuM Project team the results of the implemented actions. Those meetings were part of the SuM Project activities and happened in Milan, Italy, in May of 2015, and in Munich, Germany, in March of 2016. In those meetings, it was also possible to obtain the internal validation of the action results.

In addition, as an external validation of the crowd-design process of 'The Kitchen Challenge' initiative, four participants of the challenge have been interviewed: the representative of the EcoDesign company (see appendix A, in Portuguese); the low-income community leader (see appendix B, in Portuguese); the member of the low-income community who won the product (see appendix C, in Portuguese); and the design teacher of Univille (see appendix D, in Portuguese).

3.6.3.5 Step IV: Report the results

According to Thiollent (2011) and Gil (2011), reporting the results is configured as a strategy for assessing the external validity of the conclusions of the study. It can be carried out through congresses, conferences, symposia, mass media or reports. The Action Research results have been shared with the community through conference proceedings and academic journals, as shown in table 3.4.

Table 3.4 - Papers related to the Action Research results.

Publications[4]	Related steps of the crowd-design process
Dickie & Santos (2014)	'Sustainability problems'
Dickie *et al.* (2014)	'Sustainability problems'
Shoyama *et al.* (2014)	'Challenge'
Dickie *et al.* (2015)	'Crowdsourcing', 'solution' and 'crowdvoting'
Oliveira *et al.* (2015)	'Implementation'
Dickie & Santos (2016)	'Sustainability problems'

Source: This thesis' author (2018).

In addition, there are two reports that detail the data collection procedures, as well as the implementation and results of the 'sustainability problems' and the first 'crowdvoting'. These reports were made by the NDS/UFPR, under the coordination of this thesis' author with supervision of her supervisor. These reports are available for consulting in appendices E and F, respectively.

3.6.4 The Case Study

3.6.4.1 Overview

Case Study is a qualitative approach in which the investigator explores the phenomenon in a bounded system, over time, through in-depth data collection involving multiple sources of information (Cresswell, 2007). In a Case Study with participant observation the researcher assumes a variety of roles and may participate in the events being studied (Yin, 2002). It combines the analysis of documents with the researcher´s direct observation (Denzin, 1989).

The Case Study was about a crowd-design initiative held by a large company that had their headquarters in the city of Joinville, Santa Catarina state, Brazil. For reasons of confidentiality, the name of the company cannot be disclosed.

On this Case Study the researcher was involved from the planning to the end of the crowd-design initiative. During such period there was a close communication with the Innovation team of the partner company, with the researcher has been allocated in the innovation team's office, working as part of the team at least twice a week. Figure 3.5 shows the delineation of the Case Study.

[4] All these publications are available in annex 03, in Portuguese.

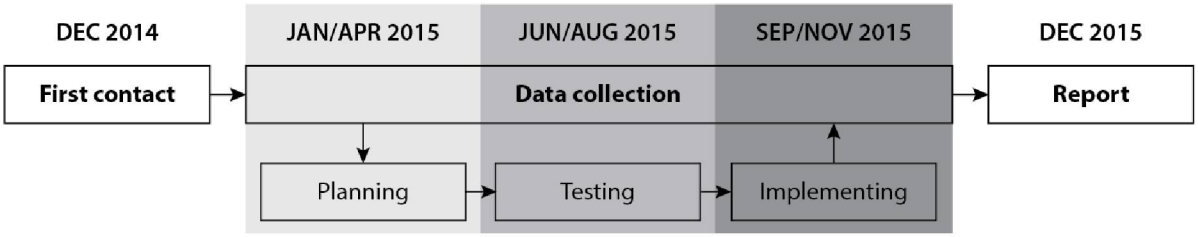


Figure 3.5 - Delineation of the Case Study.
Source: This thesis' author (2018).

From January to March of 2015, the researcher planned, together with the Innovation team, the implementation of the crowd-design initiative. The crowd on this case were the very white collars workers of the company: around 500 workers from the administrative areas (like Human Resources; Law; Sales; Marketing; among others). The SuM Project crowd-design process has been used as the blueprint for the planning of the steps of the initiative. From June to August of 2015, the innovatives.com platform was tested and adjusted to ensure confidentiality of information gathered and to improve the confidence on the process. The initiative was launched in September of 2015 and finalized in November of 2015.

3.6.4.2 Data collection

3.6.4.2.1 Direct observation

Direct observation requires attentive looking and systematic recording of events. According to Yin (2002), using participant observation allows covering events and its context in real time, as well as it is insightful to gather interpersonal behavior and motivations. The observation protocol adopted for this research adopted Spradley (1980) dimensions, as follows:

(1) Space: the place or physical settings;

(2) Actor: people involved;

(3) Activity: the conjunct of acts performed by the people;

(4) Object: the physical things present;

(5) Act: the individual actions performed by the people;

(6) Event: a conjunct of related activities performed by the people;

(7) Time: the sequencing of events during a long period of time;

(8) Objective: goals people try to reach;

(9) Feelings: emotions expressed and manifested.

From the planning to the implementation of the crowd-design initiative, these nine items were reported in a "research diary". The routine procedures were, mainly: (a) meeting the person who was responsible for the coordination of the project at the company for updates; (b) keep up with the activities regarding the initiative; (c) making notes. Furthermore, in order to ensure internal validity, subsequently the direct observation were confronted with documents such as emails exchanged with the Innovation team and the SuM Project team from Germany.

3.6.4.2.2. Planning

In addition to the direct observations, the data collected at the planning phase corresponded to the files containing the initial delineation of the crowd-design process. That initial delineation were developed during the planning meetings carried out by the partner company Innovation team and the researcher.

During the planning phase, the decisions regarding the problem to be solved and the crowd to be invited to participate were made considering the company's business strategy for new product development and the organizational culture. The crowd-design initiative should also be aligned to the company's policies about the stakeholders' participation. Human resources and legal departments were also involved and helped deciding specific aspects and details of crowd-design initiative delineation.

3.6.4.2.3 Testing

The testing phase lasted three months because of the need to adapt the innonatives.com platform mechanisms to support the closed crowd-design initiative. Once these issues were solved, the test also served as an opportunity for the innovation team to put the platform and the crowd-design process dynamics to trial before launching the initiative.

3.6.4.2.4 Implementation

The following documents were analysed in the implementation phase: (i) the rules for the crowd-design challenge, based on the standard procedures of the company for every internal/institutional program; (ii) the questionnaire applied to the participants regarding their perceptions of the workshops; (iii) the form used by the expert voting; and (iv) the video interview regarding the participants perceptions of the entire process. In total, seven participants were interviewed (the transcription of the interviews are available, in Portuguese, in appendix G).

3.6.4.3 Case Study internal and external validation

Considering that the crowd-design initiative was planned, tested and implemented with the Innovation team of the company, the internal validation is based on the documents produced and on the exchange of communications between the researcher and that team. It was also based on the follow up of the stages of the crowd-design process recorded on the innonatives.com platform. By the end of the program a report was produced and shared with the Innovation team, where the Innovation team could point possible inconsistencies and improvements.

According to Yin (2002), external validation consists of identifying aspects related to the research that have already been identified by other researchers. It requires the elaboration of a theoretical framework that is consistent with the research. On this research this aspect of the external validation has used a Systematic Literature Review in order to obtain a robust theoretical framework.

3.7 DATA ANALYSIS STRATEGY

3.7.1 COMPARATIVE ANALYSIS

The analytic approach that corresponds to a constructivist ontology is an extended and specified understanding of the congruence method, which begins with theories and assesses their comparative strength in understanding and explaining empirical cases (George & Bennett, 2005; Given, 2008). However, according to Given (2008, p. 70),

> A constructivist would not limit this method to comparing the theoretical expectations with the empirical reality on a variety of indicators for the dependent and independent variables. Instead, searching for (non)congruence is extended to causal processes. In contrast to the naturalist's inductive understanding of process tracing

> and the scientific realist's account of causal mechanisms, the constructivist deduces empirical implications that correspond to a specific theory all along the way from the causal factors to the causal processes to the effects. (Given, 2008, p. 70).

In accordance with Given (2008), as above stated, the comparative analysis was used to compare the findings from the Action Research and the Case Study with the literature background. From the literature findings, it was possible to determine the categories to be analyzed in each case. According to Given (2008, p. 71), "categorization is a major component of qualitative data analysis by which investigators attempt to group patterns observed in the data into meaningful units or categories".

The categorization was an intermediary step in an ongoing process of separating and connecting units of meaning based on the qualitative data being collected. Following the sequence proposed by Given (2008), first, the categorization gave meaning to the various informations collected in the field regarding the crowd-design process which allowed the constructions of the variables: (i) the amount of steps, (ii) the interactions through the online environment, (iii) the kind of participation and the (iv) tasks (see figure 3.5 (next page).

As a second step, the connections among these variables were established, linking on an continuous process the empirical data with with the theoretical framework. The analytic process has emphasized the innovation perspective (conventional and sustainable - see figure 3.6, next page), the level of incorporation of sustainability principles and the limits of the crowd-design process in solving the problem.

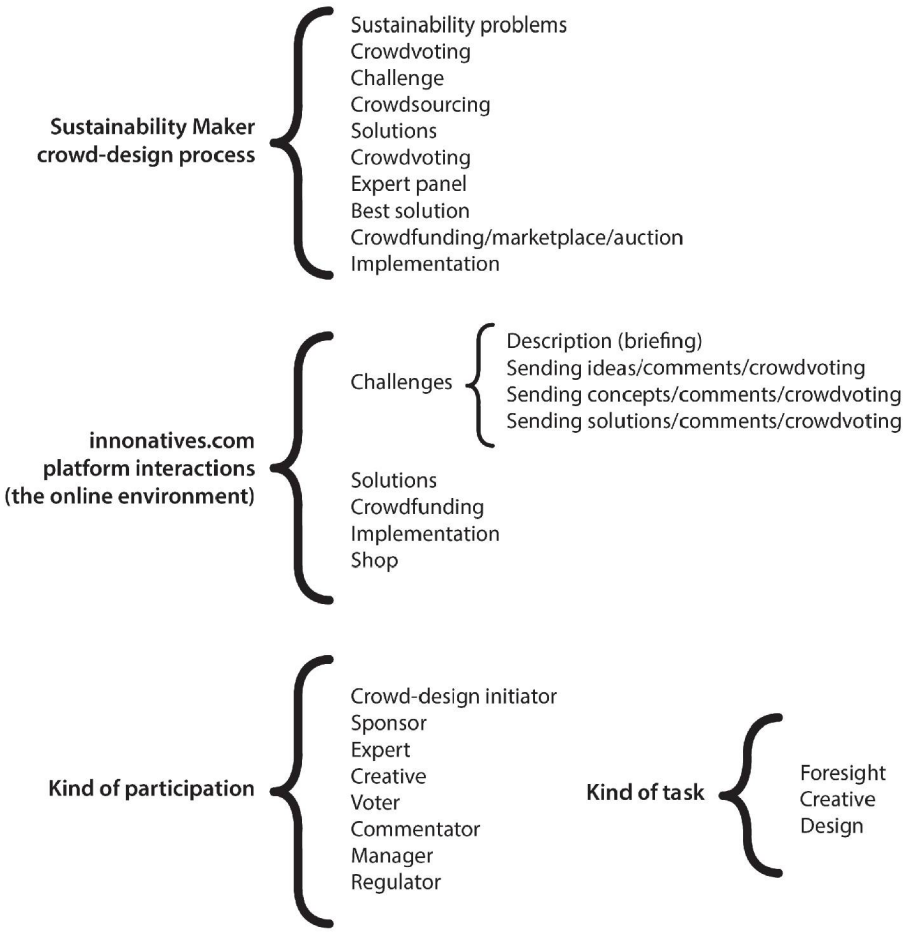


Figure 3.5 - Analyzed variables of crowd-design process.
Source: This thesis' author (2018).



Figure 3.6 - Analyzed variables of innovation approaches.
Source: This thesis' author (2018).

The results of this categorization led to the verification of the contributions for sustainability in applying the crowd-design process. From the evaluation of the positive and negative points of each case, strategic guidelines for the development of the reference model of crowd-design for sustainability were determined.

4. RESULTS AND ANALYSIS

The crowd-design initiatives resulting from both the Action Research and the Case Study with participant observation have been analysed according to the variables presented in previous chapter, i.e. (i) the crowd-design process delineation based on the SuM Project crowd-design model (i.e. the theorectical [initial] model of crowd-design adopted); (ii) the innonatives.com platform interactions (i.e. the online enviroment adopted to test the crowd-design initial model); (iii) the kind of participation in the tasks, according the possibilities given by the theory; (iv) the kind and characteristics of tasks, also given by the theory; (v) the innovation approach; and (vi) the incorporated sustainability principles on both the crowd-design process and the product.

The first initiative was started by the Design & Sustainability Research Center of the Federal University of Paraná (NDS/UFPR) and is denominated 'The Kitchen Challenge'; the second, an internal crowd-design initiative carried out in a large-scale company[1] located in Joinville, Santa Catarina State, denominated 'Water for life Challenge'. Both initiatives were held to test the crowd-design process of the SuM Project.

On this way, the first subchapter highlights the SuM Project crowd-design process and the innonatives.com platform areas as they were used in both initiatives. The second subchapter presents the results of the crowd-design initiative developed by the application of Action Research and the third, the initiative developed in the Case Study with participant observation. The fourth subchapter addresses the comparative analysis between both initiatives, and the fifth subchapter, the guidelines to achieve sustainability through a crowd-design process and the reference model of crowd-design for sustainability.

4.1 THE SUSTAINABILITY MAKER PROJECT AND THE INNONATIVES.COM PLATFORM

The SuM Project approach of the crowd-design process has ten steps, and initiates with the 'sustainability problems' step. This step aims at finding a common problem among the interested actors. Once a range of possible sustainability problems is identified, the next step is the 'crowdvoting', where the interested actors choose what is

[1] For reasons of confidentiality, the name of the company can not be disclosed.

relevant to be tackled as a 'challenge'. Thus, once the problem has been identified, the open call for solutions starts, that is, the crowd is invited to solve it through 'crowdsourcing' processes.

A challenge is composed by creative tasks that have to be clearly defined, i.e. the challenge briefing has to contain the problem context, the kind of solution that is needed, how it can be implemented, and so on. Thus, the ideas/concepts/solutions presented by the crowd go to an evaluation stage also carried out through a 'crowdvoting' process. In addition to the crowd, members of the Advisory Board of the Sustainability Maker Project, i.e. experts in Design for Sustainability as well as sponsors, and the crowd-design initiator are included in the choice of the best solution. This is how the chosen solution is addressed fit to the stakeholders needs and expectations.

Following the SuM Project crowd-design process, after the choice of the 'best solution', its 'implementation' has three possibilities: (a) the solution implementation can be financed through a crowdfunding campaign; (b) the solution can be negotiated or sold through a marketplace arrangement; or (c) the solution can be acquired through online auctions. Figure 4.1 (next page) presents the SuM crowd-design process and its relation to the innonatives.com platform.

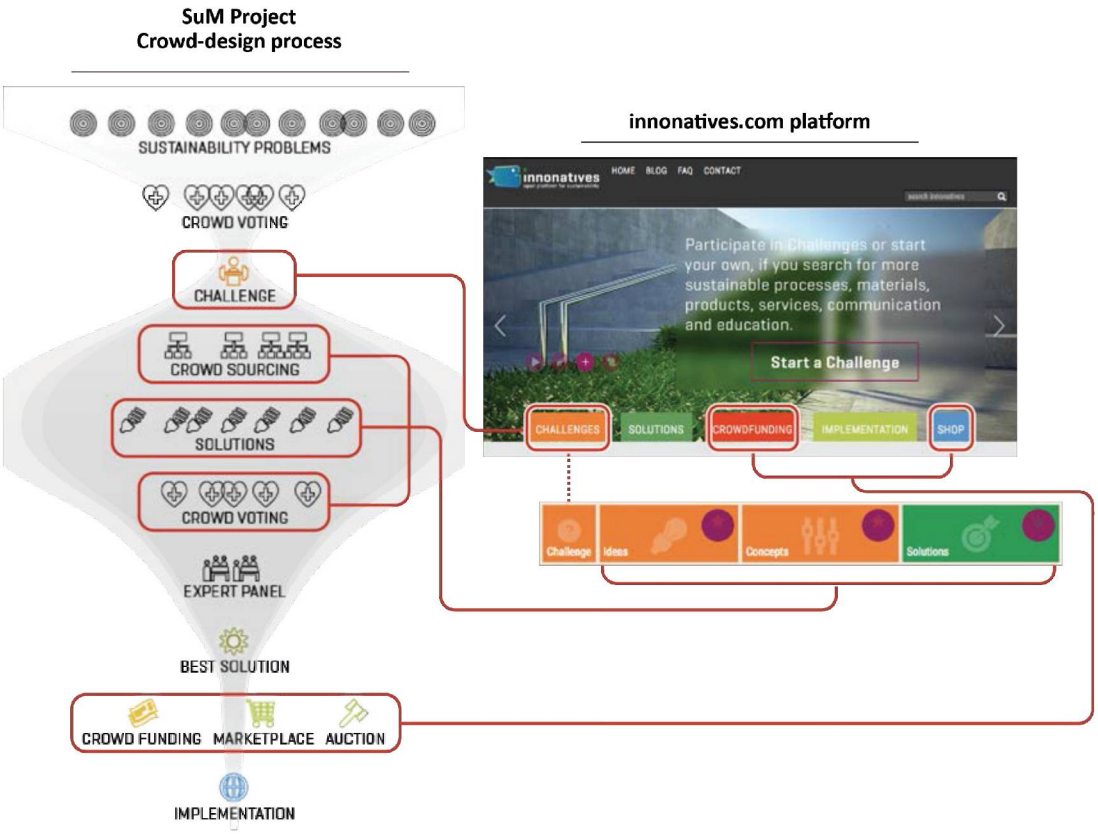


Figure 4.1 – Crowd-design process proposed by the SuM project and the innonatives.com platform areas. Source: Based on SuM (2014) and innonatives.com (2018).

The innonatives.com platform, as a result of the SuM Project, works as the online environment for the 'crowdsourcing' step of the initiatives, i.e. where the challenge is posted in. The innonatives.com platform areas are:

(i) **Challenges**: these are innovation and design projects seeking sustainable solutions that invite contributions by all (or specific) members of the innonatives.com community. According to the innonatives.com platform description, challenges can have up to three phases - ideas, concepts and solutions -, and their time period is defined by the crowd-design initiator. For the idea phase the crowd will submit general ideas, that will be in-depth outlined to create an overall concept in the concept phase. In the final solutions phase the crowd will need to post a final thorough overview of exactly how the solutions work and should be designed and implemented. During the given time period for each phase the innonatives.com Expert Panel, the crowd-design initiator and the crowd will vote on all contributions. If contributions are ranked high enough,

they will advance to the next phases of the challenge. When the solutions phase is over one final round of voting will occur and winners will be selected;

(ii) **Solutions**: it is a library of completed winning solutions for specific challenges. Solutions that do not answer to specific challenges may also be posted. Once a solution is posted on innonatives.com others will be able to comment, vote, add ideas or suggestions, collaborate and stimulate its development;

(iii) **Crowdfunding**: it allows a financial support to sustainability projects by taking donations or accepting investment in a reward that is offered by the project. Individuals from the crowd can post a request for others to fund his/her idea. To get the project funded, it needs to be in line with innonatives' Sustainability Criteria;

(iv) **Implementation**: it is an archive of sustainable solutions that have made it past the theoretical stage and have been implemented. There will be detailed case studies on the implementation process of specific solutions and their success in the real world;

(v) **Shop**: it offers a catalogue of sustainable products, services and solutions, where individuals from the crowd can browse through and purchase new and innovative sustainable solutions from around the world or apply to sell his/her products. To do so, the innonatives.com experts will evaluate the product to make sure it fits the **sustainability guidelines**, which are: a sustainable solution must be environmentally friendly, beneficial to society and support long-term economic development (innonatives.com, 2018).

The 'sustainability problem' step of the SuM Project crowd-design process can happen at the innonatives.com platform, being treated as a challenge. The challenge's functionalities at the innonatives.com platform allow this option as it can be seen in the 'Hotels on Small Islands'[2] challenge example (innonatives.com, 2018). It is important to

[2] The challenge was directed to owners, managers, or workers of hotels from small islands that are facing challenges in areas such as: Energy, Waste, Water, Wildlife Conservation or Food and Beverage. They were invited to submit challenges (big or small) in one or more of those areas to the innonatives community participate as partner. Once enough challenges were gathered, the initiators chose at least one from each category and started the open-innovation development process for realistic, cost-effective and scalable solutions. (innonatives.com, 2018).

highlight that any individual from the crowd or any organization can start a challenge if it fits the platform's sustainability guidelines (previous presented).

4.2 'THE KITCHEN CHALLENGE' INITIATIVE

4.2.1 Architecture of the crowd-design process

4.2.1.1 Delineation of the crowd-design process

The ten steps of the SuM Project crowd-design process have been adapted for the development of 'The Kitchen Challenge' initiative. Below, the characteristics and duration of each step are described, as shown on figure 4.2 (next page), whereas further subsections address the stakeholders and the tasks involved in the initiative.

The '**sustainability problems**' and the '**crowdvoting**' steps of 'The Kitchen Challenge' initiative did not occur on the innonatives.com platform because the initiative has involved a low-income community members as 'personas'. The low-income community members involved in the initiative do not have English skills neither are they familiarized with the crowd-design process and its online environment. But as the initiative has focused in household problems of these low-income families, the problem scouting had to be carried out considering a three phase strategy and the crowdvoting had to undergo two different strategies. In total, 'sustainability problem' and 'crowdvoting' steps lasted about three months.

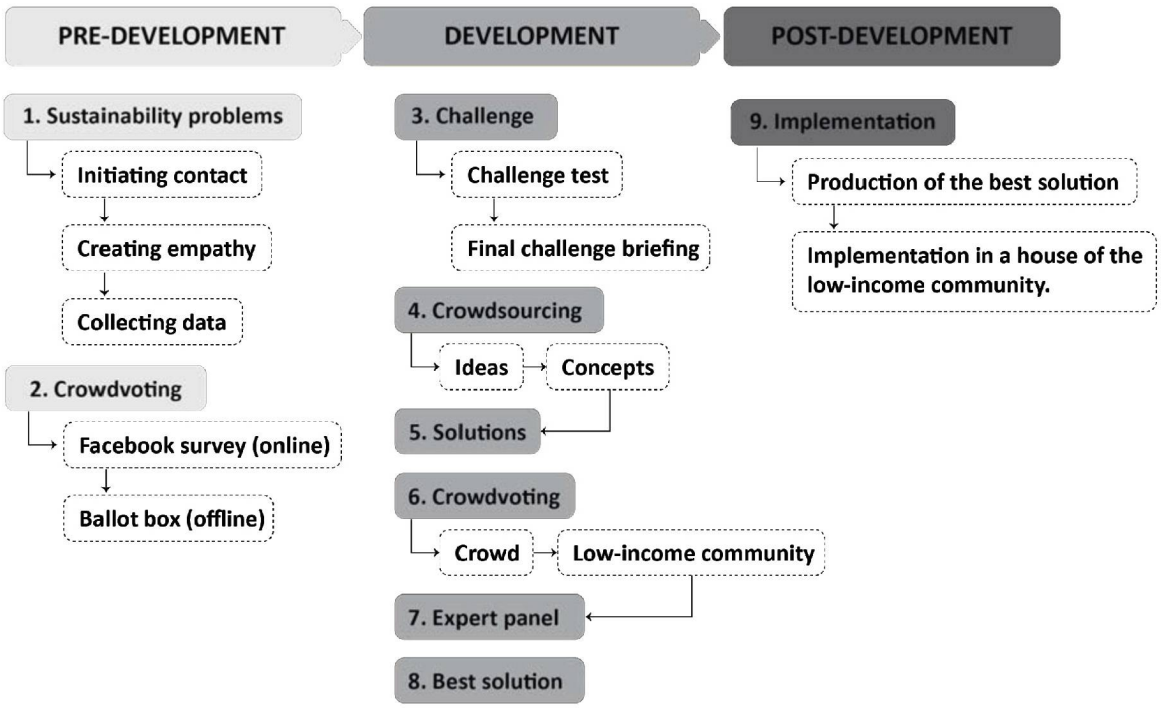


Figure 4.2 - The crowd-design process applied to the 'Kitchen Challenge' initiative.
Source: This thesis' author (2018).

According to the SuM Project crowd-design process, after the 'crowdvoting' step to choose the problem to be solved, the 'challenge' is posted on the innonatives.com platform to initiate the 'crowdsourcing' step, i.e. the creative tasks asking the crowd contribution.

However, as a step not foreseen in the SuM Project crowd-design process but pointed out by the literature a test of the initiative was launched in order to validate its description, objectives and phase time period. This test was carried with a closed group on Facebook, an alternative online environment, because the development of the innonatives.com platform has not been completed until the date of the test [August/September of 2014]. Design students from UFPR were invited to join the closed group. In total, this step lasted about one month.

After the challenge testing, the real '**challenge**' was launched on the innonatives.com platform on September 15 of 2014. It was called 'The Kitchen Challenge' because the problem to be solved was: 'Can you design an artifact to improve the socialization in the kitchens of the low-income houses?'.

On this way, the '**crowdsourcing**' step was divided in three phases, which also included the '**crowdvoting**' of each phase. In total, the 'crowdsourcing' step lasted about four months from the open call to the announcement of the best solution (see table 4.1).

Table 4.1 - Crowdsourcing phases of 'The Kitchen Challenge' at innonatives.com platform.

PHASE	TIME PERIOD	DURATION (in days)
Sending ideas and its crowdvoting phase	15/September/2014 to 31/October/2014	46
Sending concepts and its crowdvoting phase	08/November/2014 to 25/November/2014	17
Sending solutions and its crowdvoting phase	29/November/2014 to 31/January/2015	62

Source: SuM/BR Report (2014).

The '**crowdvoting**' on the innonatives.com platform was open on a continuous fashion since the 'sending ideas' phase, i.e. from the September 15 of 2014. The deadlines of the crowdvoting processes on the innonatives.com platform matched with the ending of each phase of the 'crowdsourcing' step.

Also during the time period of the 'crowdsourcing' phases, [sending ideas, concepts and solutions], motivational approaches have been applied as an effort to increase crowd's participation, such as idea creation workshops (figure 4.3) with design students of two Universities (UFPR and Univille) and a communication campaign was developed (figure 4.4, next page). The necessity of such approaches was due to the lack of knowledge regarding what is and how crowd-design process works.



Figure 4.3 - Workshops with design students.
Source: This thesis' author (2018).



Figure 4.4 - Posters and banners of the communication campaign (English and Portuguese versions). Source: This thesis' author (2018).

The choice of the '**best solution**' is considered the most important part of the process, because it is from this voting that the result will be directed to the 'implementation' step. Thus, the best solution, as mentioned before, had to be aligned to the sustainability guidelines of the innonatives.com platform, as well as aligned to the challenge briefing specificities. However, because the innonatives.com platform does not allow knowledge of who voted, and the voting does not include the criteria[3], the solution voting also had to be carried out considering different strategies.

The low-income community members participation in voting occurred through an offline approach. The main causes of this necessity were the same ones pointed out for the two primary steps. The members of the '**Expert Panel**' and the 'sponsor' voted through a form sent to them by email.

[3] The crowdvoting mechanism of the innonatives.com platform only allows the participant to assign from one to five stars (where 'one star' means the lowest grade) to each idea, concept or solution. This way, it is not visible who has voted, only the rating of each idea, concept, solution, based on the average of grades.

After the 'best solution' choice and its announcement, the sponsor produced one piece of the artifact, and the '**implementation**' step occurred through a raffle among the low-income community members.

4.2.1.2 The stakeholders

The stakeholders involved in 'The Kitchen Challenge' initiative were: (i) the innonatives.com platform as the online environment; (ii) the NDS/UFPR as the crowd-design initiator; (iii) the Eco-Design company as the sponsor; (iv) the members of the Advisory Board of the innonatives platform as the Experts; (v) the members of a low-income community as the personas; (vi) the general crowd as the tasks performers (see table 4.2).

Table 4.2 - Stakeholders and their roles in the 'Kitchen Challenge'.

STAKEHOLDER	PLAYED ROLES	WHO
Online Environment	intermediary platform	innonatives.com platform
Crowd-design initiator	Manager, voter, commentator	NDS/UFPR team
Sponsor	Voter, commentator, producer of the best solution	EcoDesign company
Expert Panel	Voter, commentator, evaluators according to sustainability guidelines.	Advisory Board members of innonatives.com platform (Experts in Design for Sustainability)
Personas	Decisors of the sustainability problems, voter	Águas Claras community members
Task performer	Creative, voter, commentator	General crowd

Source: This thesis' author (2018).

The innonatives.com platform can be characterized as an intermediary web-based platform because it allows organizations and individuals from the crowd to start challenges. Its role in the initiative, thus, was the technical support regarding the functionalities of the platform. The support received occurred both by email exchanged with the NDS/UFPR team as well as by virtual meetings.

The crowd-design process initiator was the research team of the NDS/UFPR, presented in table 4.3. It is important to highlight the competences of the NDS/UFPR team regarding participative approaches and Design for Sustainability. The participation

of the team members was crucial to the internal validation of the collected data, as well as to the operational issues, such as the field data collection and social media interactions.

Table 4.3 - NDS/UFPR team involved in the Action Research.

NAME	PROFESSION	ROLE ON THE PROJECT	INSTITUTION
Aguinaldo dos Santos	Professor	Supervisor	UFPR
Isadora B. Dickie	Designer/Professor	PhD Candidate	UFPR
Greta Bottanelli	Designer	MSc Candidate	Politecnico di Milano
Michelle A. Cuccu	Designer	MSc Candidate	Politecnico di Milano
Jairo da Costa Jr.	Designer	PhD Candidate	TUDelft
Nicolò Miccichè	Designer	MSc Candidate	TUDelft
Jessica S. Triaquim	Design Student	Undergraduate Grant	UFPR
Thayenne Shoyama	Design Student	Undergraduate Grant	UFPR

Source: This thesis' author (2018).

The sponsor role has been played by EcoDesign, a small company located in Curitiba, Paraná State, Brazil. Its core activity has been on extending the life cycle of wood waste [such as pallets] through the production of furniture. Its organizational structure includes a small factory and the commercialization of their products occurs through an e-commerce process. The motivation of the EcoDesign company in participating in this initiative included the need to increase its portfolio as the company does not have an internal design team.

Once the innonatives.com platform has its own Advisory Board, it assumed the Experts position. In this case, the experts in Design for Sustainability were invited to participate in all 'crowdsourcing' phases, by commenting and voting on the sent ideas/concepts/solutions.

Following the scope of NDS/UFPR research approaches, 'The Kitchen Challenge' initiative has involved a low-income community as representing the personas for whom the solution was addressed. "Águas Claras" is a low-income community, located in Piraquara, Paraná State, Brazil. This location is an area of environmental protection

because there lies the largest source of potable water in Paraná state. Águas Claras has about five hundred inhabitants that were invited to participate in the project after a meeting with the community leader. Figure 4.5 shows pictures taken by the NDS/UFPR team during the first visit to the community guided by the community leader.



Figure 4.5 - The Águas Claras community.
Source: NDS/UFPR (2014).

Although the call for participation in the 'crowdsourcing' step was open, i.e. allowed for the participation of people regardless of their degree of design knowledge or skills, the tasks performers of the creative tasks were design students. This may have been a consequence of JAM dynamics with UFPR's and Univille's design students. The task performers had to register at innonatives.com platform and create an account and a profile. This procedure allows to know the author of the sent proposal, as well as the author of the comments. The only thing that is not possible to know is the vote the person gave. The crowd interaction at the innonatives.com platform was observed according to the comments received by the sent proposals. These comments are public, i.e. available to all members registered at innonatives.com. Besides the comments at the platform, the participants also interacted by email [three emails containing doubts regarding the challenge have been received].

4.2.1.3 The tasks

The 'sustainability problems' and the 'crowdvoting' have been considered as tasks, even though they were not executed through an open call but directed to the participation of the 'personas'. In this initiative, these tasks were carried out also through offline procedures.

The tasks of the '**sustainability problems**' aimed the involvement of the low-income community in finding problems related to household issues. That is why the task had to be applied in three phases: (i) initiating the contact with the community; (ii) creating empathy with the community; and (iii) the data collection on the key household problems. This strategy has facilitated the approach to the community because by considering the initiative expected duration [ten months, from April of 2014 to February of 2015] there was a need to build trust between the community and the research team. The initiative objectives and the contribution of the community had to be clear to allow the data collection. Still, being a low-income community people tend to be more suspicious because, especially in Brazil, they are often exploited by external organizations or have no feedback or return from their involvement in research projects. Figure 4.6 shows the data collection moments (whose procedures have been detailed in the previous chapter).



Figure 4.6 - Data collection moments at the low-income community.
Source: SuM Report (2014).

In total, the NDS/UFPR team visited seven houses, interviewed ten people, and chaptured around 300 pictures, seven hours of audio recording and five hours of video recording. This amount of data has been analyzed through a cross analysis which resulted in a list of four main problems. In addition to this list, a concrete result of the task was the community awareness regarding its problems and the sense of participation they had during the field research.

The list of problems was not a surprise to the NDS/UFPR team as it just confirmed the results of previous researches. However, the 'sustainability problems' step can not be ignored. The involvement of the community in presenting their problems

gave them the sense of participating in analysis and solution of the problem and that was paramount in the preservation of the bottom-up connotation of the analysis, and in creating, in the researchers, in-depth understanding of the dynamics of the housing problems of the community through a broad view of all the variables that affect it.

In order to keep a continuous sense of participation, the '**crowdvoting**' step enabled the community members to choose one of the four problems that the data analysis had shown to be paramount. The chosen problem, then, turned out to be a challenge and was shared on the innonatives.com platform as an open call inviting the crowd to solve it. To do so, two different strategies were applied: (i) voting through a ballot box [i.e. an offline procedure]; and (ii) voting through a survey posted in a closed group on Facebook [i.e. an online procedure]. Only the community members who have a Facebook account were invited to participate in this closed group. Figure 4.7 shows the low-income community participation in the 'crowdvoting' step.



Figure 4.7 - The 'crowdvoting' step to decide the 'sustainability problem' of the low-income community. Source: SuM Report (2014).

Of both strategies, the voting through a ballot box resulted more effective. On June 21 of 2014, the NDS/UFPR team visited 33 houses in the community, taking two ballot boxes (as shown in figure 4.7, above), on a door to door approach, asking one representative in each house to vote directly, on the spot. This voting process reinforced the importance of having the community leader as a co-upholder of the project: her presence facilitated trust from people and made them more comfortable to vote.

In turn, the community members that were invited to the closed group on Facebook clicked 'like[4]' on the survey page but only one voted. Critical analysis of this lack of adherence to the online voting point to two possible reasons: (i) fear of sharing

[4] The survey page has received 22 "likes" and just one vote.

private information: after clicking on the voting link a message appears requesting access to the Facebook account information. Thus, it might refrain people from getting into the voting stage due to the lack of trust in such disclosure of personal information; (ii) an extra layer on the voting process: just below the title of the survey there was the option to "like", which does not configure as a vote. So, people only clicked "likes" in the survey page instead of voting.

As earlier mentioned, a step not foreseen by the SuM crowd-design process but pointed out by the literature is the '**challenge testing**'. Thus, its development has been based on the results of the benchmarking analysis, carried out by NDS/UFPR team. The result of this analysis can be found in Shoyama *et al.* (2014). The 'challenge test' consisted of: the challenge question: "Can you design an artifact to improve the socialization in the kitchens of the low-income houses?"; challenge briefing; a short video (about 2'15") which explained the context of the challenge, along with testimonials of the researchers involved in steps 01 and 02; a link to access the SuM Report containing information about the pre-challenge and the process of crowd-design; information about the sponsor (EcoDesign Company); a brief description of the SuM Project; a requirements list for the resolution of the challenge; an email to if there were any questions. All these information were available on Facebook, in a closed group, as shown on figure 4.8 (next page).

During the nine days the 'challenge test' was available, 25 volunteers were invited and added to the closed group, and five ideas have been sent. Of these, five volunteers sent an explanatory text and a drawing (sketch) to illustrate the idea to solve the challenge, according to the challenge briefing. In order to verify how the challenge would be interpreted (or misinterpreted) by volunteers who participated and also in order to understand the reason for the non-participation of the other 20 volunteers, the NDS/UFPR team applied two questionnaires: the first with questions designed to who submitted the ideas, and the second for volunteers who did not take part in the proposed activity. Questionnaires were sent directly to each one of them via their Facebook profile, as a private message.



Figure 4.8 – Closed group at Facebook.
Source: Facebook.com (web, 2014).

A total of 11 out of 20 of these questionnaires were returned. The results showed that the main reason for non-participation in the 'challenge test' was time, considered too short for developing and submitting ideas. They argued that academic demands have higher priority when compared to the challenge activity. Also, according to them, there was a lack of clarity regarding the challenge content and the crowd-design process itself. Two people pointed out that the information on the challenge being in English was the main reason for not enrollment. One volunteer did not feel comfortable in exposing his idea, even in a closed group. As suggestions and comments, the participants brought that the information should was also be available in Portuguese, and the deadlines [i.e. the time period of sending ideas] be larger.

Among the five volunteers who actually participated in the test challenge by sending their ideas, four answered the questionnaire. According to the answers it was possible to understand that the main motivation to participate was the draw of a ticket to the Brazilian Congress of Design in Gramado-RS, and secondarily the fact of being

challenged. Only one participant had its motivation in the certificate associated with enrollment in the challenge. One participant mentioned that his main motivation for the challenge were his concerns for low-income communities and sustainability.

After the 'challenge test', the open call of the '**challenge**' was started on the innonatives.com platform. The information of the 'challenge test' was improved and posted on the challenge page[5], consisting of:

- Video presentation, in English (about 2'15");
- Link to a file containing the description of the entire challenge in Portuguese;
- Summary containing information about the initiative content;
- Link to a file containing the SuM Reports of previous steps: Sustainability Problems and Crowdvoting (of the problems);
- Presentation of the sponsor (EcoDesign company);
- The crowdsourcing phases, their duration and content required;
- Solution requirements, with detailed information about what should be sent and what should be the scope of the proposals;
- Information about the selection criteria, such as 'compatibility with aspects of production EcoDesign Company'; 'Attention to aspects of Sustainable Design', etc.;
- Explanation of how the best solution will be implemented;
- Explanation and description of the prize to the author of the best solution. This topic was also presented with image support, to obtain more visual appeal and therefore motivate participants: the proposal chosen as the 'best solution' will be included at the EcoDesign company's portfolio and the author will receive 50% of the value of its sales through the e-commerce;
- Presentation text of the SuM Project team [i.e. the NDS/UFPR team] and the Águas Claras community.

It is important to mention that during the time period of 'The Kitchen Challenge', the innonatives.com platform was being improved. Part of these improvements were in its home page, but also at the challenge's layouts. It is also important to highlight the fact

[5] Available at: https://www.innonatives.com/challenge/sus-brazil/view. Accessed on February 2018.

that the briefing page allows different text configurations, and also the possibility to work with images. Nevertheless, the briefing of 'The Kitchen Challenge' was mainly composed of a video and texts.

The 'crowdsourcing' step, composed by the phases of sending ideas, concepts and solutions, mean the moment the crowd is involved, through the innonatives.com platform, to solve the challenge. On the innonatives.com platform this step allows the crowd to send ideas as a mandatory phase, and to send concepts as an optional phase, before the solution sending phase (also mandatory). In the 'The Kitchen Challenge', however, the concept sending phase was included as mandatory in order to try the entire process; also, for the participants to have time to improve their ideas by interacting with the crowd.

It is important to remember that the 'crowdsourcing' step also includes crowdvoting moments during the time period of each phase of sending proposals. The low-income community members, as well as the Experts and the sponsor were invited to vote online but there was no way of knowing whether they voted because the innovatives.com platform asks for anonymous voters. As stated above, it is possible to infer that the low-income community members except for one did not vote online.

The '**sending ideas phase**' occurred at the innonatives.com platform, and requested the participants to post their ideas to solve the challenge, along with a short description and a quick sketch (as required by the 'The Kitchen Challenge' briefing). Almost a month after the challenge launch, only two ideas had been sent.

Thus, the NDS/UFPR team developed communication materials, such as posters, leaflets and email marketing, and also spread the word through a Facebook funpage[6]. The posters were made in English and Portuguese, and were distributed in universities in Curitiba/PR and Joinville/SC. Also, digital versions of the posters were sent by email to students and to a design researchers network. The leaflets were distributed in universities of Curitiba/PR and the region around it. Between the dates September 13, 2014 to February 05 of 2015, the total of 57 posts by the NDS/UFPR team were shared by the Facebook funpage: 32 in September of 2014; 22 in October of 2014; two in November of 2014; and one in February of 2015. In addition to the posts shared on the

[6] Available in: https://www.facebook.com/profile.php?id=100004436388070. Accessed on February 2018.

social network, emails were also sent from sum.ufpr@gmail.com - created for communication with the participants.

As an alternative approach workshops were held and showed to be quite effective in the development of motivation. During these workshops potential participants received fundamental information regarding the project and further arguments for their enrollment in the challenge. A total of four workshops were promoted to enhance participation in the challenge, each one lasting about two hours approximately, involving around 100 design students from both UFPR and Univille. After the project presentation, the participants discussed the content of the challenge; the objectives of the project; the resources available to carry out the project; similar cases; similar situations already experienced and existing. Because of the workshop, a design teacher of the Univille University used 'The Kitchen Challenge' initiative as a class work with her students.

After the workshops, the number of submitted ideas increased. In total, there were 26 ideas sent. According to the challenge briefing, in the 'sending ideas phase' the participants should send an idea in a short sentence (up to 800 characters), accompanied by a rough. Regarding the sent images, it's important to point out that most of the received images had some parts cut out, making it difficult to view at the platform. This problem was due to the automatic adjustment the platform makes of the images in order to adjust them to fit the allowed size. Unfortunately, appropriate instructions regarding how to upload the image were not provided for the users..

Ot the **sending concepts phase**, the challenge briefing asked the participants to send a more detailed description about their idea, going deep into the concept description. Regarding the image, it also had to present more details. From the eight concepts sent, one did not refer to an evolution of a previously sent idea.

On the **sending solution phase**, participants should send a text with as a detailed description of the product, in addition to a draft technical drawing, with the product dimensions specification, and a text with the maximum of 800 characters to explain the solution. In total, six solutions were sent. The requirements for the solutions were: (A) to be economically accessible to the people representing the low-income segment of the Brazilian market; (B) to use wooden pallets as the principal source of material; (C) to be easy to assemble and disassemble, including the possibility of not

requiring tools; and (D) to allow an agile and easy transportation. Table 4.4 shows the evolution of the number of participants in the challenge in the 'crowdsourcing' step.

Table 4.4 – Number of participants according to the 'crowdsourcing' step.

CREATIVE TASK	NUMBER OF VALID PARTICIPANTS*
Sending ideas	23**
Sending concepts	07***
Sending solutions	06

**This refers to participants who have submitted proposals in accordance with the requested in the challenge briefing.*
***From 26 posts, three did not provide the information requested, making it difficult to understand the idea.*
****From 08 posts, one referred to an existing solution, as an incentive and exchange of information.*
Source: This thesis' author (2018).

According to table 4.4, the decrease of the sent proposals by phase is quite visible. Considering that the workshops offered by the NDS/UFPR team occurred only during the 'sending ideas phase', this may explain the lack of adherence in the subsequent phases. It is also important to notice that the tasks performers of both the 'sending concepts phase' and the 'sending solutions phase' were mostly the design students from Univille. According to the design teacher who has stimulated her students to participate in the initiative, *"[...] the students were accompanied by me and also some invited professionals, who participated in some workshops giving support to the students inserting several Design tools that were part of the discipline."*. They were also motivated because they wanted to have *"the chance of being distinguished in their first year in college."*

As previously pointed out, crowdvoting occured at the same time period of each crowdsourcing phases (sending ideas, concepts and solutions). On this way, the general crowd, the experts (i.e. the Advisory Board of innonatives platform), the sponsor (i.e. the EcoDesign company) and the crowd-design initiator (i.e. NDS/UFPR team) could vote online. These crowdvoting processes meant arriving at the ranking of the crowd preferences for the sent proposals.

Of the 26 sent ideas, 12 received no votes; nine received one to three votes and five received five or more votes. Of the 14 ideas that received votes, only seven were also sent as concepts. All sent concepts, however, have received votes: three received two votes; one received four votes; two received six votes and one received seven votes. Of

the seven concepts, six were also sent as solutions and have received votes: one received seven votes; one received eight votes; one received 11 votes; two received 22 votes and one received 41 votes.

However, the crowdvoting process during the 'sending solutions phase' was the most important. From this process, the best solution was chosen to be implemented. Although the crowdvoting processes interactions occurred through the innonatives.com platform, the crowdvoting of the solutions also had to occur in an offline way at the Águas Claras community [similar to what happened on the 'crowdvoting' to choose the 'sustainability problem']. In order to motivate the community members participation, it was decided that a piece of the chosen solution, produced by EcoDesign company, would be raffled among the community members.

So as not to interfere in the daily life of the community but at the same time to guarantee willing participation, the leader of the Águas Claras community suggested the date and the time of the voting. On this way, few days before the date set for the voting, leaflets were delivered to the community as an invitation and informing about the raffle (Figure 4.9A). The invitation was also shared through the Facebook profile of the Águas Claras Community Association (Figure 4.9B).



Figure 4.9 – Invitation to vote.
Source: NDS/UFPR (2015).

The vote took place on February 09 of 2015. On behalf of the NDS/UFPR team, this thesis' author held the voting supported by the materials: (i) a poster to identify the place of the voting (figure 4.10A); (ii) two posters showing, with photos, a retrospective of the community participation (figure 4.10B); (iii) images of the six solutions submitted by the crowd; (iv) the voting sheet; (vi) a ballot box for the gathering of the voting sheets.



Figure 4.10 - Voting for the best solution in the Águas Claras community..
Source: NDS/UFPR (2015).

In total, 17 members of the low-income community participated in the voting process. Before the participants filled in the voting sheets, they received an explanation so they could be reminded of the initiative, understand each proposal and vote. Figure 4.10C (above) shows an image of the voting in the Águas Claras community.

As already mentioned, the voting by the experts as well as by the sponsor was held through a form mailed to them. This document presents each solution and explains how to fill the vote in a table showing the criteria stated in the challenge briefing, and is available in annex 09. In total, five experts voted.

The criteria for the selection of the best solution by the Expert Panel and the sponsor were: (i) compatibility with the portfolio of the EcoDesign company and its manufacturing process; (ii) fulfillment of Design for Sustainability principles; (iii)

objectivity and clarity of the explanation of the proposal; (iv) quality of the presentation of the proposal; (v) alignment with 'The Kitchen Challenge' initiative briefing.

To make it possible to establish equivalence of the voting that took place via the innonatives.com platform with the voting by the community, the note of each proposal was given by calculating the weighted average, as shown in annex 03.

The next step was the announcement of winners, which took place on February 20, 2015 through a post in the 'The Kitchen Challenge' main page at innonatives.com platform and also by email sent to the innonatives.com community [i.e. its registered members]. The announcement to the low-income community members happened at the same moment as the raffle.

On the '**implementation**' step, the EcoDesign company produced the best solution (see figure 4.11) and delivered it to the house of the family who won the raffle (see figure 4.12, next page).



Figure 4.11 – The 'best solution' produced by the EcoDesign company.
Source: NDS/UFPR (2015).

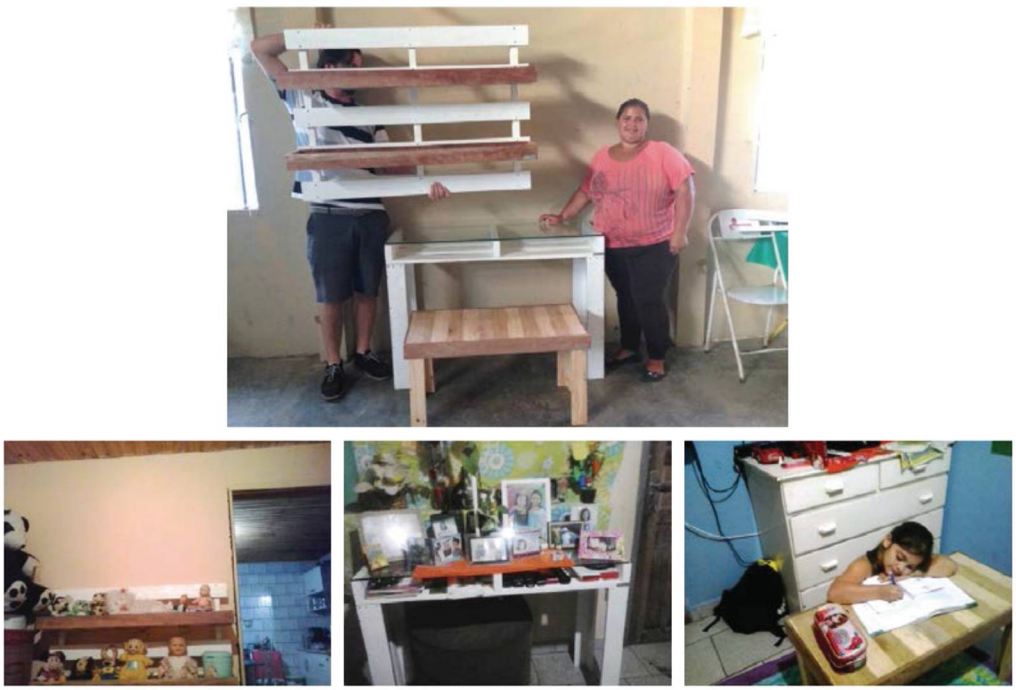


Figure 4.12 – The implementation of the best solution.
Source: NDS/UFPR (2015).

The characteristics of the artifact, according the description of the winners:

> The 'Coffee Desk' consists of a three pieces set: (i) a workbench (1200x400x800mm), (ii) a panel (1200x27x800mm) and a (iii) bench (840x400x450mm). It is manufactured of pallets: the first pallet is used to make the panel. The second, is divided into three parts, one of which is used to make the top of the workbench, another to make the bench feet and the remaining wood to make the panel shelves. The third pallet is dismantled to make the bench. The workbench finish is white, made with water based wood paint and with a glass top. The panel finish is the same of the workbench and its shelves are only varnished. The bench is finished in the natural color of the wood being only varnished. The fixing of the panel is by the French hand system, screwed on the wall of the residence. The assemblage of the workbench is done through the use of dowels to fit the feet on the top, since the glass top is fixed through double-sided tape. The bench comes assembled. The cleaning and maintenance of the furniture should be done without the use of materials such as solvents or alcohol, with neutral detergent only. [7]

[7] Free translation of the text available in Portuguese on innonatives.com platform. Accessed on February 2018. Available at: https://www.innonatives.com/solution/balcao-do-cafe-2/view.

It is important to highlight that, despite the fact that the furniture was developed to compose the kitchen, the family is using it for three different functions (as previously shown in figure 4.14): (i) the desk is being used in the living room to put photo frames and other objects; the shelf is being used to put toys; and the bench is being used as a desk for the child to do her homework and study.

Differently from the challenge briefing description the solution was not incorporated to the Eco-Design's portfolio because, according to its owner, the artifact did not have the needed aesthetic appeal to attract the company's target public. This also influenced the participants' reward. Instead of the monetary value percentage of the sales the participant would receive as proposer of the best solution, the winners received a furniture of their choice from the EcoDesign company portfolio.

A video with the presentation of the initiative was presented in the final conference of the Sustainability Maker project, in Munich, Germany, on March of 2016. The video can be accessed at this link: https://youtu.be/g-OunqWYigY.

4.2.2 The innovation approaches

To analyze the innovation approaches, it was took account both the crowd-design process and its outcome of 'The Kitchen Challenge' initiative.

From the sponsor perspective, i.e. the EcoDesign company, the crowd-design process has meant an innovative approach to develop products [process innovation]. According to the EcoDesign owner[8], this was the first time the company participated in an initiative of crowd-design. Among the motivations to participate were the increase of the network about and the interest in supporting projects that have sustainability approaches. Thus, once the EcoDesign company opened its PDP to the crowd's participation, it meant the company applied an open innovation approach to develop its products.

It can also be considered that the EcoDesign company innovated the way it addressed its consumers, i.e. it was geared to better serve the needs of consumers [the low-income ones], with the goal of increasing the product acceptance. However, the product innovation did not actually happen because the product was produced according to the materials and processes the company already uses for its other

[8] The transcription of the interview is available in appendix A, in Portuguese.

products. Neither did the organizational innovation occur, since the crowd-design process did not change the company's performance in administrative or transaction costs.

4.2.3 The incorporated sustainability principles

The introduction of sustainability criteria in the crowd-design process may occur in different moments. In "The Kitchen Challenge" initiative, the sustainability criteria were introduced from the briefing to the choice of the best solution.

According to the briefing of 'The Kitchen Challenge', the solution requirements were: "(i) to be economically accessible to the people representing the low-income segment of the Brazilian market [...]; (ii) to use wooden pallets as principal source of material: there are a large amount of this material on the Curitiba metropolitan region; (iii) to be easy to assemble and disassemble, including the possibility of not requiring tools; and (iv) it should allow an agile and easy transportation" (innonatives.com, 2015).

Based in the content of chapter 2, table 4.5 presents the economical principles incorporated to 'The Kitchen Challenge' initiative, related to both the crowd-design process and its outcome.

Table 4.5 - Economical principles incorporated to 'The Kitchen Challenge' initiative.

Economical Principles	Crowd-design process	Outcome (product)
Promoting the local economy	X	
Strengthen and valorize material inputs and local productive structures		X
Respect and value local culture	X	
Valorizing the reintegration of waste to promote their reduction		X
Promoting network organization	X	

Source: This thesis' author (2018).

According to the economical principles of sustainability, the crowd-design process applied to 'The Kitchen Challenge' initiative helped to promote the local economy, respecting and valuing local culture and promoting network organization because it involved actors from the same locality, i.e. (i) a research group of an University (public sector); (ii) a low-income community; and (iii) a company from the

private sector, with a crowd. Through the innonatives.com platform, this crowd had access to information about the problem and its context, and had to develop solutions based on that. On the other hand, the product generated by 'The Kitchen Challenge' initiative valorizes material inputs and local productive structures as it uses pallets as raw material, which also means the reintegration of waste to promote its reduction.

'The Kitchen Challenge' initiative has also incorporated the environmental principles through the crowd-design process and its outcome, as shown in table 4.6.

Table 4.6 - Environmental principles incorporated to 'The Kitchen Challenge' initiative.

Environmental Principles	Crowd-design process	Outcome (product)
Minimise material and energy consumption		X
Choice of low environmental impact resources	X	X
Optimization of product lifespan	X	X
Extension of material lifespan	X	X
Easy assembly and disassembly		X

Source: This thesis' author (2018).

Minimizing the consumption of material and energy is associated with minimizing the amount of material of the product, without impairing its function (Vezzoli & Manzini, 2008). According to the 'The Kitchen Challenge' briefing one of the criteria for the development of the artifact was the use of pallets (an aspect directly related to the scope and production process of the sponsor, the EcoDesign company). According to the description of the winning solution, the use of three pieces of pallets in the product composition allowed for the employment of geometrical forms that preserved the necessary rigidity for its use, and the finishing employed non-toxic resources. Considering that the first use of pallets is to enable the optimization of transport and storage of cargoes, in the context of the Challenge, the pallets can be considered a low impact resource because it is being re-utilized which, in turn, implies the extending of its lifespan. The materials used in the finishing are also considered of low impact.

The artifact is composed by three parts separated from each other and this facilitates its assembly and disassembly and also different configurations for the set. The

principle of 'optimization of product life' is related, in this case, to the fact that the product was designed considering the dimensions of the kitchens of low-income houses, the avoidance of technological material (such as electronic components), and the resistance of the material for its intended use. Still, the involvement of the low-income community members in the problem definition and in the choice of the best solution allows for their perception that the solution was created especially for them. Meaning, in other words, that the possibility of creating an emotional connection with the product came true. Indeed, the product implementation in a house of the low-income community has shown that the family is using it for different functions from which it was developed. Beyond their statement that "we could not put it in the kitchen because our kitchen already has furnitures" is that fact that they easily appropriated the product and valued it for a different purpose, making it their own (as previously shown in figure 4.14).

The socio-ethical principles incorporated to 'The Kitchen Challenge' initiative are mainly related to the crowd-design process, as shown in table 4.7.

Table 4.7 - Socio-ethical principles incorporated to 'The Kitchen Challenge' initiative.

Socio-ethical Principles	Crowd-design process	Outcome (product)
Promoting equity and social cohesion	X	
Favoring the integration of the weak and marginalized	X	
Improving fairness and equity in the relationship between stakeholders	X	
Improvement of the conditions of employment and work	X	
Valorization of local resources	X	X
Enabling responsible consumption	X	

Source: This thesis' author (2018).

In the process of crowd-design all socio-ethical principles were taken into account. Its participative characteristics allowed for the involvement and interaction between the actors during all the phases of the product development process. This involvement resulted in: (i) the promotion of equity and social cohesion: along with promoting partnership between public and private institutions and society in general (meaning the crowd and the low-income community), the processed fostered the

mobilization of people of different ages, beliefs and ethnic background from one community towards participation in a solution related to their own living facilities; (ii) the improvement of equity between stakeholders: during the different stages of the crowd-design process in the innovatives.com platform, all those involved had access to the same information, were able to share all comments and had the same right to choose (vote). However, this could be improved with an online environment (the platform) in the native language of the users. In one study conducted by Dickie *et al.* (2015, p. 13) one other handicap of the platform mentioned by the users was in its layout. They considered it had "too many elements grouped very close to one another".

One other aspect of the involvement of the low-income community in the process is that people in less favorable social condition had a voice and were active in the decision making process of the product development. The use of offline strategies made this possible. However, if the platform were adequate, especially in the language aspect, as mentioned above, this involvement could have been widened.

Through the crowd-design process it was possible to create the conditions for changes in the present pattern of production and consumption, proposing it to be more responsible from a sustainable point of view. This is one of the assets of the crowd-design process as it allows for a greater transparency in the processes of development and production of a product.

The socio-ethical principle associated to the product is the 'valorization of local resources'. It refers not only to the material resource, i.e. the pallets, which is a local resource used by the EcoDesign company, as previously explained, but also to the valorization of the local identity. The valorization of the pallets occurs as it gained another use: from a "mere" cargo crate to a piece of furniture for the use of low income families. So, in addition to extending the lifespan of the material, as mentioned earlier, its new use also means a valorization of this resource as well as of the identity of the low income community.

4.2.4 Limits of the crowd-design process in solving the problem

The evolution in the number of received ideas shows the importance of having a communication plan, but also having alternative ways for presenting the project to potential participants. Considering the crowd-design process as a new way to make

design and develop new and sustainable solutions, it is expectable that people would have many doubts about its functioning. Even though inf Brazil Design Contests are quite common, which means the students are familiar with the procedures of sending their projects to an Advisory Board and waiting for the result, they had never participated in a process that had more than one phase and one in which they could share their ideas and build something together.

On the other hand, the support provided to the participants in all phases of 'crowdsourcing' (not only in the sending ideas phase but also in the subsequent ones of concept and solution sending) made them feel more motivated. One exemplary case was that of a design professor at Univille who used 'The Kitchen Challenge' initiative as part of the activities in the course she was giving. According to her, this meant she had gave support to her students who were participating in the initiative as to the use of design tools for the development of proposals. However, it must be said that support was not an intrinsic motivating instrument for the participation of the crowd in the crowd-design process. The case of this professor shows that doing so, i.e. developing support strategies, may be interesting in order to more efficiently motivate participants and to effectively help them during the process. Open IDEO platform does this as it designates one person from the team to be the 'facilitator' in each one of the initiatives[9].

Another aspect related to the crowd motivation to participate lies in the communication of the initiative. The means used for communication in 'The Kitchen Challenge' were: posters developed and hung by the NDS/UFPR team in two universities (UFPR and Univille), emails sent by NDS/UFPR to all registered users of the innovatives.com platform, and posts by NDS/UFPR on the initiative's funpage in Facebook[10]. As the NDS/UFPR team carried a follow up on these strategies as to their reach and the public's interaction, it noticed that the funpage was not an efficient as few people accessed it and the subsequent posts were all from members of the team.

As previously pointed out, the 'crowdsourcing' step of 'The Kitchen Challenge' initiative followed the dynamic suggested by the innonatives.com platform, where it was possible to carry out up to three different phases to find the best solution. The

[9] The participation of the author of this thesis in a challenge promoted by the Open IDEO platform made clear that the facilitator is the one responsible for the direct communication with the participants.

[10] It is important to notice that these posts were shared without the use of the 'sponsored post' service offered by Facebook. This service is called "Boosted Posts" aims at sharing the posts to a target public in order to increase viewing of the post and it must be paid for.

'crowdvoting' through the innonatives.com platform, then, happened in three different moments, and the crowdvoting on the solutions' phase meant the choice of the best solution by the crowd. However, in the voting system at the innonatives.com platform, the crowd could attribute from one to five stars, as shown on the figure 4.13 (next page). There is no space for an explanation of the choice at this platform so, for 'The Kitchen Challenge' initiative, a value scale corresponding to the stars was established based on a value scale from "poor" to "excellent", where one star stands for "poor" evaluation. After the voting, an average is automatically calculated (also shown in figure 4.13) and, then, it is possible to know which idea/concept/solution was better accept by the crowd.

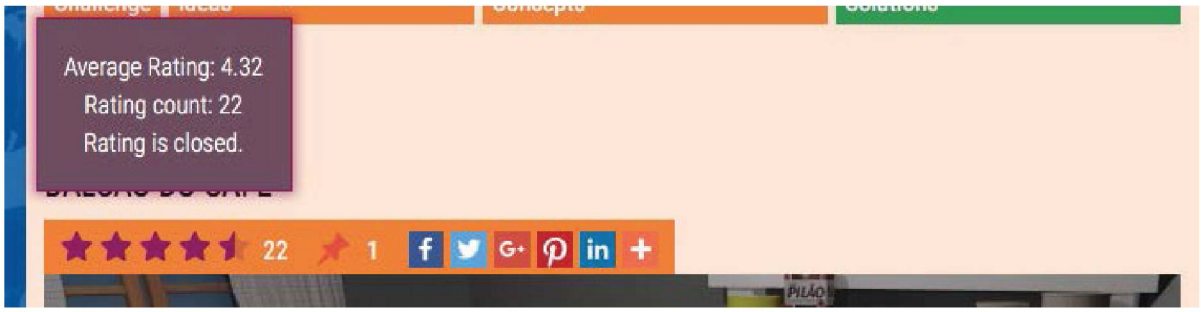


Figure 4.13 – Crowdvoting dynamic on the innonatives.com platform.
Source: innonatives.com (2015).

The experts were invited to vote online in all crowdvoting tasks. But considering that voting on innonatives.com platform is secret, the last phase the vote by the experts happened out of the platform. So it was possible to follow sustainable principles because they voted through a form sent by email. The Águas Claras Community members were also invited to vote online in all phases, but there is no way to make sure it did happen due to the barriers in access to the platform in English. This brings up the matter of the importance of having a platform in the language of the country where the research is done, in this case, a platform in Portuguese, so that uniformity in the data collection can be guaranteed. In addition, it is also necessary to develop voting mechanisms that allow for an evaluation of the propositions based on sustainability guidelines of the platform as well as of those specifically related to the purpose of the initiative.

Regarding the voting among the low-income community, the NDS/UFPR team concluded it would be necessary for future projects with similar characteristics to have a more up beat communication: as explained before, the dissemination of the online voting occurred by means of daily communication of the community leader with the

neighborhood and the use of two banners positioned in strategic places. Besides intensifying the communication process by other means (ex: flyers, letters, loudspeakers, etc.) the content of the communication could integrate some sort of gamification and so guarantee more clarity on the individual benefits deriving from the voting process.

Regarding the partner company's business model, nothing has changed. It is important to say the EcoDesign company agreed to participate in this project as a way of trying new approaches to increase its products portfolio. However, as the information that the company's business was not doing well came to us, later in the process, we can consider this as one important factor for the project not having had an impact in changes for the company.

4.3 THE 'WATER FOR LIFE CHALLENGE' INITIATIVE

4.3.1 The company involved in the initiative

The company involved in the 'Water for Life Challenge' initiative is a large-scale Brazilian multinational present in more than 40 countries, with 7,000 employees and 23 factories, nine in Brazil and 14 abroad. The Company Group is made up of companies of pipes and fittings, painting tools, PVC doors and windows, and corrugated pipes. The research was conducted at the company's headquarters is located in Joinville, North of Santa Catarina State, South of Brazil.

This initiative was promoted by the Innovation department of the company and its objective was to launch a new institutional initiative to stimulate the culture of innovation, fostering participation in the generation of collective solutions to the problem: "How can we promote sustainable water consumption through new products?".

At the beginning, there were three possibilities for the crowd-design initiative: (1) involving the internal public from the plant (around 1,000 people), (2) involving the internal public from administrative departments (around 500 people), or (3), involving the external public, such as those in technical assistance (around 1,500 people). The final decision to involve the internal public from the administrative departments was due to the fact this was the first time the company was working with open innovation through an online platform. Also, because involving the other two publics could mean

the necessity of investment in equipment (like computers for the plant sector) and also the development of a company's own platform (due to the fact the innonatives.com platform language is English and the other public, in general, does not master this language).

4.3.2 Architecture of the crowd-design process

4.3.2.1 Delineation of the crowd-design process

Different from 'The Kitchen Challenge', a planning of the initiative occurred over four months, where the SuM Project crowd-design process was modified three times, at least. The first and the last versions had differences mainly regarding the 'sustainability problems' and 'crowdsourcing' steps and the strategies to motivate the participation of the employees [here referenced as 'crowd'].

The first version would have eight steps: (1) align the crowd-design process to the company's business strategy, (2) internal divulgation of the initiative, (3) problem scouting of the 'sustainability problems', (4) crowdvoting (to define the problem to be solved), (5) challenge test and launch, (6) crowdsourcing (sending ideas, concepts and solutions), (7) crowdvoting (to choose the three best solutions), and (8) crowdfunding. The option in performing the 'crowdfunding' step was based on the idea that the three chosen solutions would compete with each other for implementation. It is important to emphasize that crowdfunding would had to be fictitious, that is, by investing virtual coins.

Three workshops were scheduled in order to familiarize the participants with the process as they came from the administrative sector and that this crowd-design initiative was the first the company was holding: the first one in order to present the project objectives to the participants and invite their participation, the second to help the participants with ideas generation and the third to help them to develop a crowdfunding campaign.

To motivate participation, and also allow the crowdfunding process, a virtual coin was created. So, at each action such as commenting or posting an idea, the participants received corresponding virtual coins. As an important issue to motivate the public, rewards were planned to be received not only to the winners, but also by all participants.

The initiative planning also included the planning of communication. It was considered necessary not only to keep the public motivated during the initiative time period but also informed about its steps. To develop the materials for the communication campaign, the company hired an advertising agency who developed the visual identity of the initiative only.

In addition to the department of Innovation, the involvement of the departments of Product Development, Human Resources, Judicial, Communication and Information Technology was also necessary for the project planning. Figure 4.14 (next page) refers to the first meeting involving all mentioned departments in the planning of the initiative. After this meeting, the number of steps of the process and the initiative objectives were adjusted.



Figure 4.14 – Meeting with the departments involved on the project planning.
Source: This thesis' author (2018).

One adjustment made referred to the '**sustainability problems**' step. This step should happen through the alignment between the business strategy for new product development and the objective of the crowd-design initiative. So, it happened internally, and the departments of Innovation and Product Development decided which problem the 'crowd' should solve. Thus, the '**crowdvoting**' step that follows the problem scouting was not necessary.

Although not foreseen in the SuM Project crowd-design process but considered as an important step [from literature review and the results from 'The Kitchen Challenge' initiative] the '**challenge testing**', in this case, helped the Innovation team to

better understand the innonatives.com functionalities and the crowd-design process dynamics. Although the innonatives.com platform is programed to allow closed challenges, it had to suffer some adjustments in order to improve and facilitate the crowd-design initiative applied in this case. The department of Information Technology was highly involved in this step. From the testing results, the crowd-design process was reconfigured in its very last version, as shown in figure 4.15 (next page).

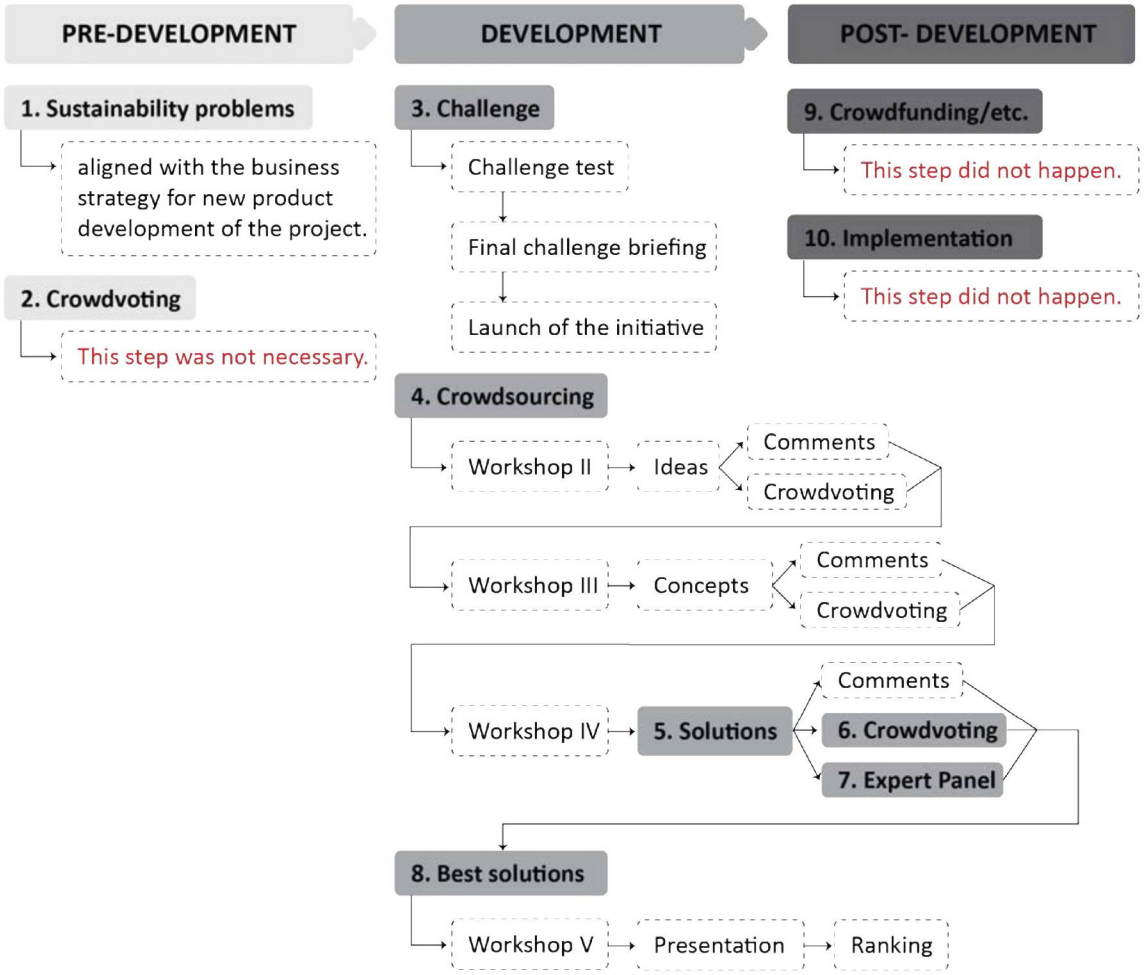


Figure 4.15 – Final version of the crowd-design process.
Source: This thesis' author (2016).

As a standard procedure from the large-scale company, every internal and/or institutional initiative has to follow a set of rules. In this case, the Judicial department helped on the writing of a document. This document, the so called "*Regulamento*" (available, in Protuguese, in annex 04), was available at the challenge home page at the

innonatives.com platform and represented the terms of agreement to participate in the initiative.

The 'crowd' participation was carried out in five steps, each of which consisted of on-line procedures (on the innonatives.com platform), face-to-face workshops and off-line procedures. The first step was the initiative launch, which occurred as an internal campaign, through the use of internal communication channels.

The phases of sending idea, concept and solution followed the protocol of the innonatives.com platform, i.e. during the time period of each step, comments and crowdvoting processes were held. The sending concept step was included to make the process a little bit easier for the participants, since there was no specific skills or knowledge requested from the participants. Table 4.8 shows the crowdsourcing phases and their time period.

Table 4.8 - Crowdsourcing phases of 'Water for Life Challenge'.

PHASE	TIME PERIOD	DURATION (in days)
Sending ideas and its crowdvoting	August 31 of 2015/September 14 of 2015	15
Sending concepts and its crowdvoting	September 24 of 2015/October 13 of 2015	19
Sending solutions and its crowdvoting	October 26 of 2015/November 07 of 2015	12

Source: SuM/BR Report (2014).

Unlike what happened in 'The Kitchen Challenge', the workshops were included in all 'crowdsourcing' phases, always before these happened. The difference in the crowdsourcing steps, however, were the criteria to go to the next step, as shown in table 4.9.

Table 4.9 - Criteria to select the ideas, concepts and solutions in the 'crowdsourcing' steps.

Step	Criteria	Condition to run the next step
Sending Ideas	(i) Clarity of information; (ii) Submission of information: title of the idea; slogan; descriptive of the idea; visual representation of the idea; (iii) Adherence to the theme of the initiative, i.e. 'How can we promote sustainable water	Idea averaging 3.0 stars or more (online voting result on innonatives.com platform) and falling within the evaluation criteria will be classified for the next step.

	consumption through new products?'; (iv) Framing ideas in one or more predefined categories, ie 'reduce, reuse, recycle'; (v) Product ideas, systems or product-service system (PSS); (vi) Inheritance or derivation.	
Sending Concepts	(i) Clarity of information; (ii) Submission of information: title of the concept; slogan; detailing the idea; contextualization of related problems; advantages and differentials vis-à-vis existing products and solutions (if any); visual representation of the storyboard '; (iii) Suitability to the objectives of the challenge; (iv) Functional viability; (v) Inheritance or derivation.	The ten concepts that obtain an average of 3.0 stars or higher (online voting result on innonatives.com platform) and are within the evaluation criteria will be classified for the next step.
Sending Solutions	(i) Clarity of information; (ii) Submission of information: title of the solution; slogan; three-dimensional digital representation (rendering); detailed description of the operation; product/system specifications; low fidelity physical model'; (iii) Manufacturing potential; (iv) Potential to meet market needs; (v) Functionality of the product or system.	The three solution proposals that have a grade point average of 4.0 or higher (online voting result on the innonatives.com platform) and are within the evaluation criteria will be classified for the next step.

Source: Based on the "*Regulamento*".

After the crowdsourcing steps, i.e. after the solution crowdvoting, the last step involved: (i) the preparation and presentation of the proposal for the Leadership team; (ii) the evaluation of the proposals by the Leadership team for the choice of the winner. The participant whose project was ranked in first place by the Leadership team evaluation received a cash award for use in a training course. The three proposals presented at this stage were also be submitted to the 'Technical Committee of Opportunities' to check for the feasibility of a technical and marketing study.

During the time period of the initiative, the motivation strategy for participation adherence was the creation of virtual coins, called '*Garras*'. Thus, the participants received '*Garras*' according their activities and interactions on the innonatives.com platform, such as sending proposals and/or commenting on the sent proposals. At the end, the participants were recognized by their participation and could exchange the amount of '*Garras'* for gifts provided by the company.

4.3.2.2 The stakeholders

The stakeholders involved in 'Water for Life Challenge' initiative were: (i) the innonatives.com platform as the online environment; (ii) the Innovation team [on behalf of the large-scale company] as the crowd-design initiator; (iii) the Leadership[11] team as the Experts; (v) the administrative departments employees as crowdsourcing tasks performers (see table 4.10).

Table 4.10 - Stakeholders and their roles in the 'Water for Life Challenge'.

STAKEHOLDER	PLAYED ROLES	WHO
Online Environment	intermediary platform	innonatives.com platform
Crowd-design initiator	Manager, voter, commentator	Innovation team
Expert Panel	Voter, commentator, evaluators according to sustainability guidelines.	Leadership team
Task performers	Creative, voter, commentator	Employees from the administrative departments

Source: This thesis' author (2018).

Such as in 'The Kitchen Challenge', the innonatives.com platform was the intermediary web-based platform. Its role, thus, was the technical support regarding the functionalities of the platform. The received support occurred mainly by email exchanged with this thesis' author [on behalf of the Innovation team] as well as by virtual meetings. It is important to highlight the inclusion of this thesis' author as an user admin of the innonatives.com platform in order to facilitate the inclusion of the participants in the closed group[12], as well as the analysis of the interactions.

The crowd-design initiator was the large-scale company, represented by its Innovation department team, which was composed by a coordinator, three analysts and this thesis' author [as participant observer, and just during the time period of the initiative]. Included in the manager tasks were the development of the communication materials, such as posters, and email marketing, planning and conducting workshops, and managing the inclusion of the participants in the closed challenge on

[11] The Leadership Team is the advisory board of the company, and is composed of the managers of areas such as Innovation, Product Development, as well as the President of the company.

[12] Only registered participants and those defined as administrators and experts, could have access to the closed challenge information within the platform.

innonatives.com platform.

The Expert Panel, composed by the managers and coordinators of the Innovation, Product Development departments, helped decide the three best solutions from the ten ones chosen by the 'crowd'. These three solutions were, then, presented to the Leadership team of the company, who ranked them as 1st., 2nd., and 3rd. places.

As already mentioned, the task performers were the employees from the administrative departments of the company. All 500 employees were invited to participate, individually and voluntarily, regardless of their knowledge or skills in product development. As the only restriction, however, employees belonging to the 'Sales Force' and/or directly connected with the organization/execution of the initiative could not participate.

It is important to mention that it was also necessary to predict the roles of participation. Different from 'The Kitchen Challenge' initiative, the participants were known and restrict to a limited number of people. Thus, it was important to emphasize to the participants the way they could participate, i.e. (a) as solvers: the person who sends ideas, concepts and solution, (b) as commentators: the person who helps the solver, posting comments about the idea/concept/solution sent, and (c) voter: the person who helps choose the bests ideas/concepts/solutions. This distinction was also used to plan the amount of coins referent to each action.

4.3.2.3 The tasks

The planning of the initiative is considered a task as it was highlighted by the literature review in the cases in which organizations are the initiators of the initiative. However, the 'sustainability problems' and the 'crowdvoting' [to choose the problem to be solved] were not considered as tasks, once they did not happen through participatory approaches. The tasks involved in planning were: (i) the crowd-design process delineation (as previously explained), (ii) the test of innonatives.com platform functionalities for closed challenges and (iii) the development of a communication plan.

Testing the innonatives.com platform functionalities meant to launch a real, but small, challenge (see figure 4.16, next page). To do so, people of the departments involved in the initiative planning were invited to participate in the challenge in order to choose the name of the initiative. Thus, they had to register on the innonatives.com

platform and follow the steps: (1) reading the instructions on the challenge's home page, (2) posting an idea for the program's name, (3) posting comments on the sent proposal, (4) voting in one name's option. The three most voted proposals would run the crowdfunding step.

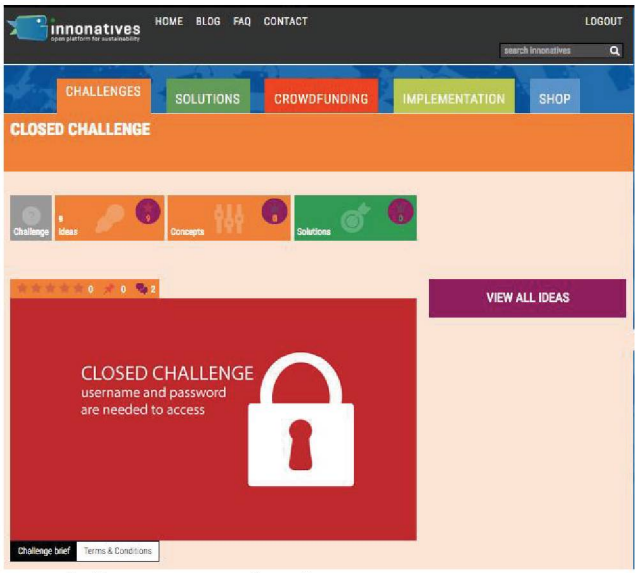


Figure 4.16 - Challenge testing briefing page at innonatives.com platform.
Source: innonatives.com (2015).

The test was available from July 13 to 4th August of 2015. In total, five people sent a total of eight valid ideas, and 30 votes were recorded. Different from planned, the three selected ideas did not run the crowdfunding step because the innonatives.com platform was not operating this module until the date of the test. So, the crowd-design process to be applied in the real initiative had to be modified because the Innovation team decided to exclude the crowdfunding step from the process. Nevertheless, the name of the initiative came from the most voted proposal.

During the planning step, the development of the communication materials was carried out. The advertisement agency developed the visual identity, but other materials, as posters and email marketing, had to be developed internally because of the short available time to develop the communication. So, the invitation and the presentation of the initiative communication (figure 4.17, next page), was sent by email to all > 500 employees while posters were fixed on the office kitchens located on each the three floors of the company building, and at the employees' entrance (there the

company has a board to receive this kind of material, where all other internal communication is hanged).



Figure 4.17 – Poster inviting for participation.
Source: This thesis' author (2015).

The 'Water for Life Challenge' was launched on August 24 of 2015. On this date, about 100 employees from the administrative departments attended the 'Workshop I' (see figure 4.18, next page). It happened at the company's auditorium, located in the same building where the employees work. Its agenda included the explanation about the initiative; its objectives; phases and the challenge theme: save water. The president of the company could not be present; but he recorded a message supporting the program and inviting the employees to participate.



Figure 4.18 – Workshop I - the presentation of the initiative.
Source: This thesis' author (2018).

After the presentation, many people asked for more information. They also wanted to compliment the Innovation team for this unexpected but exciting innovation initiative. After that, the next activity was to monitor the registration of the participants on the innonatives platform. With an admin login, this thesis' author could verify how many people were registered, who and from which department they were. This made it possible to create an email list for direct communication with the participants. It is important to mention that the innonatives.com platform enables the sending of emails to the registered participants However, it does not allow editing of the message and this turned a problem because emails sent through the platform could easily fall into the spam box due to restriction settings in the email system of the company. Because of this shortcoming of the tool, it was not used. After sending the communication reminding the employees about the necessity to register for the Workshop II, the number of registers at both the platform and the workshop grew considerably.

The 'Workshop II – Tools for generating ideas' took place on August 31 of 2015, at three different times because of the amount of interested people. In total, 76 people attended it (figure 4.19, next page).



Figure 4.19 – Workshop II - Tools for generating ideas.
Source: This thesis' author (2018).

Each session lasted three hours, with activities such as empathy exercise, brainstorming sessions and synthesis of ideas. Different from the Workshop I, the second workshop did not take place at the company's auditorium. It had to happen in a different building because of the need of tables and chairs to allow the interactions demanded by the creative work planned. At the end of each session, all participants were invited to fulfill a 'satisfaction questionnaire', which aimed at knowing their opinion about the workshop activities and also to verify if they felt they were able to submit their ideas to solve the challenge. The findings were:

- All members agreed with the fact working in a creative process with a lot of people together could demand more than just three hours;
- The fact that the workshops were held outside of the company was important. Not only was the place where they were held more appropriate for them but that it was not far from where the company is located made it faster to move from one to the other (specially important as the workshops happened during working hours);

- To discuss a creative process with people who don't work directly with this would be an exciting challenge and could also be very surprising;
- Although each person considered the challenge an enriching experience, not everyone declared the intent to send in an idea to solve the problem.
- Many thought the workshop duration was not enough. They wanted more time to complete the development of their ideas.

After Workshop II, the interactions in the innonatives.com platform started. 43 of the participants sent ideas, and more than 1,400 comments [in total] were posted. In the crowdvoting of sent ideas [a period of a week], more than 400 votes considered all 43 proposals to attend the criteria to run for the next step: sending concepts.

Almost a month after Workshop II, 'Workshop III - From ideas to the concept generation' occurred on September 28 of 2015. All participants that sent ideas were invited to participate. So, the workshop was divided in two groups, because 39 people subscribed to participate and attended the activity (figure 4.20). The participants were able to learn more about the development process of the product they were working with.



Figure 4.20 – Workshop III - From ideas to the concept generation.
Source: This thesis' author (2015).

After Workshop III, 29 concepts were sent. It means that not all ideas evolved into concepts. Only one concept was allowed per participant. The reasons given for this decrease in numbers were mainly: (i) lack of confidence in the sent idea; (ii) lack of time to send a concept because of the amount of work. It is important to highlight that the participants were allowed to work in the initiative activities during their work time, but

they could also access the innonatives.com platform out of their work period [although this did not characterize hours of extra work, as described in the '*Regulamento*']. In a week' time the crowd voting of sent concepts was held and 10 proposals (in accordance with the "Regulamento'') received more than 430 votes and fulfilled the requirements to run for the next step: sending solutions.

On October 26 of 2015, the ten participants who had their concepts selected through the crowdvoting, participated of the 'Workshop IV - Modeling the solution'. They worked on the solution prototyping (figure 4.21).



Figure 4.21 – Workshop IV - Modeling the solution.
Source: This thesis' author (2015).

After Workshop IV, ten people sent in their solutions, which had received more than 360 comments and more than 330 votes, in total. The Expert Panel, i.e. a team composed by specialists from the Engineering and Product Development departments of the company, as well as by the manager of the Innovation department, voted on the best solution from among the 10 sent. However, in the same manner it occured in 'The Kitchen Challenge' this voting process was held through a form sent by email. The evaluation by the Expert Panel considered the potential of each proposal as to: (1) production processes involved; (2) response to market needs; (3) functionalities of the product/system. All matters related to these criteria were bound by sustainability principles, as shown in table 4.11 (next page).

Table 4.11 - Evaluation criteria by the Expert Panel of the 'Water for Life Challenge' initiative.

CRITERIA	ISSUES	DIMENSION OF SUSTAINABILITY TO WHICH PRINCIPLES ARE RELATED
1. Production Process	1.1Needs of investment in resources (structure, machinery, personnel, materials).	Economical
	1.2 Choice of resources and processes of low environmental impact.	Environmental
	1.3 Minimization of use of resources (structure, machinery, personnel, materials).	Environmental
	1.4 Need of establishing partnerships or networking organization for the production of the product/system.	Economical / socio-ethical
2.Response to market needs	2.1 Efficiency related to logistics (storage, transportation) and waste.	Environmental
	2.2 Contribution to responsible consumption.	Environmental, Socio-ethical
	2.3 Adequacy to cultural needs.	Socio-ethical
	2.4 Contribution to/ promotion of social inclusion (through the use of the product).	Socio-ethical
3. Functionality of the product/system	3.1 Promotion of equality as to use conditions.	Socio-ethical
	3.2 Possibilities of use (variation in the presentation form of the product/ modulations of the system.	Environmental
	3.3 Need of outsourcing the maintenance of the product/system.	Economical / Environmental
	3.4 Need of adjustments for adequacy of improvement (redesign/selection of materials.	Economical / Environmental

Source: This thesis' author (2018).

The announcement of the three selected solutions[13] happened during a workday: all the employees of the administrative building were invited to the second floor and then, the manager of the Innovation area, made the announcement (figure 4.22, next page).

[13] The chosen solutions cannot be shown here because this was a closed challenge with confidentiality clauses.



Figure 4.22 – The winners' announcement.
Source: This thesis' author (2015).

The final phase occurred out of the innonatives platform. So, after the announcement of the three solutions, 'Workshop V – How to present your project to the Leadership team' aimed at helping the authors of the three solutions with the preparation of the presentation of their proposal. The managers of strategic departments as well as the president of the company chose the 1st, 2nd and 3rd places during a work meeting. The prize varied according to the classification: to the first place, the prize was an amount of R$7.000,00 (seven thousand *reais*) to be spent in a specialization course at the winner's choice. The amount to the 2nd place was R$5.000,00 (five thousand *reais*) and to the 3rd place, R$3.000,00 (three thousand *reais*) for the same goal.

The Leadership team evaluated the proposal according to the company's business strategy. Few days after the meeting, the ceremony that marked the end of the initiative took place at the same auditorium of the first workshop, and the final ranking was announced.

4.3.3 The innovation approach

There was no product innovation as there was no implementation of the product proposed. However, there was innovation in the process. This was the first innovation initiative of this company based in processes which counted on participation processes for product development. It was the first initiative of this company in the context of open innovation and which used online environment for interaction with the crowd.

Regardless of the fact that the product was not implemented, the process set workers on the path of experimenting with the culture of innovation, and this provided them the opportunity of sharing in the process of product development through the development of ideas.

More important than the final product was the integration of workers in the process of exchanging ideas and discussing them. According to the statement of one of the workers who were interviewed, this was his first participation in this type of initiative and he found it interesting and stimulating to be able to contribute to the evolution of solutions for important problems. For him, "to be part" of the solution process made him learn a lot and was very satisfying.

A video with the presentation of the initiative was presented in the final conference of the Sustainability Maker project, in Munich, Germany, on March of 2016. The video can be accessed at this link: https://youtu.be/1ZCnGKWbnH4.

4.3.4 The incorporated sustainability principles

In 'Water for Life Challenge' initiative, the sustainability criteria were introduced from the briefing to the choice of the best solution.

According to the '*Regulamento*' of the 'Water for Life Challenge' initiative, the goal was the development of products that permitted the re-use, the recycling and the reduction of water consumption. The challenge was a way for the company to stimulate the culture of innovation among its employees, making use their knowledge and creativity.

However, there was no obligation on the part of the company to internally adopt or launch the winning solution. Because of that, the economical principles incorporated to the 'Water for Life Challenge' initiative refer to the crowd-design process only, as presented in table 4.12, next page.

The principles 'promoting local economy' and 'valorizing material inputs and local productive structures' are associated, in this case, to one of the criteria for the choice of the better solution: to be produced according to the processes and materials already in use by the company. So, the proposals sent by the participants should consider plastic as the main material to be used in the product.

Table 4.12 - Economical principles incorporated to 'Water for Life Challenge' initiative.

Economical Principles	Crowd-design process
Promoting the local economy	X
Strengthen and valorize material inputs and local productive structures	X
Respect and valuing of local culture	X
Valorizing the reintegration of waste to promote its reduction	X
Promoting network organization	X

Source: This thesis' author (2018).

The principles 'respect and valuing of local culture' and 'promoting networking organization' can be associated to the fact that the initiative involved employees of the company, valorizing and stimulating the internal culture towards innovation. Also, considering the amount of employees (> 500), the initiative promoted the interaction with colleagues who, otherwise, they would not be acquainted with.

The principle of 'Valorizing the reintegration of waste to promote its reduction' was almost automatically addressed in the solution proposals due to the very theme of the initiative, water.

The environmental principles of sustainability, in this case, are related to the proposal chosen by the Leadership team as the best solution (1º place). As it is not possible to show the proposal due to the confidentiality issues, the analysis below (see table 4.13) was based on the criteria evaluated by the Expert Panel.

Table 4.13 - Environmental principles incorporated to 'Water for Life Challenge' initiative.

Environmental Principles	Outcome (product)
Minimise material and energy consumption	X
Choice of low environmental impact	

resources	
Optimization of product lifespan	X
Extension of material lifespan	
Easy assembly and disassembly	

Source: This thesis' author (2018).

The product chosen as first place is a mechanism that, attached to kitchen, lavatories and laundry sinks makes the reuse of water possible. So, it is a product that minimizes the consumption of the resource. The optimization of the life span of the product has to do with it being made of a very resistant material whose technology of production is already in use by the company.

The socio-ethical principles incorporated to the 'Water for Life Challenge' initiative, presented in table 4.14, are related to the crowd-design process only.

Table 4.14 - Socio-ethical principles incorporated to 'Water for Life Challenge' initiative.

Socio-ethical Principles	Crowd-design process
Promoting equity and social cohesion	X
Favoring the integration of the weak and marginalized	
Improving fairness and equity in the relationship between stakeholders	X
Improvement of the conditions of employment and work	X
Valorization of local resources	X
Enabling responsible consumption	

Source: This thesis' author (2018).

The only socio-ethical principle that could not be incorporated into this initiative was 'favoring the integration of the weak and marginalized' because the crowd-design process was carried out internally to the company, i.e. it was closed to the participation of the generic crowd.

'Promoting equity and social cohesion' and 'improving fairness and equity in the relationship between stakeholders' principles, in this case, can be associated to the adherence of participation by the crowd, not only by sending ideas, concepts and solutions, but also by posting comments in the sent proposals and voting to choose the

best ideas, concepts and solutions. In other words, the participation through the innonatives.com platform helped create a network for the exchange of information between the participants, getting them together in favor of one cause: help others in the development of proposals and solutions.

The principles 'improvement of the conditions of employment and work' and 'valorization of local resources' were associated to the promotion of innovation culture among the employees of the company. That is, through the participation in a product development process, the employees competences were recognized and stimulated to develop new ones directed to innovation.

4.3.5 Limits of the crowd-design process in solving the problem

Considering the main objective of the initiative, i.e. promoting the culture of innovation among the company, it can be said that the crowd-design process was an effective tool. According to the interview held with seven participants (available in appendix G) the process of crowd-design helped them to develop capacities and skills they did not know they had. They also emphasized they would be glad to participate again in case the initiative should re-occur, including the possibility of participating in other roles[14].

Just as it happened in 'The Kitchen Challenge' initiative, the crowdvoting process carried out through the innonatives.com platform did not allow the disclosure of who has voted and which criteria the voter used to make his/her choice. The voting for the best solution had to be held out of the platform so that the Expert Panel could consider the criteria described in table 4.11, shown above.

The interviewed participants also mentioned the English language adopted by the innonatives.com platform as a barrier to feel confident in accessing the platform. Although the instructions posted on the challenge page on the platform innonatives.com were in Portuguese, as well as the participants had been instructed to use this language when posting their proposals and comments, some participants would prefer that the entire platform interface were in Portuguese. According to them, this would further facilitate the interaction, making them feel less insecure when accessing the platform.

In fact, the use of an intermediary platform meant, in this case, the need for the

[14] Of the seven interviewed two did not participate in sending proposals but did so through comments and votes for the choice of the best proposal.

participants to adapt to the initially proposed process and also intervened in their motivation. In addition to the language issue, the fact that the platform used did not allow for an evaluation of the proposals in accordance with the established criteria for the solution development, as well as the fact that it does not have mechanisms that facilitate the visualization of the interactions of each participant (different from the mechanism 'Design Quotient' of the Open IDEO platform mentioned before) made the process of choosing the best solution and the grading process difficult.

4.4 COMPARATIVE ANALYSIS

4.4.1 The crowd-design process

Table 4.15 shows the comparative analysis regarding the specific characteristics of the crowd-design process of both initiatives.

Table 4.15 - Comparative analysis of the crowd-design process.

Crowd-design process of SuM Project	'The Kitchen Challenge'	'Water for life Challenge'
Sustainability Problems	Problem scouting in a low-income community, through offline approaches.	Aligned with the large-scale company business strategies.
Crowdvoting	Through both online and offline approaches.	Decided by managers of the large-scale company.
Challenge	Open	Closed
Crowdsourcing (sending ideas, concepts and solutions)	On the innonatives.com platform	On the innonatives.com platform
Crowdvoting	On the innonatives.com platform (general crowd); through a form sent by email (Experts and sponsor); offline procedures (personas).	On the innonatives.com platform By the employees ('crowd'), through a form sent by email (Experts).
Expert Panel	Composed by the members of the Advisory Board of the innonatives.com platform (experts in DfS).	Composed by the managers of the large-scale company (experts in innovation and product development).
Best Solution	Selected through the weighted average among all the voting.	Three solution were chosen by the 'crowd' (online voting) and were ranked by the Expert Panel members.
Crowdfunding / Marketplace /	N/A	N/A

Auction		
Implementation	Occurred through the production of the solution by the sponsor and delivered at the low-income community.	N/A

Source: This thesis' author (2018).

Based on the classification of the participatory approaches given by Ford *et al.* (2015), the 'design with' approach characterizes the entire process of 'The Kitchen Challenge' initiative. In the two first steps of the process, i.e. 'sustainability problems' and 'crowdvoting' steps, as well as in the 'crowdvoting' to choose the best solution, the low-income community members were consulted about their needs and, in a certain way, they also validated the developed solutions. The crowd's participation in the 'crowdsourcing' phases (sending ideas, concepts and solutions) can also be considered as a 'design with' approach because they participated in the creative process of the product development, as well in the voting to choose the best solution. The decentralization of the decision-making process is a characteristic of the of the bottom-up approach, which converts the PDP into an organic process (De Toni *et al.*, 2011).

In the 'Water for Life Challenge', as the problem to be addressed by the crowd was defined by the company, characterizes as a 'top-down' approach. However this characterization applies only to the first two steps of the process. Like in 'The Kitchen Challenge' initiative, the participation of the crowd in the creative and decision-making tasks (here referring to the crowdvoting processes during the sending of ideas, concepts and solutions) also characterizes the 'Water for Life Challenge' as a 'design with' approach. So, actually, it combined 'top-down' with 'bottom-up' approaches during the whole process.

In both initiatives it was necessary to include: (i) a test to validate information on the challenges as well the functioning of the platform dynamics; (ii) workshops that required the presence of participants and aimed at explaining the process of crowd-designing, motivate participation, and provide support during the creative activities (the development of ideas, concepts and solutions); (iii) the planning and development of communication materials to promote the initiatives, with information and invitation to participate.

None of the initiatives used the 'crowdfunding' functionality of innovatives.com

platform. In 'The Kitchen Challenge' it was necessary because the implementation of the best solution was done by the partner company. In 'The Water for Life Challenge', because the decision on the implementation of the best solution was up to the company's evaluation.

4.4.2 The stakeholders

Table 4.16 shows the comparative analysis regarding the stakeholders involved in both initiatives.

Table 4.16 - Comparative analysis regarding the stakeholders.

Stakeholders	'The Kitchen Challenge'	'Water for life Challenge'
Online environment	innonatives.com platform	innonatives.com platform
Crowd-design initiator	Pubic sector (a Federal University)	Private sector (the Innovation team of a large-scale company)
Sponsor	Private Sector (a small company)	The company itself
Expert	Experts in Design for Sustainability (Advisory Board of the innonatives.com platform)	Experts in innovation and product development (from the large-scale company)
Creative	General crowd	Employees from the administrative sectors of the large-scale company
Voter	General crowd, experts, crowd-design initiator, sponsor, personas	Employees from the administrative sectors of the large-scale company, experts
Commentator	General crowd, experts, crowd-design initiator	Employees from the administrative sectors of the large-scale company, experts, crowd-design initiator
Manager	Crowd-design initiator	Crowd-design initiator
Regulator	N/A	Crowd-design initiator
Personas	Low-income community members	N/A

Source: This thesis' author (2018).

A comparison of the two initiatives shows that 'The Kitchen Challenge' involved a

larger number of stakeholders because: (i) it was an initiative open to the participation of any interested person (general crowd) whereas the other initiative was proposed within a limited and pre-set number of participants; (ii) the crowd-design initiator was not, in the first case, the same as the sponsor organization, whereas in the "Water for Life" initiative, it was; and (iii), the first one involved a low-income community in their own environment as personas whereas the second recruited participants from the work environment.

Regarding the roles played by the stakeholders both initiatives were quite similar. The crowd acted as 'creator', 'voter' and 'commentator' (the main difference, however, was that the 'crowd' in 'Water for Life Challenge' initiative corresponded to the employees of the large-scale company). Both initiatives had an Expert Panel that acted as voter and commentator. However, the composition of this panel for each one of the initiatives was different according with the necessary competences for the evaluation of the solutions, that is, knowledge about the sustainability principles and about the production processes of each company.

Regarding the online environment, i.e. the innonatives.com platform, it is important to consider, in further use, if the offered functionalities are suitable to the tasks required and to the public it addresses. As the crowd-design process depends on the online environment, it is important to deeply know the platform in order to plan the process and define the public and how it will be involved in the initiative.

4.4.3 The tasks

As previously presented in chapter 2, the crowd-design process involves the crowdsourcing of the creative tasks, considered by the literature as having a high level of complexity because they deal with problem solving (Howe, 2008; Thuan *et al.*, 2016). The creative tasks of both initiatives occurred in the phases of sending ideas, concepts and solutions. However, the crowd-design process can involve other typologies of crowdsourcing, also presented in chapter 2. Both initiatives also included: (i) the 'crowdvoting', i.e. a task that seeks to obtain the opinion of people about a particular topic (Beherend *et al.*, 2011; Bannerman, 2013; Djelassi & Decoopman, 2013); (ii) the 'crowdopinion', i.e. the feedback from participants about the sent proposals (Estellés-Arolas, 2016).

For the comparative analysis, the following were also considered as tasks: (i) the two initial steps of the SuM Project crowd-design process (i.e. 'sustainability problem' and 'crowdvoting' steps), also classified as foresight tasks (Battistella & Nonino, 2012); (ii) the challenge testing; (iii) the workshops; and (iv) the voting by the Expert Panel (in both initiatives) and by the low-income community (in 'The Kitchen Challenge' initiative only). Table 4.17 presents the comparison of those tasks in both initiatives.

Table 4.17 - Comparison of the tasks of both initiatives.

TASK	'THE KITCHEN CHALLENGE'	'THE WATER FOR LIFE'
Creative	Occurred through the innonatives.com platform mechanisms of sending ideas, concepts and solutions.	
Crowdvoting	Occurred through the innonatives.com platform mechanisms at during the time period of each phase of sending ideas, concepts and solutions.	
Crowdopinion		
Problem scouting (referring to the 'sustainability problems' and 'crowdvoting' steps of the SuM Project crowd-design process)	Considered as a bottom-up approach, it occurred involving a low-income community as 'personas' and did not use the innonatives.com platform mechanisms.	Considered as a 'top-down' approach, it occurred by the alignment of the initiative with the business strategy for product development of the company[15].
Challenge testing	Carried out in an alternative platform (Facebook), aimed to test the understanding of the challenge information by involved design students.	Carried out in the innonatives.com platform, aimed the understanding the platform functionalities by involving the Innovation team of the company.
Workshops	Occurred just during the phase of sending ideas.	Occurred before each phase of the creative tasks.
Voting by the Expert Panel in the solution phase	Occurred through a form sent by email to the Advisory Board of the innonatives.com members.	Occurred through a form sent by email to the managers of Innovation and Product Development departments of the company.
Voting by the 'personas' in the solution phase	Carried out through offline approach such as a ballot box.	N/A

Source: This thesis' author (2018).

Table 4.18 (next page) shows the different time span of the tasks of each

[15] It is important to point out that besides the problem scouting be considered as a top-down approach in the 'Water for Life Challenge' initiative, the creative tasks are part of the bottom-up approach once the participatory approach is the 'design with'.

initiative.

Table 4.18 - Comparison of the time span of each task in each of the initiatives.

TASK	'THE KITCHEN CHALLENGE'	'THE WATER FOR LIFE'
Problem scouting (referring to the 'sustainability problems' and 'crowdvoting' steps of the SuM Project crowd-design process)	Three months	N/A
Planning of the initiative	N/A	Four months
Challenge testing and preparation of the final Challenge	One month	
Creative	Ideas: One and a half month Concepts: Half of a month Solutions: Two months	Ideas: Half of a month Concepts: ⅔ of a month Solutions: Half of a month
Workshops	Two hours (ideas)	Three hours each (ideas, concepts and solutions)

Source: This thesis' author (2018).

As the table shows: (i) the duration of the problem scouting in 'The Kitchen Challenge' initiative added to the duration of the 'challenge testing' and of the preparation of the final 'challenge' was the same spent to the planning of the 'Water for Life' initiative (in this case, the planning phase included the 'challenge testing' and the preparation of the final 'challenge'); (ii) the duration of each phase of the 'creative tasks' was larger in 'The Kitchen Challenge' initiative.

Considering that holding the workshops in both initiatives helped to keep the motivation for participation (according to the statements of those interviewed), it is important to stress that this strategy should be an indispensable to the execution of the process.

4.5 A REFERENCE MODEL OF CROWD-DESIGN FOR SUSTAINABILITY

The process of crowd-design for sustainability aims to promote a value chain involving all stakeholders, contributing to the three dimensions: economical, environmental and socio-ethical. This subchapter presents the guidelines to achieve sustainability through the crowd-design process, and also presents its reference model.

4.5.1 Guidelines to achieve sustainability through the crowd-design process

4.5.1.1 Economical principles

Crowd-design process enables the development of economically feasible models of production and consumption by cutting operational costs and increasing efficiency and effectiveness of projects (Zelenika & Pearce, 2012). The crowd-design process allows for the participation of the stakeholders in each and everyone of the phases of the process, through the online environment. In the cases studied, as the accomplishment of tasks was made through the innovatives.com platform, the operational costs related to the crowd participation during the phases of sending ideas, concepts and solutions were reduced if compared to traditional participative procedures (like market survey, focus groups, etc.).

However, in the case of the "Water for Life challenge' the development of a specific platform was considered. As this would mean an increase in operational costs it was decided to use an intermediary platform. In 'The Kitchen Challenge' case there was no alteration in the operational costs from the sponsor' point of view.

Other potential contributions of the crowd-design process to the economical dimension of sustainability are summarized as follows:

- **To strengthen and valorize material inputs and local productive structures:** developing a product with crowd participation leads to the possibility of adapting production according to the available resources in a given area. A crowd-design initiative may also be related to the development of a solution for some specific material that is abundant in a given region. Likewise, this material can be used to replace the use of non-renewable resources. This kind of contribution is mainly related to the eco-design, eco-efficient PSS design and systemic design approaches (see figure 2.29, presented in chapter 2).

In 'The Kitchen Challenge, the partnership with the local company meant the valorization of a local productive structure as well as valorization of the recyclable materials the company uses.

In the 'Water for Life Challenge' initiative the company was interested in fostering the innovation culture among its workers through the development of a new product that would use processes and materials the company already works with.

- **Respecting and valuing local culture**: sharing ideas and knowledge through crowd-design initiatives could make explicit certain cultural characteristics of a community. In sustainable innovation terms this correspond to the smart growth associated to the green economy. Still, once crowd-design initiatives can be proposed by both organizations and individuals, it is possible to share people's needs, thereby privileging local knowledge and inherently challenging and transforming the relationship between knowledge, expertise and power (Anderson, 2014).

In 'The Kitchen Challenge' initiative, the fulfillment of this principle was mainly due to the participation of a low-income community in the phases of problem scouting, choice of the problem to be solved and choice of the best solution. This made it possible for the crowd to contribute with proposals that met up with proposals that answered to the community needs, giving its culture value and respect.

In the case of the 'Water for Life Challenge' the crowd design process privileged the knowledge of the company' employees and provided them with the development of new expertises.

- **Promoting network organization**: crowd-design initiatives are intrinsically favorable to networking organization because people get to know each other, as well as their different competences and potential contributions.

Indeed, this principle can be observed in both initiatives. In 'The Kitchen Challenge', the networking was composed by organizations from the public and private sectors, a low-income community and a crowd. The crowd, in this case, were people from many parts of the world, including design students from Univille.

In the 'Water for life Challenge', the crowd-design process increased the networking from the employees of the same company. According to the statement of one of the participants, her participation allowed her to meet people from other sectors of the company that she never thought she would even encounter.

- **Promoting the local economy**: directly linked to the network organization is the promotion of the local economy, i.e. through a crowd-design initiative it is possible to find diverse suppliers as well as opportunities for different market

niches locally. Once crowd-design process can be applied in all PDP phases, including its earliest phases, it increases the possibilities of the design solution fitting stakeholders requirements and needs.

This principle was observed in 'The Kitchen Challenge' initiative mainly because the crowd-design process and its outcome were directed to solve a problem demanded by a low-income community.

- **Valorizing the reintegration of waste to promote its reduction**: crowd-design initiatives can promote the finding of solutions that avoid waste not only in the product development process but in the product life-cycle. Crowd-design initiatives can also aim at finding solutions for existing production/consumption's wastes; i.e. promote a transition to sustainable solutions.

In 'The Kitchen Challenge' initiative, this principle was directly related to the material (pallets) used in the furniture. In the 'Water for Life Challenge' initiative, it was related to the theme 'water'.

4.5.1.2 Environmental principles

Crowd-design, as a distributive process, may improve the efficiency of production/consumption systems, not only because of the reduction of the environmental impacts regarding the product development and production processes it may enhance, but also because of the possibility of sharing knowledge regarding sustainable materials and practices. In this context, by applying the crowd-design process to the PDP the benefits to the environmental dimension of sustainability can be:

- **Choice of low environmental impact resources**: among the reasons to undertake a crowd-design initiative (see Wu *et al.*, 2015) the search for sustainable solutions should be a motivator to engage the crowd in the product development process. Since people from anywhere in the world, provided with Internet access, can contribute with ideas for solutions, it is very likely that existent low environmental impact solutions appear among the crowd's proposals. Other possibility allowed by the crowd-design process is the

participation of specialists in sustainability as commentators and voters allowing for the best solution to be evaluated according to the impacts it may cause (Tischner & Beste, 2017).

In 'The Kitchen Challenge' initiative, the choice of using a low environmental impact resource was stated in its briefing. In the 'Water for Life Challenge' initiative, the condition was the use of raw material already in use by the company.

- **Minimise material and energy consumption**: in this case, resource minimization concerns not only the resources employed in the product development process (Tracey, 2004; Shenk & Guittard, 2011; Djelassi & Decoopman, 2013) - such as logistics, equipment, etc. - but also those employed in the production process and in the product itself. As the best solution is shared with the crowd, it can be produced in any location and on demand, provided the copyright and other legal aspects involved are respected (which will vary according to the initiative and the place of implementation). However, in crowd-design for sustainability initiatives, the creative commons should be prioritized (Tischner & Beste, 2017). Still, participation via crowd-design can result in new product concepts and alternative production techniques.

The use of the platform innovatives.com as the online environment for the participative process of solution development in both initiatives meant a reduction of costs as to the PDP. However, as mentioned earlier, in case organizations wish to develop a crowd design initiative on a specific platform, it should bring to consideration the rise in costs related to the PDP, initially, at least.

As in 'The Kitchen Challenge' initiative there were no alteration in the costs of the process of production. The partner company did not have to invest in machinery as the product could be made by the same process it usually uses. In the 'Water for Life Challenge' initiative the product was not produced - only its mock-up of low fidelity - and this answered for no costs in production.

- **Optimization of product lifespan and extension of material lifespan**: one possible way for extending the product's life is the presence of an emotional connection between the user and the product (Schifferstein & Zwartkruis-

Pelgrim, 2008). Crowd-design initiatives, as previously shown, can generate the sense of ownership, i.e. the user feels like he/she was part of the development of the solution and, therefore, is even more connected to the product (Djelassi & Decoopman, 2013). The user-product attachment can stimulate the loyalty of the user to the product and his/her wish to have it for a longer time instead of discarding or replacing it shortly. On the other hand, crowd-design initiatives can also seek solutions that aim at giving a new purpose to existing products as in the case of Open Design initiatives (Howard *et al.*, 2012; Macul & Rozenfeld, 2015), and as seen in the 'The Kitchen Challenge' initiative related above.

Still, the outcomes of a crowd-design process may be among anyone of the four DfS levels suggested by Ceschin & Gaziulusoy (2016). The solutions can be a sustainable product (whose development is based on eco-design principles, for instance) or a Product-Service System (PSS). The process can be a social innovation, as seen in the 'The Kitchen Challenge' initiative related above. All those options enclose the environmental dimension of sustainability.

4.5.1.3 Socio-ethical principles

According to Zelenika & Pearce (2014), as people come online to learn, share, socialize and 'change the world', they are also gradually recognizing and taking up the ability to add content rather than be passive receivers of information. Watson (2009) and Anderson (2014) note that Internet-based platforms and the human urge to communicate is creating the basis for the golden age of activism and involvement, increasing the openness of our major social institutions. Benkler (2006) agrees and adds that the intrinsic human desire for acquiring and sharing knowledge having the Internet as a platform is a key driver in making easier and faster for people to participate in the online peer-to-peer (P2P) social exchange.

Stakeholder participation in the crowd-design process can contribute to both equity and social cohesion. Considering identification and selection of stakeholders as a required task of the design process, the choice of target users becomes a critical design issue itself (Albinson *et al.*, 2008). This dynamic identification and engagement of stakeholders is especially important in the PDP via crowd-design process, because

despite the pre-set arrangement of stakeholders, it brings the possibility of engagement of unpredictable stakeholders. The inbuilt bias in this participatory approach then becomes an open discussion on who may be affected by or can contribute to the design. In crowd-design, there is no fixed or static stakeholder set; therefore it is necessary to make the identification and engagement of stakeholders as an ongoing activity in the design process itself (Albinson *et al.*, 2008).

Because information, knowledge and culture are central to human freedom and development, the change brought on by the networked information environment holds many promises: first as a dimension of individual freedom, as a platform for better democratic participation; and in an increasingly information dependent global economy, as a mechanism to achieve improvements in human development everywhere (Benkler, 2006).

In this context, crowd-design initiatives benefits the socio-ethical dimension of sustainability by:

- **Improving working and employment conditions**: According to Gordon (2014), remote design has become a powerful trend for new designers. Exclusively in the Open IDEO platform there is a mechanism that allows the crowd to see others' contribution in statistics terms (Lakhani *et al.*, 2013). Called 'Design Quotient' (DQ), the amount of points of each participant derives from his/her number of interactions in the challenges available on the platform. Thus, the DQ helps to build the participant's reputation (Battistella & Nonino, 2014) which, in turn, increases her/his possibilities of being hired by the organizations involved in the initiative (Gordon, 2014).

This happened in the 'Water for Life Challenge' initiative with the creation of a reward (the '*Garras*') to be received by participants according to their interactions in the initiative. However the fact that the innovatives.com platform does not have a specific mechanism to account for participation, this account was done out of it, that is, at the end of each phase, the author of this thesis would check who were the authors of the propositions as well as the comments posted to each one of them so it would be possible to award the amount of Garras relative to each interaction (this amount was stated in the '*Regulamento*').

- **Favoring the integration of the weak and marginalized (Facilitating the inclusion of all)**: when a crowd-design initiative is open to anyone's participation (not only of people with specific skills) every contribution will be taken into account even though the selected will depend on the voters. This does not weaken the Internet-based platforms where a crowd meets to discuss and share proposals for sustainable problems as a feasible tool to promote and facilitate the inclusion and participation of all stakeholders.

In 'The Kitchen Challenge' initiative this was more evident because of the involvement of a low-income community as 'personas'. Even though participation of the community was through offline procedures, as explained above, the reason for this involvement was to test alternative procedures to the use of the innovatives.com platform so as to understand how the integration of this community to the process could be attained.

- **Improving fairness and equity in the relationship between stakeholders**: the crowd-design process allows stakeholders to participate in all phases of the product development, including in its implementation. The participatory approach "design with' considers stakeholders able to comment in the initial phases of the process (participating as decision makers) as well as bringing in suggestions and developing solutions (like in the creative tasks). On the other hand, the 'design by' approach (see Ford *et al.*, 2015) takes participants as the very designers. This approach, however, is related to the final steps of the product development process, thus related to the Open Design processes, as presented in Chapter 2. Both approaches place the stakeholders on the same level of importance in the product development process.

- **Promoting equity and social cohesion**: social cohesion can be improved by crowd-design initiatives because it allows connectivity of individuals in order to achieve common goals. Throughout the online environment people can share both problems and ideas in search to solve them.

In 'The Kitchen Challenge' initiative the promotion of equity was extended to the neighbors of the low-income community as they were given the possibility of

participating in the decision making process.

- **Valorizing local resource and skills**: based on the statement that people are creative and resourceful in their own contexts (Gordon, 2014) it can be inferred that crowd-design process allows local people's empowerment, achievable through capacity building, self-reliance and microfinance (2013).

Participants in both initiatives were keen to stress the fulfillment of this principle. According to the statement of the design teacher, mentioned above, her students who participated in 'The Kitchen Challenge' felt challenged to develop solutions for real problems, by developing products in a participative way, and this was very stimulating for them, right in their first year of the design course.

In the 'Water for Life' initiative, participants thought their participation in the process as one excellent possibility to develop abilities and also as a push towards matters of sustainability.

- **Fostering greater transparency for consumption**: when organizations use crowd-design, the stakeholders' participation means they take part in some important decisions not only regarding the product itself but also regarding its production and consumption (Boons & Lüdeke-Freund, 2013). It helps organizations to meet the emerging demands for sustainability features in products and services (Bhamra & Lofthouse, 2007).

4.5.2 The process of crowd-design for sustainability

The comparative analysis provided the empirical means that together with the literature fostered the development of the reference model of crowd-design for sustainability. The reference model of Product Development Process given by Rozenfeld *et al.* (2006) was used as the theoretical reference from which the phases of the reference model here presented were structured.

The model herewith presented for the process of crowd-design for sustainability is divided into three macro-phases: (i) pre-development; (ii) development; and (iii) post-development. As in the PDP reference model, this division facilitates the modularization of the crowd-design process, where each macro-phase is divided in

micro-phases that can be applied separately to respond to the needs of each organization. Figure 4.24 presents the scheme of the reference model of crowd-design for sustainability.

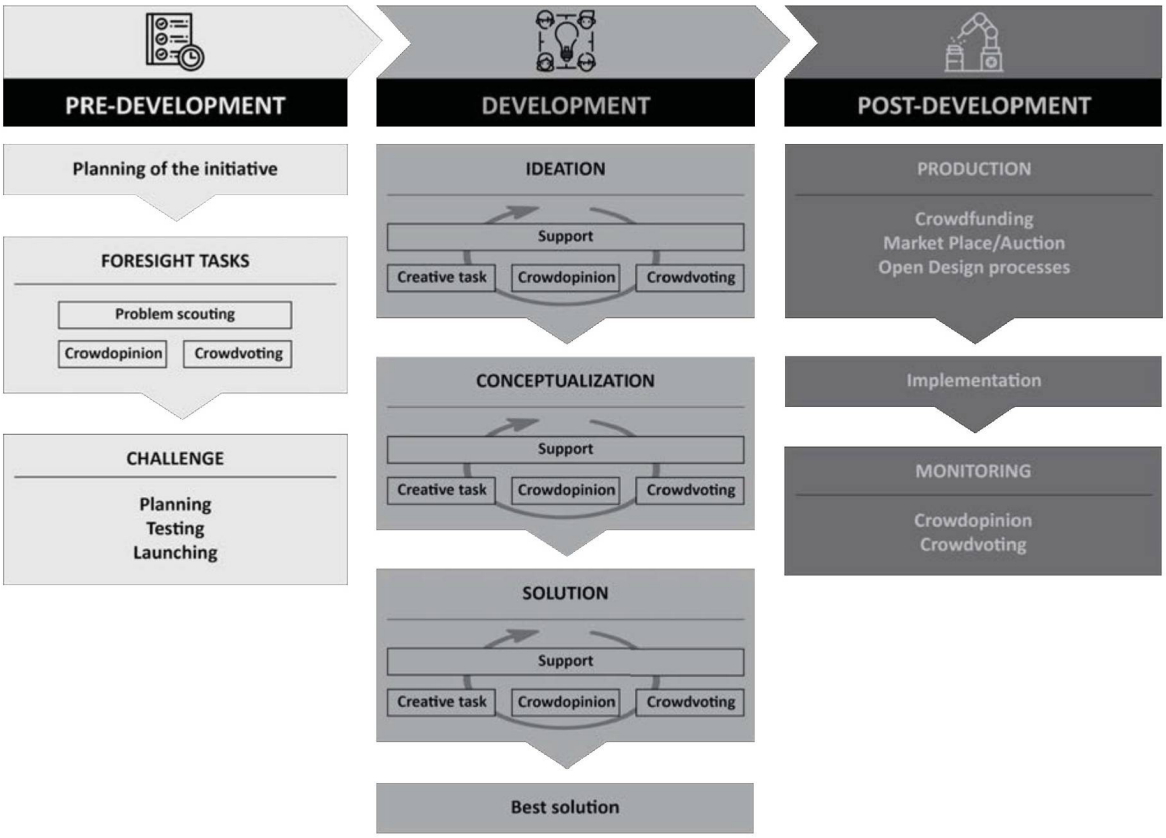


Figure 4.24 - The reference model of crowd-design for sustainability.
Source: This thesis' author (2018).

This model of the crowd design process for sustainability can be applied in all the phases of the PDP (Oliveira, 2016) because it bridges from the initiative planning to the product implementation. The next topics describe the procedures of each macro-phase.

4.5.2.1 Pre-development macro-phase

This macro-phase is divided into three micro-phases: (i) planning the initiative of crowd-design; (ii) foresight tasks; and (iii) challenge.

According to the literature findings regarding crowd-based processes (Nakatsu *et al.*, 2014; Choi & Lee, 2015; Wu *et al.*, 2015, Oliveira, 2017), the **planning of the initiative** should contemplate: (a) the selection of the online environment; (b) the decision regarding the the crowd to be involved (characteristics, required skills, etc.); (c)

the decision regarding the process' steps, their duration and their tasks; and (d) the decision regarding the reward mechanisms. However, this micro-phase has been modified by the research and the experience gathered in the development of the two initiatives described above.

For the selection of the online environment, the crowd-design initiator has to take into consideration not only the scope of the platform, that is, whether it is suitable according to sustainability criteria or not, but also language issues. This is directly related to the profile of the participants and it is necessary to consider not only the crowd in general (who will participate in the creative tasks) but all the other stakeholders, such as regulators, sponsors and personas. It is important to keep in mind that the last two ones also participate in the processes of decision making in the choice of the proposals sent by participants.

The denomination 'f**oresight tasks**' comes from the literature (Battistella & Nonino, 2012) and is used here to name a micro-phase related to problem scouting. From the comparative analysis we infer that the problem scouting can occur in two different ways: (i) in alignment with the business strategy of the organization that proposes the initiative (a top-down approach), or (ii) through participatory processes involving stakeholders interests and demands (a bottom-up approach).

The top-down approach is characteristic of the cases in which the central competences of the organization who proposes the initiative are already established, as seen in the 'Water for Life Challenge' one. The determination of the problem to be solved is dependent on those competences and this establishes the possible profiles of the products to be developed by the crowd (Oliveira, 2017). On the other hand, the 'bottom-up' approach leaves the decision about the problem to be solved to the stakeholders, thus addressing their concerns and demands, as seen in 'The Kitchen Challenge' initiative. When this is the chosen approach some procedures should be foreseen: (a) a crowdopinion process in order to define the problems at stake; and (b) a crowdvoting process for the decision-making to choose the problem to be solved.

According to the innonatives.com platform, a **challenge** is composed by the challenge briefing which has to contain the problem context, the kind of solution that is expected, the specific sustainability aspects/issues and criteria, how can the solution be implemented, and so on. However, what the innonatives.com platform does not explain

is how this information should be planned nor the importance of validating it before launching the challenge. The importance of these issues were pointed out by the literature (Shoyama *et al.*, 2014; Wu *et al.*, 2015) and verified in both initiatives presented above. Another issue verified in the field refers to the importance of having a communication plan.

The challenge micro-phase proposed here refers to (a) the **planning of the challenge,** in which a briefing should be produced explaining the challenge, its phases, its duration, the criteria for the selection of proposals, etc. The planning of the communication setup of the challenge which is a strategic factor to call the participation of the crowd; (b) the **testing of the challenge**, in which the understanding of the information contained in the briefing should be validated by a testing group of people with the same characteristics of the targeted public. As seen 'Water for Life Challenge' initiative, the challenge test served to test the functionalities of the online environment where the interactions of the development macro-phase were held (this will be detailed in the next subchapter); (c) the l**aunching of the challenge**: the moment the challenge is posted online, initiating the development macro-phase.

4.5.2.2 Development macro-phase

This macro-phase encloses the micro-phases which correspond to the product development by the crowd. According to the literature, these tasks are denominated **creative tasks** (Howe, 2008; Battistella & Nonino, 2012). In the crowd-design process of the SuM Project, these creative tasks correspond to the 'crowdsourcing' step. The innonatives.com platform predict from two to three creative tasks: sending ideas, sending concepts (not mandatory) and sending solutions.

Although the crowd-design process of the SuM Project does not mention the possibility of running a crowdvoting process during the time period of the 'crowdsourcing' step (i.e. one of the creative tasks) this was done in the field study by using the mechanisms available at the innonatives.com platform. However, the field study also showed that the voting mechanism of the innonatives.com platform is not effective for the proposals evaluation regarding the sustainability criteria.

Besides the crowdvoting process, during the time period of each creative task at the innonatives.com platform, the stakeholders can communicate with each other by posting comments on the sent proposals pages.

In the reference model here presented, creative tasks are those of sending proposals that aim at solving the challenge. It is the crowd that sends these proposals and the procedure follows the three phases of the PDP: ideation, conceptualization and solution. It is up to the crowd-design initiator to plan, according to what the challenge demands, which of them will have to be implanted: just one, two ou the three.

It is important to stress the need of building strategies for each of the phases mentioned above so that the participants have support in order to help them in the developing of proposals. This support may be in the form of workshops with participants present, as was the case in both initiatives discussed, by having in the very online environment toolkits or by having a facilitator easily available to the participants (as in the Open IDEO platform).

In each of these phases there happens crowdvoting and crowdopinion processes. This model emphasizes crowdopinion because this task is the way the stakeholders contribute with comments, suggestions and opinions on each of the proposals sent. It is from these contributions that the task performer may improve the idea, concept or solution he/she sent. And these aspects are extremely important to evaluate the fulfillment of the socio-ethical principles of sustainability. The crowdvoting process also occurs in the three phases. It is important that the model contemplates an online voting mechanism that allows for the evaluation of the proposals according to the sustainability principles, by the stakeholders and by the crowd in general. The suggestions made by Rosa (2012) for the economic dimension, by SDO-Mepss (2018) for the environmental dimension and by Prado (2011) for the socio-ethical dimension should be adequate tools to offer pathways to systematically consider these three sustainability dimensions in a crowdvoting process. This would provide for an adequate choice of a "solution" at the end of the creative tasks.

4.5.2.3 Post-development macro-phase

This macro-phase corresponds in finding ways to produce, implement and monitor the product after its implementation.

According to the crowd-design process of the SuM Project, there are three possibilities to make the **production** of the best solution possible in the case of initiatives that do not have a sponsor or are not initiated by a company but by individuals from the crowd: (i) through a crowdfunding process, (ii) through marketplaces; and (iii) through auctions. Another strategy for the production of the best solution found in literature refers to Open Design processes (Howard *et al.*, 2012; Macul & Rozenfeld, 2015), that is, to the process of sharing the specifications and instructions of a product that is already developed and is ready to be produced through a Do-it-Yourself process or FabLabs. Although these strategies have not been tested in initiatives described, they were stated by literature as feasible possibilities.

In the theoretical reference model, the **implementation** corresponds to the product launching in the market (in the case of companies) (Rozenfeld *et al.*, 2006). In 'The Kitchen Challenge' initiative, where the company was a sponsor only, the implementation occurred when the product was delivered to be used by a low-income family. Because the sponsor did not take the product into its portfolio for considering it had not market appeal, this example drives us towards a different statement. Together with the Open Design process of production, 'The Kitchen Challenge' shows that the implementation of the product as of its use is a relevant item of the model here proposed.

Monitoring refers to the collection of information regarding the performance of the product in the market and also regarding its use (Rozenfeld *et al.*, 2006). Companies use to monitor the market performance according to the amount of sales of a given product (Oliveira, 2017). However, according to Djelassi e Decoopman (2013) monitoring can also be done through crowd-based processes, such as crowdopinion and crowdvoting, where the company can ask for a feedback from users about the product. The model here proposed considers all these alternatives.

5. CONCLUSIONS

Even though the crowdsourcing theme is still in its initial studies regarding its processes and characteristics in the field of design, when it comes to the development of sustainable solutions, the literature review showed that its nature does have direct connections with Sustainability principles, not only related to socio-ethical dimension, but also to the economic and environmental dimensions. However, these topics are seldom included in the formulations in the same literature.

Along with the literature findings, the crowd-design process of the Sustainability Maker Project as well as the innonatives.com platform were tested through a field study which encompassed two different initiatives.

In the first initiative, 'The Kitchen Challenge', the access to international web-based platform by the low-income community, in which the level of literacy was low, was impaired and demanded the formulation of new strategies to enable crowd-design as a process to involve the low-income communities in developing countries (as is the case of Brazil) in the decision-making process regarding the product development.

As the empiric data has shown in this initiative, to achieve mainly the socio-ethical principles of Sustainability, the crowd-design process had to be applied as an hybrid approach, in order to allow not only the participation of the low-income community members as "personas" but also the participation of the members of the crowd as "solvers", "voters" and "commentators".

From literature, however, it comes that in a crowd-based process the term "crowd" is used to characterize the possibility of stakeholders participation as an asynchronous manner, in the same online invironment. On this way, the size of the crowd does not really matters. What matters is the participation of different stakeholders, by playing different roles. This "crowd" characteristic, however, is basically what charactrize the achievement of the principles of the three dimentions of Sustainability. In order to work as a platform that facilitates the stakeholders participation, the online environment has to be aligned to the crowd-design process, its tasks and the possibility of roles played by the participants.

In "The Kitchen Challenge", the crowd-design approach is considerate as hybrid process mainly because of: (i) the necessity of having a design team on the field (i.e. in the low-income community) collecting the needed data to develop the briefing of the challenge, that in turn, intented to find solutions to solv a real-problem faced by a low-

income community; (ii) the necessity of having workshops to explaing how the crowd-design process works and how the “crowd” could contribute not only sending proposals but also commenting and voting on the sent proposals. What this initiative has shown is that an hybrid approach of crowd-design is useful when the participation of the stakeholder "personas" matters to achieve the socio-ethical principles of Sustainability. Once the hybrid approach allows the participation of the “personas” since the PDP initial phases; i.e. the problem scouting, it means that including the “personas” from this phase allowed the inclusion of a real demand for real-world necessities.

However, other cultural barriers were also found in this initiative. In inspite of the hybrid approaches to find the problem definition, and to allow the voting with the low-income community members, there were necessary to held workshops with the design students to explaining them about the crowd-design process – meaning that the crowd-based processes are still unexplored by the design community. These kind of initiative are often related with design contest, which differs to the crowd-design process because of the way the interactions occurs. In a design contest, the interations are based mostly in sending proposals for solution. In a crowd-design process, however, the interactions are bases in collaboration, i.e., the participans can contribute with the sent proposals by posting comments to improve it, and voting to help choosing them as the proposals tha fits to the briefing.

Regarding the stakeholders, the roles played by the "sponsor", "experts" and "members of the crowd" interacted online, in the same online environment, the innonatives.com platform, after the open call (i.e. the challenge launch). On this way, the roles have direct connextion with the crowd-design tasks.

As shon by the literature, the tasks varies according its typologies. In “The Kitchen Challenge”, the tasks were based on creative demands (i.e. be in agreement with the briefing requirements) and on collaborative process (i.e. commenting and voting in the sent proposals). The comments sent by the participants has shown collaborative content mainly because the "commentators" tried to encourage the improvement of the sent proposals. The improvements were mainly regarding the Sustainability principles related to its three dimensions.

In the second initiative, ‘Water for Life Challenge’, the crowd-design process was applied in a large-scale company and its employees acted as the crowd. Even in this

closed challenge approach, the key principles of the crowd-design process of the SuM Project and the innonaives.com platform were respected.

In this inictaitive, the interactions also occurred trought hybrid manner. The crowd was "pre-selected" but their participation by posting proposals, voting and commenting were voluntary.

However, once the members of the crowd had never participated in a crowd-design initiative before, workshops had to be offered to explain the participants on how to develop their ideias, concepts and solutions. But different of what happened in "The Kitchen Challenge", the participants of the workshops were not designers neither design students. The participants who have sent proposals were people from the admnistrative sector of the large-scale company. On this way, the workshops heped them to develop their creative habilities. In this sense, it could be said that the design team was fundamental to help the participants to develop and improve their capacity of popose solution to solve the crowd-design initiative briefing (detailed in the "Regulamento").

Regarding the phases of PDP contemplated in the field study, there were two different situations: in the first initiative, the process of crowd-design comprised all steps from problem scouting to product implementation, meaning that it englobed the pre-development and the development macro-phases established by Rozenfeld's *et al.* (2006) PDP reference model. In this case, the partner company produced the chosen solution (the best solution). In the second initiative, the crowd-design process also comprised the pre-development and development macro-phases, the latter being performed only until the decision-making for the best solution phase, for reasons of the company's decision.

It was the coming together of the field experience - the empirical data - and the literature that it was possible to answer the research question - how to develop sustainable solutions in design by involving the crowd over the Internet? - and develop the reference model of crowd-design for Sustainability.

Following the PDP reference model proposed by Rozenfeld *et al.* (2006), the reference model of crowd-design for sustainability is also divided into three macro-phases: (i) pre-development; (ii) development; and (iii) post-development, which allows for the inclusion of the sustainability principles in all the phases of the product development process because it bridges from the initiative planning to the product implementation.

The process of crowd-design for Sustainability differs from others design approaches mainly because of how the participants are involved on the PDP (i.e.. mainly trought an online environmet that allows participation on an asynchronous manner), and of how the sustainability criteria are introduced to them.

In both cases, the Sustainability criteria were included since from the briefing of the challenge. The participants were "challenged" to find solutions that could solve sustainable problems, by sending and invited to choose sustainable solutions.

In "The Kitchen Cahllenge" initiave, Sustainability principles were included from the briefing when the open call invited the crowd to solve a real problem for those in the base of the pyramid. The crowd response was its proposals that had to fit in the sustainable criterias (as proposed by the briefing available to the participants). The other stakeholders, who had also interacted in the online invironment, helped to improve the posposals, by given some tips and comments about how to make the proposals more suitable to the problem.

In the task of voting, the tested online environment (i.e. the innonatives.com platform), shown that it still need improvements. This is, its mechanisms of voting need improvements regarding the Sustainability criteria.

Regarding the method, this research was of an exploratory nature, its ontology based on Constructivism approaches and its epistemology on Interpretivism. The research and analysis methods were carried out through a qualitative approach.

The Systematic Literature Review (SLR), as proposed by Conforto *et al.* (2011), carried out in two different moments (2014 e 2016), was a valuable asset to deepen understanding, in the consolidation and formalization of the constructs, as well as to make their correlations possible. The results of the two SLRs showed, on their turn, that there is a lot to be done in the research field of the crowd-design theme.

The unsystematic literature review, a constant practice during the whole research process was also very important and was used mainly to find processes of a similar nature and concepts that related the crowd-design process with the principles of sustainability.

In the Action Research the interaction of researchers of NDS/UFPR with the SuM Project team, during the whole duration of the work proved essential to the filling in of the voids in the literature.

In the Case Study held at the large-scale company participant observation by the author of this thesis in the Innovation Department team was fundamental for the structuring and development of the initiative as it allowed for a close observation and thus an accurate grasping of the process as well as the possibility to describe it in detail.

With the description of the initiatives it was possible to show the variables important in the process of crowd-design, the approaches to innovation used, and the principles of sustainability associated to each one of them. This greatly help the execution of the comparative analysis. In the process of developing the reference model of crowd-design for sustainability the confrontation of the reviewed literature with the field data proved to be an efficient strategy.

Finally, it is important that this reference model of crowd-design for Sustainability here proposed be tested in further studies to check its effectiveness and, if necessary, work on its improvement. These studies includes not only it effectiveness on advances in the product development process but on in Product Service Systems and co-design process.

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APPENDIX A

Entrevista 01: (Ator 01.1)

Profissão: CEO da empresa EcoDesign

1) Como você ficou sabendo do projeto e do Desafio The Kitchen Challenge?
R - *Por meio do Núcleo de Design e Sustentabilidade da UFPR.*

2) Você/a sua empresa já havia participado de um processo como esse, o de Crowd-Design?
R- *Foi a primeira vez.*

3) Quais foram as motivações para participar do desafio?
R - *Difundir os princípios da Sustentabilidade.*

4) De que maneira ocorreu a sua participação no processo (em que fases e quais funções)?
R- *Apoiamos com a produção do produto final.*

5) Quais eram suas expectativas, enquanto empresa, antes de participar do The Kitchen Challenge?
R- *Envolvimento com o projeto em si, ampliação de networking, apoio a projetos com cunho sustentável.*

6) Suas expectativas foram supridas?
R - *Sim.*

7) Você vê a multidão como uma fonte viável de soluções sustentáveis?
R - *Sim.*

8) Você vê oportunidades de melhorias no processo executado?
R - *Sim.*

9) Você/sua empresa participaria novamente de um processo como esse?
R- *Sim.*

APPENDIX B

Entrevista 01: (Ator 02.1)

Descrição: Moradora da Comunidade Parque das Águas Claras – Piraquara/PR

OBS.: A entrevista com este ator deu-se em forma de depoimento, transcrito a seguir.
OBS.: The interview with this actor took the form of testimony, as transcribed below.

Olá, meu nome é Debora e eu moro nas Águas Claras. Eu participei do projeto da cozinha. Recebi o pessoal do projeto na minha casa e contribuí com eles, dando informações. Depois, eu participei da votação escolhendo o desafio dos móveis da cozinha. E eu fui a sorteada. O móvel serviu para três opções, porque não teve como eu montar ele do jeito que ele era. A mesinha, que é o banquinho, a minha filha faz dever da escola. A prateleira eu uso para [colocar] porta retrato e agora para o pinheirinho [o depoimento deu-se em época de Natal]. E a outra prateleira eu uso para guardar os ursinhos [de pelúcia]. Queria agradecer a este projeto em que todo mundo foi contemplado, todo mundo gostou e, o móvel que foi o mais escolhido, como eu fui a mais sortuda eu fui premiada com o móvel. Agradecer por tudo que tenham feito por nós e esperar mais projetos que venham pra frente.

APPENDIX C

Entrevista 01: (Ator 03.1)

Descrição: Presidente da Associação de Moradores da Comunidade Parque das Águas Claras – Piraquara/PR

OBS.: A entrevista com este ator deu-se em forma de depoimento, transcrito a seguir.
OBS.: The interview with this actor took the form of testimony, as transcribed below.

Boa tarde, eu sou Lenira, presidente da Associação das Águas Claras. Eu conheci o projeto através da Isadora e do Prof. Aguinaldo. Participei do começo ao fim. Participei quando eles começaram a ir nas casas; da reunião – teve [sic] várias pessoas que participaram da reunião. Participei da votação, do sorteio. Participei até o final; fui do começo ao fim. Uma que a gente aprende muita coisa. Achei tudo de bom e espero que eles venham desenvolver mais algum projeto com nós [sic] aqui. Nós estamos à disposição. Eu acho que é ótimo participar, escolher, dar opinião – cada um do seu jeito, todo mundo opinou. Minha mensagem é agradecer muito a Isadora, que de todos que passaram por aqui foi ela que nunca abandonou nós [sic]. Ela terminou o projeto e continuou visitando nós [sic], participando com nós [sic] e que ela seja sempre bem vinda aqui na nossa comunidade.

APPENDIX D

Entrevista 01: (Ator 01.1)

Profissão: Professora Doutora do Departamento de Design da Univille

1) Como você ficou sabendo da iniciativa?

R- Soube da iniciativa e do desafio 'The Kitchen Challenge' *através da profª Isadora Dickie, que estava divulgando o projeto na universidade onde eu trabalho.*

2) Você já havia participado de alguma outra iniciativa como esta?

R- Nunca havia participado de uma iniciativa de crowd-design, não conhecia o crowd-design. Então me interessei pelo assunto e decidi envolver uma turma [da disciplina] de Metodologia Projetual I, do curso de Design de Produto.

3) E como foi a sua participação/a participação de seus alunos nesta iniciativa?

R- Nós participamos desse desafio seguindo todas as etapas propostas, dentro dos prazos propostos, e inserindo diversas ferramentas de Design que faziam parte da disciplina. Então, os alunos foram acompanhados por mim e também por alguns convidados, alguns profissionais convidados, que participaram de alguns workshops dando apoio para os alunos.

4) Quais foram as suas motivações para participar da iniciativa?

R- A minha motivação para participar do desafio 'The Kitchen Challenge' *foi, primeiramente, levar uma situação real para dentro de sala de aula e, outros motivos que eu tive, foram envolver os alunos em iniciativas maiores do que a universidade onde eles estavam inseridos naquele momento, para que eles tivessem uma visão mais global do Design e da própria universidade. A recepção dos alunos foi extremamente positiva, eles se envolveram fazendo pesquisas profundas, indo a campo e conversando com as pessoas e também se envolveram no sentido de terem oportunidade de serem premiados logo no primeiro ano de faculdade. Então, eles ficaram motivados também pela premiação e pela concorrência com outros colegas e com outros designers.*

5) Quais eram as suas expectativas no início?

R- As minhas expectativas, antes de participar do 'The Kitchen Challenge' *tinham muito a ver com a experiência de ensino-aprendizagem, eu queria muito motivar os alunos que estavam no primeiro ano a desenvolverem paixão pelo Design e pelas possibilidades que o Design pode oferecer, especialmente as possibilidades de benefício social. Então, eu percebi que essa possibilidade de ajudar pessoas em situações mais frágeis, de fragilidade social, também foi um grande estímulo pros alunos desenvolverem seus projetos. Com certeza minhas expectativas foram supridas. Eu percebi que os alunos desenvolveram propostas bastante pertinentes à situação que foi apresentada pra eles e, principalmente, que eles tiveram todas as preocupações em relação à viabilidade produtiva, de acordo com o que nos dizia o briefing do* 'The Kitchen Challenge'.

6) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para desenvolver soluções sustentáveis. O que você acha disso?

R- Eu vejo a multidão, sim, como uma fonte viável de soluções sustentáveis porque as pessoas todas, nos seus contextos de vida, tem conhecimentos específicos sobre as suas necessidades e sobre as soluções para essas necessidades. Então, a partir do momento em que o designer faz uma imersão profunda em um grupo social, ele vai se deparar com particularidades a respeito das preferências e das necessidades do público, que ele levaria muito tempo pra levantar em uma pesquisa mais afastada ou simplesmente levando em consideração o seu conhecimento próprio.

7) Você percebe alguma oportunidade de melhoria no processo, na plataforma, na interação?

R- Eu vejo oportunidades de melhoria no processo, principalmente em relação à divulgação, eu senti falta de uma divulgação mais maciça desta oportunidade, e eu também senti falta de que as pessoas que estavam participando tivessem a disciplina de acompanharem o desafio até o final. Eu acho que esse também foi um ponto positivo do envolvimento de uma turma de curso de design porque eu, como professora, pude orientar e disciplinar os alunos durante o processo. Esse foi o meu papel.

7) Você participaria novamente de uma iniciativa como esta? Se sim, como seria sua participação?

R- Eu participaria, sim, novamente de um processo como esse porque eu senti que os alunos tiveram uma resposta muito mais entusiasmada a um briefing real. E, também, mediante os vídeos que eles assistiram, as informações que eles receberam sobre o público que eles estavam procurando atender. Então, eles viram pessoas reais, em situações reais, e dificuldades reais, e isso fez com que eles desprendessem uma energia muito mais apaixonada e muito mais séria, no sentido de desenvolver uma solução efetiva pro problema que foi apresentado.

8) Há algum comentário/mensagem que você queira expor?

R- Bem, essas foram as minhas respostas, eu agradeço a oportunidade de poder falar sobre a minha experiência. Até a próxima!

sustainability maker brazil

REPORT 01

Step 01 - Problem Scouting

Design & Sustainability Research Center | Federal University of Parana - Brazil
August, 2014.

innonatives
open platform for sustainability

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INTRODUCTION

The Sustainability Maker Project (SuM)

The Sustainability Maker Project (SuM) is an initiative that consists of a consortium of organizations and Universities that aims at the creation of an online platform based on the principles of open innovation. Its objective is to facilitate the connection of people that might have a relevant role as far as the resolution of sustainability-related problems are concerned. The project is led by the E-Concept (Germany), and the development of the platform is funded by the European Community through the LIFE program (LIFE11 ENV/DE/000342).

The platform that will be used to start innovation challenges, and also share ideas, comment and vote, will be the Innonative Platform (www.innonative.de). This platform will connect people and organizations, that want to pose Sustainability related problems to the platform to be solved, with people and organizations that like to develop creative problem solving solutions, and support their implementation. Through this platform, will be possible to create radical innovation for Sustainability through Crowd Sourcing, Crowd Voting and Crowd Funding.

Crowd Sourcing is the act of outsourcing in an open and collaborative manner, a job traditionally performed by an employee hired for a company. This outsourcing happens in the form of an open call for a large group of people, and is usually performed on the web. (ADAMS, 2011)

The selection of alternatives process facing the crowd in these environments can use **Crowd Voting**. This usually occurs through sites that seeking to obtain the opinion of a large number of people about a particular topic. (BEHREND et al., 2011)

Crowd Funding can be understood as a way to fund projects through the involvement of the crowd. It consists of a public solicitation to fund specific projects. In this approach, small contributions of isolated individuals are added to contribute to enable the implementation of a given project. (BANNERMAN, 2013)

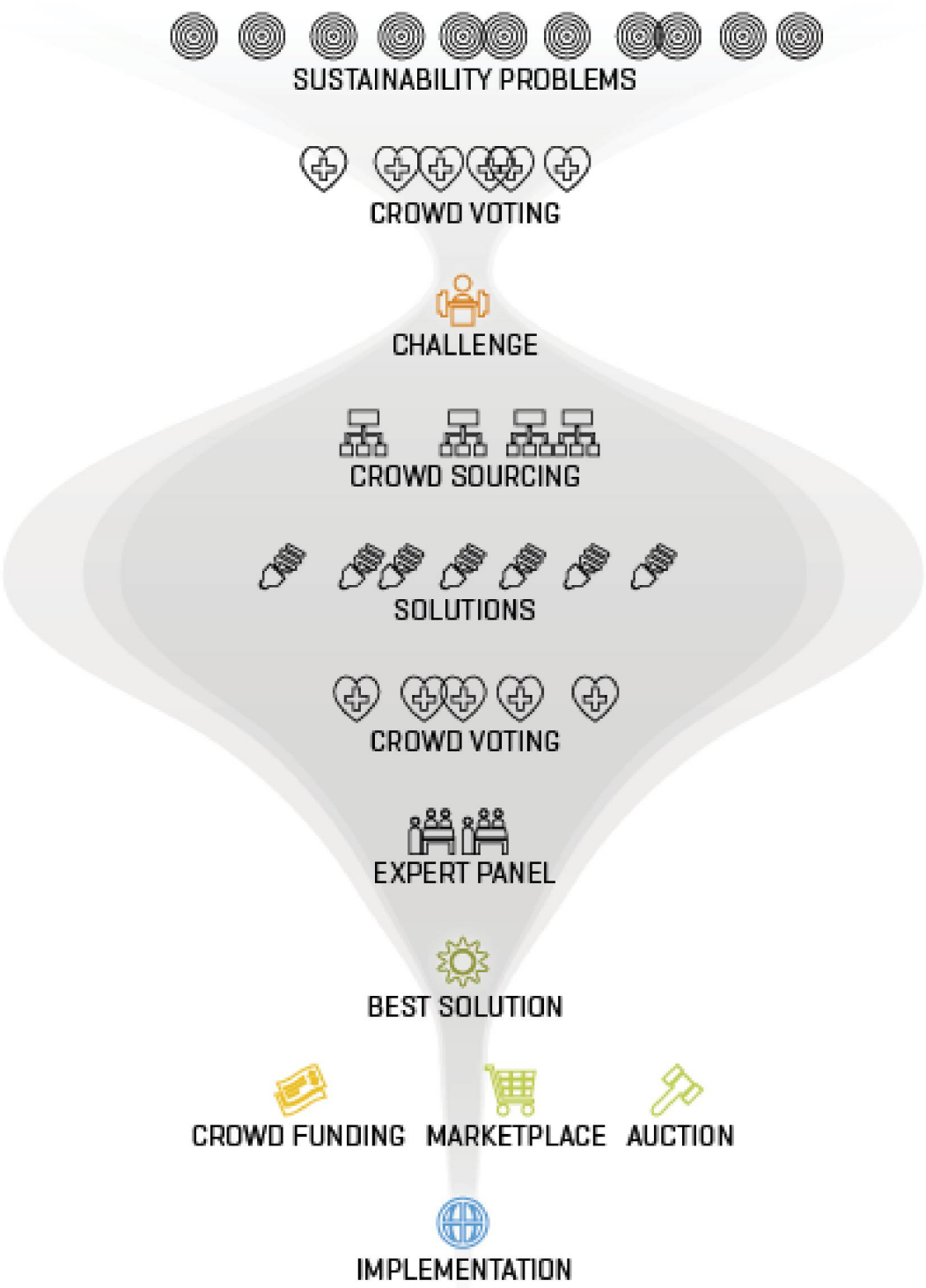
The work process follows the steps: sustainability problems (or problem scouting); crowd voting; challenge; crowd sourcing; solutions; crowd voting; expert panel; best solution; crowd funding, market place and/or auction; and implementation - as presented on the image 01.

In this model, the starting point refers to the problem understanding of a given community or organization as well as their implications for sustainability. In order to determine the problem that is actually relevant to the perception of the community/organization affected, the problems are voted by the group of people who reported them. Then, happens the first Crowd Voting. From there, the challenge is set - the called challenge step - whose process of developing the idea solution is open and carried from the Crowd Sourcing process.

The challenge consists in defining a central question, supported by information that enable participants to properly understand the problem. This information can include textual accounts from synthesis to videos, photographs or storyboards. Based on these

information and with clear benefits to motivated participation, the crowd presents ideas to solve the problem during a pre-established amount of time. The entire set of ideas is then put to a vote - this being the second time where Crowd Voting occurs. On the SuM Project this Crowd Voting also involves consultation to an Advisory Board (composed of various sustainable design experts from different parts of the world) and the involvement of the community where the problem was originally identified.

Image 01 - Sustainability Maker Process



After choosing the best idea to solve the central problem of the challenge - Step Best Solution - begins the process of gathering the resources to enable implementation. This is carried out through Crowd Funding on the Innonatives Platform. The actual idea implementation occurs when the necessary funds have been raised.

About the Brazilian SuM Project (SuM/BR): the Team and the Partners

The Design & Sustainability Research Center from the Federal University of Parana (NDS/UFPR) is the SuM partner in South America. The contribution of this research group consists on developing case studies, thus enabling the identification of improvements on the Innonatives Platform in order to make it effective in an emergent context. NDS/UFPR team consists on this first case study consists of:

Professor Aguinaldo dos Santos (Coordinator and Member of the SuM Advisory Board)
Isadora B. Dickie (PhD candidate at Design Postgraduate Program, Federal University of Parana - Brazil)
Greta Bottanelli (Master student at Politecnico di Milano - Italy)
Michele Cuccu (Master student at Politecnico di Milano - Italy)
Nicolò Micciché (Master student at TU Delft University - The Netherlands)

The business partners on this first case study are two companies, as presented below:

SOLIFORTE
www.soliforte.com.br
Soliforte Recycling Ltda. have been founded in 2007 with the installation of a construction waste processing plant, providing throughout the Curitiba Metropolitan Region. Besides pioneering the implementation of construction waste processing activities, Soliforte is the flagship company of the sector in which it operates. It already is able to produce pavers and blocks out of construction waste and currently the company got funding to develop an entire construction system for low income housing, focused on low income households.

EcoDesign
www.lojaecodesign.com.br
EcoDesign is a small company in Curitiba. Its core activity has been on extending the life cycle of wood waste through the production of furniture. Its organizational structure includes a small factory and shop attached to it. The commercialization of their products occur mainly through the web.

STEP 01 - PROBLEM SCOUTING (PHASES I, II and III)

The Step 01 aims to involve the community to mapping sustainability problems related to housing. To carry out this step, the strategies were divided in three phases:

Phase I - First Contact
From a meeting with the leader of the community, to invite the community to get involved in to the project;

Phase II - Creating Empathy
Consisted in a preliminary consultation about the community profile (questionnaire) and initial survey of problems perceived by residents in response to the question “what is the main problem in your house?”;

Phase III - Collecting Data
To collect data on a sample of dwellings from multiple sources of data collection (direct observation on a guided tour on the house, interview, paparazzi and storytelling).

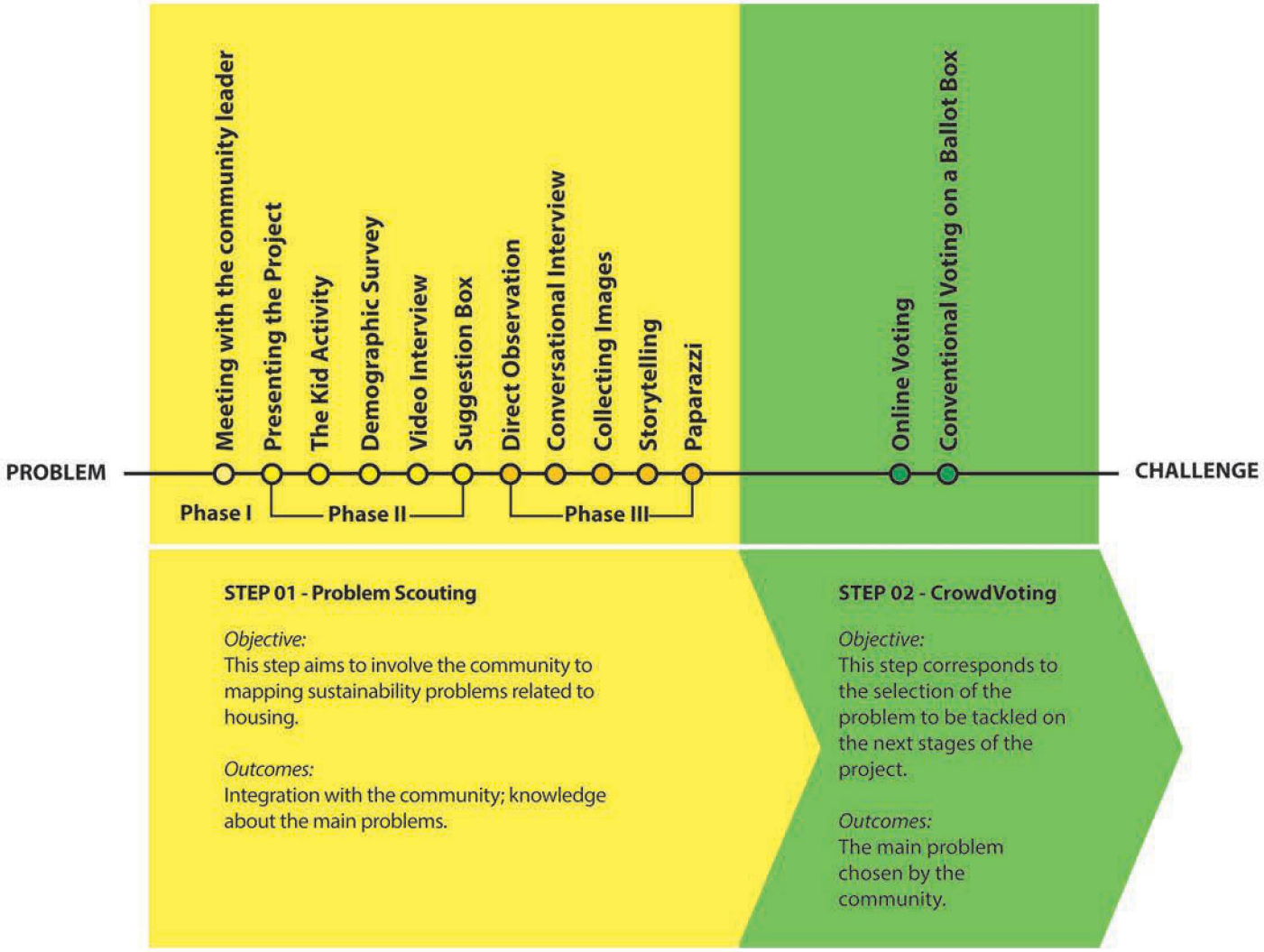
This was a concern related directly to the SuM/BR mission in this step: to unveil key sustainability problems and challenges.

STEP 02 - CROWD VOTING

The Step 02 corresponds to the selection of the problem to be tackled on the next stages of the project by means of a Crowd Voting approach. The REPORT 02 is about this step.

Image 02 shows the strategies and tools used in each step mentioned above.

Image 02 - Strategies and tools used in each step mentioned above



STEP 01

PROBLEM SCOUTING
(PHASES I, II and III)

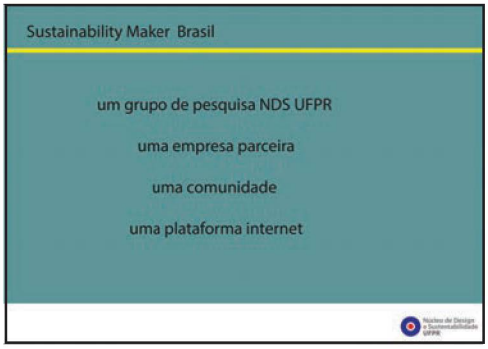
1. PHASE I - Initiating the contact with the community

On April 06 2014, the Sustainability Maker Brazil Project (SuM/BR) was presented to the leader of Águas Claras association, Mrs. Lenira Rodrigues. Backed by a slide show (image 03), the team explained the project objectives and deliverables as well as the importance of community participation. Upon acceptance to participate in the project, the next meeting was scheduled for April 26. On this day, the team would meet up with the other community's residents.

Image 03 - Part of the Slides Presentation







* The file of full presentation can be found at: https://drive.google.com/file/d/0BwF0sLPxolCpRUlZZ2Y0MWRhUnM/edit?usp=sharing

After this conversation, the team followed Mrs. Rodrigues on a walkabout through the streets of the community, where it was possible to better understand the characteristics of the urban setting where the SuM case study would take place (image 04).

Image 04 - The Águas Claras Community



Águas Claras community association headquarter frontage.


Ground where will be built the new association headquarters.


Entrance of Águas Claras Community.


Águas Claras landscape.

In order to test a video format to gather information to the creation of an appropriate challenge, a video teaser has been recorded with the community leader. This video brought a point of view of the community leader about one problem that the community faces. During the same visit the research team also filmed the surroundings of the community in order to register the overall conditions of their houses and streets. Subsequently these videos were edited and resulted on a small vignette in order to contextualize the SuM case study in Brazil. This video was presented to the Advisory Board meeting, on April 22nd 2014, in Amsterdam (Image 05).

The video is also available at youtube:
https://www.youtube.com/watch?v=5xQ9tDbsFqs&feature=youtu.be.

Image 05 - Images from the small vignette



0'15"



0'25"



1'23"

Finally, in an agreement with the community leader the research team agreed a day to present the project to the whole Águas Claras community. Mrs. Rodrigues suggested Saturday, the 26th April 2014. The choice of Saturday was not casual: it's the day that people

in the community stay at home and, therefore, it is when there was a higher likelihood of having a broader community enrollment on the event. The team asked if it was necessary to create some flyers or visual material to distribute in the community, but Mrs. Rodrigues said it was not necessary: "The best way to spread an information here is word of mouth", she said. Indeed, throughout the week she's used to met a lot of people who visited her house and on those occasions she could talk about the project.

2. PHASE II - Creating Empathy with the Community

2.1 RESEARCH PROTOCOL

2.1.1 Preparation

The research team had two weeks to organize the second visit, and the related activities. The main importance of this visit was to establish a sort of empathy with people by making them more familiar with the project goals and expected outcomes. The biggest concern at this stage was to avoid people mix up the SuM/BR Project with actions that were under the City Council and State Government responsibility. Indeed, many of the community problems did not require a crowd design process as they have already widely known solutions, requiring the use of existing tools and resources with the municipality. Thus, the research team had to emphasize the exact scope of the SuM/BR Project in order to avoid over-expectations.

The research team prepared a 3 hour encounter with the community. Each participant signed a "term of conditions" (see Appendix 01). The planned activities for this meeting with the community were established as: Visual presentation of the project; Kid activity; Demographic survey; Video interview with locals with focus on their perception of key household problems; Suggestions box.

2.1.2 Presenting the Project

On this encounter, the content of the visual presentation was organized according to three main steps: (1) present a general view of the SuM/BR Project; (2) the scope of the possible solutions that could come out of the project; (3) a short agenda of the key milestones. On this phase, besides of creating empathy between researches and community, it was understood the event offer a good opportunity to initiate the collection of information which could unable a better understanding of local problems.

A key concern on this presentation was making it easy for the local people to understand the SuM/BR Project, avoid as much as possible buzzwords, over-technical language and possible misunderstandings. Crowd-Design is a hard topic to explain even to Designers, so the words and the definitions used on this presentation were carefully formulated.

2.1.3 The Kid Activity

The research team assumed that parents who would attend the visit along with their children. Hence, the "kid activity" was mainly designed as a distraction to keep them in a different place, enabling the full attention of the participants on the other SuM activities. The "kid activity" consisted of a drawing session, based on a toolkit distributed by the organisation Design for Change Brasil (toolkit available at the link http://www.dfcbrasil.com.br/).

2.1.4 Demographic Survey

After the slide presentation of the project goals the team applied a survey to collect the overall demographic profile of the community. The questionnaire (Appendix 2) includes questions such as how many people live in the same household; the amount of kids per family; how many rooms within their houses, etc.. The questionnaire adopted the IBGE (2010) structure to classify the low-income households. All adults taking part on the community meeting were invited to answer the survey.

2.1.5 Video Interview

The video interview was organized as a semi structured interview. and it was applied after the participant had responded the demographic survey. The research team wanted to gather people's own voice regarding their perception on key problems on their households. The researchers propose two questions to every participant as the starting point of each video recording: "What do you like and what you don't like on your household? What would you priority if you could modify your households?". The team developed and used a short and really simple "interview guide" (see Appendix 03), consisting of a list of questions and topics that the researchers needed to cover during the semi-structured interview. The video recorder involved the use of two cameras with microphones.

2.1.6 Suggestions Box

On Phase I - Initial contact with the Community, the researches have noticed that the entire community have access to only one mail box. Therefore, the team understood that the use of a suggestion box might offer a viable channel to collect the opinion of the community members. As a result at the end of this visit the research team left closed to the mail box (at Mrs. Rodrigues's house) a cardboard-made suggestion box. It was left there during an entire month.

2.2 RESULTS

2.2.1 Project Presentation

On April 26, the SuM/BR Project team went to Águas Claras to present the project to the community. The meeting occurred at the "Águas Claras Community Association" headquarters, which consisted a rented house within the community. Around 40 people attended the meeting. Of these 40 people, around 10 were children.

The team members were introduced to people and then the presentation started (image 06). Throughout the presentation the attendees seemed interested and receptive. Even if the topic was not so familiar to their repertoire, people seemed to like the idea. Only one man asked a question at the end of the presentation, about which kind of problems the Sustainability Maker should help to solve. He brought a simple example to us: if he had to think about one of the biggest problem of Águas Claras, is that streets have no address identification and people have no address or CEP (Postal Code), so they couldn't receive letters directly in their homes. The second one that came to his mind was garbage waste organisation. In reply to his questions, the team answer that those were clearly urgent problems for the community, but they were out of the SuM/BR Project scope because they were under the City Council responsibility. The other people who were present at the meeting agreed with the man who asked the questions. They also wanted to know what kinds of problems would be part of the project scope.

Image 06 - Some slides of the presentation and some images of the presentation moment













* The file of full presentation can be found at: https://drive.google.com/file/d/0B17ZJ6af1CXGWUptbzlQakFqTm8/edit?usp=sharing

The team had to emphasize that the scope of problems include those within the households and that could use the competencies of both partner companies (Soliforte and EcoDesign). No questions were asked by the community regarding what kind of benefits would result for the companies or what would happen to the community if the idea that came as a result of the project was a commercial success.

2.2.2 The Kids Activity

When the meeting began, all children were immediately brought to the building's porch to start the "kid activity", so the rest of the team could start to present the SuM/BR Project. There were around 10 children (Image 07).

Image 07 - Some images of the Kids Activity





2.2.3 Demographic Survey

After presenting the project schedule, the researchers began to apply the questionnaire. Most of the people filled the questionnaire without support. Of the 30 people present at the meeting, 20 responded to the questionnaire (Image 08).

In the image 10 (next page) there are the main findings obtained through the questionnaire. This sampled families indicated that the community did fit on the criteria of "low income" established for this SuM/BR case study.

Image 08 - People filling out the questionnaire





Important to notice that around 60% of the participants do have access to the internet which is in tune with the results of the national survey carried out by IBGE (2011), which showed that in 2011 around 65% of people do had access to the internet. This situation will demand an hybrid approach to enable crowd voting, mixing web-based approach with physical approaches.

Also, this demographic survey was important to let us know that many houses have only three rooms: bedroom, bathroom and kitchen. This means that the houses that do not have a living room, lots of activities such as studying and receiving visits are made in the kitchen.

2.2.4 Video Interview

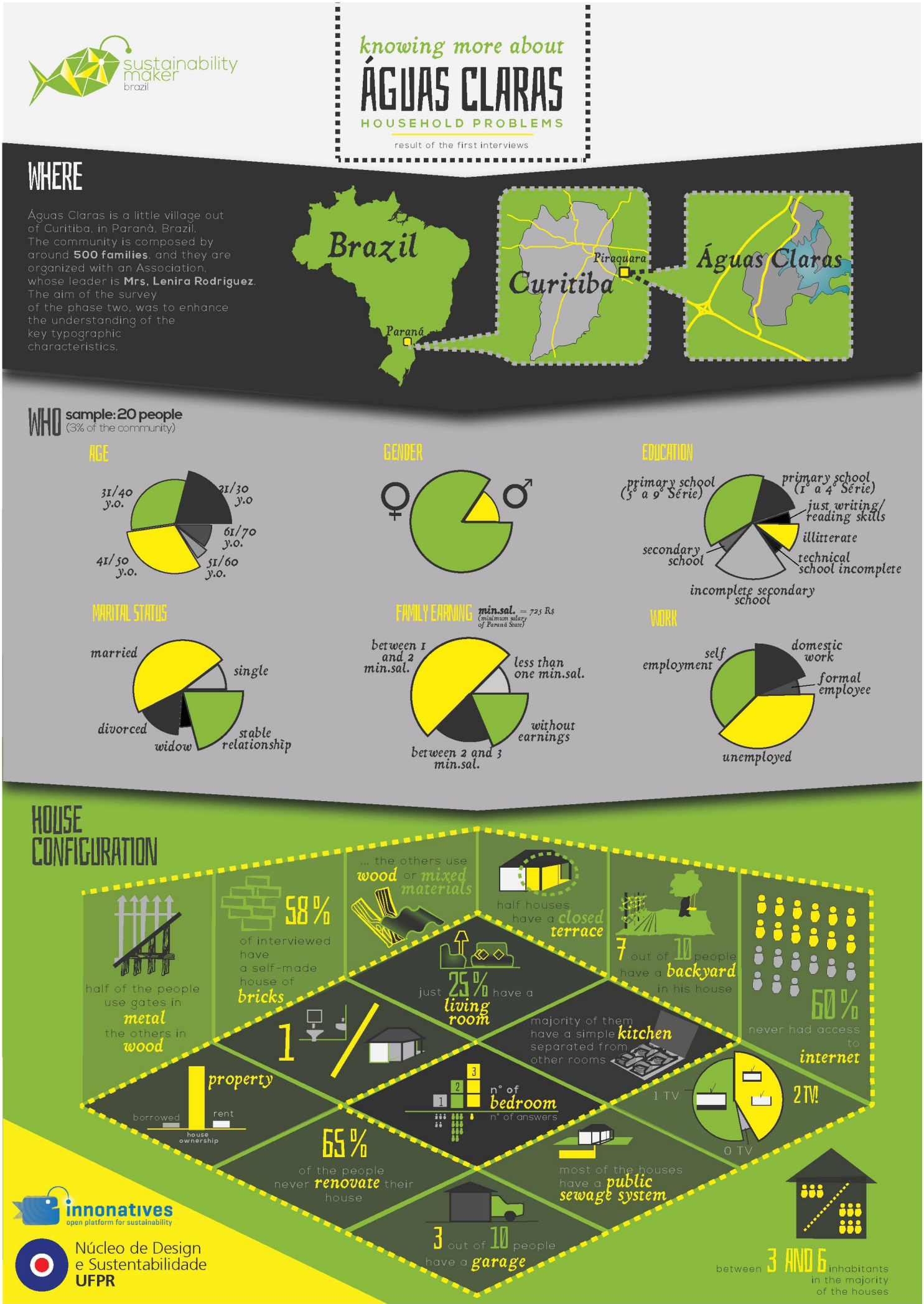
Each participant has been invited to volunteer to the video interview. At the outset, they seemed to be a bit afraid and shy and reluctantly accepted the invitation. The video interview took place in a corner of the large room that took place the SuM/BR presentation. The research team organized two interview desks, each one with two chairs. The interviewed was asked to sit in front of the camera and the researcher sat sideways (image 09). Initially the interviewees showed some embarrassment to talk freely about their household problems in front of the camera. However, they gradually ignore its presence and began to be more confident, providing answers to every questions posed to them.

Image 09 - Video Interview moment



Only five people wanted to participate in the video interview. The main problems people have pointed were two: (1) lack of space in the kitchen; and (2) lack of finishing in the bathroom, for example, tiled coaching on the walls and also on the floor.

Image 10 - Infographic with the main findings obtained through the questionnaire



The meeting had no scheduled ending time since it was not possible to anticipate how many people would attend the event. The entire event lasted and estimated three hours with the researchers thanking personally to every participant. Hence, after have been interviewed, each participant would leave the event.

2.2.5 Suggestion Box

After a month, the suggestion box was collected. Unfortunately, there was no one suggestion. The Sum/BR team believe this happened due to the reason that, despite having been presented at the meeting, none reminder was made to the community people about the opportunity to submit suggestions through the box. Maybe this is why people have forgotten about this tool. But that does not mean that the tool is not suitable for this type of situation.

2.3 LESSONS LEARNT FOR THE SuM PROJECT

After the conclusion of the Phase II, the team had the opportunity to analyse the methodologies used to face the phase:

- **The survey was a good tool to collect initial data about the volunteers** but it requires further improvement. The language used was sometimes too technical and, as a result, some people filled the questionnaire only partially. Also, the questionnaire took too long to be answered, beyond the researchers expectations.

- **The video interview was a really ice-breaker tool to start talking with people and get more qualitative informations**. An improvement that should be mentioned here is the need for a more adequate preparation of the setting for video-recording. Putting people away from their households context reduced their capacity to reflect on the issues posed to them and, therefore, did not showed effective to get relevant information. Thus, the video-interview performed during this visit could have been avoided; collecting relevant information while starting to create empathy might be difficult. People had to explain with words but couldn't show it in a quick and rapid process. That's the main reason why the team decided to go deeper with the interviews with people who decided to volunteer and allow the researcher to enter in their houses.

- **The Suggestion box tool could have been applied in a more effective way**; an option could have been of giving to the Suggestion box a more personal connotation, making it circulate in different houses. Using archetypes associated with the Suggestion Box could be an interesting strategy to enhance further the community involvement on providing suggestions. An example of such strategy could be Santa Claus´s Box: "what you say to Santa Claus if you could point one problem to be solved on your house?". Also, the need to remind people to use the tool.

- **Taking the opportunity of having a good number of attendees** the research team arranged some home visits on the community in order to get more insight and go deeper in the collection of information on the key households issues in Águas Claras. The date and time of each visit was agreed with each participant, according to his or her avaibility. Mrs. Rodrigues (community leader) also agreed in sharing with the research team some contacts of people she thought would collaborate to the project but couldn't not attend the event on the second meeting (in Phase II).

3. PHASE III - Data Collection on the Key Household Problems

3.1 RESEARCH PROTOCOL

3.1.1 Data Collection

3.1.1.1 Background

The outcomes of PHASE II - Creating Empathy with the Community pointed to the need of a more in-depth and insightful approach to effectively involve the community on presenting their views what would be relevant problems to be backled by the SuM/BR Project. The contacts collected during event on Phase II allowed the team to schedule individual house visits with some community members. Due to the in-depth and qualitative connotation of the approach, the team opted for a sample composed by 5-7 responsive units (5-7 families/house dwelling), all of them fitting inside of the criteria of "low income" (earning less than 3 mininum salaries/household - around 723 Euros).

The visit was planned in order to provide the team with direct information and to enhance the community members involvement on the project. The project being a pilot for a crowd-based process makes the community involvement members crucial to maintain the empathy and create "enthusiasm" on the next stages of the project. The visit was planned to be carried out in one hour. Next image (image 11/next page) shows an overall view of the research protocol adopted on this phase of this SuM/BR case study.

3.1.1.2 Direct observation

The data collection in each family initiate with a tour on the house, guided by the family representant. Direct observation during the tour followed a standard protocol with the intent of achieving a higher level of consistency across the researchers. The document included a table to be filled during the visit with key aspects of performance on the built environment, thus contributing to avoid the loss of any fundamental information (see Appendix 05). As a preparation to perform the guided tour the research team has gone through an internal training in order to adopt the same criteria on all field observations.

3.1.1.3 Conversational Interview

Simultaneously to the direct observation the data collection in each house involved the use of an open-ended interview. The topics that guided the open ended interview can be found in Appendix 04 and, basically, attempted to understand the aspects about the dynamics of the family in the relationship with the house spaces and artifacts.

3.1.1.4 Collecting Images

Having some visual references is understood on this project as paramount to confere a higher level of validity to the responses presented during the open-ended interviews. The research team collected photographs and videos throughout the whole visit, always trying to collect those images that better represent the responses of the participants. The photographs also enabled the characterization of the main households typologies withing the community as well as their typical contents in terms of artefacts and finishings.

The coding scheme developed during the analysis of the audios files provided the structure to characterize the images collected throughout the study.

Image 11 - Home visits Guidelines

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home visit GUIDELINES

on the field qualitative research

INTRO

This infographic will present you **guidelines** and **tools** used by the team during the visit of people's home in the **Águas Claras** community.
The team planned to have a **semi-structured interview**, not to lose any opportunity of gathering information, but using it hust as a frame to build a **dialogue** with the hosts. This visit happens after a presentation of the project to the whole community, but it's always important remark once again the **aim of the project.**

WHAT YOU NEED

MIN. TWO PEOPLE
to help each other in the activities

OBSERVATION SHEET
to not lose any insight from the observation

TERMS OF CONDITION
to formalize the consense to record their house for study purpose

A2 PAPER, MARKERS, & DISPOSABLE CAMERA
to leave to the hosts

TRIPOD
to leave the camera recording

CAMERA AND/OR VIDEOCAMERA
to take pictures and videos

SMARTPHONE – VOICE RECORDER
to record the whole dialogue and not forget anything!

STORYTELLING CARDS
to estimultate the dialogue above certain topics you care

HOW IT WORKS?!

create your own 5-6 subtopic of research, with 4-5 cards each.

put an image for each image, and no words

let your host choosing the cards he/she want to talk about for each sub-topic.

create a moodboard of the choosen cards

OUR SUBTOPICS

"the house"
"part of the house"
"material of the house"
"tools in the house"
"activities in the house"
"synesthetic feelings"

ACTIVITIES

1 INFORMAL GREETINGS
you are being hosting by someone in his house. have an informal and polite approach! Use this time to **remind the aim of the project**

2 GET CONSENT!
not all the peole like being recorded. ask if it's possible to take pictures, video and audio and, **don't forget to make them sign the term of conditions!**

3 GENERAL VISIT
while one of you is talking with your host, the other applies **data collection techniques**

4 STORYTELLING MOMENT
while one of you is filling the **observation sheet**, the other can do the storytelling activity with the host. If he doesn't mind, take even a **audio take** of the dialogue

5 LEAVE THE PAPARAZZI ACTIVITY
it can be that they have still something to say, that they forget. they can use paper, markers and disposable camera to collect this information for one week after the interview

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3.1.1.5 Storytelling

The storytelling is a technique that enables the exploration of the key households problems in a more friendly way. Through the use of his/her own words, the teller illustrate the problem (or his/her vision of a possible solution) as it was a true story. This allows the use of coloquial language and exposes the range of values and issues that surrounds a given problem. This technique also enables the involvement of other people in the family as they can fill the blanks left by the teller.

The approach adopted on this case study to carry out the storytelling adopted pre-prepared cards as a stimuli to make people tell their stories (see Appendix 06). The categories of images on these cards included: "synesthetic feelings", "rooms in the house", "activities in the house", "features of the house", "tools in the house". The categories were defined according with the focus of the research (house-dwelling). Some images were chosen to be far from the context of the respondents on purpose: to in order to elicit questions and reactions that might be relevant to a thorough understanding of the problem. The respondents would be exposed to groups of four cards cards, each of them with different images associated with the built environment. The respondent would then choose one card and explain why did he/she have chosen that particular card and why not the other ones. The explanations and stories presented during this iterative selection process were audio recorded for subsequent analysis.

3.1.1.6 Paparazzi

Participants were given a camera and were asked to take pictures of things they like and things they dislike in their house. This technique is called "photo ethnography" or "paparazzi". This self-documentation technique allows to gather the participant own point of view with the benefit of avoiding changes in behaviour due to the researcher´s presence. Every participant received a disposable cameras and paper/pencil (for taking notes) in order to collect images during a period of two or three weeks.

3.1.2 Analytical Strategy

3.1.2.1 Individual Analysis

Each data collection technique received its own individual analysis, followed by a cross analysis. The individual analysis adopted the "code scheme" obtained on the analysis of the audio-files. The audio files of the interviews were partially transcribed focusing on the most significant passages. In order to be selected, a passage should contain a content associated with a problem associated with the household, either expressed directly or indirectly. Each file was then shared on GoogleDrive with the entire team, where each member could provide further comments. The partial transcripts were then analysed by the team following the "coding" technique (CHARMAZ, 2006). Table 01 shows an exemple of the undertaken process.

Table 01 - The undertaken process

Partial transcript (from audio files)	Intial coding
"We don't have space and we keep on amazing amount of stuff... you accumulate, and accumulate...." (The woman was showing a great amount of of belongings which were stored in cardboard boxes on the corridor)	[Researcher 01] Lack of planning, lack of storing space [Researcher 02] Lack of planning/lack of space to stow [Researcher 03] accumulation [Researcher 04] disorder/lack of space

Codes are "labels" that are applied to each piece of transcript in order to transform expressions and statements aiming a standard structure for categorization. Each researcher

separately analysed the transcripts and presented its interpretation, comments and proposed codes next to the piece of transcript (initial coding). On a second phase (focus coding), these initial codes were triangulated with the rest of the team and condensed in a final, unique coding scheme.

3.1.2.2 Cross Analysis

A "on the wall" approach (VISSER et al., 2005) was used in order to analyse the data resulting from the previous analysis was used in order to create connection, merge similar contents and create a final list of problems. The pictures selected in the previous phase were printed and a visual mind-map was created. The mind-map contained insightful sentences and final codes coming from the transcripts, which were selected during the coding activity; these were printed and displaced as main guides for the composition of the map. Moreover, such insights were combined with pictures and comments during the elaboration of relations and connections between the various insights. Field notes taken during the visits were included in the elaboration of the map. The image 13 (next page) is an infographic that resumes the cross analisys process.

3.2 RESULTS

The object of the analysis was to define a set of problems commonly shared by the community members. The process was divided in phases and prioritized the analysis of the audio files, which were the most complete raw data available. The analysis of the other raw data followed in parallel the analysis of the audio files, to support and integrate it on the process of identifying the key household problem on this community. Next image (image 12) shows a synthesis of the collected data.

Image 12 - Collected data

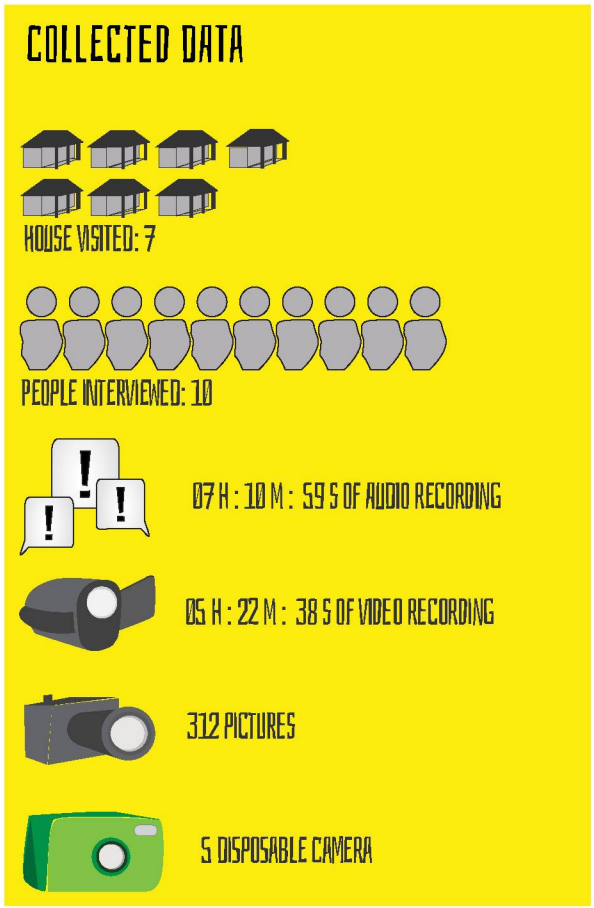
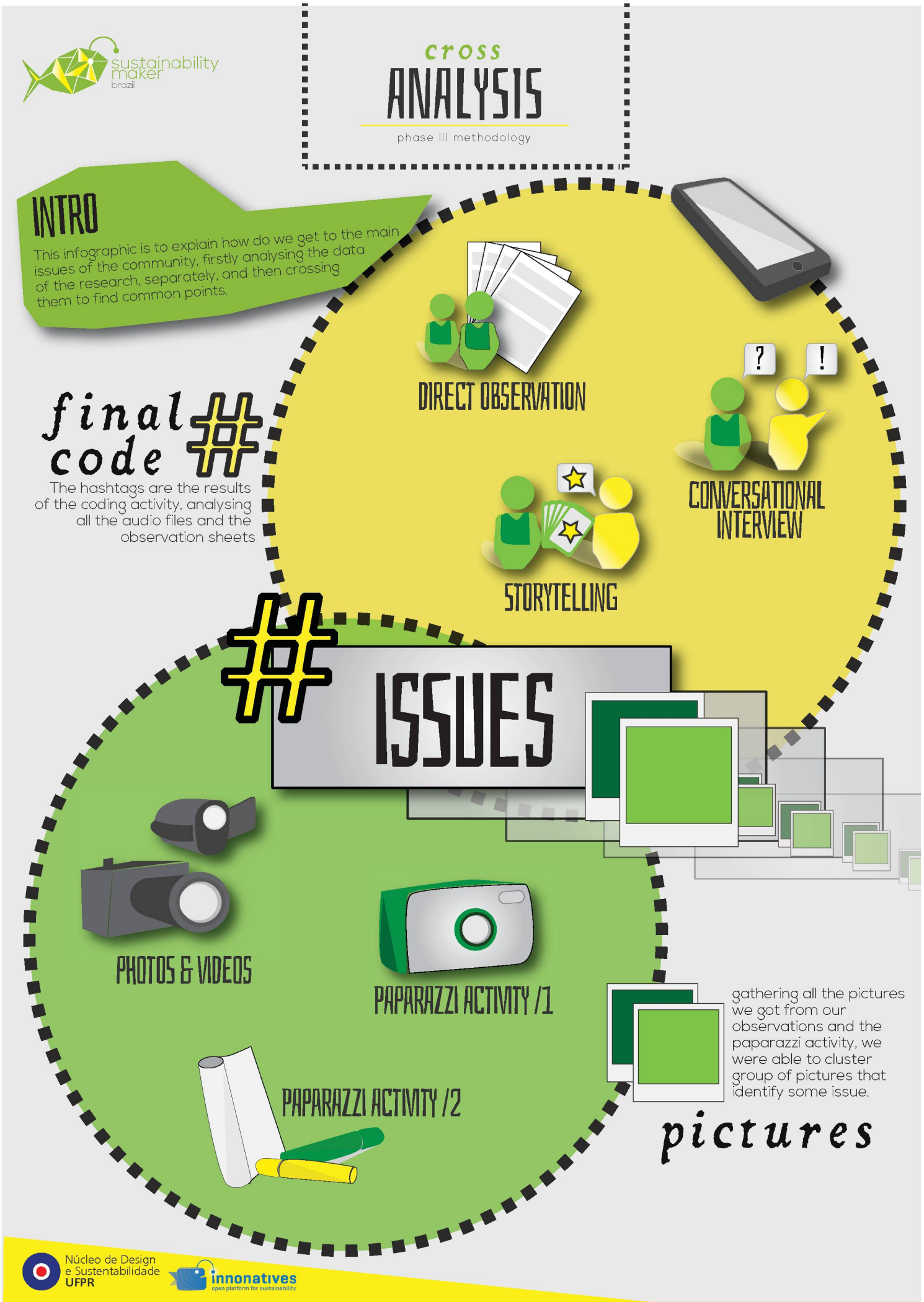


Image 13 - Infographic of Cross Analysis Process



3.2.1 Individual Analysis

3.2.1.1 Direct Observation

The team got into the community had a brief introduction in each household that previously accepted the research team´s visit. Initially the researchers were flanked by the community leader but as soon as the actual data collection started the team acted independently. After the introduction, the respondent took the team on a guided tour of his/her house; simultaneously, the researchers asked to the respondent the permission of taking pictures, videos and to record the conversational unstructured interview.

Only one of the seven homes visited had only one room, and had no bathroom. Two other houses were complete built in masonry, but only one being designed by their owners. The image below (table 02) shows the main features observed in the visited houses.

Table 02 - Summary of direct observations

House	Number of rooms	House building materials	Vernacular solutions	Objects and equipments
#01	01	Wood (walls and ceiling) Masonry (floor)	- Brackets attached to the walls of the house; - Apparent electrical installations; - Water pipes apparent.	Single bed, dresser, stove, refrigerator, separate mattress, kitchen cabinet.
#02	04 (02 bedrooms, 01 kitchen, 01 bathroom, 01 loundry)	Masonry	- Shim for leveling furniture; - TV antenna set with hanger on the ceiling; - Wooden board on the door to bar entry of dog in the house.	Double and single beds, wardrobes, sofas, tables, cabinets, stove, refrigerator, microwave, etc.
#03	06 (02 bedrooms, 01 kitchen, 01 bathroom, 01 livingroom, 01 loundry)	Wood (walls and ceiling) Masonry (floor and bathroom walls)	The whole house was built by the owner. There is no finish on electrical wirings. The wooden walls are not regular, having many holes between the boards.	Appliances in general, including the wood burning stove, sofas, cabinets, etc.
#04	05 (02 bedrooms, 01 kitchen, 01 bathroom, 01 livingroom)	Wood (walls, floor and ceiling) Masonry (only in the bathroom)	The whole house was built by the owner. There is no finish on electrical wirings. The washing machine is in the bathroom, there is no more space in the house for a laundry. The bathroom walls, which are made of brick, was built by own resident. This wall is an opening that resembles a window, but it is "closed" with paper.	Appliances in general, including the wood burning stove, sofas, cabinets, etc.
#05	07 (02 bedrooms, 01 livingroom, 01 diningroom, 01 kitchen, 01 loundry, 01 bathroom)	Wood (living room, dining room and bedrooms walls and ceiling) Masonry (floor, kitchen, loundry and bathroom)	Not applied. Despite having wooden walls, the house has a good finish.	Appliances in general,, sofas, cabinets, dining table. A broken computer.
#06	03 (01 bedroom, 01 bathroom, 01 kitchen)	Wood (internaly walls, floor and ceiling) Masonry (external walls and kitchen floor)	Apparent electrical installations; Piece of marble on the wall to cover a hole.	Double bed, wardrobe, mirror, sofa and TV (in room); stove, refrigerator, small tv (in the kitchen).
#07	09 (01 ensuite, 01 bedroom, 01 livingroom, 01 diningroom, 01 kitchen, 01 bathroom, 01 loundry, 01 cabinet)	Masonry	Not applied. This house was designed by the owners, being completely well structured.	Appliances in general, sofas, cabinets, computer, dining table, etc.

According to the observations, the problem most often encountered was the lack of finish on electrical installations. For the research team, this is an important issue because it affects the safety of homes - many even built with wood.

3.2.1.2 Conversational Interviews

In all, 10 people participated in the interviews: in four of the seven visited houses, only one person was interviewed. On the other three houses, a couple responded the questions. This number was aleatory, because was the people who were present at the appointed time for the visit. Next table (table 03) shows a short profile about the people who was interviewed.

Table 03 - People interviewed profile

House	Number of interviewed people per house	Short profile
#01	01	Female, 38 years old, single, lives alone.
#02	02	- Female, 60 years old, married, lives with her husband. - Male, 48 years old, married, lives with his wife.
#03	01	Male, 65 years old, married, lives with his wife, son and daughter in law.
#04	01	Female, 27 years old, married, lives with her husband and a 06 years old son.
#05	01	Female, 45 years old, married, lives with his husband and a 08 and 18 years old sons.
#06	02	- Female, 64 years old, married, lives with husband. - Male, 66 years old, married, lives with wife.
#07	02	- Female, 40 years old, married, lives with husband and a 11 years old son. - Male, 42 years old, married, lives with wife and a 11 years old son.

During the conversation, the researchers asked more about the main activities that dwellers developed in every room and if the size and the objects were sufficient for this. Each interview lasted approximately 40 minutes to one hour. In total there were more than seven hours of recording interviews.

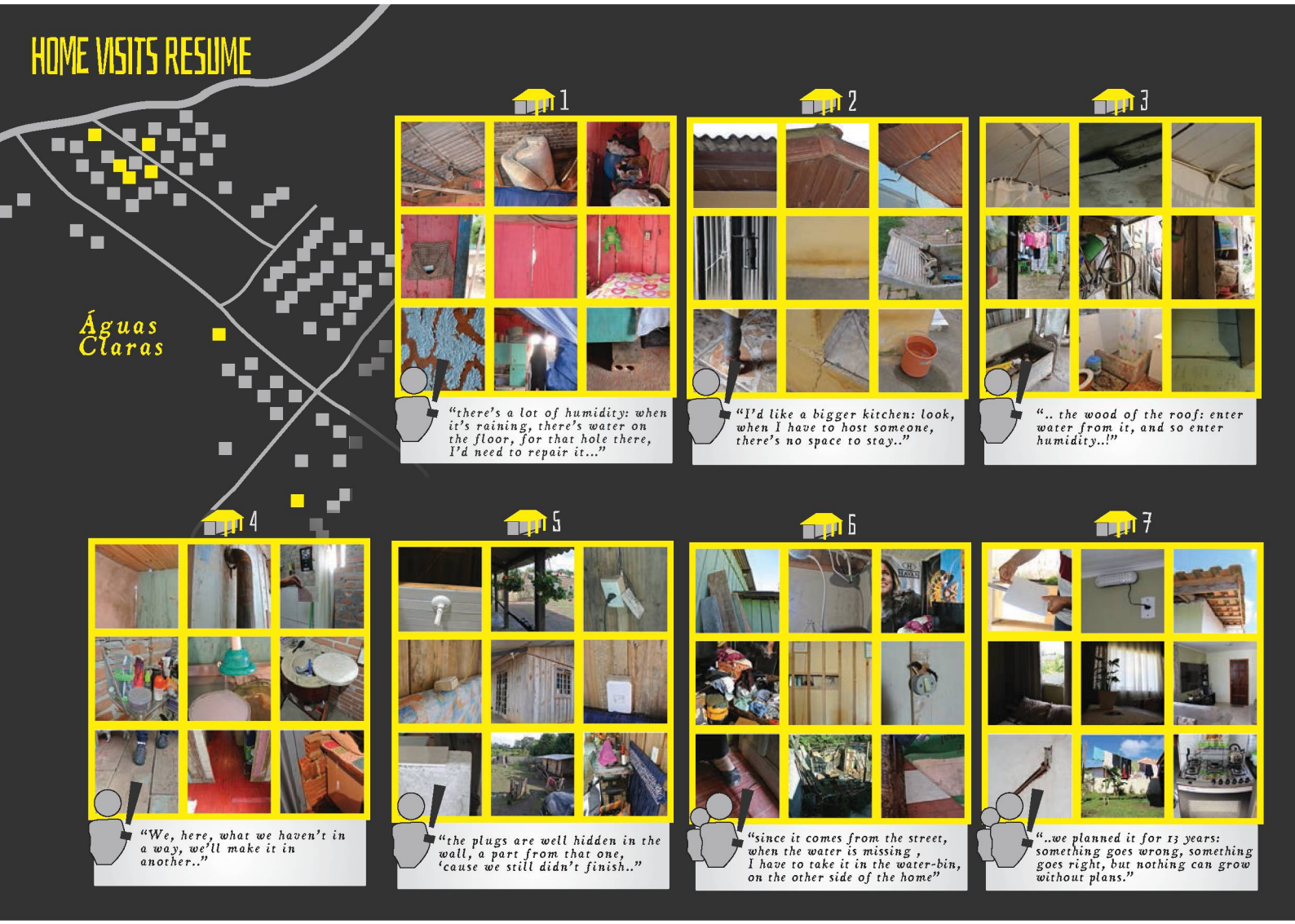
The audio of the interviews were distributed among researchers to do the transcription. The audio of each interview was transcribed into a separate file, in tabular format, where the left column contains the transcript and the right column would be filled by all researchers, assigning codes to interpreted statements. After a first phase of "initial coding" a triangulated phase of "focus coding" was undertaken. The researchers collectively discussed their interpretation and initial codes of the transcripts (supporting the discussion with the selected pictures). Such operation led to a shared understanding and a final code scheme that identified the issue in a unique way. Such procedure has been performed for each transcripts, resulting on a final "coding scheme". Below, an example of final codes coming from one of the houses:

Image 14 - Clowd Tag with the final codes coming from one of the houses



As the individual analysis of Conversational Interview, the Photographs/Video analysis followed the same code scheme. Thus, each researcher selected a few images from the houses and associated a code for each of them. The result, is a "moodbord" for each house, showed in the image below.

Image 15 - Photographs/Video resume of each house

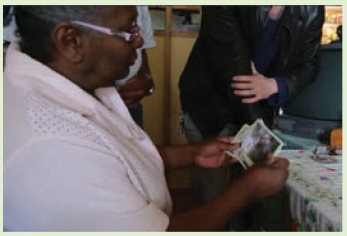


Despite some of taken images correspond to things pointed by the resident during the guided tour, it's important to say that some photographs also correspond to the researcher's perception about things that could be considerate problems. This way, it was possible to make the cross analysis considering the problems pointed by residents and the problems observed by the researches.

3.2.1.4 Storytelling

After the guided tour, the respondent was invited to undertake the Storytelling activity. The cards using on this activity have prompted respondents to provide further descriptions about their perceptions on local problems. Next table (table 04 - next page) presents the Storytelling activity results.

Table 04 - Storytelling Results

House	Image	Story
#01		"I'd like to choose the bathroom card. There is no bathroom in my house. I have to use my neighbor bathroom to take a shower and make others necessities. Even I knowing her and her family, It's embarrassing."
#02		"I'd like to choose the kitchen card because it's place I like most to stay when I'm home. Normally, when it is clean, I like to play there with my grandson. He brings his toys and we used to play together. I think the kitchen is the bigger place of my house".
#03		"I pick up the kitchen card. Because it's the bigger place we have at home. Here is the place where my wife preparing the meals and works painting her handcrafts. It's also the place where my grandsons comes to play with theirs toys. But, the kitchen size isn't good. Because when my wife is cooking, for exemple, the kids are playing at the same time - we like to be together - and sometimes you can do an movement and, with no intention, you can touch some child, hurting it. I'd prefer a big kitchen, but my wife likes a small one, because it's easy to clean up."
#04		"Well, I chose this card because it's identical to the bathroom walls I have. These walls were built by myself with the help of my father in law. We both raise these walls. It was the only way to have a masonry bathroom [her house is made with wood boards]. But I didn't had money for coating it all. So, it's very difficult to clean up the uncoated areas. But, I have a child at home, so, I have to do it."
#05		"Is this a card about a garage? Because I think we're needing one. Your car is standing outside, without a protection against rain. If I could build a garage, it also could work like an storage room, because we have a lot of things that have no space to guard on. Also the clothes, after washing, could be hanging in the garage. My husband doesn't like when I hang the clean clothes at the yard. He says that it could look like a shantytown."
#06		"Is this a kitchen? My priority is to make a new kitchen, because the one I have, has a lot of problems. For example, it hasn't an appropriated coated for washable areas. I would like to have a kitchen that I could clean easily. Also, my kitchen hasn't have a plumbing to connect with the water tank. Thus, the used water comes from the public supply, directly from the outside the house. And here is a place where there is water shortages. So, as there isn't a plumbing that carries water to the water tank, I often have no water to wash the dishes."
#07		"I will tell you a story about my tools. As I work with placement of lining the ceiling, I have a lot of tools. But, I remember when a friend of my gave me a part of a hammer. It was a part because he gave me just the top of the hammer, without the cable holding it. So, I had to use my creativity and build a new cable. And I had to do this because the hammer still is a good quality. So, I made a wood cabe and now I have a brand new hammer. It reminds me that we always find a way to reuse old materials before discarding them; if they still have a good looking."

From those stories, the most relevant information to this research were:

- **About the kitchens**. According those stories, the problems that can be extracted are: lack of space to perform activities as cooking, eating, studying, playing and working; and access to coating materials for the washable areas as the sink.
- **About the bathroom**. The related problems were about the lack of access to coating

materials for coating the entire bathroom, not only for the washable areas as sink and shower. According the people, if all the walls were coated with a washable material, it would be easier to clean up.

3.2.1.5 Paparazzi

Following the research protocol at the end of each household visit, the respondent was asked to undertake the self-documentation activity (paparazzi) that would have been collected by the team in the following days. After the final greetings the team left the house of the respondent, concluding the visit.

Results from the "Paparazzi" activity were collected and analysed after that the analysis of the results from the other activities was completed. Nevertheless, some additional insights might be collected from the a posteriori analysis of the resulting pictures. The disposable cameras were provided to the representatives of five families; together with the cameras the respondents were provided with pens and paper that were presented as supports for a possible drawing activity. The aim of this drawing activity was to contingently integrate the "paparazzi" activities: suggestions and solutions related to the "household problems" pointed out in the pictures could have been developed and communicated by the respondent on these supports.

About the gathered materials, unfortunately, out of the five cameras that were delivered by the researchers (each with a capacity of 27 photos), just four were collected – one of the respondents resulted not to be reachable when the team undertook the collection of the cameras. The integrative drawing activity was not successfully undertaken by the respondents and just one poster was returned to the team. The poster contained some sketches that resulted not to be interpretable without a direct interaction with the author.

The pictures contained in the four gathered cameras were developed and analysed. In the following table (table 04) a first classifications of the pictures can be found. More details will be displaced later on this section of the report.

Table 04 - Classifications of the pictures

	Number of Pictures	Usable* Pictures	Relevant** Pictures
Camera 01	21	21	6
Camera 02	5	5	4
Camera 03	14	11	2
Camera 04	21	zero	zero

* Pictures are considered usable if the condition in which were made allowed a clear and visible outcome.
** Pictures with a clear subject and a with a relevance for the theme of the research (household's problem) were considered as "relevant". "Not relevat" pictures included pictures which did not have connections with the research.
*** "Camera 4" was probably used in the wrong way, and all the 21 developed pictures came out completely grey.

As can be seen in the table above, respondents got engaged from the activity and actually perform the required activity. Obviously, some pictures were randomly shoot and fell out of the field of relevance of this research; moreover, some of the pictures were shoot in bad light condition and the results came out not to be readable. The respondents were explained to took pictures of what encountered their dissatisfaction in within their house dwelling; due to the lack of interaction a posteriori with the people that shoot the pictures only those who have a clear and unique subject were considered. These unique subjects were considered as the objects of dissatisfaction and complain of the respondent (as they were asked at the beginning of the study) and therefore analysis was performed accordingly to the above mentioned guidelines. The repetition of pictures with same subject was ignored and the repeated pictures considered as one due to the qualitative connotation of the study. In the image below (image 16 - next page), the most significant pictures from all the cameras are organized and their relevance is discussed.

Image 16 - Paparazzi Results Moodboard

Camera 01



#01 - House entrance: made of wood, it was built by the resident itself. This stairs are not safe enough.
#02 - House entrance: the wood stove's chimney is localized at the entrance of the house.
#03 - House roof: there is a lot of electrical wires.
#04 - House's yard: lack of paving.
#05 - Laundry: is shared by the residents that live at the same ground.
#06 - External paving: this is made of different materials.

Camera 02



#01 and #02 - House entrance: there is no coat on the floor.

#03 and #04 - apparent plubing.

Camera 03



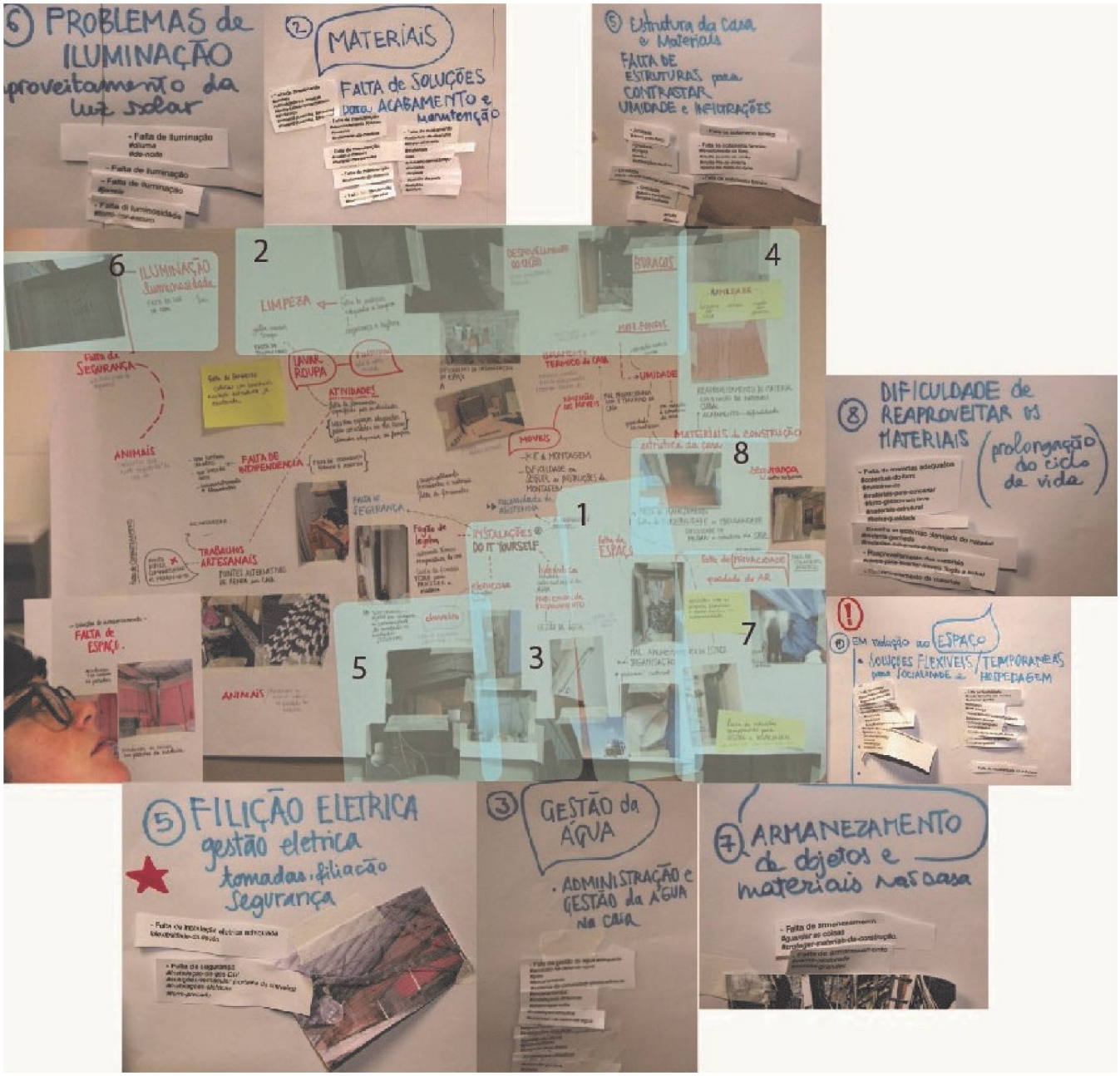
#01 - Door: Door: "peeling" painting.

#02 - lacking a glass at the window.

3.2.2 Cross Analysis

The cross analysis worked out just like showed at the image 13, at topic 3.1.2.2. The team met to do the cross analysis using the materials: large blank sheet, colored pens, selected audio transcripts and images printed in paper. A visual combination of interview transcripts, codes, pictures, notes and connections facilitated the identification of dimensions of issues (identified on the final map and showed in the image 16) that were possible to condense in a final list of problems. The final list, however, resulted in eight main problems.

Image 16 - Visual scheme of Cross Analysis Results



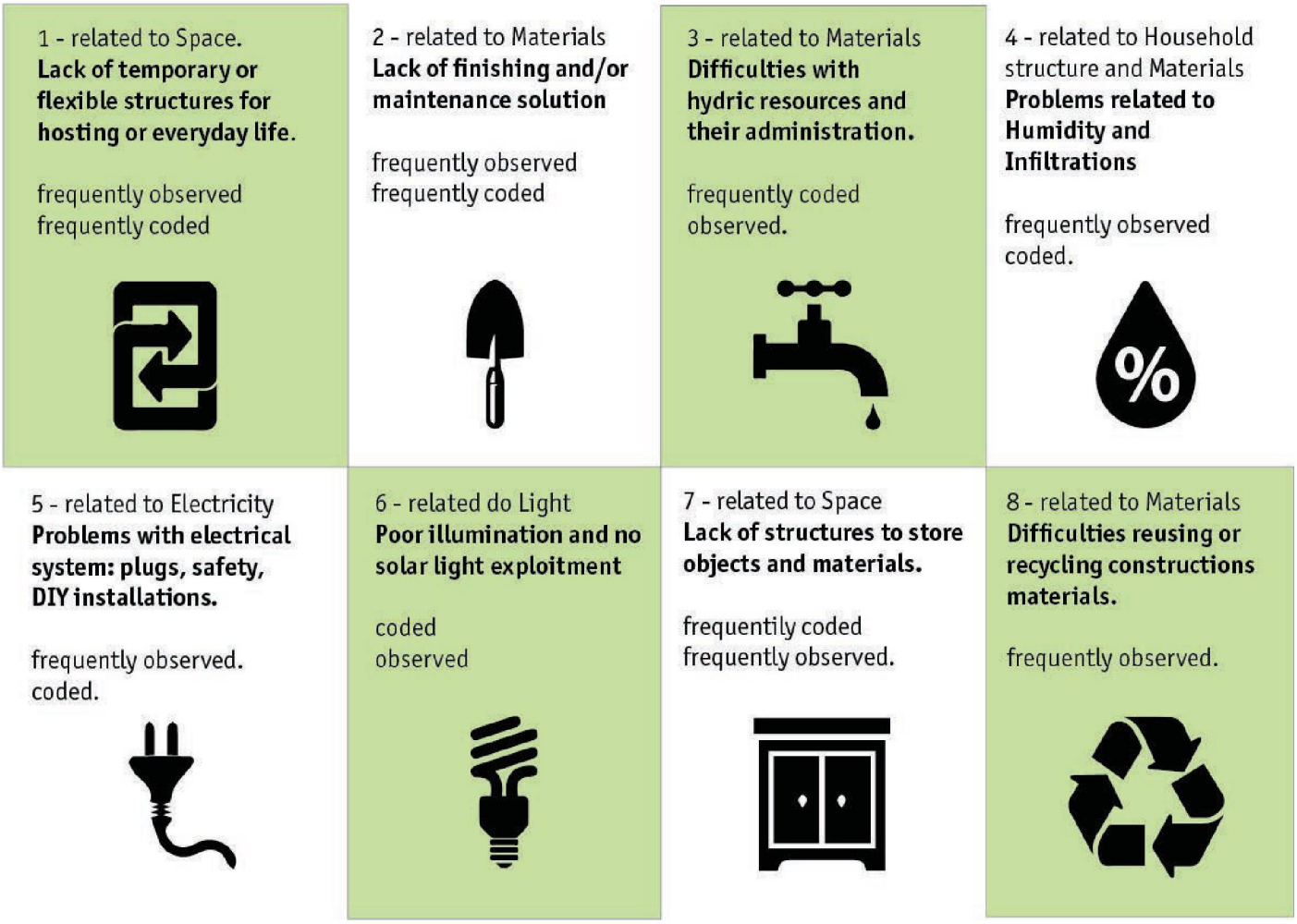
3.2.3 Synthesis of Problems to be Considered on the Definition of Challenges

The process of identifying the key problems on the household on this community has revisited the "individual analysis" and the "cross analysis" on the previous sections, using the following criteria:

- The frequency with which each issue was coded (transcripts, see Appendix 07);
- The emphasis given from the respondent to the specific issue (transcripts);
- The frequency with which each issue was observed (pictures).

Next image is a synthesis of the final problems obtained through the cross analysis.

Image 17 - Synthesis of the final problems



A final list of main problems was then selected, considering the issues in which the above-mentioned dimensions were strongly combined (frequently observed and coded):

- **Lack of flexibility in the spaces inside the house** (living/storage space). It could mean that the house's dimension, around 40m2, is not sufficient to comport all stuff they have. Also, it could be that the existing furnitures are not designed for reduced environments. But is a fact that the families are numerous. Since there is no possibility of increasing the size of the house and therefore the size of the rooms, the existing furniture does not allow flexibility in using space, such as the kitchen, which is used for various activities in addition to cooking and eating.

- **Lack of appropriate finishings** (electrical and hydraulic system / coat materials). This issue was more often observed that it was related by the residents. But it refers to safety, cleaning and also aesthetic issues. DIY is a common practice among the low income people. Therefore, some installations - such as electrical and hydraulic - does not have adequate finish. It could not being safe, causing leaks (plumbing); electrical shock or fire (electrical installations). Also, it could cause some discomfort regarding the appearance of the house. At the same time, some areas such as bathrooms and kitchens need to be finished with washable materials.

Besides the final list of problems that resulted from the analysis phase, a concrete outcome of the developed process was the awareness instilled into the community and the participatory feeling that they (hopefully) got during the field research.

The short-list of key problems were not a surprise for the Brazilian researchers, since

they confirm results from previous research. However, the research team understand that such phase could not be skipped. The involvement of the community on presenting their problems, with the participatory-property feeling were paramount to preserve the bottom-up, crowd-led connotation and to create in-depth understanding of the research team with the dynamics of the problems within the community, with a broad view of all variables that affect it.

3.3 LESSONS LEARNT FOR THE SuM PROJECT

The main lessons learnt from this phase of the Brazilian case study can be summarized as:

- **The importance of having the leader of the community on board of the project**: having the leadership of the community backing the SuM project is of paramount importance to the success on getting an accurate understanding on the real world problems faced by low income households. Indeed, respondents were collaborative, involved and not reticent to provide feedback to the researchers, making it fairly easy to collect all information required by the research protocol. The flow of the conversation was natural and continuous, and the active participation of the hosting families facilitated the work of the researchers. The interviews were rich and insightful, which were then integrated by additional information gathered during the Storytelling activity and complemented by pictures and video shooting;

- **Improve the storytelling process**: further improvements need to be directed for developing a more effective approach to implement the storytelling activity. On the field the researchers have performed adjustements in real time, mainly regarding the amount of "provocative" cards shown in every cycle;

- **The benefits and set backs of a multi-cultural team**: the activities on the field presented some difficulties related to language barrier, since none of the families speak other language than portuguese. Mixing groups of Brazilian and Foreign researchers has been the strategy that was adopted to overtake such barrier. However, at the same time, having in the research team people from other countries, with different socio-economic paradigms, helped to identify issues that would not be noticed by the local researchers;

- **Special attention to the quality of audio acquisition**: as far as the quality of the data is concerned, some of the audio files presented poor quality either due to the quality of the equipment or due to the circumstances of its recording process on the field. Indeed, some parts were not understandable and this might have result on misunderstandings during the transcription and the subsequent analysis. That is quite an important issue since audio files presented themselves as the most important data for identifying the household problems;
-
- **Shifting the "conversational interview" into a "semi-structured interview"**: the amount of information gathered on a conversational interview expand the complexity of separating what is truly useful for the project purpose. One possible alternative is the adoption of a semi-structured interview associated with a check-list on key guidelines for what is considered a minimum conditions for a low income household;

- **Developing a Visual support for the Paparazzi**: the researchers expected that the families would use the paper/pencil to describe/draw the issues they find relevant within their household. It did not work since none of the families have return any notation. Perhaps an alternative would be to replaced it with a a picture of their own house, with a scheme of their internal layout. This would have given the respondents the opportunity of directly manipulating something that is within their domain.

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Appendix 01 - Terms of conditions document

UFPR | NDS | *Sustainability Maker BRAZIL*

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

TERM OF CONDITIONS

Você está sendo convidado(a) a participar como voluntário(a), do Projeto ***Sustainability Maker BRAZIL***, desenvolvido pela equipe do *Núcleo de Design e Sustentabilidade* da *Universidade Federal do Paraná* e coordenado pelo Prof. PhD Aguinaldo dos Santos.

> *You are being invited to participate as a volunteer of the Sustainability Maker Brazil Project, developted by Design & Sustainability Research Center team, from the Federal University of Parana and coordinated by Prof. PhD Aguinaldo dos Santos.*

A sua participação será fundamental para a construção deste Projeto, que tem por objetivo inserir-se em uma plataforma de inovação aberta, baseada em experiências colaborativas para a solução de problemas relacionados à habitação que afetam a comunidade Parque das Àguas Claras, no município de Piraquara, no Paraná.

> *Your participation will be fundamental for this project, which aims to be part of a platform for open innovation based on collaborative experiences for solving problems related to housing affecting the Águas Claras community in the municipality of Piraquara in Parana.*

Destacamos que a sua participação neste projeto é opcional e representa riscos ou desconfortos mínimos. No caso de autorização de uso de imagem e voz, destacamos que não haverá pagamento de cachê, e que a utilização destas imagens terá finalidade de divulgação **sem fins comerciais**. Em caso de recusa ou de desistência em qualquer fase do projeto, você não será penalizado(a) de forma alguma.

> *It is confirmed that your participation in this project is discretionary; the project is characterized by a low level of risk and inconvenience. The material collected during the study (audios, images…) will be exploited just in case of authorization and without commerical purposes. In case you won't agree with the utilization of your data in whatever phase of the project you won't be penalized.*

CONSENTIMENTO

CONSENT

Eu, abaixo assinado,
I, undersigned,

( ) **DECLARO ESTAR CIENTE** e **ME INTERESSO** em participar do referido Projeto;
( ) DECLARE THAT I KNOW AND I'VE BEEN INTERESTED in participating on the Project;

( ) **AUTORIZO**, para todos os fins de direito, o uso de minha imagem e voz para divulgação **sem fins comerciais**.
( ) AUTHORIZE, for all legal purposes, the use of my image and voice for disclosure without commercial purposes.

Nome do Voluntário:_____
Volunteer's Name: _____
Documento de Identidade: _____
Document's number: _____

Assinatura: _____
Signature: _____

Curitiba, _____de _____ de 20_____.

Appendix 02 - The Socio-demographic survey

Name:_____ Age: ____
Gender: ( ) Female ( ) Male

1) Education:
( ) Literate (you can read and write) ( ) 1ª a 4ª série ( ) 5ª a 9ª série ( ) Supletivo
( ) Highschool ( ) Incomplete ( ) Completed
( ) Technical degree ( ) Incomplete ( ) Completed
( ) University ( ) Incomplete ( ) Completed
( ) Post-graduate ( ) Incomplete ( ) Completed
( ) Others: _____
OBS.: The content of this section depends on the scholar system in force in the country.

2) Marital status:
( ) Single ( ) married ( ) divorced ( ) widow
( ) Other: _____

3) How many people do live in your house: TOTAL: _____ people
Name: _____ Degree of kinship: _____ Age : _____
Name: _____ Degree of kinship: _____ Age : _____
Name: _____ Degree of kinship: _____ Age : _____
Name: _____ Degree of kinship: _____ Age : _____

4) Family income:
( ) No income ( ) Until €240 ( ) from €240 to €480
( ) From € 480 to € 960 ( ) From € 960 to € 2400

5) Occupation:
( ) Not paid ( ) Homemaker ( ) freelance ( ) Employeed
( ) Employer Carteira de trabalho Assinada : ( ) Sim ( ) Não

6) Your house is:
( ) owned ( ) rented ( ) ceded ( ) others _____
( ) made out of wood ( ) mixed [wood/concrete] ( ) concrete

7) Your house has:
( ) Doors > ( ) wood ( ) grille
( ) veranda > ( ) open ( ) closed
( ) garage for ____ cars
( ) kitchen > ( ) connected with the dining room
( ) livingroom > ( ) connected with the dining room
( ) sala de jantar ( ) ____ bathroom(s) ( ) ____ room(s) ( ) backyard
( ) Others: _____

8) House-related services:
( ) Garbage colletion > _____
( ) Collection and Wastewater Treatment > ( ) Sewer Collection ( ) Septic

( ) Television connections: _____

9) Did you made any reforms in your house? ( ) YES ( ) NO
Where? _____

10) Did you have trouble in performing such reforms?
( ) YES ( ) NO

Can you tell us which were these reforms?
_____
_____
_____

11) Do you have computers connected with the Internet?
( ) Yes (how many?)_____ ( ) No

12) Do you have smartphone and related Internet access?
( ) Yes (how many?)_____ ( ) No

13)Do you have any tablet and related Internet access?
( ) Yes (how many?)_____ ( ) No

14) Do you have any e-mail address?
( ) NO ( ) YES, here it is: _____

15)Do you have any Social Network account?
( ) Facebook _____
( ) Twitter _____
( ) Orkut _____
( ) Other:_____
( ) I do not have account on Social Networks.

16)How often do you access the Internet?
( ) Everyday ( ) once a week ( ) once a month ( ) Rarely ( ) Never

Appendix 03 - Simple interview guide fot the video-interview

1) O que você gosta na sua casa? O que isso influencia na sua vida?
1) What do you like in your home? What does this influence in your life?

2) O que você não gosta na sua casa? E, como isso influencia a sua vida?
2) What do not you like in your home? And how it influences your life?

3) Se você pudesse melhorar algo na sua casa, o que seria?
3) If you could improve something in your house, what would it be?

4) E, você tem alguma ideia de como faria para melhorar isso?
4) And, do you have any idea how to do to improve this?

Appendix 04 - Conversational interview guidelines

Antes de iniciar a atividade do Storytelling, conversar informalmente com o morador. O roteiro a seguir foi utilizado em todos os casos.

- Relembrar os objetivos do Projeto;
- Perguntar se há permissão para gravar a conversa e fotografar a casa;
- Solicitar uma visita guiada pela casa, para conhecer e observar os cômodos;
- Solicitar que o morador explique, caso necessário, sobre a sensação térmica no interior da casa, quais os materiais utilizados e como eles foram obtidos (através de compra ou de doações), quem construiu e como foi construída a casa, quais as interações que acontecem em cada ambiente, etc.

Before starting the activity of Storytelling, talk informally with the resident. The following script was used in all cases.

- *Remembering Project objectives;*
- *To ask if there is permission to record the conversation and photograph the house;*
- *To request a guided tour to observe the rooms of the house;*
- *Ask the resident to explain, if necessary, about the thermal sensation inside the house, which materials was used and how they were obtained (by purchase or donation), who built and how the house was built, which interactions take place in each room of the house, etc..*

Appendix 05 - Guidelines for the observation - Table

ROOM: _____

structure	FLOOR	WALLS	CEILING	DOORS AND WINDOWS	PLUMBING SYSTEM	ELECTRICAL SYSTEM
Covering features (apparence, texture, washable or not; where does the material come from?)						
Humidity/fungos/ mould						
Uniformity (irregularities, puddles, bubbles, infiltrations).						
Scratches, holes						
Size						
Vernacular solutions						

ROOM: _____

FURNITURE/HOUSE APPLIANCES:

WHICH ONES:

_____

_____

_____

_____

_____

_____

_____

_____

SIZE, QUANTITY:

_Do they fit in the dedicated space?

_____

_Do they perform their function?

_____

_Do they have an influence (positive/negative) on the activities performed in the room?

_____

DAILY ACTIVITIES PERFORMED IN THE ROOM:

_____

_____

Appendix 06 - Probes for Storytelling - Cards

(a) part of the house



(b) Activities in the house



(c) Features of the house





(d) Tools in the house



(e) Synesthetic feelings



Appendix 7: Final Codes Table

List of Final Codes	Counted in the Transcripts
Lack of space, includes: - lack of temporary solution; - flexibility; - lack of Planning.	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx (41)
Lack of Finishing	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx (35)
Do it Yourself	xxxxxxxxxx (10)
Lack of Storing	xxxx (04)
Lack of Privacy	xxxxxx (06)
Humidity	xxxxxxxxx (09)
Water and hydric system	xxxxxxxxxxxxxxxxxx (19)
Lack of independence	xxxxx (05)

Acoustic Insulation	xx (02)
Lack of specific Tools	xxxxxx (06)
Illumination and Luminosity	xxxxx (05)
Aesthetics	xxxxx (05)
Quality of Air	xxxxx (05)
Insects	xxxxxxx (07)
Necessity of Assistence	xxx (03)
Reuse and Recycle of Materials	xxxxxxxx (08)

Garbage collect	x (01)

Lack of Security	xxxxx (05)
Lack of Thermic Insulation	xxxxxxxx (08)
Security	xxxxxx (06)
Electric System	xxxx (04)

sustainability maker brazil

REPORT 02

Step 02 - Crowd Voting

Design & Sustainability Research Center | Federal University of Parana - Brazil
August, 2014.

innonatives
open platform for sustainability

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STEP 02

CROWD VOTING

1. Background

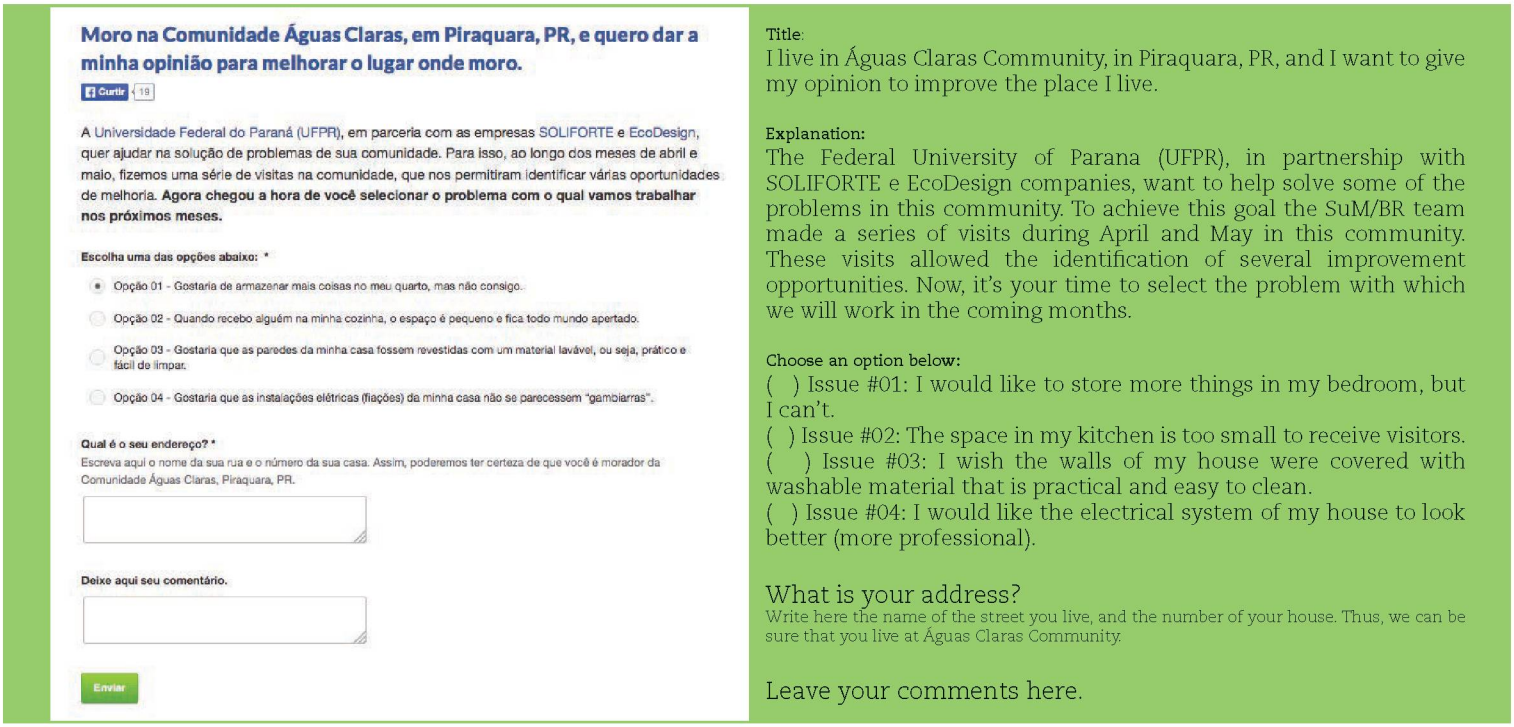
Following the overall structure set by the SuM/BR Project this Step 02 corresponds to the selection of the problem to be tackled on the next stages of the project by means of a CrowdVoting approach. The selected problem will be converted into a challenge and will be posted in the Innonatives platform (innonatives.de). The "crowd" on this pilot study was considered the entire community of Águas Claras (around 500 families in total) since the problem scouting focused on their reality. Since the survey carried out on the previous stage indicated that around 60% of people had access to internet, the CrowdVoting was carried out simultaneously through two approaches: (1) web-based online voting; (2) conventional voting using a cardboard ballot box.

1.1 CROWD VOTING STRATEGIES

1.1.1 Online voting

At this stage the Innonatives Platform was not available for use and, because of that, the research team adopt an existing social network platform. The following requirements to choose the social network platform: (a) it had to allow the development of a poll; and (b) be popular among residents of the Águas Claras Community. The social network Facebook was chosen since it met both requirements. The poll was created from the "Enquete" application, which allows the layout shown in image 01.

Image 01 - The poll developed for Online Voting



Before start voting, the poll was tested by three SuM/BR team members. After making sure that it worked out, the poll's link was shared in two ways, as follow. At first, the poll's link was shared at the SuM/BR Facebook open group, named *Votação Águas Claras*: https://www.facebook.com/groups/votacaoaguasclaras, as showed at image 02 (next page).

Also, the link was shared with a Águas Claras community member, so she could share the link with other residents in an attempt to stimulate broader involvement of the community on the CrowdVoting process.

Image 02 - Votação Águas Claras Facebook's group



Apart from sharing the link, a banner was placed at the headquarters of the Águas Claras Community Association and also in front of the head of the Água Claras Neighborhood Association (located at the entrance of the community - image 03).

Image 03 - Banners to encourage community participation in the online CrowdVoting





The online voting period began on June 21 and ended on June 29. But in these nine days, only one person voted. Because of this, the SuM/BR team agreed to extend the voting period for another week. Thus, the online voting period ended on 06 July. In total, the online voting period lasted 16 days.

1.1.2 Conventional Voting on a Ballot Box

The SuM/BR team scheduled another visit to Águas Claras - on June 21 2014 - in order to have the possibility of a live interaction with the community members. This visit would have been used to make a simultaneous vote on the spot. Such option was considered in order to reach those families that did not have access or familiarity with the internet.

Moreover, a live contact with the community members would contribute to enhance the community interest on the project and help spreading the words about the web-based vote.

The SuM/BR team went to the field with two cardboard ballot boxes (image 04), on a door to door fashion, asking one representant in each house to vote directly on the spot. This voting process reinforce the importance of having the community leader as a champion of the project: her presence has facilitate trust of people and make them more comfy to vote.

Image 04 - The Ballot Box for Voting





Each cardboard ballot boxes had on top a sticker that reported the interested problems and matched them with a colour of a poker chip (black, blue, red and green). The SuM project goals was briefly revised for people still have not hear of it. Subsequently all four problems were exposed to the respondents in order to get their vote. Participants were asked to select the issue that she/he considered most relevant. After the selection of the most urgent problem, the respondent had to locate in the ballot box a poker chip of the colour that matched the problem of their choice.

1.2 RESULTS

1.2.1 Online voting results

The online voting period lasted from June 21 to July 6 2014 (16 days). The poll results showed a total of 22 "likes". However, after all the 16 days of online voting there was only 01 vote on the system that could be counted as valid (the others were test carried out by the research team). See below the problem that has been chosen by this community member.

Issue #02: **01 vote**
The space in my kitchen is too small in order for me to receive visitors.

1.2.2 Results of Voting obtained on the Ballot Box

During the on-spot voting carried out in the community, the SuM/BR team visited 33 houses and collected 33 votes (only one vote for each house was allowed). The process of consulting directly the community involved the use of two ballot boxes. Below, the results of both ballot boxes.

Issue #01: **06 votes**
I would like to store more stuff in my bedroom, but I can't.

Issue #02: **16 votes**
The space in my kitchen is too small in order for me to receive visitors.

Issue #03: **09 votes**
I wish the walls of my house were covered with washable material that is practical and easy to clean.

Issue #04: **02 votes**
I would like the electrical system of my house to look better (more professional).

1.2.3 The final result

Adding up to the votes of the two forms of voting (online and through the ballot box), the issue #02 (The space in my kitchen is too small in order for me to receive visitors) received 17 votes - thus, being the most voted problem to be tackled by the SuM Project. The following images (image 05) show two kitchens of the houses visited in Step 01 - Problem Scouting.

Image 05 - Two kitchens of visited houses in STEP 01 - Problem Scouting (see REPORT 01)



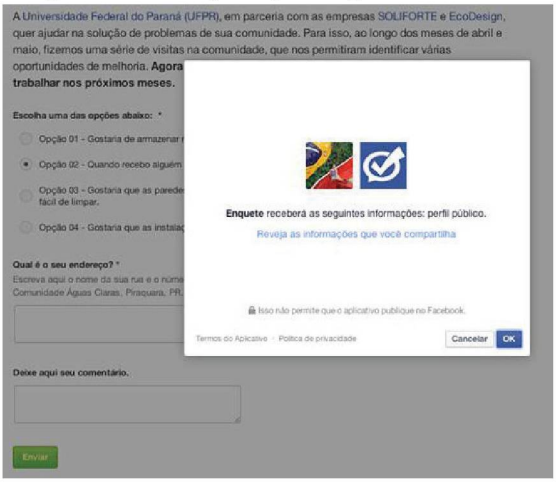


1.3 Lessons Learnt for the SuM Project

Critical analysis of this lack of adherence to the online voting point to two possible reasons:

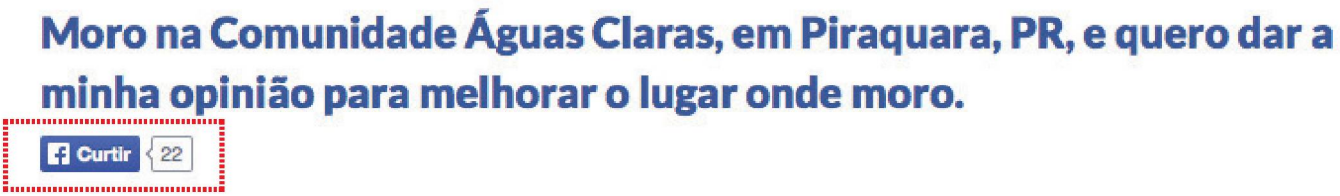
- **Fear of sharing private information**: according to the image 06, after clicking on the voting link a message appears requesting access to the Facebook account information. Thus, it might refrain people from getting into the voting stage due to the lack of trust with such disclosure of personal information.

Image 06 - Message requesting access to the Facebook account information



- **An extra layer on the voting process**: just below the title poll had the option "like", which does not configure an actual vote. So, people only "likes" the poll, instead of voting, as showed at image 07.

Image 07 - The "like" option



- **The need for more up beat communication process:** as explained before the dissemination of the online voting occurred by means of daily communication of the community leader with the neighbourhood and the use of two banners positioned on strategic places. Besides of intensifying the communication process by other means (ex: flyers, letters, loudspeakers, etc) the content of the communication could integrate some sort of gamification or more clarity on the individual benefits deriving from the voting process.

APPENDIX G

Entrevistado: (Ator 01.2)

Setor/Área: Jurídico

Tempo de Empresa (até 2015): 1 ano e 2 meses

1) Como você ficou sabendo da iniciativa?

R- Como eu trabalho no jurídico, eu acabei sabendo um pouco antes, talvez, as outras pessoas por questão de envolvimento no projeto [planejamento], *e participação na elaboração dos Regulamentos* [[houve mais de uma versão do Regulamento]].

2) Você já havia participado de alguma outra iniciativa de inovação da empresa?

R- Nunca participei de outra iniciativa de inovação, nem dentro da empresa, nem fora; eu tinha uma certa ideia a respeito, mas foi a primeira participação.

3) E como foi a sua participação nesta iniciativa?

R- A minha participação foi ativa desde o início. Eu procurei sempre fazer parte de todas as fases, de forma... participando extensivamente, sempre dando ideias e, inclusive a minha ideia foi sendo aprovada e evoluindo conforme as fases chegando a fase de solução entre as dez.

4) Quais eram as suas expectativas no início?

R- A minha expectativa sempre foi alta. Quando eu fiquei sabendo da iniciativa eu logo me interessei e procurei ter alguma ideia que pudesse me levar adiante. Então eu sempre tive essa expectativa alta, acreditei na minha ideia e acho que fui correspondido.

5) Você percebe alguma oportunidade de melhoria no processo, na plataforma, na interação?

R- Eu achei bem interessante a forma como foi feito, através de plataforma online. Talvez, eu não sei se seria uma melhoria ou não, mas talvez pudesse ser unificada uma das fases do processo, tornando um pouco menos extenso. Eu sei que a gente tem pouco tempo em razão do nosso trabalho interno, mas acredito que se fosse um pouquinho mais rápido a ideia seria menos desgastada com o tempo.

6) Você participaria novamente da iniciativa? Se sim, como seria sua participação?
R- Participaria com certeza. Eu gosto deste tipo de iniciativa, me interesso por inovação. Acho que minha participação seria exatamente igual. Eu acho que eu me dediquei bastante e não modificaria nada da maneira como foi feito [com relação à participação].

7) O desafio desta primeira iniciativa foi relacionado ao consumo sustentável da água. Você tem alguma sugestão de tema para os próximos desafios?
R- Olha, como eu faço parte do prédio administrativo, eu acredito que é interessante manter os desafios voltados para produtos, porque são áreas diferentes da que a gente trabalha. Eu acho que a intenção da iniciativa é justamente essa, de buscar opiniões de pessoas não relacionadas com aquilo, pra surgirem com opiniões e ideias diferentes. Então eu manteria em produtos, talvez em mercados que a empresa pretende avançar, energético ou algo relacionado.

8) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para inovação. O que você acha disso?
R- Eu concordo. Acho que para buscar uma inovação tem que ter participação ativa dos colaboradores. Entendo que se não fosse dessa forma seria mais uma questão de pesquisa, apenas, com opiniões, com votações. Então acho que deve ser mantido esse sistema de participação.

9) Há algum comentário/mensagem que você queira expor?
R- Olha, a iniciativa superou minhas expectativas, no início eu achei que não fosse ser aderido por um grande número de pessoas, principalmente por ser a primeira iniciativa desenvolvido na empresa, mas superou minhas expectativas tanto pelo número de participantes como pelas pessoas comentando e buscando informações; então meu apoio é total e espero que tenha mais iniciativas como esta na empresa.

Entrevistada: (Ator 02.2)
Setor/Área: Recursos Humanos
Tempo de empresa (até 2015): 2 anos e 8 meses

1) Como você ficou sabendo da iniciativa?
R- Fiquei sabendo da iniciativa através do Jornal Mural, do e-mail de comunicação e através dos banners espalhados pela empresa também.

2) Você já havia participado de alguma outra iniciativa de inovação da empresa?
R- No formato desta iniciativa, nenhuma. Nunca tive oportunidade de participar de nenhuma iniciativa semelhante, tampouco tive conhecimento de iniciativas semelhantes a este formato em outras empresas.

3) O que você achou de interessante sobre o formato desta iniciativa?
R- A forma que eu achei mais interessante foi a abertura que esta iniciativa teve para que os colaboradores colocassem suas ideias em prática. A gente pode fazer vários testes e abordagens diferentes que a gente não usaria no dia-a-dia, e pensar bastante "fora da caixinha", levando isso para as nossas atividades diárias, não necessariamente apenas para o desafio.

4) E como foi a sua participação nesta iniciativa?
R- Eu participei através do primeiro treinamento que teve, a apresentação, o workshop onde a gente acabou saindo "fora da caixinha" mesmo. Eu não entreguei nenhuma ideia, mas em contrapartida eu participei através de comentários dos colegas colocaram suas ideias no sistema.

5) Quais eram as suas expectativas no início?
R- A minha expectativa do início era de algo muito diferente do que foi apresentado. Ela era algo como "o que nunca ninguém pensou" "que forma que a gente poderia trabalhar", né... era uma forma assim "aquilo que ninguém nunca pensou, porque é que a gente pensaria?", né? "Existe ainda alguma coisa para ser pensada e que forma que a gente poderia colocar?". Então esta foi uma das minhas expectativas do início, e ela se realizou no final. Muitas das ideias que foram abordadas nem sempre eu pensava que tinham suas

funcionalidades e aí no decorrer do processo verificou que tinha sim, e que era possível realiza-las e outras que eu pensei "poxa é tão óbvio e nunca ninguém pensou". E isso eu acho que faz você ter a visão de que as pessoas podem ir além do que alguém já foi. [Então as tuas expectativas foram atendidas?] *Sim, as minhas expectativas foram muito atendidas.*

6) Você percebe alguma oportunidade de melhoria no processo, na plataforma, na interação?

R- Oportunidade de melhoria que eu vejo, é... eu posso dizer um pouco, da forma como foi feita, eu acho que a gente podia abrir pra família. No primeiro workshop que foi apresentado foi um pouco do "vamos pensar como criança, sem limites" e acho que na nossa família tenha isso no dia-a-dia, porque às vezes é pai e mãe que estão em casa e talvez estender isso à família eu acho que ia ser algo muito legal. Quando eu falo de plataforma, algo que às vezes a gente ficava olhando, buscando informação, eu acho que isso pode melhorar um pouco mais, como o ranking não ficar aparecendo através de quadrantes, o ranking das imagens, quem tem quem não tem, em que posicionamento você está, ou o que falta... e o aviso de datas "olha, não esqueçam", porque isso ficou muito através dos e-mails de apresentação e não do sistema [da plataforma]. *De repente isso poderia ser automatizado, o sistema mesmo mandar mensagens de "olha, você não responde" "você não entra há três dias", né, "faça o seu acesso". Eu acho que com a nossa rotina do dia-a-dia fez com que algumas pessoas não tenham participado por conta das suas atividades.*

7) Você participaria novamente da iniciativa? Se sim, como seria sua participação?

R- Eu não só participaria de uma próxima iniciativa como essa, como eu me prepararia mais. Ficaria com medo, pelo menos pouco dele, em relação a apresentar uma proposta e não ficar com medo de ser ridícula, do tipo "não faz sentido, não tem fundamento" e realmente colocar a ideia, pois a gente está numa empresa onde todos querem o melhor.

8) O desafio desta primeira iniciativa foi relacionado ao consumo sustentável da água. Você tem alguma sugestão de tema para os próximos desafios?

R- Algo que as pessoas falaram muito nos próprios comentários foi porque o desafio foi exclusivo da água. Porque que a gente não olhou um pouco da parte de energia, ou porque

a gente não conciliou as duas coisas? E quando a gente fala da empresa, a gente fala de outros segmentos que a gente poderia abordar, como formato de ter uma melhoria de processo que traria uma melhoria para o meio ambiente como uma parte da sustentabilidade, através de processos como energia elétrica, como construção sustentável, algo que nós podemos ajudar o próprio meio ambiente.

9) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para inovação. O que você acha disso?

R- Eu acho que é importante o formato como a gente fez, a gente finalizou e fechou ele só para a empresa. Quando você abre, as pessoas começam a ter outras visões e podem nos auxiliar a crescer. Então às vezes você pensar em fazer um produto exclusivo prejudica uma ideia que às vezes parecia não ser tão boa porque a pessoa não pensou como um todo e o que acontece: a gente perde uma oportunidade de fazer bem para o próximo. Não olhar só o cenário do que a empresa pode produzir ou não. Então quando você fala de uma plataforma que ela é aberta para qualquer pessoa, você faz com que outras pessoas auxiliem aquilo que você teve uma ideia pequena a se tornar realidade. Seja ela através da empresa que está patrocinando ou através de qualquer outro órgão que queira patrocinar uma ideia como essa.

10) Há algum comentário/mensagem que você queira expor?

R- Na verdade eu só queria parabenizar porque a ideia eu achei fantástica. As pessoas com quem eu pude conversar se empenharam muito nisso porque deram valor, entenderam o real significado, e tem muita gente com muita ideia bacana, então eu acho que isso não pode ficar na primeira versão, eu acho que a gente tem que dar o segundo passo seja ele permanecendo com a questão da água, ou olhando para outros cenários, e talvez imaginando um passo maior como o que a gente pode fazer para o mundo, não só para a empresa.

Entrevistado: (Ator 03.2)
Setor/Área: Administração de Vendas
Tempo de empresa (até 2015): 3 anos

1) Como você ficou sabendo da iniciativa?
R- Eu fiquei sabendo da iniciativa, primeiramente, através dos banners espalhados pela empresa, depois a gente recebeu um e-mail com as informações detalhadas, né, e pode realmente sanar a curiosidade e participar.

2) Você já havia participado de alguma outra iniciativa de inovação da empresa?
R- Eu não tinha participado de nenhuma iniciativa de inovação, seja aqui na empresa, nem fora.

3) E como foi a sua participação nesta iniciativa?
R- A minha participação pra mim, nesta iniciativa, foi excelente... eu sou um dos finalistas. [Ou seja, você participou mandando ideias?] *Isso. No primeiro workshop foram passadas as informações de como seria e eu encaminhei duas ideias inicialmente... e posteriormente para a fase de conceitos eu preferi apostar somente na que eu achava mais viável e interessante, com mais potencial, no caso. E aí depois foi amadurecendo a medida que foram acontecendo os workshops.*

4) Quais eram as suas expectativas no início?
R- As minhas expectativas eram, na verdade, para crescimento pessoal. Poder enxergar de alguma outra forma e poder dar alguma ideia que colaborasse com o meio ambiente e com a sociedade em si. [E estas expectativas foram atendidas?] *As minhas expectativas em relação à iniciativa, sim, foram atendidas, na verdade, eu diria superadas. A gente começou de uma forma, mas a iniciativa tomou uma proporção, aqui dentro da empresa, incrível. Bastante gente participando, torcendo, comentando, enfim, um engajamento muito grande aqui dentro.*

5) Você percebe alguma oportunidade de melhoria no processo, na plataforma, na interação?

R- Eu vejo que a iniciativa pode melhorar, na verdade, no tempo dos workshops. Eu acho que quanto mais contato a gente tiver, a gente pode amadurecer as nossas ideias ou corrigi-las, enfim, a gente pode trocar informações e isso realmente agrega muito.

6) Você participaria novamente da iniciativa? Se sim, como seria sua participação?

R- Eu participaria novamente da iniciativa, com certeza. Eu acho que eu cresci muito e hoje começo a enxergar de uma outra forma. Sou... na verdade, eu me tornei capaz de ver coisas que eu ainda não tinha sido capaz de ver em mim, como colocar minhas ideias em prática, isso é muito bom.

7) O desafio desta primeira iniciativa foi relacionado ao consumo sustentável da água. Você tem alguma sugestão de tema para os próximos desafios?

R- Eu tenho, sim, algumas ideias de temas para iniciativas futuras. Acho que a gente trabalha muito com o cliente, acho que o cliente é a alma do nosso negócio aqui, então serviços ao cliente seria incrível também, poder agregar alguma coisa que trouxesse não só a questão do produto, que aí a gente vai entregar para o cliente, vai repassar, mas a forma que a gente vai atender ele, isso é primordial aqui na empresa.

8) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para inovação. O que você acha disso?

R- Eu acho que a participação de todos é fundamental. A gente percebe porque com o engajamento das pessoas, a gente não está fazendo um produto para uso exclusivamente nosso, pessoal, mesmo. A ideia é que através do produto a gente possa colaborar com a sociedade mesmo, então, todos vão ganhar. Quanto mais ideias, mais cabeças pensando, mais a gente tem a ganhar, daí.

9) Há algum comentário/mensagem que você queira expor?

R- A mensagem que eu queria dizer é agradecer, na verdade, a todos, desde a diretoria por ter por ter liberado, o presidente, o pessoal de Inovação; Isadora, Alexandre, Fran, Sandro, enfim, todos que colaboraram de alguma forma, foram muito importantes. A gente vê essa importância no amadurecimento das ideias, como começou e como está finalizando hoje,

não só a minha ideia nem só as ideias dos finalistas, mas eu acho que a de todos, realmente até as dez principais ali, foi um amadurecimento tremendo. E, antes que eu encerre, vou deixar aqui a minha mensagem: "Água, aqui é <nome da empresa>, você decide" – vou vender meu produto [risos].

Entrevistado: (Ator 04.2)

Setor/Área: Coordenador do Tele-Serviços

Tempo de empresa (até 2015): 17 anos

1) Como você ficou sabendo da iniciativa?

R- Eu fiquei sabendo da iniciativa pela comunicação interna da empresa, e-mail, banners. Depois a gente teve uma apresentação no auditório onde lá eu pude conhecer um pouco mais ainda do que era essa proposta.

2) Você já havia participado de alguma outra iniciativa de inovação da empresa?

*R- No passado, a empresa fez um incentivo através do e-mail <ideias@*nomedaempresa*.com>, mas não era nada tão estruturado como foi esta iniciativa. Esta iniciativa realmente foi algo diferente, bem mais organizado, bem mais estruturado com uma proposta que, eu creio, incentivou mais as pessoas a participarem.*

3) E como foi a sua participação nesta iniciativa?

R- Nesta iniciativa eu optei por ser um 'comentador', aquele que varia mais nos comentários ao invés de postar uma ideia. Eu quis fazer desta forma pela função de coordenação, acompanhar as pessoas e ser, neste primeiro momento, aquele que comentaria, que apoiaria com comentários.

4) Quais eram as suas expectativas no início?

R- No início a dúvida era como seria o desenrolar das etapas, porque ele era todo estruturado em etapas; como é que a plataforma iria favorecer as ideias, como é que seria o desenvolvimento disso dentro dessa plataforma. Então eu tinha dívidas, né, e expectativas de como seria o desenrolar disso durante o tempo. [E estas expectativas foram atendidas? Você se surpreendeu? O que você achou?] *Com o desenrolar da iniciativa eu pude ver que realmente a plataforma ela ajudava, a dinâmica de comentários dos colegas incentivava aquele que tinha postado a ideia a rever sua própria ideia, a melhorar, a ser provocado, a mudar. E, realmente entendi que era algo diferente, que traria mesmo contribuições interessantes.*

5) Você percebe alguma oportunidade de melhoria no processo, na plataforma, na interação?

R- Eu acho que a plataforma, ele teve alguns momentos que falhou em não postar os comentários, em não permitir a pontuação das estrelas. Então, eu acho que a plataforma em si, ela pode ser um pouco trabalhada. E da proposta da iniciativa, eu não vejo, assim, hoje, nada tão diferente. Acho que ela foi tão bem montada, bem organizada, que eu acho que o caminho seria por aí mesmo, mudando só o tema, que foi água, para um outro tema.

6) Você participaria novamente da iniciativa? Se sim, como seria sua participação?

R- Com certeza participaria novamente, agora colocando uma ideia.

7) O desafio desta primeira iniciativa foi relacionado ao consumo sustentável da água. Você tem alguma sugestão de tema para os próximos desafios?

R- Tenho uma sugestão. Eu acho que a gente fez um belo trabalho em desenvolver algo dentro do nosso know-how, *mas eu gostaria de provocar, numa próxima iniciativa, com um produto que não seja do portfólio da empresa. Como se pudesse ser estruturado uma nova linha para se buscar no mercado, fora do portfólio que a gente trabalha hoje. Sair mesmo "da caixinha" daquilo que a gente tem de produtos, pra desenvolver algo diferente e inovador que a gente ainda não trabalha.*

8) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para inovação. O que você acha disso?

R- Eu acho que a ideia discutida em multidão ela é fantástica, porque ela promove o consolidar de mais deias. Então, uma ideia trabalhada por uma única pessoa, ela perde a oportunidade de ser melhor estruturada do que quando você tem várias pessoas comentando e apoiando aquela ideia. Então ficou claro para mim que a discussão em grupo ela favoreceu que muitas ideias que nasceram de um formato, fossem melhoradas, fossem aperfeiçoadas, fossem desenvolvidas com a contribuição da multidão. [Fala mais dessa ideia de "fora do portfólio da empresa"] *A empresa é muito forte como marca em material de construção. E, se a gente fosse para desenvolver uma outra linha de produtos, que hoje a gente não trabalha, mas dentro do ramo de material de construção, a chance de termos sucesso seria muito grande. Por exemplo, interruptores e tomadas. Eu acho que é uma linha que já tem a placa que é PVC, então já tem um pouquinho do que a gente utiliza,*

mas aí tem todo o componente do cobre, dos ligamentos, dos interruptores e tomadas. Mas eu acho que isso seria uma linha que a gente agregaria muito pra vender em elétrica, por exemplo, ou em lojas de materiais de construção em comum que trabalham com interruptores e tomadas. E poderia ser discutido nessa multidão como fazer isso dentro do nosso portfólio.

9) Há algum comentário/mensagem que você queira expor?

R- Quero elogiar a todos que participaram da iniciativa, do desenvolvimento, da organização, do projeto. Foi muito bom, foi fantástico, que possam vir outras iniciativas assim para gente continuar crescendo e contribuindo.

Entrevistada: (Ator 05.2)
Setor/Área: Analista de Marketing
Tempo de empresa (até 2015): 3 anos na empresa

1) Como você ficou sabendo da iniciativa?
R- Fiquei sabendo da iniciativa através do e-mail marketing e também da comunicação do pessoal da Inovação.

2) Você já havia participado de alguma outra iniciativa de inovação da empresa?
R- Já participei da iniciativa "Todos na Obra", também promovida pela área de Inovação. [Qual a diferença que você vê entre esta iniciativa e o "Todos na Obra"?] *No "Todos na Obra", a gente foi até a obra, viu é... todas as iniciativas, todo o trabalho das pessoas colocando a mão na massa mesmo, e nessa a gente foi mais pesquisando o cenário mesmo, mais amplo, né. Aquele* [Todos na Obra] *foi na obra mesmo e foi mais em grupo. E essa foi mais individual.*

3) E como foi a sua participação nesta iniciativa?
R- A minha participação foi tanto com comentários, foram poucos, mas eu fiz alguns comentários [risos], *com a proposta da ideia e agora eu estou entre uma das finalistas.*

4) Quais foram as suas motivações para participar da iniciativa?
R- As minhas motivações foram de reconhecimento, em primeiro lugar, porque um projeto deste ele te traz esse reconhecimento, mostra o teu potencial, o que você tem de ideia mesmo, e isso foi bem bacana e... seria isso.

5) Quais eram as suas expectativas no início?
R- As minhas expectativas até foram superadas, assim, porque eu não sabia o quão grande ia se tornar esse projeto. E, no começo lá, a gente ficou pensando 'será que a ideia vai pra frente, ou não', então foi bem bacana, eu achei. Bem bacana mesmo.

6) Você percebe alguma oportunidade de melhoria no processo, na plataforma, na interação?
R- Da iniciativa em si, assim, eu gostei bastante de todas as etapas, eu acho que foram bem explicadas, foram bem orientadas, então eu não teria nenhuma melhoria. Talvez, assim, alguma coisa de ir a campo mesmo, dar uma explorada nisso, e ter mais etapas para talvez tu ver ali o custo, levantar custos do produto, levantar essas questões... só isso.

7) Você participaria novamente da iniciativa? Se sim, como seria sua participação?
R- Eu participaria, sim, novamente, e participaria com novas ideias.

8) O desafio desta primeira iniciativa foi relacionado ao consumo sustentável da água. Você tem alguma sugestão de tema para os próximos desafios?
R- Acho que poderia ser alguma coisa voltada a reciclagem de materiais. Acho que é bem bacana, também.

9) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para inovação. O que você acha disso?
R- Bem, a metodologia utilizada para a iniciativa foi boa, sim, tanto porque as pessoas poderiam mostrar o que você poderia melhorar, tanto pra dizer 'ah, isso não ficou muito legal', dar um feedback, né, isso é bastante importante, até para você saber se as pessoas estão gostando mesmo, ou não estão gostando muito disso, vamos melhorar nisso ou aquilo... isso ajuda bastante a construir.

9) Há algum comentário/mensagem que você queira expor?
R- Não... já estou até nervosa aqui [risos] *porque eu não ensaiei nada* [risos]. *Mas eu queria só deixar um comentário que seria assim, é... no começo a gente pensa que a ideia não vai ser tão bacana, que não vai pra frente... eu ouvi várias pessoas comentando que não participaram porque ficaram com medo de que, principalmente da área técnica e da área de produto, a gente achou que eles fossem arrasar, iam mandar ideias, então eu nem vou participar porque minha ideia nem vai ser tão bacana assim. E, mesmo assim, tiveram de outras áreas que a gente nem imaginava, o jurídico, né, o financeiro, que mandaram ideias muito bacanas mesmo, que surpreenderam a gente. Então isso foi bem bacana do*

projeto, de mostrar que a pessoa tem potencial e que ela pode sim, não importa a área que ela esteja, ela pode, sim, mandar uma ideia, e inovar.

Entrevistada: (Ator 06.2)
Setor/Área: Engenharia de Aplicação
Tempo de empresa (até 2015): 1 ano e meio

1) Como você ficou sabendo da iniciativa?
R- Eu fiquei sabendo principalmente por e-mail, e também pela divulgação dos colegas que acabaram incentivando a participação.

2) Você já havia participado de alguma outra iniciativa de inovação da empresa?
R- Eu participei ano passado do "Todos na Obra" que também foi uma iniciativa de inovação. A diferença foi a questão que a gente foi pra obra mesmo, a gente foi pro campo, mas ao mesmo tempo a gente não participou do processo de solução. Então duas diferenças, nesta iniciativa a gente não foi para o campo, mas a gente participou até o final do processo de criação da solução mesmo, né, da ideia. A diferença também é que lá [no "Todos na Obra"] *a gente tinha uma discussão em grupo sobre a problemática e a gente tinha essa interação e nesta, era mais individualizada a solução mesmo, a gente recebia sugestões, mas não teve aquele momento de todo mundo ficar reunido.*

3) Quais eram as suas expectativas no início?
R- Pois é... no início eu fiquei bem apreensiva, assim... eu me inscrevi mas eu pensei 'ah, não custa nada, né?' e acabou é... eu me inscrevi, tinha a expectativa mais de conhecer a iniciativa, né, conhecer qual que era a proposta, e foi por isso mais... [E a iniciativa atendeu às suas expectativas, ou não, como é que foi?] *Sim, atendeu, porque eu fui até os dez últimos, né, eu não imaginava que chegaria tão longe... e conforme foi avançando, eu mesma comecei a acreditar mais na minha solução, que no começo eu achei que era um pouco banal, mas então foi avançando e eu fui melhorando a ideia, fui amadurecendo o pensamento e fui acreditando mais no potencial dela.*

4) Você percebe alguma oportunidade de melhoria no processo, na plataforma, na interação?
R- Achei a iniciativa bem bacana... como sugestão ou como... né, para as próximas edições, eu acho a questão do aproveitamento, entende? Porque como o <S.S.> [coordenador da área de Inovação] *falou, não acaba aqui esta iniciativa. Então eu acho que, eu acho um*

pouco, eu fico com um pouco de receio de, por exemplo, eu sair da empresa e eu acabar tendo o meu produto lançado, quem sabe, e não ter esse retorno, essa... sei lá, essa visibilidade, essa... entende? Então eu acho que isso poderia, talvez, não sei se é uma questão da empresa mesmo, né, mas isso que ficou um pouco... que eu acho que deveria melhorar, assim.

5) Você participaria novamente da iniciativa? Se sim, como seria sua participação?
R- Participaria, com certeza. A questão do envio dependeria da proposta, né, se eu teria algum envio bacana eu participaria com certeza... mas achei legal a parte dos comentários também... mesmo ali quando fechou a plataforma eu continuei falando com o <R.C.L.> [um dos participantes finalistas] *'ah, fala comigo... apresenta pra mim'* [risos] *e isso é bacana também, incentivar os outros colegas, ajudar eles... então com certeza eu participaria, acho bem bacana.*

6) O desafio desta primeira iniciativa foi relacionado ao consumo sustentável da água. Você tem alguma sugestão de tema para os próximos desafios?
R- Eu acredito que poderia ser... uma sugestão seria a implantação de ideias sustentáveis na empresa, entende? Talvez no nosso cotidiano, nos nossos processos, algo que possa realmente fazer um... ter um efeito no final, né, de sustentabilidade. Talvez relacionado à empresa, a processos... né... talvez alguns gestos pequenos que podem trazer benefícios.

7) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para inovação. O que você acha disso?
R- Eu achei bacana essa metodologia, porque mesmo quem não mandava a ideia podia ter algo a contribuir que melhorasse bastante, ou alguma crítica que realmente fizesse a diferença para o esclarecimento. Achei uma proposta diferente, né... um pouco até complicada às vezes, de lidar com críticas externas, né, mas foi bem bacana para o crescimento da ideia, e do crescimento pessoal mesmo.

8) Há algum comentário/mensagem que você queira expor?
R- Ai meu Deus, eu não preparei nenhuma frase de efeito [risos]*. Eu achei que o maior benefício da iniciativa foi a interação. Porque eu acabei conhecendo pessoas novas que talvez eu não teria a oportunidade de conversar e de interagir se não fosse essa iniciativa.*

Na minha opinião foi o melhor ganho, assim... a amizade do <R.C.L.> [um dos participantes finalistas], *do <V.A.>* [participante da iniciativa]*... que talvez eu nunca conversaria, entende, se não fosse a iniciativa. Acho que foi isso o principal.*

Entrevistado: (Ator 07.2)

Setor/Área: Marketing de Produtos

Tempo de empresa (até 2015): 7 meses e meio

1) Como você ficou sabendo da iniciativa?

R- Fiquei sabendo da inciativa por meio... do envio do e-mail que foi encaminhado para toda a base da empresa, né... e foi onde eu tive interesse e acabei entrando em contato com o setor de Inovação, antes mesmo da liberação da próprio iniciativa em si, né...

2) Você já havia participado de alguma outra iniciativa de inovação da empresa?

R- Não. Por ser novo na empresa, essa é a primeira iniciativa que eu participo, né...

3) E como foi a sua participação nesta iniciativa?

R- Acho que, de uma maneira geral, ela foi bem produtiva, desde a primeira parte que foi a de conceituação do produto, né... a fase de ideação, passando pela fase de brainstorming, foi uma parte muito... todas as etapas foram bastante participativas, né, envolvendo a própria contextualização da ideia, envolvendo o progresso do desenvolvimento da ideia como um todo, e pegando as próprias sugestões que vinham pelo portal, né, pelo site, para aprimorar aquilo que a gente havia... aquilo que a gente havia idealizado, né.

4) Qual foi a sua motivação para participar da iniciativa?

R- Minha motivação é... interesse pela criação, né. Esse foi o principal motivo pelo qual eu acabei aderindo à iniciativa.

5) E com relação as suas expectativas, quais eram no início?

R- Era... ter um reconhecimento na empresa, né, fora de uma área onde eu estou atuando atualmente. Expandir um pouco o leque de atuação dentro da empresa. Não ficar recluso apenas a área de Marketing de Produtos. Acho que essa interação com as demais áreas foi importante. [Então elas foram atendidas?] *A iniciativa foi bastante válida, né, superou as expectativas... eu achei que seria um negócio mais simples, né... e todos os workshops que tiveram para orientação de como desenvolver o produto, de como aprimorar a ideia, eu acho que eles acabaram me surpreendendo, né, de uma certa forma... o processo como foi desenvolvido, ela foi além daquilo que eu imaginava.*

6) Você percebe alguma oportunidade para que o processo melhore em algum ponto?
R- No momento eu não consigo... [Plataforma, interação, etapas, quantidade de fases... alguma coisa que te chamou a atenção... que você pensou "isso daqui, se tivesse um próximo, poderia ser melhorado"] *Ah, talvez, talvez... acho que um apoio mais na fase final, um apoio técnico maior, pra desenvolver... pra direcionar de maneira mais técnica o produto... mas acho que, de uma maneira geral, ele tem... teve uma sequência bem produtiva... acho que não... não penso em nada, assim, que poderia ser melhorado, nesse momento.*

7) Você participaria novamente se houvesse uma segunda edição?
R- Participaria, com certeza. [E como é que seria essa participação?] *Em que sentido?* [Como é que você participaria, desta vez?] *Hum... da mesma maneira como participei atualmente, de maneira ativa, em todas as etapas, se fosse passando cada etapa, né?* [risos].

8) Esse desafio foi relacionado ao consumo sustentável da água. Você tem alguma sugestão de tema para os próximos?
R- Acho que eficiência energética seria um bom tema... aí também fugindo um pouco da, do negócio da empresa, acho que a questão de mobilidade urbana seria um tema legal também para se trabalhar.

9) A iniciativa baseou-se em uma metodologia participativa, com o envolvimento online da multidão para inovação. O que você acha disso?
R- Acho que trocar essas informações, trocar opiniões, é a única forma de poder aprimorar novas ideias, né? Então, acho que essa forma de poder compartilhar ideias, com certeza só tem a contribuir, né, a melhorar a metodologia de criação em si.

10) Há algum comentário/mensagem que você queira fazer, que não estava nas perguntas?
R- Por ser novo na empresa, e justamente a iniciativa veio justamente neste mesmo momento, né... acho que algo que a iniciativa contribuiu foi justamente esta exposição, né, pra empresa, né... essa visibilidade. Então, pra mim isso foi muito oportuno, né... porque eu

recém entrei e... acabei tendo uma visibilidade para outras áreas que a gente acaba não tendo muito contato, né? Então, acho que esse foi um ponto importante, pessoalmente, né...

ANNEX 01

Gmail **Isadora Dickie <isadora.dickie@gmail.com>**

Your Amazon Mechanical Turk Account Registration

1 mensagem

Mechanical Turk <mturk-noreply@amazon.com> 23 de abril de 2014 16:37
Para: Isadora Dickie <isadora.dickie@gmail.com>

Greetings from Amazon Mechanical Turk,
We have completed our review of your Amazon Mechanical Turk Worker Account. We regret to inform you that you will not be permitted to work on Mechanical Turk.

Our account review criteria are proprietary and we cannot disclose the reason why an invitation to complete registration has been denied. If our criteria for invitation changes, you may be invited to complete registration in the future.

Thank you for your interest in Mechanical Turk.
Sincerely,
Amazon Mechanical Turk
https://www.mturk.com
410 Terry Avenue North
SEATTLE, WA 98109-5210 USA

Gmail **Isadora Dickie <isadora.dickie@gmail.com>**

Update on your request to join Amazon Mechanical Turk

1 mensagem

Amazon Mechanical Turk <contactus@mturk.com> 10 de junho de 2016 14:49
Para: isadora.dickie@gmail.com

Greetings from Amazon Mechanical Turk,

Congratulations! Your previous request to join the Amazon Mechanical Turk marketplace has been accepted. Please follow this link to complete the registration process: https://www.mturk.com/mturk/beginsignin

As a Worker participating in the Amazon Mechanical Turk marketplace, you can transfer the earnings you receive from Requesters to an Amazon.com gift card balance. Please note that newly registered Workers may only complete a limited number of Human Intelligence Tasks (HITs) each day, and payments from Requesters are delayed until you have been active on Amazon Mechanical Turk for at least 10 days. To get started now, please follow this link: https://www.mturk.com/mturk/beginsignin.

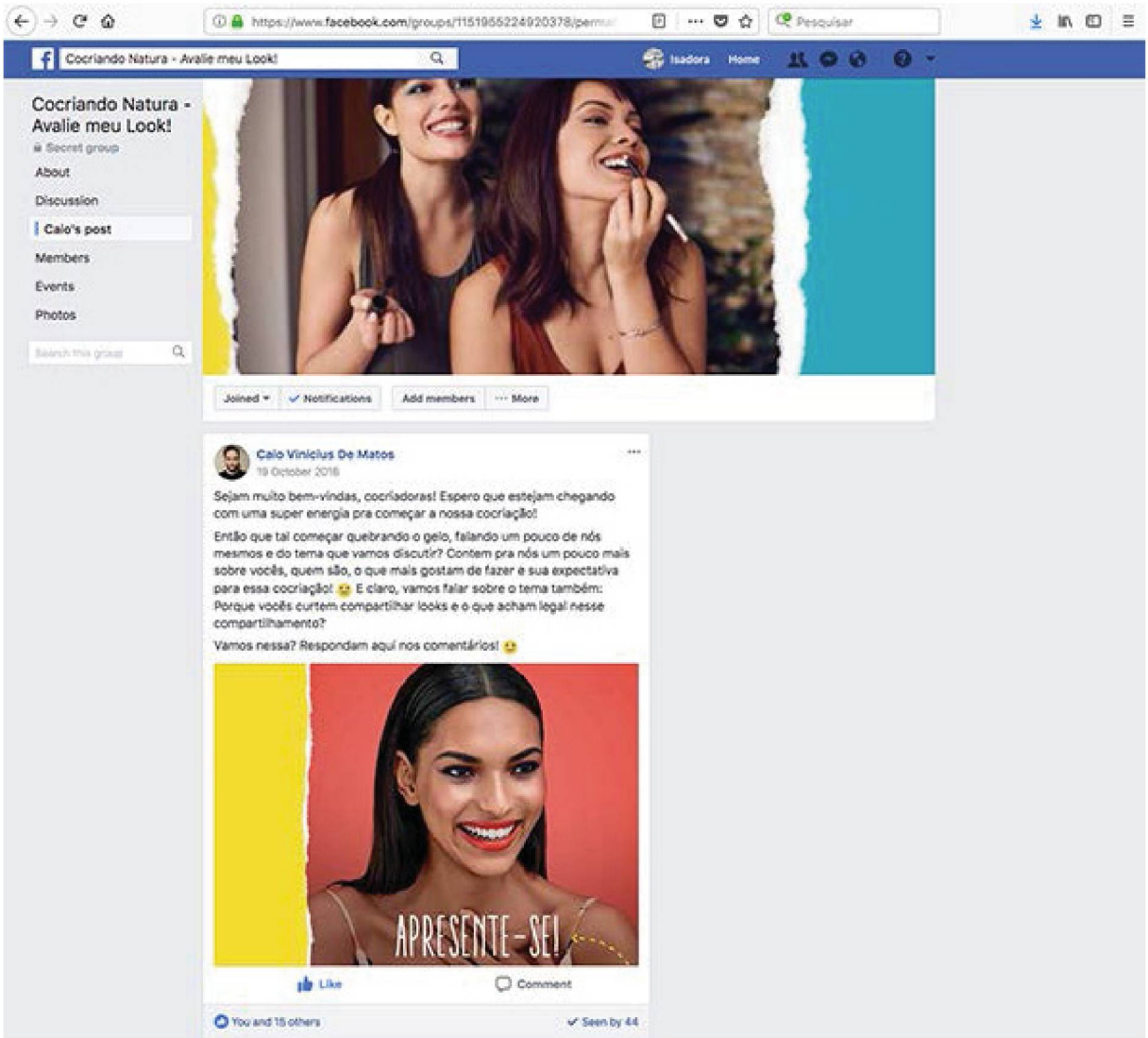
Additional information about getting started can be found at https://www.mturk.com/mturk/help?helpPage=worker.

We're excited to have you join the Amazon Mechanical Turk marketplace!

Sincerely,

Amazon Mechanical Turk
https://www.mturk.com

ANNEX 02


Cocriando Natura - Avalie meu Look!
Isadora
Home
Cocriando Natura - Avalie meu Look!
Secret group
About
Discussion
Calo's post
Members
Events
Photos
Joined
Notifications
Add members
More
Calo Vinicius De Matos
19 October 2016
Sejam muito bem-vindas, cocriadoras! Espero que estejam chegando com uma super energia pra começar a nossa cocriação!
Então que tal começar quebrando o gelo, falando um pouco de nós mesmos e do tema que vamos discutir? Contem pra nós um pouco mais sobre vocês, quem são, o que mais gostam de fazer e sua expectativa para essa cocriação! E claro, vamos falar sobre o tema também: Porque vocês curtem compartilhar looks e o que acham legal nesse compartilhamento?
Vamos nessa? Respondam aqui nos comentários!
APRESENTE-SE!
Like
Comment
You and 15 others
Seen by 44

11° P&D DESIGN Congresso Brasileiro de Pesquisa e Desenvolvimento em Design 2014

Gramado – RS

De 30 de setembro a 2 de outubro de 2014

BASES PARA ENTENDIMENTO DO CROWDSOURCING E SUA APLICAÇÃO EM PROJETOS DE CROWD-DESIGN

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Resumo: Este artigo apresenta um estudo teórico sobre a aplicabilidade do crowdsourcing em projetos de crowd-design. Utilizou-se como método a revisão bibliográfica sistemática (RBS) tendo como base portais de indexação de documentos em formato de artigos e capítulos de livros. Apresenta-se, portanto, além do protocolo utilizado na realização da RBS, os conceitos de crowdsourcing e os fins diversos para os quais vem aplicado. O que se percebe é que a RBS, quando bem planejada, mostra-se eficaz na busca de artigos que abordam os temas de interesse. Com relação aos trabalhos analisados, nota-se que trata-se de um tema recente e que há muitas lacunas com relação à sua forma de aplicação, inclusive no que se refere ao desenvolvimento e produtos.

Palavras-chave: revisão bibliográfica sistemática, crowd-design, crowdsourcing

Abstract: *This paper presents a theoretical study on the applicability of crowdsourcing in crowd-design projects. The method used was the systematic literature review (SLR) based on indexing documents portals in articles and book chapters formats. It presents, therefore, beyond the protocol used in the making of SLR, the concepts of crowdsourcing and the various purposes for which it is applied. What is noticeable is that the SLR, when well planned, is effective in finding articles that cover topics of interest. Regarding the studies analyzed, we note that this is a recent issue and that there are many shortcomings with regard to its application form, including for the product development.*

Keywords: *systematic literature review, crowd-design, crowdsourcing*

1. INTRODUÇÃO

A facilidade do compartilhamento instantâneo de informações entre multidões, proporcionada principalmente pela internet, está afetando não somente a maneira das

pessoas se comportarem e se relacionarem, como também a maneira de se projetar em design. Manzini et al. (2004) já entendiam a atividade projetual de Design como sendo um processo que permite: (1) ter uma ideia daquilo que se quer como solução; (2) conhecer ou buscar os recursos disponíveis e (3) implementar a estratégia adequada para alcançar os resultados. Tendo em vista que estas habilidades não pertencem apenas aos designers com formação universitária, para Freire e Damásio (2009), a atividade projetual já saiu dos escritórios de desenvolvimento de produtos para se tornar um processo difuso.

Algumas práticas já demonstram que a abertura dos projetos para a multidão faz com que usuários e consumidores tenham voz ativa nas decisões do processo de desenvolvimento de produtos e serviços. Isso contribui de maneira significativa para a inovação em empresas dos mais diversos setores. O caso da empresa Procter & Gamble (P&C), citado por Albors et al. (2008) e Enkel et al. (2009), é um dos exemplos onde os processos internos de inovação em produtos foram abertos através da prática do crowdsourcing. Esta prática viabilizou uma mudança na política de propriedade intelectual da empresa, passando a patente de seus produtos para terceiros, ou seja, para os participantes dos processos abertos de desenvolvimento de produtos. Outra mudança percebida pela empresa foi o fato de que, com a abertura dos processos para a multidão, a empresa aumentou em 50% a taxa de satisfação com os produtos.

Neste contexto, o crowd-design pode ser entendido como uma modalidade emergente de sistemas de projeto e produção que utiliza os conhecimentos e recursos disponíveis na multidão, geralmente através da internet, com o propósito de resolver problemas e/ou criar conteúdo. Sua realização pode ocorrer de forma voluntária ou remunerada. Assim, esse artigo apresenta um estudo teórico sobre a aplicabilidade do crowdsourcing em projetos de crowd-design. O que se percebe, com base na literatura consultada, é que as mudanças em processos de desenvolvimento de produtos e modelos de negócios estão se direcionando para o "crowd" (multidão, em tradução livre do inglês) devido à economia de tempo e dinheiro que estes processos proporcionam. Também, porque envolver muitos usuários na busca por soluções podem aumentar as chances de êxito. Sendo assim, este estudo busca esclarecer como o crowdsourcing pode ser aplicado na prática do crowd-design.

Para a realização desse estudo, utilizou-se o método da revisão bibliográfica sistemática (RBS), cujo protocolo é detalhado na subseção 2.1. O portal de consulta foi o Periódico CAPES[1], já que inclui em seu sistema de busca artigos de outros portais, como SCOPUS[2] e Science Direct[3], por exemplo.

Como resultado, este artigo traz, além do protocolo seguido para a realização da RBS, os principais conceitos de crowdsourcing e qual a natureza dos projetos que utilizam esta prática. Por fim, discute-se a aplicabilidade do crowdsourcing em projetos de crowd-design, onde, apesar dos estudos já apontarem para alguns cuidados, ainda há muitas lacunas que demandam novos estudos.

2. METODOLOGIA E DESENVOLVIMENTO

[1] www.periodicos.capes.gov.br/

[2] www.scopus.com/scopus/home.url

[3] www.sciencedirect.com/

A RBS consistiu na busca de artigos do Portal de Periódicos CAPES, associando as palavras crowdsourcing e design. A realização da RBS seguiu um cronograma, baseando-se nas etapas propostas por Conforto et al. (2011), ilustrada na figura 1.

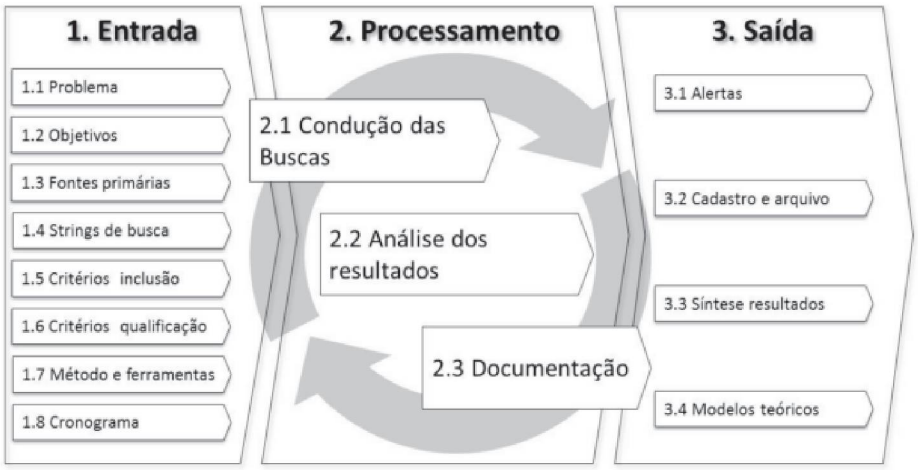


Figura 1 - Etapas para a realização de uma RBS
Fonte: Conforto et al. (2011)

Estas etapas foram executadas de acordo com o cronograma apresentado no quadro 1.

Quadro 1 – Cronograma da RBS

Etapas da RBS segundo Conforto et al. (2011)	Procedimentos realizados	MARÇO 2014	ABRIL 2014
ENTRADA	Entendimento teórico a respeito da RBS	X	
	Elaboração do Protocolo da RBS (Entrada)	X	
PROCESSAMENTO	Pesquisa nas bases de dados de acordo com os strings de busca (Processamento)	X	
	Realização da Seleção 1 (Processamento)	X	X
	Realização da Seleção 2 (Processamento)		X
	Leitura Completa dos Artigos (Processamento)		X
SAÍDA	Organização dos dados e informações nas ferramentas (Saída)		X

Fonte: Elaborado pelos autores.

2.1 Protocolo da revisão bibliográfica sistemática

De acordo com Conforto et al. (2011, p. 6) "a definição do problema é o ponto de partida da revisão bibliográfica sistemática." Assim, definiu-se como **problema** a seguinte questão: como o crowdsourcing pode ser aplicado ao crowd-design? A busca pela resposta, portanto, seguiu objetivos principais e secundários, que foram "a base para a análise dos artigos encontrados nas buscas." (CONFORTO et al., 2011, p. 6). **Objetivo principal:** Elucidar de que maneira o crowdsourcing pode ser aplicado à prática do crowd-design. **Objetivos Secundários:** (a) elucidar os conceitos de crowdsourcing; (b) relacionar os periódicos que mais publicam sobre o tema; (c) relacionar a quantidade de publicações por ano; (d) evidenciar os principais contextos e objetivos de aplicação do crowdsourcing.

A escolha das **fontes primárias** se deu de acordo com a realização de uma pesquisa bibliográfica preliminar, ou seja, sem o rigor de uma revisão sistemática

(CONFORTO et al., 2011). A partir desta investigação inicial, foi possível definir as palavras-chave da pesquisa, ou os strings de busca. Os **strings de busca**, ou seja, os termos utilizados no preenchimento dos campos específicos nas plataformas de base de dados, foram "crowdsourcing" e "design". A aplicação desses strings de busca se deu de duas maneiras: a primeira busca utilizou as palavras como chave de busca específica, e a segunda busca utilizou as palavras combinadas, como por exemplo, "crowdsourcing" + "design".

Os **critérios de inclusão** utilizados, dentre os disponíveis na plataforma Portal de Periódicos da CAPES, foram: "somente artigos"; "artigos no idioma inglês"; "artigos revisados por pares" e "recorte de tempo: artigos publicados nos últimos 10 anos". Para a definição dos **critérios de qualificação**, levou-se em consideração os objetivos apresentados anteriormente. Assim, definiu-se que interessariam para o estudo artigos que, além de definir e conceituar os termos citados, também trouxessem exemplos práticos e resultados destas aplicações ou análises.

Já o **método** utilizado para a RBS, foi: elaboração do protocolo; acesso à base de dados do Portal de Periódicos da CAPES durante as duas primeiras semanas do mês de março do corrente ano para seleção dos artigos a partir da leitura do título e resumo (Seleção 1). Após as buscas, foi realizada a leitura completa dos artigos (Seleção 2). As **ferramentas** selecionadas para serem utilizadas na etapa de processamento e saída de informações foram, respectivamente, o software Meledey[4] e um software de edição de planilhas. Por fim, seguiu-se o cronograma já apresentado na tabela 1.

2.2 Dados acerca da Revisão Bibliográfica Sistemática

A tabela 1 apresenta a quantidade de artigos encontrados pelo Sistema de Busca do Portal de Periódico CAPES para os strings de busca utilizados junto aos critérios de inclusão.

Tabela 1 - Quantidade de Artigos encontrados pelo Sistema de Busca do Portal de Periódico CAPES, de acordo com os strings de busca

Strings de Busca Utilizados	Critérios de Inclusão Acionados	Número de Artigos encontrados pelo Sistema
"Crowdsourcing"	• Somente artigos; • Artigos no idioma inglês; • Artigos revisados por pares; • Recorte de tempo: artigos publicados nos últimos 10 anos.	1.195 (mil cento e noventa e cinco artigos)
"Crowdsourcing" + "Design"	• Somente artigos; • Artigos no idioma inglês; • Artigos revisados por pares; • Recorte de tempo: artigos publicados	598 (quinhentos e noventa e oito artigos)

[4] Mendeley é um gerenciador de referências livre (grátis) para estudantes e pesquisadores. A partir de sua utilização é possível criar uma biblioteca digital totalmente pesquisável em segundos, citar enquanto escreve, bem como ler e fazer anotações em PDFs em qualquer dispositivo (Disponível em: http://www.mendeley.com/en/2/1/). Acesso em 30/04/2014.

	nos últimos 10 anos.	

Fonte: Dos autores.

O filtro para o string de busca "crowdsourcing", mesmo com os quatro critérios de inclusão acionados, encontrou mais de mil artigos. Desta maneira, restringiu-se a busca adicionando o termo "design". Assim, o número de artigos diminuiu pela metade. Destes, foram selecionados 41 (quarenta e um) artigos para a leitura integral, a partir da leitura do título, resumo e das palavras-chave. A leitura completa dos artigos foi realizada virtualmente, através do software Mendeley. Este software permite destacar partes relevantes do texto e incluir comentários no próprio arquivo. Também, auxilia na elaboração automática da lista de referências. Os conteúdos extraídos de cada artigo foi organizado em um software de edição de planilhas, sendo os principais: (a) nome dos autores; (b) ano da publicação; (c) título do artigo; (d) definição de crowdsourcing; (e) se o artigo citava o Mechanical Turk[5] como exemplo de plataforma crowdsourcing; (f) assunto ou contexto de aplicação do crowdsourcing; e (g) comentários gerais a respeito da aplicabilidade para o crowd-design.

Estes procedimentos foram fundamentais para: (1) a leitura direcionada dos artigos, pois, já sabia-se o que se estava buscando de informação e (2) a organização dos dados para posterior análise (apresentada no tópico 3).

Com relação aos periódicos que mais publicam sobre o tema, percebe-se que a maioria pertence às áreas de Computação e Tecnologia da Informação. Apesar disso, também foram encontradas publicações em periódicos de áreas relacionadas ao Marketing, Gerenciamento de Negócios, Conhecimento e Processos, bem como da área de Psicologia Social.

De acordo com o critério de inclusão "recorte de tempo: artigos publicados nos últimos 10 anos", a busca trouxe o seguinte resultado: (a) nenhum artigo para anos anteriores a 2008; (b) dois artigos de 2008 a 2009 (sendo um artigo por ano); (c) dois artigos em 2010; (d) seis artigos em 2011; (e) 14 artigos em 2012; (f) 16 artigos em 2013 e (g) dois artigos em 2014 (considerando até o mês de abril). Considerando-se que o termo crowdsourcing apareceu pela primeira vez em 2006, percebe-se, portanto que as discussões sobre os temas desta pesquisa são recentes e vem ganhado representatividade ao longo dos últimos quatro anos: 38 artigos publicados entre 2011 e 2014 (até o mês de abril), comparado aos quatro artigos publicados entre 2008 e 2010.

3. RESULTADOS E DISCUSSÃO

3.1 Definição de Crowdsourcing

Dos 41 trabalhos que compõem a RBS, 16 referenciam Jeff Howe como autor do termo e apresentam a sua definição. Porém, outros autores apresentam diferenças na definição do mesmo termo. O quadro 2 contém a relação das principais definições de crowdsourcing encontradas e seus respectivos autores. A relação foi organizada em ordem cronológica para, desta forma, observar se houve alteração ao longo dos anos.

[5] Este dado foi acrescentado a partir da leitura do terceiro artigo, onde percebeu-se que os dois artigos lidos anteriormente também citavam esta plataforma. Ao final da leitura dos artigos, percebeu-se que é a plataforma de crowdsourcing mais citada.

Quadro 2 - Definições de Crowdsorcing encontradas na RBS

Autor(es)/Data	Definição de crowdsourcing
Howe (2006), também citado por ENKEL et al. (2009); CORNEY et al. (2010); BÜCHELER E SIEG (2011); ALONSO E MIZZARO (2012); ESTELLES-AROLA E GONZALES-LADRON-DE-GUEVARA (2012); ZAHO e ZHU (2012); BAYUS (2013); BANNERMAN (2013); DAI et al. (2013); DJELASSI e DECOOPMAN (2013); GASSENHEIMER et al. (2013); GERBER e HUI (2013); GUPTA e SHARMA (2013); HIRTH et al. (2013); TUNG e TSENG (2013); WEEKS e VELTRI (2013)	Refere-se ao ato de uma empresa ou instituição terceirizar [ou fazer um convite aberto] para uma rede indefinida (e geralmente grande) de pessoas, um trabalho ou tarefa que, geralmente, seria realizado pelos seus próprios funcionários.
Kleemann et al. (2008, apud BEHREND et al., 2011)	Refere-se à mobilização intencional para exploração comercial de ideias criativas e outras formas de trabalho realizadas por consumidores.
Corney et al. (2010)	É uma ferramenta para facilitar a inteligência das máquinas em uma fábrica baseada no conhecimento.
Adams (2011)	Crowdsourcing refere-se a um mecanismo específico que as empresas usam para se envolverem com os consumidores. Tarefas como a resolução de problemas e controle de qualidade, uma vez que foram realizados, quer internamente ou contratados para os funcionários externos, estão agora "terceirizadas" para os grupos-alvo específicos, públicos ou gerais ("a multidão") através da web.
Wexler (2011)	Pode ser entendido como o uso de uma entidade focal em uma multidão entusiasmada ou vagamente ligada para fornecer soluções para problemas.
Behrend et al. (2011, apud AZZAM E JACOBISON, 2013)	É operacionalmente definido como o recrutamento pago de (...) uma força de trabalho global independente para o objetivo de trabalhar em uma tarefa especificamente definida ou um conjunto de tarefas.
Bannerman (2013)	O termo 'crowdsourcing' invoca comparações obscuras com a terceirização, mas, ao mesmo tempo, é otimista, retratado a maneira de aproveitar a criatividade das massas de graça, ou por um preço moderado.
Djelassi e Decoopman (2013)	Refere-se à abertura dos processos e modelos de negócio da empresa para "a multidão" por meio de aplicativos da Web 2.0 com o objetivo de obter acesso a recursos externos (ideias, habilidades, conhecimentos, tecnologias, etc.).

Fonte: Dos autores, baseados nos autores citados no próprio quadro.

Assim, apesar de não explicitar que o crowdsourcing pode acontecer de maneira que haja a remuneração dos participantes, a definição mais utilizada é a de Howe, de 2006. Apenas a partir de 2011 é que a definição de crowdsourcing aponta para a questão da remuneração (BEHREND et al., 2011, apud AZZAM E JACOBISON, 2013). Todas as definições encontradas, porém, enfatizam a utilização do conhecimento e/ou criatividade da multidão para um determinado propósito.

Estelles-Arola e Gonzales-Ladron-de-Guevara (2012) realizaram um estudo aprofundado a respeito das definições de crowdsourcing e, a partir da análise de casos, chegaram a seguinte definição:

> [...] é um tipo de atividade participativa online, na qual pessoas e/ou empresas propõem para um grupo de pessoas de várias áreas do conhecimento, heterogêneo e numeroso, a partir de uma convite aberto, o engajamento voluntário a uma tarefa. A tarefa, de complexidade e modularidade variadas, e da qual a multidão deve participar oferecendo seu trabalho, dinheiro, conhecimento e/ou experiência, sempre implica em benefício mútuo. O usuário irá receber a satisfação para determinada necessidade, seja ela econômica, reconhecimento social, auto estima ou o desenvolvimento de habilidades individuais, enquanto que o demandante da tarefa irá obter e utilizar para seu benefício os resultados que os usuários trouxerem, dependendo do tipo de atividade demandada. (ESTELLES-ARROLA e GONZALES-LADRON-DE-GUEVARA, 2012, p. 197).

A definição destes autores traz uma síntese do que vem a ser o crowdsourcing, acrescentando que podem haver desdobramentos, como por exemplo, o engajamento a multidão no financiamento de projetos. Segundo Bannerman (2013) e Djelassi e Decoopman (2013), quando isto acontece, o processo é chamado de crowdfunding[6]. Geralmente estes financiamentos ocorrem para a viabilização de projetos culturais. A plataforma kickstarter.com, por exemplo, possui 13 categorias diferentes de projetos financiáveis: arte, história em quadrinhos, dança, moda, comida, jogos, fotografia, edição, tecnologia, teatro, cinema, música, e design, sendo estes três últimos os mais populares entre os usuários (ZHOU, 2012). Outro desdobramento apontado por Djelassi e Decoopman (2013) é o crowdlabor[7], onde o consumidor fornece o trabalho e executa tarefas que vão das mais simples às mais complexas. A diferença para o crowdsourcing é que o participante é considerado um trabalhador real da empresa (DJELASSI e DECOOPMAN, 2013).

3.2 Crowdsourcing e sua aplicabilidade ao Crowd-Design

Para Corney et al. (2010), a aplicacão do crowdsourcing oferece a oportunidade de descobrir efetivas estratégias de resolução à problemas, pois devido à natureza digital da atividade, é possível gravar, observar e avaliar as estratégias de solução à problemas da perspectiva de muitos indivíduos. Essas atividades são executadas por pessoas que não necessariamente se conhecem, mas interagem com a empresa através de ferramentas virtuais e da conexão com a internet. Por isso, inúmeras são as aplicações possíveis, e a natureza dos projetos são diversas. Nesse sentido, no quadro

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[6] São exemplos de plataformas de crowdfunding: kickstarter.com, mymanagercompagny.com, indiegogo.com.

[7] Por exemplo: mobileworks.com, samasource.org e transcribeme.com.

3 há uma relação sobre a natureza das principais abordagens encontradas na literatura consultada.

Quadro 3 - Natureza das principais aplicações de crowdsourcing

Objetivo do Projeto	Referências
Aprendizagem e colaboração em rede	ALBORS et al., (2009); CORNEY et al. (2010)
Pesquisa e desenvolvimento (científico e não científico)	ENKEL et al. (2009); BÜCHELER e SIEG (2011)
Desenvolvimento de produtos	BRABHAM (2010); DJELASSI e DECOOPMAN (2013)
Melhoria de serviços	ADAMS (2011)
Pesquisa de opinião	BEHREND et al. (2011)
Resolução de problemas	SANSOM (2011)
Avaliação de relevância	ALONSO (2012); ALONSO e MIZZARO (2012)

Fonte: Dos autores.

Para ilustrar com mais detalhes sobre a natureza das aplicações de crowdsourcing, Zaho e Zhu (2012) utilizaram duas dimensões para classificá-las: contexto e função. O contexto, por sua vez, foi dividido em duas categorias: empresarial e não-empresarial. O primeiro contexto inclui empresas, organizações sem fins lucrativos ou mercados, enquanto que o segundo inclui as organizações sem fins lucrativos ou instituições, tais como bibliotecas públicas, centro de pesquisa e desenvolvimento, governo, etc., onde a participação em massa e a colaboração científica acontecem. Para os autores, o contexto de uma aplicação desempenha um papel importante no sentido de refletir os impactos e significados do crowdsourcing.

Já a dimensão da função representa a parte do produto e/ou do ciclo de vida do serviço que está sendo requisitado através do crowdsourcing (VUKOVIC, 2009 apud ZAHO e ZHU, 2012). Ou autores afirmam que é possível caracterizar as funções do crowdsourcing pela natureza e complexibilidade da tarefa. Tarefas de baixa complexidade geralmente referem-se a tarefas de rotina, como a coleta de dados, classificação e tradução de textos simples. Tarefas de média complexidade geralmente se referem às tarefas criativas, como desenvolvimento de logotipo, fotografia ou publicidade gerada pelo usuário. Já as tarefas de alta complexidade estão relacionadas, principalmente, ao desenvolvimento de produtos (ZAHO e ZHU, 2012). Ainda, para Djelassi e Decoopman (2013), o crowdsourcing pode ser classificado, de acordo com as tarefas, em não criativo e criativo, sendo este último associado ao desenvolvimento de produtos.

Djelassi e Decoopman (2013) abordaram a questão do desenvolvimento de produtos, porém, sob a ótica do Marketing. Como resultado, encontraram as interrelações entre os diferentes componentes deste modelo de negócio e as interações entre empresas e clientes. A principal limitação do estudo citado, porém, é que foram entrevistados apenas os consumidores que já tinham experiência na participação de um processo de crowdsourcing, mas não ficou claro se estes

participantes eram Designers ou profissionais de áreas afins. O estudo também não esclarece quais os obstáculos e os medos que limitam a participação dos usuários que não são familiarizados com a prática do crowdsourcing. Além disso, as empresas da amostra do estudo foram empresas de bens de consumo, que, segundo os autores, é o setor em que o crowdsourcing é usado com mais frequência. Ainda, na opinião dos autores, valeria a pena estender a pesquisa para outros setores, como o de serviços ou bens de consumo duráveis (DJELASSI e DECOOPMAN, 2013).

Brabham (2010), no entanto, comenta que o envolvimento de não-especialistas na resolução de problemas de design pode trazer soluções de qualidade superior e mais rentáveis para as empresas. O autor acredita, ainda, que o processo de desenvolvimento de soluções a partir do crowdsourcing gera uma riqueza de dados, e que as ideias vencedoras contribuem de forma significativa para a compreensão de como as pessoas resolveriam um determinado problema, podendo ser fonte de inspiração para a inovação. Nesse sentido, o caso da empresa P&G, citado por Albors et al. (2008), ilustra as vantagens da utilização do crowdsourcing para a inovação: antes da abertura do processo, apenas 10% da capacidade de inovação da empresa era utilizada. No entanto, os autores não esclarecem como se deu este processo; apenas enfatizam que, para este processo ser sustentável, depende do incentivo e motivação oferecidos aos participantes. Já Enkel et al. (2009) apontam para a ocorrência da desvantagem competitiva em empresas que não aproveitam a oportunidade de inovar incluindo a multidão em seus processos, pois, para os autores, "a maior inovação é baseada em uma recombinação do conhecimento existente, conceitos e tecnologia" (ENKEL et al., 2009, p. 314).

Massanari (2012), por sua vez, analisou cinco plataformas de crowdsourcing com foco em projetos de design gráfico[8], com o objetivo de esclarecer as mudanças que ocorrem na maneira de se projetar. Constatou que os Designers que participam deste tipo de processo provavelmente recebem uma remuneração muito menor do que os salários, tendo como base os valores de mercado dos Estados Unidos. Talvez porque, segundo a autora, as empresas que demandam este tipo de projeto através das plataformas não tenham conhecimento sobre a importância e o valor que o design possui. Neste mesmo sentido, encontrou-se em Bannerman (2013) a informação de que algumas organizações internacionais de design têm se revelado contra o crowdsourcing. Um exemplo é a organização *SPEC NO!,* formada por Designers para protestar contra concursos, onde, muitas vezes, os designers apresentam projetos, mas não tem a garantia de pagamento. Esta pode ser, sem dúvida, uma forte desvantagem em se utilizar o crowdsourcing em projetos de crowd-design.

Apesar disso, a quantidade de plataformas de crowdsourcing é crescente. A Plataforma Amazon Mechanical Turk, por exemplo, foi citada pela maioria dos artigos como a mais conhecida e, portanto, referência no quesito plataforma de crowdsourcing para a realização de tarefas de baixa complexidade - de acordo com a classificação de Zhao e Zhu (2012). O quadro 4 traz a lista de outras plataformas, citadas por, pelo menos, dois artigos.

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[8] Plataformas analisadas por Massanari (2012): 99designs.com; designbyhumans.com; designcrowd.com; huffingtonpost.com; threadless.com

Quadro 4 - Plataformas de Crowdsourcing citadas em mais de um artigo

Plataforma	Link	Referências
Mechanical Turk	www.mturk.com	ALONSO e MIZZARO (2012); ALONSO (2012) e AZZAM e JACOBSON (2013)
99Designs	www.99designs.com	BANNERMAN (2013) e ZHAO e ZHU (2013)
Odesk	www.odesk.com	AZZAM e JACOBSON (2013) e DIN, LAN, WELD (2013)
INNOCENTIVE	www.innocentive.com	ALBORS, RAMOS e HERVAS (2008) e BANNERMANS (2013)

Fonte: Dos autores.

Ainda, Zaho e Zhu (2012) apontaram como plataformas exclusivas de crowdsourcing para desenvolvimento de produtos: 99Designs, Threadless (www.threadless.com), iStockPhoto (www.istockphoto.com), Mass Mapping (site não encontrado) e People Per Hour (www.peopleperhour.com).

A utilização destas plataformas requer, no entanto, conhecimento sobre o funcionamento do processo, incluindo a fase de preparação. Nesse sentido, Alonso (2012) enfatiza a importância dos estágios iniciais, ou seja, da preparação de uma tarefa: primeiro, deve-se escolher, criteriosamente, a plataforma de crowdsourcing onde a tarefa será disponibilizada; segundo, deve-se testar a realização da tarefa com uma equipe interna, para ter certeza de que as informações estão claras, e que a tarefa pode ser realizada inclusive por não especialistas.

Já Brabham (2010) aponta nove princípios norteadores para a elaboração da tarefa: (1) definir claramente o problema e as soluções que são esperadas; (2) determinar o nível de comprometimento da empresa com os resultados obtidos, no sentido de explicitar o tipo de solução que será produzida e porquê; (3) entender o que motiva a participação dos usuários; (4) investir em um site que é utilizável, interessante e bem concebido; (5) ter um plano promocional e um plano para o crescimento da comunidade; (6) ser honesto, transparente e ágil; (7) não controlar o comportamento da multidão, pois ela não está sendo consultada para realizar os objetivos organizacionais e sim convidada a se envolver no processo de desenvolvimento de produtos; (8) reconhecer os usuários, entregando-lhes as premiações que lhe forem prometidas; (9) avaliar o projeto sob vários ângulos, solicitando sempre o feedback dos participantes. Seguindo estes princípios, o autor acredita ser possível elaborar um projeto de crowdsourcing que seja eficaz.

4. CONSIDERAÇÕES FINAIS

Para contribuir com o entendimento das mudanças que estão ocorrendo na maneira de se projetar em design, este artigo apresentou um estudo para elucidar a aplicabilidade do crowdsourcing em projetos de crowd-design. Como método de investigação teórica, a RBS mostrou-se eficaz, sobretudo na organização da pesquisa. A principal vantagem foi iniciar a pesquisa a partir da elaboração de um protocolo, que guiou, principalmente, os primeiros estágios e sistematizou a busca de artigos.

Assim, pode-se entender que o crowdsourcing é uma prática recente e que vem sendo investigada por várias áreas do conhecimento. Devido à redução de tempo e custo para a realização de tarefas que possuem diferentes fins e graus de

complexidade, esta prática é crescente entre as empresas, sendo relacionada principalmente à inovação. Esta pode estar associada tanto à abertura do processo, como aos próprios resultados obtidos.

Apesar das investigações científicas sobre o assunto terem se intensificado somente a partir dos anos 2010, no que diz respeito a projetos de crowd-design, muitas ainda são as lacunas. Faltam, por exemplo, investigações de casos específicos sobre projetos de desenvolvimento de produtos, onde seria possível esclarecer as dúvidas a respeito da motivação dos participantes, do teor das tarefas (clareza das informações, grau de complexidade, tempo disponível para a execução, dentre outros) e das respectivas remunerações. Talvez, por este assunto não ser muito explorado em estudos científicos, o que se encontrou como desvantagem foi o fato de algumas entidades de design perceberem esta prática como especulativa. Como ainda não estão claros os procedimentos para a aplicação do crowdsourcing para o crowd-design, não se apresenta claro, também, qual é o papel do Designer neste tipo de processo.

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O PROCESSO DE DESENVOLVIMENTO DE PRODUTOS VIA CROWD-DESIGN: oportunidades para a sustentabilidade

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Resumo: O presente artigo avalia as implicações para a sustentabilidade do processo de desenvolvimento de produtos realizados em plataformas de Crowd-Design. O texto é baseado em pesquisa-ação em andamento no Núcleo de Design e Sustentabilidade da UFPR, através do Projeto Sustainability Maker. Com base na literatura e nos resultados obtidos com a realização da primeira etapa do estudo em andamento, é apresentada uma análise comparativa do modelo ortodoxo do processo de desenvolvimento de produtos com um modelo baseado no Crowd-Design, incluindo recomendações para aplicações práticas bem como as principais vantagens e desvantagens desta abordagem de projeto sob a ótica da sustentabilidade.

Palavras-chave: inovação, PDP, Crowd-Design, design para a sustentabilidade.

Abstract: *This paper assesses the implications for the sustainability of the product development process performed in Crowd-Design platforms. The text is based on action research in progress at the <blind review> through Sustainability Maker Project. It presents also a comparative analysis of the orthodox model of the product development process with a model based on Crowd-Design, based on the literature and the results obtained by carrying out the first stage of the ongoing study. It includs recommendations for*

practical applications as well as main advantages and disadvantages of this project from the perspective of sustainability approach.

***Keywords**: innovation, DPP, Crowd-Design, design for sustainability*

1. INTRODUÇÃO

O contexto da rápida expansão da conectividade em rede oferece grandes oportunidades para avanços no campo do Design, especificamente no processo de desenvolvimento de produtos (PDP). Dentre as oportunidades está o fenômeno da crescente abertura do PDP para a participação de todos os *stakeholders* através da internet, configurando uma verdadeira "multidão".

Conforme Tapscott & Williams (2008) a colaboração em massa, através de seu custo reduzido, permitem que muitos milhares de indivíduos e pequenos produtores criem em conjunto soluções em produtos/serviços e ingressem em mercados, o que no passado só as grandes empresas conseguiam. Desta forma, tem-se como pressuposto que o envolvimento desta multidão no processo de Design (Crowd-Design) pode gerar não só um número maior de soluções alternativas, mas também reduzir o tempo de desenvolvimento de projetos, diminuir custos, além de possibilitar a criação de redes de suporte à implementação e manutenção das soluções.

Este artigo se propõe a avaliar as implicações para a sustentabilidade do processo de desenvolvimento de produtos realizados em plataformas de Crowd-Design a partir de uma análise comparativa entre o modelo ortodoxo do processo de desenvolvimento de produtos e um modelo baseado no Crowd-Design. O tema vem sendo analisado no âmbito do Núcleo de Design e Sustentabilidade da UFPR através do Projeto Sustainability Maker (www.sustainabilitymaker.org). O projeto é liderado pela empresa E-Concept (Alemanha), sendo o desenvolvimento da plataforma financiado pela Comunidade Européia através do Programa LIFE (LIFE11 ENV/DE/000342). No projeto Sustainability Maker um dos autores deste artigo ocupa a posição no *Advisory Board*.

2. DEFINIÇÕES

O **Crowd-Design** é uma modalidade emergente de sistema de projeto e produção que utiliza os conhecimentos e recursos disponíveis na multidão, geralmente através da internet, com o propósito de resolver problemas e/ou criar conteúdo. Sua realização pode ocorrer de forma voluntária ou remunerada.

Outra abordagem associada ao Crowd-Design é o Crowd-Sourcing. Este último é um termo utilizado pela primeira vez em 2006, por Jeff Howe em um artigo da revista *Wired* (ALONSO, 2012; BAYUS, 2013 e ABRAHAMSON, 2013). **Crowd-Sourcing** consiste no ato de terceirizar, de maneira aberta e colaborativa, um trabalho tradicionalmente realizado por um funcionário contratado de uma empresa. Esta terceirização acontece sob a forma de um convite aberto para um grande grupo de pessoas, e geralmente é realizado a partir da web.

O processo de seleção de alternativas nestes ambientes voltados à multidão pode utilizar o **Crowd-Voting**. Este usualmente ocorre através de sites que buscam obter a opinião de um grande número de pessoas acerca de um determinado tópico. Exemplo de Crowd-Voting pode ser encontrado na votação sobre qual a melhor

tradução para um dado texto na plataforma Mechanical Turk, da Amazon (ALONSO E MIZZARRO, 2012; ALONSO, 2012; AZZAM E JACOBSON, 2013; BANNERMMAN, 2013).

Para financiar projetos através de envolvimento da multidão pode-se utilizar o **Crowd-Funding**, que consiste da solicitação pública de financiamento de projetos específicos. Nesta abordagem, contribuições pequenas de indivíduos isolados são somadas de forma a contribuir para viabilizar a execução de um dado projeto (ROBSON, 1993). O financiamento é solicitado on-line, geralmente em quantidades relativamente pequenas, a partir de doadores individuais ou investidores, e são destinadas para projetos específicos, como: empréstimos pessoais para as pequenas empresas, produção camisetas (t-shirt), ou a produção de filmes ou música (BANNERMAN, 2013). Nesse sentido, o Crowd-Funding desafia o modelo tradicional de investimento privado, através do qual um grande investidor ou um pequeno grupo de investidores financia um projeto (BELLEFLAMME et al., 2011). O financiamento pode ocorrer também através de maneira similar a *equity funds*, onde os apoiadores passam a ser sócios do projeto.

3. MODELOS DO PROCESSO DE DESENVOLVIMENTO DE PRODUTOS (PDP)

3.1 Modelos Ortodoxos do PDP

Gomes (2011) comparou os modelos de Processo de Desenvolvimento de Produtos (PDP) propostos por Crul e Diehl (2006), Charter e Tischner (2001), Varžinskas (2007), Pereira (2003), Rozenfeld et al. (2006) e Baxter (2000). O autor conclui que o modelo de Rozenfeld et al. (2006) é o mais completo dentre estes autores. Sua estrutura é baseada em três macro-fases: pré-desenvolvimento, desenvolvimento e pós-desenvolvimento, conforme descrito a seguir.

Na macro-fase de pré-desenvolvimento é onde é delineada a estratégia de PDP da empresa, incluindo os objetivos e metas relativos ao portfólio. Esta macro-fase divide-se em Planejamento Estratégico do Produto e Planejamento do Projeto. O objetivo do Planejamento Estratégico do Produto é a definição de um portfólio de produtos para a empresa, ou seja, descrever uma linha de produtos e os projetos a serem desenvolvidos. Este Planejamento Estratégico pode envolver inclusive planos de retiradas de produtos já constantes no portfólio. O Planejamento do Projeto é um elemento essencial desta macro-fase, apontando desde o escopo do projeto e do produto, orçamento, prazos, definição do pessoal, recursos, procedimentos de avaliação, análises de risco e indicadores de desempenho do projeto e produto (ROZENFELD et al., 2006).

A macro-fase de desenvolvimento envolve o processo de projeto, detalhamento e produção do produto. Esta macro-fase divide-se em Projeto Informacional, Projeto Conceitual, Projeto Detalhado, Preparação da Produção e Lançamento do produto. Na fase de do Projeto Informacional devem resultar as especificações-meta do produto, que orientarão a geração de soluções, fornecendo uma base para elaboração de critérios de avaliação e tomadas de decisão. A fase seguinte trata do Projeto Conceitual, o qual objetiva a busca, criação, representação e seleção de soluções para o problema identificado no Projeto Informacional. No Projeto Detalhado, são realizadas todas as especificações e detalhamentos, os protótipos são testados resultando no detalhamento de todos os recursos, manuais de uso, instruções de assistência, além de suporte às equipes de venda. Finalmente, na Preparação da Produção é produzido um lote de produção piloto, permitindo que o

processo produtivo seja mapeado e melhor definido. Por fim, ocorre o Lançamento do Produto, implicando em projeto e implementação de processos de assistência técnica e auxílio ao consumidor (ROZENFELD et al., 2006).

Finalmente, a última macro-fase do modelo de Rozenfeld et al (2006) trata do pós-desenvolvimento, que inclui as atividades do pós venda até o fim do seu ciclo de vida do produto. Esta macro-fase divide-se no modelo nas etapas de Acompanhar o Produto e Processo e Descontinuar o Produto. O acompanhamento do produto inclui a realização de atividades como: avaliação da satisfação do cliente, o monitoramento do desempenho do produto, auditoria pós-projeto e o registro de lições aprendidas. A descontinuidade do produto inclui as atividades de: analisar e aprovar descontinuidade do produto, planejar a descontinuidade do produto, preparar o recebimento do produto, acompanhar o recebimento do produto, descontinuar a produção, finalizar suporte ao produto e a avaliação geral e encerramento do projeto (ROZENFELD et al., 2006).

3.2 Modelo de PDP via Crowd-Design

O modelo de PDP via Crowd-Design apresentado na figura a seguir é adotado no Projeto Sustainability Maker (SuM, 2014, web). Neste modelo, o ponto de partida refere-se à compreensão dos problemas de uma dada comunidade ou organização, bem como suas implicações para a sustentabilidade. Com o propósito de determinar o problema que seja efetivamente relevante na percepção da comunidade/organização afetada, estes são votados pelo próprio grupo de pessoas que os relatou. Acontece, então, o primeiro Crowd-Voting. A partir daí, é definido o desafio - etapa *challenge* -, cujo processo de desenvolvimento da ideia solução é aberto e realizado a partir do processo de Crowd-Sourcing.

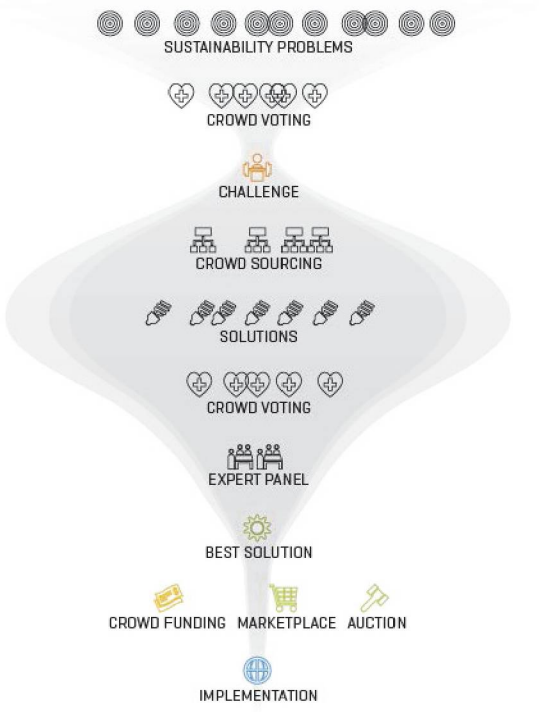


Figura 1 - Modelo de PDP via Crowd-Design.
Fonte: SuM (2014, web).

O desafio consiste na definição de uma pergunta central, apoiada por informações que permitam aos participantes a compreensão adequada do problema. Estas informações podem incluir desde relatos textuais até vídeos síntese, *storyboards* ou fotografias. Neste caso, muitas poderão ser as ideias de solução para o desafio - etapa *solution*. Por este motivo, ao final do processo de Crowd-Sourcing, as ideias de soluções recebidas são postas em votação, sendo este o segundo momento onde ocorre o Crowd-Voting. Este acontece a partir do envolvimento da comunidade de onde surgiu o problema juntamente com o envolvimento de um grupo de especialistas (*expert panel*).

Após a escolha da melhor ideia de solução do problema central do desafio - etapa *best solution* -, inicia-se o processo de viabilização de implementação. Esta é realizada a partir do processo de Crowd-Funding, via de regra aberto, onde a ideia de solução escolhida é apresentada à multidão com o intuito de que a produção seja por ela financiada. A implementação do projeto ocorre quando a melhor ideia de solução é produzida com os recursos arrecadados (SuM, 2014, web). Pode-se utilizar também as plataformas de *marketplace* ou leilões virtuais para comercializar as soluções desenvolvidas.

3. MÉTODO DE PESQUISA

A coleta de dados nesta pesquisa vem sendo realizada com base nos princípios de Thiollent (1985), Mello e Turrioni (2011) e Robson (1993) para a pesquisa-ação. Para tanto, a pesquisa de campo segue, desta forma, um processo cíclico, sendo que o presente artigo foi elaborado quanto o processo de Crowd-Design se encontrava na etapa de levantamento de problemas, conforme ilustra a figura a seguir.

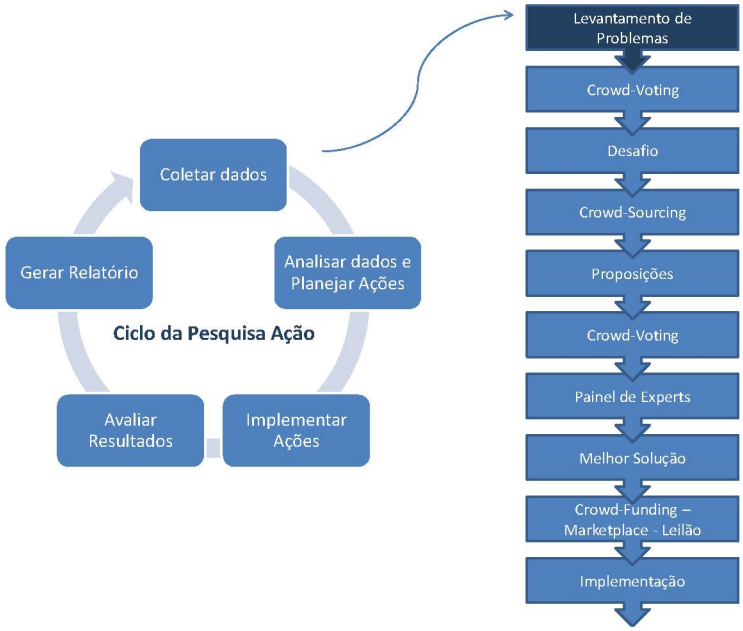


Figura 2: Ciclo da Pesquisa Ação e o Contexto da Fase do Projeto Sustainable Maker
Fonte: Dos autores.

Na pesquisa-ação onde o modelo do Projeto Sustainability Maker vem sendo desenvolvido, além do envolvimento de uma comunidade de baixa renda no município de Piraquara/PR, há o envolvimento também de uma empresa da iniciativa privada. O

desafio do projeto é justamente a compatibilização da demandas e interesses da comunidade com os delineamentos estratégicos e as competências da empresa parceira.

A fase na qual se encontrava o projeto quando da redação do presente artigo é referente ao "levantamento de problemas". Para realizar esta etapa, o protocolo de coleta de dados prevê três visitas a campo: (1) reunião com a líder da comunidade para verificar o interesse em participar do projeto; (2) consulta preliminar acerca do perfil da comunidade (questionário) e levantamento inicial de problemas percebidos pelos moradores em resposta à pergunta *"qual o principal problema em sua habitação?"*; (3) coleta de dados em amostra de moradias através de múltiplas técnicas de coleta de dados (entrevista, *paparazzi* e *storytelling*). A estratégia de análise envolve a utilização de *brainstorming*, mapas mentais e *storyboards*.

4. ANÁLISE COMPARATIVA DO MODELO ORTODOXO DO PDP x CROWD-DESIGN

A seguir é apresentada análise comparativa do PDP e Crowd-Design com foco em cinco aspectos. A análise utiliza tanto informações oriundas da literatura assim como *insights* obtidos na pesquisa ação em andamento.

4.1 Definição do Problema

O modelo de Rozenfeld et al. (2006) utiliza uma estrutura modular, estabelecendo em seu primeiro módulo as definições estratégicas, a partir das quais é determinado o foco das próxima etapas do PDP. No modelo do Projeto Sustainainability Maker, a primeira etapa trata da compreensão do problema, o que pode incluir atividades como: (1) contatar a comunidade, (2) coletar suas contribuições e (3) fazer uma primeira triagem com relação aos problemas relatados. Só a partir daí é que os problemas poderão ser entendidos, votados (etapa Crowd-Voting), e o problema escolhido poderá ser transformado em desafio. Este modelo prioriza, portanto, o sentido "bottom up" do processo de decisão.

Segundo Manzini (2008), quando há mudanças no modo como indivíduos ou comunidades agem para resolver seus problemas ou criar novas oportunidades, há, na verdade, inovações guiadas por mudanças de comportamento dos indivíduos, geralmente emergindo através de processos operacionais "de baixo para cima" em vez daqueles "de cima para baixo" (MANZINI, 2008, p. 62). Os processos operacionais aos quais o autor se refere são, na verdade, iniciativas cuja a própria comunidade se envolve, desde a definição até a solução dos problemas. Conclui-se, portanto, que sob o ponto de vista da definição do problema, a abordagem em Crowd-Design oferece maiores possibilidades de resultar em soluções efetivamente sustentáveis pois amplia a governança do processo de Design.

Para o levantamento de problemas, a equipe da pesquisa-ação já realizou o encontro com os moradores da comunidade, onde além de apresentar o projeto, também foram coletados dados sobre, por exemplo, a quantidade média de moradores por habitação, materiais utilizados para a construção das mesmas e quantidade de cômodos. Porém, em resposta à pergunta *"qual o principal problema em sua habitação?"*, alguns moradores citaram, por exemplo, a falta de identificação das ruas (como placas e número do CEP). Entende-se que a resolução a este tipo de problema compete aos órgãos públicos relacionados à urbanização. Nesse sentido, a coleta de dados em amostras de moradias vem se mostrando mais eficaz. Até a

finalização deste artigo, esta coleta ainda não havia sido concluída. Porém, a partir dos dados já obtidos com a aplicação das técnicas de observação e *storytelling*, começam a aparecer os reais problemas, diretamente relacionados às habitações. Apesar disso, é apenas com a conclusão desta etapa que os dados serão analisados por completo para que se possa retornar à comunidade para a apresentação dos problemas comuns e para a realização do primeiro Crowd-Voting.

4.2 Definição de briefing

No modelo de Rozenfeld et al. (2006), a macro-fase denominada pré-desenvolvimento contempla o Planejamento do Produto, que inclui a descrição do Briefing. Para Tavares (2007), Briefing é um instrumento usado para coletar informações para, com base nelas, planejar e agir. A equipe de Design é usualmente claramente definida e as possiblidades de comunicação com o público alvo é ampla, possibilitando inclusive a própria revisão do problema.

No modelo aberto da Plataforma Sustainability Maker (SuM, 2014, web), pode-se dizer que a definição do Briefing acontece na macro-fase denominada *challenge*, pois este é o momento de síntese das informações críticas que serão utilizadas pela "multidão" na elaboração de propostas para solução do problema (Crowd-Sourcing). Clareza no Briefing, além de linguagem estimulante, é um dos aspectos críticos para o sucesso de um desafio no processo de Crowd-Design. Para definir o Briefing, portanto, são necessários testes para saber se as informações contidas no mesmo são suficientes e entendíveis. Num processo de Crowd-Sourcing, o desenvolvimento da solução é aberto, isso significa que profissionais e pessoas de todo o mundo podem participar, enviando suas ideias. Nesse sentido, até mesmo a questão do idioma pode ser uma barreira para sua plena realização.

Assim, como forma de já testar qual a melhor maneira de disponibilizar as informações na plataforma do Projeto Sustainability Maker, foi desenvolvido um vídeo[1] *teaser*, que traz o apontamento de um problema na visão de uma das moradoras da comunidade. O vídeo foi elaborado de maneira a contextualizar o tema – Habitação de Interesse Social; apresentar a comunidade através de imagens coletadas no local; e mostrar o depoimento da moradora. Para que o vídeo pudesse ser visto e entendido por um maior número de pessoas, o idioma utilizado nos textos explicativos e nas legendas foi o inglês.

No caso da geração de ideias a partir do Crowd-Sourcing, os autores Azzam e Jacobson (2011); Alonso (2012); Alonso e Mizzaro (2012) enfatizam a necessidade de realizar testes com a equipe interna antes de abrir o desafio para a participação da comunidade externa, pois é fundamental que as informações disponibilizadas no Briefing sejam claras e suficientes para que as pessoas possam entender o desafio de maneira correta e, consequentemente, gerar ideias de soluções que façam sentido.

Os usuários das comunidades são usualmente os que melhor conhecem o contexto e dinâmica do problema. Contudo, como observado na pesquisa-ação, muitas vezes as pessoas nestas comunidades não tem uma linguagem para comunicar seus problemas para a "multidão". O profissional Designer pode contribuir neste aspecto, utilizando a competências intrínsecas à área, bem como instrumentos de áreas como antropologia, psicologia e sociologia.

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[1] O vídeo está disponível para visualização neste link:
https://www.youtube.com/watch?v=5xQ9tDbsFqs&feature=youtu.be

Assim, no projeto de Crowd-Design em desenvolvimento, a definição do Briefing será realizada pela equipe após a primeira sessão de Crowd-Voting realizada na comunidade. O problema escolhido pelos moradores será, então, transformado em desafio. Os documentos disponibilizados na plataforma de Crowd-Sourcing[2] deverão, além de contextualizar e esclarecer o problema, apresentar os resultados almejados com o projeto. Os materiais previstos para compor o Briefing do desafio são: textos explicativos, apresentando a comunidade e definições do escopo; imagens em foto e vídeo, bem como ilustrações como infográficos para ilustrar o contexto e a realidade da comunidade. Ainda, devido à parceria com a empresa privada, o Briefing deverá conter informações sobre aspectos relativos à produção da solução. Por este motivo, as sugestões de solução deverão vir acompanhadas de documentos que explicitem as informações técnicas de produção, inclusive para que possa ser entendido e replicado em contextos semelhantes. Esta replicação poderá ser facilitada pelos *marketplaces* e leilões virtuais.

4.3 Processo de Desenvolvimento da Solução

No modelo de Rozenfeld et al. (2006) as informações contidas no Projeto Informacional orientam a geração de soluções, iniciada com a fase do Projeto Conceitual. Nesta fase é onde acontecerá a busca, a criação, a representação e a seleção de soluções para o problema identificado. No caso do modelo da abordagem de Crowd-Design utilizada no Projeto Sustainability Maker a fase de desenvolvimento da solução é quando acontece a abertura do processo para o Crowd-Sourcing. Assim, as pessoas envolvidas nesta fase podem ser absolutamente desconhecidas do usuário, justamente por se encontrarem na multidão.

A abordagem metodológica que esta multidão de "Designers" utilizará no processo de criação e desenvolvimento das proposições de soluções é ampla e ilimitada. Para superar este obstáculo é possível que a plataforma de Crowd-Design possa determinar já no "*challenge*" (desafio) as ferramentas, estruturas e escopo mínimo das proposições, como, por exemplo:

- *Explique sua ideia em uma sentença;*
- *Qual é a necessidade que você está querendo resolver?*
- *Quem se beneficiará da implementação de sua ideia?*
- *Quem vai monitorar seu sucesso?*
- *Quem está equipado para implementar sua ideia no mundo real? Você? Sua organização? Outra organização ou entidade?*
- *Onde esta ideia seria implementada?*
- *Como poderia ser prototipada ou testada sua ideia de forma a testar sua pressuposições?*

Assim, prevê-se para o projeto em andamento a realização de um pré-teste junto à uma equipe interna formada por especialistas e não-especialistas para avaliar a consistência e a clareza das informações contidas no Briefing. Os feedbacks recebidos com a realização do pré-teste serão analisados e, caso seja necessário, serão realizadas as devidas alterações. Após o desafio ser disponibilizado definitivamente na plataforma de Crowd-sourcing, o processo de desenvolvimento da solução deverá see

[2] A plataforma www.innonatives.com é a plataforma que será utilizada pelo projeto Sustainability Maker, e está em fase de finalização.

continuamente monitorado, não no sentido de controlar os participantes, mas, principalmente, no sentido de fornecer feedbacks, promovendo contínua motivação para a participação da multidão. Após o prazo estipulado para o desenvolvimento da solução, as propostas serão analisadas por um painel de especialistas, bem como pela empresa parceira, em aspectos relativos à qualidade, viabilidade de produção e implicações para a sustentabilidade, e levadas para a segunda sessão de Crowd-Voting na comunidade.

4.4 Financiamento e Risco

Nas metodologias de PDP ortodoxas, como é o caso da proposta por Rozenfeld et al. (2006), a implementação do projeto ocorre, geralmente, na penúltima fase, e antecede o monitoramento do desempenho do produto no mercado. Neste caso, a implementação do projeto ocorre ao final da macro-fase denominada desenvolvimento. Tendo em vista que este modelo já prevê a implementação do projeto desde a etapa de pré-desenvolvimento (quando da realização do planejamento estratégico), pode-se inferir que a prototipagem é garantida, já que a empresa prevê estes custos.

No modelo proposto por Rozenfeld et al. (2006), portanto, é a própria empresa que assume os riscos em conseguir novos consumidores para o produto. O mesmo, porém, não acontece no modelo de PDP que visa o Crowd-Design. Neste modelo, a implementação do projeto pode ser considerada incerta, tendo em vista que, via de regra, depende do sucesso do crowdfunding (ou *marketplace* ou leilão) para efetivamente viabilizar financeiramente sua realização. Alternativas típicas de colaboração em um ambiente Crowd-Funding são exemplificadas abaixo, com base nas proposições iniciais geradas na pesquisa-ação:

- *Ofereça R$1 ou mais: HALL DA FAMA E COMUNIDADE: Seu nome irá para o Hall da Fama no site do projeto. Além disto você fará parte da comunidade de membros patrocinadores do projeto. Obrigado!*
- *Ofereça R$15 ou mais: VIDEO: Seu nome será mostrado em um vídeo documentário que será feito para o Projeto onde apresentaremos um grande "obrigado" a todos os que colaborarem com nossa iniciativa.*
- *Ofereça R$25 ou mais: CARTÃO SKETCH: Receba uma impressão em alta qualidade de sketches do projeto. Coloque isto na parede ou mesmo em uma moldura em sua mesa de trabalho que lhe relembrará de sua contribuição ao projeto.*
- *Ofereça R$35 ou mais: CAMISETA: Seja parte da gangue e ganhe uma camiseta com o slogan do Projeto (tamanhos P, M e XG). A camiseta é produzida na cor branca com um print exclusivo que vai se diferenciar de suas outras camisetas.*
- *Ofereça R$39 ou mais: BONÉ: Deixe todo mundo saber que você apoia um grande Projeto e que está utilizando um boné de alta qualidade;*
- *Ofereça R$75 ou mais: VISITE A COMUNIDADE: Encontre também o time de Designers e tire uma foto com um protótipo em um tour através da comunidade do projeto. Você receberá um Cartão Sketch para comemorar sua visita memorável;*
- *Ofereça R$ 129 ou mais: BOLSA ESPECIAL: Este é um acessório de alta qualidade, para uso diário, desenhado pelo time do projeto;*
- *Ofereça R$1.700 ou mais: adquira um dos Produtos desenvolvidos pelo Projeto com um Design especial para você. Ficará perfeito em sua casa ou apartamento, tornado seu ambiente único.*

O Crowd-Funding é associado a uma gama de esperanças e ideais, para além do retorno econômico imediato. Em projetos que visam a sustentabilidade, o Crowd-Funding é uma prática através da qual pode-se mobilizar os recursos necessários, mesmo que em pequena escala, para fornecer mais oportunidades para mais pessoas.

Desta maneira, pode-se fomentar a produção popular mais difundida entre aqueles que não poderiam ter acesso ao capital inicial para financiar seus projetos criativos, reforçando os níveis de engajamento (BANNERMAN, 2013).

Para o projeto de Crowd-Design em andamento, prevê-se o aporte financeiro (integral ou parcial) da empresa parceira, diminuindo, desta forma, o risco de não concluir o projeto com um modelo/protótipo. Tendo em vista que esta empresa estará envolvida desde o início do processo até a escolha da "*best solution*", é provável que a empresa assuma os custos de produção do modelo. Este, por sua vez, poderá servir para a verificação do funcionamento *in loco* da solução.

4.5 Propriedade intelectual/industrial

Nas metodologias de PDP ortodoxas, a propriedade intelectual de um projeto tem conexão com a propriedade industrial, e por este motivo, requerem um processo muitas vezes demorado. Com a propriedade industrial é possível assegurar o monopólio ou o uso exclusivo sobre determinada criação ou inovação no mercado.

No processo de Crowd-Design o problema dos direitos autorais não pode ser ignorado, mesmo não sendo obrigatório. Assim, uma opção para projetos desenvolvidos em Crowd-Design e com foco na sustentabilidade é o lançamento de desafios em licença aberta. Um exemplo é o Creative Commons (CC), um tipo de licença jurídica gratuita. O CC é uma organização sem fins lucrativos, cujo objetivo é o compartilhamento e o uso da criatividade e do conhecimento. Disponibilizando o material em licença aberta, os autores dos projetos fornecem, de forma simples e padronizada, a concessão do direito de uso das suas obras intelectuais. O CC é uma estratégia eficaz para maximizar a criatividade, o compartilhamento e a inovação (CREATIVE COMMONS, 2014, web). O Projeto Sustainability Maker prevê, em seu escopo, a utilização do CC para a concessão do direito de produção dos projetos desenvolvidos nesta plataforma.

Assim, uma vez inserido na plataforma Sustainability Maker, os resultados do projeto de Crowd-Design em andamento poderão ser compartilhados com o mundo todo, através do *marketplace* formado com este objetivo. Nesse sentido, uma vez que a solução encontrada terá licença aberta em CC, muitas poderão ser as comunidades beneficiadas com a solução encontrada pelo projeto. No que tange à sustentabilidade, portanto, este fato pode ser considerado uma grande vantagem.

5. CONSIDERAÇÕES FINAIS

As plataformas para Crowd-Design constituem em oportunidade de canalizar a criatividade da população de baixa renda no encaminhamento dos problemas de seu próprio entorno. O reconhecimento desta oportunidade ocorre em um contexto onde esta população vem aumentando gradualmente sua capacidade de compra. Este aumento de capacidade, ao mesmo tempo que traz benefícios na elevação da qualidade de vida da população de baixa renda, traz consigo grande risco ambiental devido à possibilidade de réplica dos estilos de vida da população mais rica. Por outro, lado este mesmo fenômeno oferece a possibilidade do design, via este novo ambiente democrático de projeto instrumentalizado pela internet, possibilitar o "*leap-frog*" nos padrões de consumo (descontinuidade sistêmica), ou seja, a adoção de soluções radicalmente superiores sob a ótica da sustentabilidade.

Do mesmo modo, a aplicação do Crowd-Design para a sustentabilidade pode ser potencializada com o envolvimento, desde o início, de empresas parceiras que visam, sobretudo, a inovação em seus processos produtivos. O desafio, porém, está na compatibilização da estratégia da empresa com os problemas demandados pela comunidade. Nesse sentido, alguns dos problemas já apontados pela comunidade terão que ser descartados, não só pela sua natureza (como o exemplo dado), mas principalmente por não estarem alinhados com as competências e estratégias da empresa parceira ao projeto..

Contudo, apesar do rápido crescimento desta modalidade de projeto/produção, não se observa também registros de sua efetiva adoção no ambiente de sala de aula em Cursos de Design. O ambiente crowd exige novas metodologias de projeto e nova formas de relacionamento do Designer com todos os atores associados ao desenvolvimento e implementação de soluções, incluindo o próprio usuário. Desta forma, entende-se como premente ampliar a compreensão acerca de métodos e ferramentas associados ao Crowd-Design de forma a permitir que este conteúdo seja passível de inserção no processo de aprendizado dos graduandos dos Cursos de Design.

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Elaboração do "desafio" no processo de Crowd Design do projeto *Sustainability Maker Brazil*

The "challenge" preparation on the Crowd Design Process of Sustainability Maker Brazil Project

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Resumo

Este artigo apresenta o estudo para a elaboração da etapa do desafio do Projeto *Sustainability Maker Brazil* (SuM/BR). Com base no resultado das etapas anteriores do Projeto SuM/BR, realizou-se uma análise de *benchmarking* a respeito de como esta etapa acontece em outras plataformas de Crowd Design e elaborou-se o desafio do SuM/BR. Para testar se as informações eram claras e suficientes foi realizado um teste com voluntários, alunos do curso de graduação em Design da UFPR. A partir do envio das ideias dos voluntários, foi possível verificar as melhorias necessárias na descrição e disponibilização do desafio.

Palavras Chave: crowd design; crowdsourcing; benchmarking.

Abstract

This paper presents a study for the development of the challenge stage of Sustainability Maker Brazil Project (SUM/BR). Based on the outcome of previous stages of the SUM/BR, it was carried out a benchmarking analysis as to know how this step happens on other Crowd Design platforms and drew up the challenge of SUM/BR. To test whether the information was clear and sufficient, a test with volunteers, students of the degree course in Design UFPR was performed. From sending the ideas of the volunteers, it was possible to verify the improvements needed in the description and provision of the challenge.

Keywords: *crowd design; crowdsourcing; benchmarking.*

Introdução

O desenvolvimento de produtos via Crowd Design já é uma realidade atual e cada vez mais crescente. Uma busca rápida e assistemática no Google traz inúmeros resultados de sites e plataformas que convidam a participação da multidão para resolver problemas e/ou criar conteúdo, a partir de processos de crowdsourcing e seus desdobramentos. O Núcleo de Design e Sustentabilidade da Universidade Federal do Paraná (NDS-UFPR), vem trabalhando com este tema no desenvolvimento do Projeto *Sustainability Maker Brazil* (SuM/BR), liderado pela empresa E-Concept da Alemanha, sendo o desenvolvimento da plataforma financiado pela Comunidade Européia através do Programa LIFE (LIFE11 ENV/DE/000342). No projeto *Sustainability Maker* um dos autores deste artigo ocupa a posição no *Advisory Board.*

O termo Crowd Design refere-se a uma modalidade emergente de sistema de projeto e produção que utiliza conhecimentos e recursos disponíveis na multidão através de uma plataforma na internet, com o propósito de resolver problemas e/ou criar conteúdo. Nestes casos, os problemas são propostos em forma de "desafios". A forma de disponibilizar as informações para os desafios variam de acordo com o objetivo da plataforma. Devido a escassez de material que oriente para a formulação de desafios em casos de Crowd Design, este artigo apresenta o estudo realizado para a elaboração do desafio que guiará o processo de desenvolvimento de produto via Crowd Design do Projeto SuM/BR na Plataforma Innonatives.com.

Para tanto, com base nos resultados das etapas anteriores do Projeto SuM/BR, apresentadas na sequência, realizou-se uma análise de *benchmarking* em plataformas de Crowd Design. Após esta análise, o desafio do SuM/BR foi elaborado. Como forma de testar se as informações a serem disponibilizadas eram claras e suficientes, realizou-se um "desafio teste" com alunos do curso de graduação em Design de Produto da UFPR. Como resultado, o desafio foi reformulado com informações mais detalhadas acerca do funcionamento do processo de Crowd Design na Plataforma Innonatives.com. Assim, as orientações apresentadas neste artigo guiam para a preparação e postagem do desafio do Projeto SuM/BR.

Definições

O entendimento do que vem a ser o Crowd Design é possível a partir das definições de crowdsourcing e seus desdobramentos. Cunhado por Howe em 2006, o crowdsourcing se refere ao ato de uma empresa ou instituição terceirizar (ou fazer um convite aberto) para uma rede indefinida (e geralmente grande) de pessoas, um trabalho ou tarefa que, geralmente, seria realizado pelos seus próprios funcionários (AROLAS e DE GUEVARA, 2012).

O termo vem ganhando variações de acordo com o teor da atividade desenvolvida. Crowdfunding, por exemplo, corresponde ao processo de financiamento coletivo de projetos, visando sua implementação. Já crowdvoting, corresponde ao processo de escolha e votação pela multidão. Importante ressaltar que estes processos ocorrem através de plataformas online (ROBSON, 2012; BANNERMAN, 2013; DJELASSI e DECOOPMAN, 2013). Porém, existem outras variações do termo crowdsourcing. O Quadro 1 apresenta as variações do termo, bem como seu respectivo significado, os autores que os utilizaram e exemplos de plataformas online que utilizam dos processos.

TERMO	DEFINIÇÃO	FONTE/ AUTOR(ES)	EXEMPLOS DE PLATAFORMAS
Crowdfunding	Consiste, fundamentalmente, em um processo onde se busca o financiamento de um dado projeto através de contribuições pequenas de indivíduos, que somadas contribuem para viabilizar a execução do referido projeto.	Robson (2012); Bannerman (2013); Djelassi e Decoopman (2013).	Catarse.com; Murmura.cc; Benfeitoria.com; Cidadedemocratica.org.
Crowdvoting	Votação que usualmente ocorre através de sites que buscam obter a opinião de um grande número de pessoas acerca de um determinado tópico.	Beherend et al. (2011); Robson (2012); Bannerman (2013); Djelassi e Decoopman (2013).	OpenIDEO.com; Murmura.cc; Goodmaker.com; Idealego.com; Camiseteria.com; Cidadedemocratica.org.
Crowdsourcing	É um conceito relativamente novo que engloba diversas práticas. Pode ser relacionado a todo e qualquer projeto colaborativo via internet, como co-criação ou projetos de inovação aberta.	Arolas e De Guevara, (2012).	
Crowdstorm	Processo utilizado para gerar ideias. Diferente do processo de brainstorming, o crowdstorm é realizado online e feito pela multidão. Podendo ainda ser simples, que apenas demanda soluções para um determinado problema, e mais complexo onde as pessoas podem interferir nas soluções dadas por outras pessoas, construindo ideias maiores e melhores.	Abrahamson (2013).	OpenIDEO.com; Cidadedemocratica.org,
Crowdlabor	Processo que aproveita-se da larga distribuição de trabalho disponível online para cumprir uma série de tarefas, das simples até as mais complexas.	Crowdsourcing.org (2014).	Mturk.com; Crowdsrping.com; Hiretheworld.com; Odesk.com; Innocentive.com; Yet2.com; Battleofconcepts.nl; 99designs.com.br; Edge-amsterdam.com; Itsnoon.net.
Crowdcreativity	Processo que aproveita-se do grande número de talentos criativos para projetar e desenvolver arte original, mídia ou conteúdo. Crowdsourcing é	Crowdsourcing.org (2014).	OpenIDEO.com; Murmura.cc; Goodmaker.com; Mykindacrowd.com; Innovationexchange.com;

	usado para tocar em comunidades on-line de milhares de criativos para desenvolver produtos e conceitos originais, incluindo fotografia, publicidade, cinema, produção de vídeo, design gráfico, vestuário, bens de consumo e conceitos de branding.		Itsnoon.net; Cidadedemocratica.org.br; Zooppa.com; Cognistreamer.com; Mindjet.com; En.eyeka.com; Challenge.gov; Battleofconcepts.nl;

Quadro 1 - Variações e definições dos termos "crowd" utilizados na literatura e nas Plataformas Online
Fonte: Dos autores, com base nas referências citadas no quadro.

Estes processos e definições foram úteis para analisar as plataformas no *benchmarking* apresentado neste trabalho. Considera-se híbrida, portanto, a plataforma que utiliza mais de um processo denominado "crowd".

O Projeto Sustainability Maker Brazil (SuM/BR)

O processo de Crowd Design e o resultado das etapas anteriores do Projeto SuM/BR

O Projeto *Sustainability Maker* é uma iniciativa de um consórcio de organizações e universidades que visa a criação de uma plataforma on-line com base nos princípios da inovação aberta (Open Innovation). Seu objetivo é facilitar a conexão de pessoas que podem ter um papel relevante na resolução de problemas relacionados à sustentabilidade. No Brasil, este projeto está sendo desenvolvido pelo Núcleo de Design e Sustentabilidade da Universidade Federal do Paraná (NDS/UFPR) e denomina-se *Sustainability Maker Brazil* (SuM/BR). A Figura 1 mostra o processo de Crowd Design, cuja característica principal é ser aberto e colaborativo.

O Projeto SuM/BR conta com a participação de duas empresas parceiras, que se caracterizam como *sponsors*, a Soliforte e a EcoDesign. A primeira, atua no desenvolvimento de produtos oriundos da reciclagem de materiais da construção civil. A segunda, desenha, produz e comercializa móveis em madeira, fabricados com *pallets*.

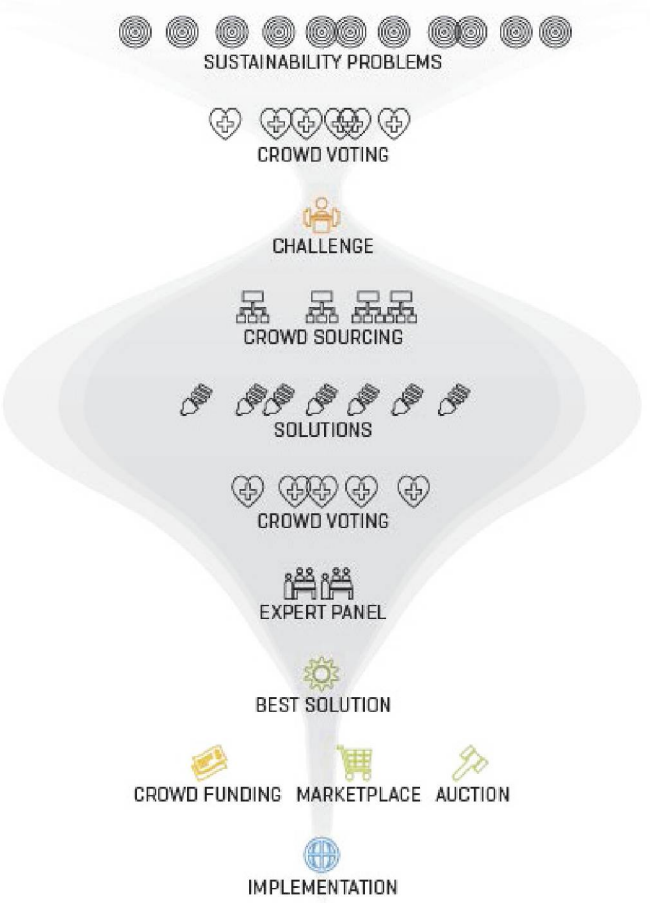


Figura 1 - Processo de Crowd Design proposto pelo Projeto *Sustainability Maker*
Fonte: SuM (web, 2014)

De acordo com a Figura 1, as duas primeiras etapas correspondem ao reconhecimento do problema (sustainability problems) e crowdvoting. A equipe do Projeto SuM/BR, do NDS/UFPR - composta por doutoranda, mestrandos e alunas de iniciação científica sob a orientação do professor PhD Aguinaldo dos Santos - concluiu uma pesquisa-ação destas duas primeiras etapas do Projeto SuM/BR. Durante os meses de abril a julho de 2014, a equipe do SuM/BR pesquisou junto à uma comunidade de baixa renda do município de Piraquara, no Paraná, problemas relacionados às habitações. A Figura 2 apresenta os procedimentos utilizados na execução destas etapas iniciais.



Figura 2 - Procedimentos utilizados nas etapas 01 e 02 do Processo de Crowd Design
Fonte: Dos autores.

Assim, a Etapa 01 correspondeu ao reconhecimento dos problemas junto à comunidade. A partir dos procedimentos realizados, chegou-se à quatro principais problemas relacionado às habitações através de uma análise cruzada. Tendo em vista que o processo de Crowd Design considera a participação dos usuários - no caso a comunidade - na escolha do problema que será transformado em desafio, foi realizado um processo de crowdvoting - Etapa 02. Neste caso, além da votação pela internet, também realizou-se uma votação utilizando uma urna, de maneira presencial. Como resultado, a comunidade escolheu o seguinte problema para ser solucionado: "Quando recebo alguém na minha cozinha, o espaço é pequeno e fica todo mundo apertado".

A Plataforma Innonatives.com

A plataforma que será usada para iniciar desafios, e também compartilhar ideias, comentários e votos, será a Plataforma Innonatives (www.innonatives.com). Esta plataforma irá conectar pessoas e organizações que querem resolver problemas relacionados à sustentabilidade e apoiar a sua implementação. Através desta plataforma, será possível criar inovação para a sustentabilidade através de processos de crowdsourcing, crowdvoting e crowdfunding. A Figura 3 apresenta a interface da página incial da Plataforma Innonatives, onde será disponibilizado o desafio do Projeto SuM/BR.

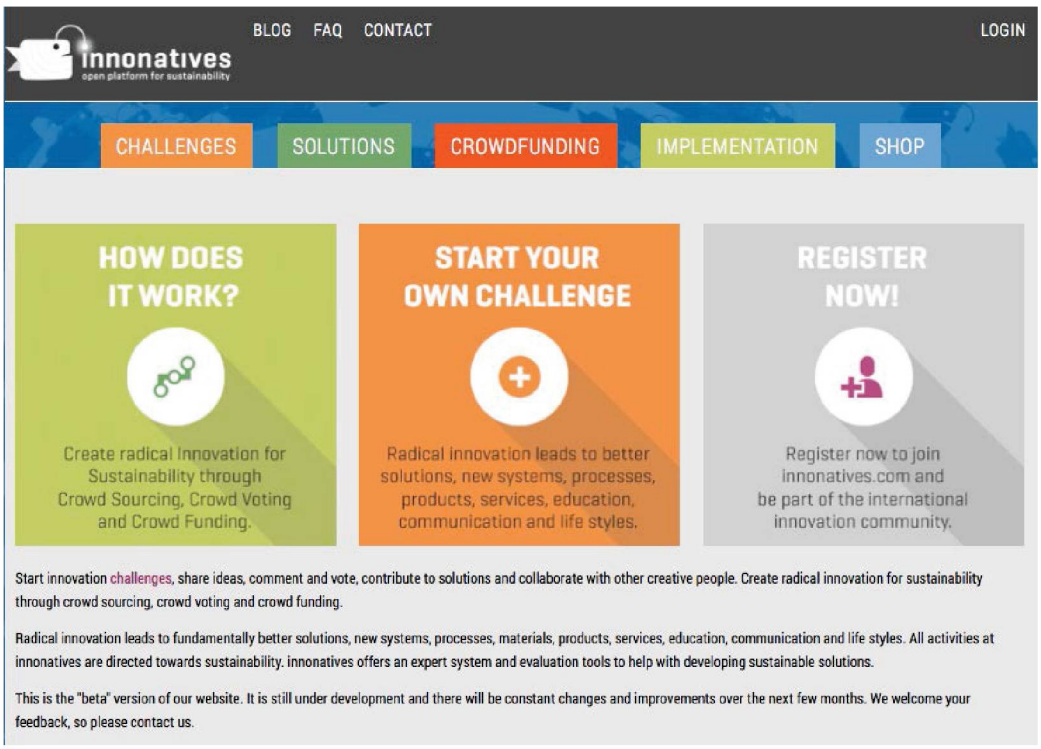


Figura 3 - Interface da Plataforma Innonatives.com
Fonte: Innonatives.com (web, 2014)

Esta plataforma é uma versão beta, e o Projeto SuM/BR está sendo desenvolvido como um dos pilotos para testá-la. Ao clicar na aba "Challenge", o participante poderá visualizar os desafios disponíveis. Dentre eles, estará o desafio do Projeto SuM/BR. A Plataforma permite que o desafio seja realizado em três fases, a saber: (1) envio de ideias de solução; (2) envio de conceito da solução; (3) envio da solução final. As informações a serem disponibilizadas para cada desafio são de responsabilidade do demandante. Neste caso, é responsabilidade da equipe do Projeto SuM/BR disponibilizar as informações necessárias para o entendimento do desafio, bem como para a motivação dos participantes.

Procedimentos Metodológicos

Para a elaboração do desafio do Projeto SuM/BR foram realizados os seguintes procedimentos:

- Consulta ao relatório do Projeto SuM/BR para entendimento das fases anteriores (apresentado anteriormente);
- Análise de *benchmarking* de Plataformas de Crowd Design;
- Elaboração do desafio;
- Aplicação do "desafio teste";
- Reelaboração do desafio com base nos resultados do "desafio teste".

A realização da análise de *benchmarking* contemplou: (1) a busca pelas plataformas de Crowd Design; (2) a definição das variáveis da análise; e (3) a análise propriamente dita. As plataformas selecionadas para análise possuiam as seguintes características: eram nacionais (ou seja, idioma em português) e internacionais (ou seja, idioma em inglês), tinham cunho social ou comercial. Estas plataformas foram analisadas quanto à: (a) linguagem (verbal e visual); (b) etapas do processo (quantos e quais processos "crowd"); (c) duração do desafio;

(d) motivação para os participantes; e (e) origem da demanda. No total, foram encontradas na busca assistemática 41 plataformas. Destas, oito foram analisadas de maneira aprofundada, pois eram as que mais se assemelhavam ao processo proposto pela Plataforma Innonatives.com.

Com base nos resultados da análise de *benchmarking* e com os resultados das duas primeiras etapas do Projeto SuM/BR, o desafio foi desenvolvido. Para isso, foram realizadas três reuniões de *brainstorming* para definição e produção das mídias a serem utilizadas e das informações a serem disponibilizadas. No caso das mídias, foi confeccionado um vídeo explicativo e imagens com a pergunta do desafio, seguindo a identidade visual existente do projeto. Além disso, para servir de canal de comunicação da equipe do Projeto com os participantes do desafio, foi criado um e-mail, o sum.ufpr@gmail.com.

Como a Plataforma Innonatives.com ainda não estava disponível (sua finalização ocorreu após a data de realização do "desafio teste"), o "desafio teste" foi realizado em uma plataforma alternativa, o Facebook. A escolha desta rede social para a realização do "desafio teste" foi em função de: (a) ser utilizada pelos alunos que se voluntariaram em participar da atividade; (b) permitir postagem de mídias como vídeo e imagens; e (c) permitir que o processo ocorresse em um grupo fechado. É importante destacar que para o "desafio teste", não era importante que o desafio tivesse as três etapas sugeridas pela Plataforma Innonatives.com, pois o que se queria era saber se as informações disponibilizadas eram suficientes principalmente para o envio das ideias de solução. Assim, as informações foram disponibilizadas em inglês porque a Plataforma Innonatives.com é internacional.

No dia 01 de setembro de 2014, então, o desafio foi divulgado para os alunos do curso de graduação em Design de Produto da UFPR. Não foram dadas muitas informações à respeito do projeto para que não houvesse interferência no entendimento da proposta online, apenas foi dito que seria um projeto de curta duração e como motivação para a resolução do desafio seria emitido um certificado de horas formativas (necessários para a obtenção do título de bacharel por aquela universidade). No total, 25 alunos, do primeiro ao sexto semestre, se voluntariaram para participar da atividade. Após serem adicionados ao grupo fechado no Facebook, foram instruídos a assistir ao vídeo explicativo do desafio e a ler as informações fornecidas. Também, foi divulgado o e-mail para o caso de haver alguma dúvida. No dia 05 de setembro de 2014, prazo estipulado para enviar as ideias, não foi recebido nenhum e-mail com dúvidas sobre o desafio e apenas um voluntário havia postado sua ideia. Assim, decidiu-se adiar o prazo para o dia 09 de setembro. E para aumentar a motivação do desafio, foi anunciado o sorteio de passagens de ida e volta para o 11° Congresso Brasileiro de Design, em Gramado (RS). No total, o desafio ficou disponível para os partcipantes durante 09 dias. A seguir, são apresentados os resultados.

Resultados

Benchmarking

Dentre as plataformas analisadas (Figura 4) observou-se o uso de linguagem verbal e visual convidativas, que tendem a aproximar o usuário/participante e faz com que ele compreenda melhor o objetivo da plataforma e do desafio. Para que o participante entenda o desafio, foram disponibilizadas informações textuais e também em vídeo. Das oito plataformas selecionadas quatro apresentam um esquema do passo a passo do funcionamento do processo para participação na plataforma, esclarecendo as etapas. A duração dos desafios ou projetos apresentados na plataforma tem uma variação de tempo decorrente dos níveis de dificuldade de cada projeto, sendo de criação ou produção, tendo uma variável mínima de um

mês a um ano. A maior motivação encontrada nas plataformas é a recompensa em dinheiro, sendo que apenas uma plataforma oferece a recompensa com a ajuda para a implantação do projeto. Além do dinheiro, uma das plataformas oferece ajuda em serviços específicos para o projeto, e outra oferece os créditos nas embalagens do produto. Como demanda, somente uma plataforma tem a demanda oriunda apenas de pessoas (multidão); quatro plataformas tem a demanda oriunda de empresas; e três com a demanda vindo de empresas, pessoas, ONGs, escolas, parlamentares e gestores públicos.

	Passo a passo do Processo	Duração do Desafio	Motivação para os Participantes	De onde vem a Demanda para o Desafio	Processos de Crowdsourcing utilizados nas plataformas
GOOD MAKER	Possui passo a passo	De acordo com cada projeto, variando de 2 semanas a 2 meses	Recompensa em dinheiro ou serviços	Vem de qualquer pessoa, instituto ou empresa	Crowd Creativity Crowd Voting
openIDEO	Não possui passo a passo	De acordo com cada projeto, variando de 1 a 2 meses	Recompensa em dinheiro e viabilidade da idea	Vem de qualquer pessoa, instituto ou empresa	Crowd Creativity Crowd Voting Crowd Storm
MÚRMURA	Possui passo a passo	Aproximadamente 1 mês	Melhorar o espaço urbano e a implementação da ideia	Vem de qualquer pessoa	Crowd Creativity Crowd Voting Crowd Funding Crowd Wisdom
crowdSPRING	Não possui passo a passo	Aproximadamente 1 mês	Recompensa em dinheiro	Vem das empresas	Crowd Creativity Crowd Labor
LEGO	Possui passo a passo	365 dias	Recompensa em dinheiro e créditos nas embalagens	Vem da empresa Lego	Crowd Creativity Crowd Voting
Camiseteria	Não possui passo a passo	Permanente na plataforma	Recompensa em dinheiro	Vem da empresa Camiseteria	Crowd Creativity Crowd Voting
CIDADE DEMOCRÁTICA	Possui passo a passo	2 meses	Implementação da ideia para solucionar o problema	Vem das ONGS, escolas, parlamentares, gestores públicos, empresas e cidadãos	Crowd Creativity Crowd Voting Crowd Wisdom Crowd Storm
its.noon	Não possui passo a passo	1 mês	Recompensa em dinheiro	Vem das empresas	Crowd Creativity Crowd Labor

Figura 4 - Benchmarking de Plataformas Online para processos Crowd
Fonte: Dos autores.

"Desafio teste" do Projeto SuM/BR

A elaboração do "desafio teste" teve como base a análise de *benchmarking*, onde observou-se quais informações e como deveriam ser disponibilizadas. Assim, o título do desafio foi definido como "*The Kitchen Challenge*" para ser curto, chamativo e direto. A pergunta do desafio foi "*Can you design an artifact to improve the socialization in the kitchens of the low income houses*?" (Você consegue projetar um artefato para melhorar a socialização nas cozinhas das casas de baixa renda?).

Ainda, o "desafio teste" foi composto por: resumo (*summary*); vídeo de curta duração (02:11) - que explicava o contexto do desafio, juntamente com depoimentos dos pesquisadores envolvidos nas etapas 01 e 02; relatório contendo informações sobre o pré-desafio e sobre o processo de Crowd Design; informações sobre os *sponsors* (Soliforte e

EcoDesign); breve descrição do Projeto SuM/BR; lista de requerimentos para a resolução do desafio; além de um e-mail para se caso houve dúvidas. Todas estas informações foram disponibilizadas na rede social do Facebook, em um grupo fechado (Figura 5).

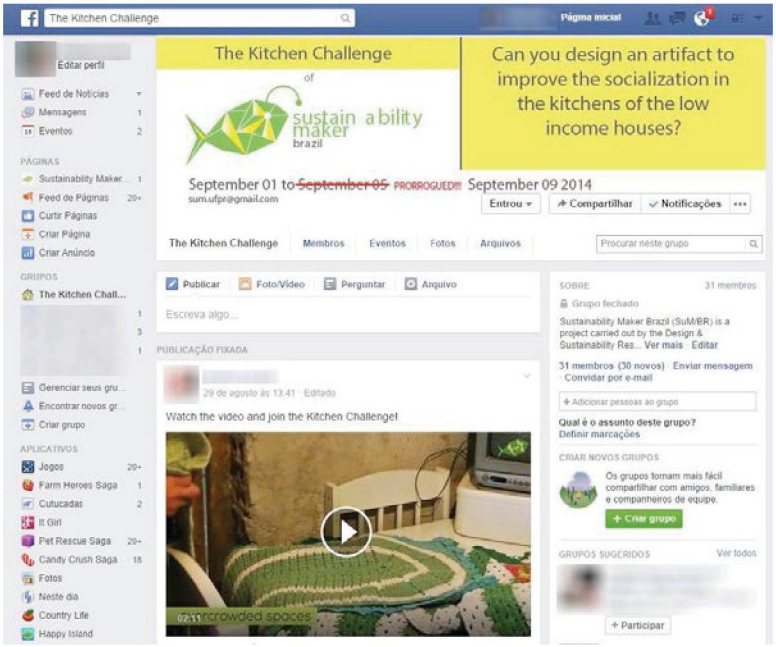


Figura 5 - Grupo fechado para o "desafio teste" na rede social Facebook (omitido para revisão cega)
Fonte: Facebook.com (web, 2014)

Validação das informações do "desafio teste"

Dos 09 dias que ficou disponível e dos 25 voluntários adicionados ao grupo fechado, cinco ideias foram enviadas. Estes cinco voluntários enviaram um texto explicativo e um desenho (sketch) para ilustrar a ideia de resolução do desafio, atendendo ao que foi proposto (*Upload your ideas in this group, by sending a text and a sketch that explain your solution idea*). Quanto ao conteúdo propriamente dito, das cinco propostas recebidas uma não contemplou o que foi proposto, pois trata-se de um artefato não projetado diretamente para o ambiente requerido, a cozinha. Das outras quatro propostas, pode-se observar que todas possuem em comum a possibilidade de serem utilizadas de mais de uma forma, otimizando a questão de falta de espaço. Porém, nenhuma possui foco específico no melhoramento da socialização dentro do ambiente.

Com intuito de verificar como o desafio foi interpretado pelos voluntários que participaram e também entender a razão da não participação dos outros 20 voluntários, elaborou-se dois questionários: o primeiro com perguntas destinadas aos que submeteram as ideias e o segundo para os voluntários que não participaram da atividade proposta. Os questionários foram enviados diretamente a cada um, via perfil do Facebook.

Dos 20 questionários enviados aos voluntários que não participaram do desafio, 11 foram os respondentes. Observou-se, assim, que o principal motivo da não participação na atividade foi o prazo, considerado "muito curto" para o envio das ideias. Como justificativa, responderam que deram prioridade aos trabalhos acadêmicos, visto que o período que se encontravam era de final de trimestre. A falta de compreensão do desafio, bem como o que era solicitado também foi alegado como motivo de não participação. O fato das informações sobre o desafio estarem em inglês foi apontado por duas pessoas como principal motivo por

não terem participado. Apenas um voluntário não se sentiu confortável em expor sua ideia, mesmo sendo em um grupo fechado. Como sugestões e comentários, os alunos sugeriram que as informações fossem disponibilizadas também em português, e que os prazos fossem maiores.

Dos cinco voluntários que participaram do desafio enviando suas ideias, 4 responderam ao questionário. Com as respostas, pode-se observar que alunos conseguiram compreender o contexto do desafio com as informações que foram disponibilizadas no grupo. A ajuda e compreensão através do vídeo explicativo se deu de diferentes formas para cada participante, não pendendo para nenhum extremo. A maior motivação encontrada pelos participantes foi o sorteio de uma passagem para o Congresso Brasileiro de Design em Gramado-RS, e também o simples fato de serem desafiados. Apenas um dos participantes teve sua motivação no certificado de horas formativas. O contexto do desafio - comunidade de baixa renda e sustemtabilidade - foi citado por um participante como a maior motivação para a sua participação. Nenhuma sugestão ou comentário foi deixado pelos participantes.

Considerações Finais

Este artigo teve por objetivo apresentar um estudo que resultou em orientações para a elaboração do desafio a ser disponibilizado na Plataforma Innonatives, de acordo com o processo de Crowd Desgin. A elaboração do desafio baseou-se nos resultados das etapas anteriores do Projeto SuM/BR, bem como na análise de *benchmarking* realizada para o entendimento da etapa do desafio em outras plataformas de Crowd Design. Para testar se as informações eram claras e suficientes, realizou-se um "desafio teste", com tempo de duração menor, com voluntários - alunos do curso de graduação em Design de Produto da UFPR.

A partir da análise de *benchmarking* foi possível observar que as informações disponibilizadas no desafio variam de acordo com o objetivo proposto. Porém, é comum as plataformas utilizarem uma linguagem direta e convidativa, inclusive com a utilização de mídias variadas, como vídeo e imagens esquemáticas. Apesar da amostra de plataformas ser relativamente pequena, foi possível observar semelhanças entre as plataformas analisadas.

O "desafio teste" foi útil para avaliar se as informações disponibilizadas eram claras e suficientes. Percebeu-se, porém, que a língua estrangeira - ou seja, o inglês - é um fator limitante no que diz respeito a participação do público. Por outro lado, o simples fato de participar de um "desafio" já se torna uma motivação relevante. Apesar de que isso não significa que ter outro tipo de motivação não ajude.

Assim, a partir dos resultados apresentados por este estudo, orienta-se o desenvolvimento do desafio para o Projeto SuM/BR da seguinte maneira:

(1) **Com relação a linguagem**: Decidiu-se por adotar uma linguagem verbal convidativa, ou seja, menos formal. Para a linguagem visual procurou-se hierarquizar as informações de maneira mais clara e objetiva possível, além de criar identidade visual uniforme em todo o material e seguindo a identidade já adotada pelo Projeto SuM/BR.

(2) **Com relação ao prazo e complexidade da solução solicitada**: O envio da solução para o desafio do Projeto SuM/BR acontecerá em três etapas. A primeira é referente ao envio de ideias para a resolução do desafio através de um texto explicativo curto e o prazo é de 22 dias. A segunda etapa requer que o usuário envie o conceito da ideia com auxílio de *sketches* e *storyboard*, tendo um prazo igualmente de 22 dias para isso. A terceira e última etapa refere-se ao envio da solução propriamente dita, incluindo desenhos técnicos, *rendering* e informações técnicas, também dentro de um prazo de 22 dias. Assim, a duração do desafio é de aproximadamente dois meses, com intervalo

de uma semana entre cada etapa para a avaliação e análise das ideias de solução pelo *Advisory Board* do SuM/BR, empresas parceiras e representantes da comunidade de Águas Claras, enviadas em cada fase.

(3) **Com relação à motivação**: Para a melhor solução será concedido 50% do lucro sobre as vendas do produto pelo e-commerce da Empresa EcoDesign, um dos *sponsors* do projeto, além de um certificado de participação. Para a 2ª e 3ª melhores soluções será enviado um kit do SuM/BR e certificados de participação.

Por fim, também se percebe a importância de se elaborar um plano com estratégias de divulgação do desafio, para que o público fique instigado a saber mais sobre o projeto, incentivando a sua participação.

Agradecimentos

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Estudo comparativo das características informacionais de plataformas de crowdsourcing considerando a perspectiva do usuário

Comparative study of informational characteristics of crowdsourcing platforms considering the user's perspective

Isadora Burmeister Dickie, Roy Schulenburg, Carlos Felipe U. Rojas, Marina Ramos Pezzini, Aguinaldo dos Santos

inovação aberta, avaliação de interface, eficiência da informação

Este trabalho apresenta um estudo comparativo das características informacionais entre duas plataformas online de crowdsourcing, *a partir da perspectiva do usuário. Este tipo de plataforma tem sido cada vez mais utilizada por empresas como forma de promover inovação aberta. Conduziu-se este estudo com base nos fundamentos do Design Centrado no Usuário, aplicando-se as técnicas* Think Aloud e Eye Tracking *para que os usuários pudessem relatar a experiência de uso em cada uma das plataformas. Desta forma, foi possível compreender quais os tipos de informação são mais úteis para o entendimento e realização de uma das etapas do processo de* crowdsourcing.

open innovation, interface evaluation, information efficiency

This paper presents a comparative study of the informational characteristics between two online crowdsourcing platforms, carried out from a user perspective. This type of platform has been increasingly used by companies as a way to promote open innovation. This study was conducted on the grounds of User-Centered Design, applying the Think Aloud and Eye Tracking techniques for the users could report the use experience in each of the platforms. Thus, it was possible to understand what types of information are most useful for understanding and conducting of crowdsourcing process.

1 Introdução

Plataformas que operam processos de *crowdsourcing* são cada vez mais comuns na internet. Isto vem sendo impulsionado por empresas que vem utilizando o *crowdsourcing* como estratégia para desenvolver a inovação aberta (DJELASSI e DECOOPMAN, 2013; SIMULA e AHOLA, 2014). Desenvolvidas para funcionar como um ambiente *online* onde os usuários - no caso, a multidão - devem realizar tarefas, as plataformas de *crowdsourcing* precisam conter um repertório de informações em formato e quantidade adequada a ponto de permitir rápido e acurado entendimento dos seus processos pelos usuários, permitindo a realização das ações

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necessárias com eficiência e eficácia. Diferentemente de uma rede social com objetivo meramente de promover a comunicação entre pessoas, as plataformas de *crowdsourcing* são utilizadas como ferramenta tanto para o compartilhamento de informações como para a colaboração na criação, desenvolvimento e implementação de soluções a problemas.

Considerando que trata-se de um processo recente no Brasil - apesar de já ser consolidado em diversos países da Europa, como Alemanha e Holanda, e também nos Estados Unidos -, a motivação para este estudo pode ser expressada pela pergunta: quais informações o usuário precisa e como elas devem estar apresentadas para assegurar um processo de crowdsourcing eficiente e eficaz? Melhorar a qualidade da interface destas plataformas se apresenta como elemento chave para estimular a aceleração da disseminação das plataformas de Crowd-design não só juntamente à população mas, também, junto a empresas interessadas no desenvolvimento de inovações abertas. Apesar disto, não foi encontrado na bibliografia consultada referências que apontassem para as características informacionais que auxiliassem desenvolvedores de plataformas de *crowdsourcing*.

O objetivo deste trabalho, portanto, foi o de analisar as características informacionais de plataformas *online* de processos denominados *crowd*, através de um estudo comparativo sob a perspectiva do usuário. O artigo está dividido em quatro partes. A primeira apresenta as bases teóricas nas quais este estudo se baseou - a conceituação de *crowdsourcing* e sua relação com a inovação aberta; e a informação nas interfaces das plataformas e a avaliação pelos usuários. A segunda parte descreve a metodologia utilizada na condução da pesquisa com os usuários e os procedimentos de triangulação dos dados. Na terceira parte estão os resultados obtidos; e na quarta parte, as considerações finais e sugestões para estudos futuros.

2 Bases teóricas

Aplicação do *crowdsourcing* para a inovação aberta

O termo *crowdsourcing* foi cunhado por Jeff Howe, em 2006, e refere-se a terceirização de tarefas para a multidão que antes eram executadas pelos próprios funcionários de uma empresa (ALONSO E MIZZARO, 2012; ESTELLES-AROLA E GONZALES-LADRON-DE-GUEVARA, 2012; ZAHO e ZHU, 2012; BANNERMAN, 2013; DJELASSI e DECOOPMAN, 2013). Essa terceirização ocorre através da internet, por meio de um convite aberto à participação dos usuários nos chamados desafios. Os desafios são compostos pela explicação do problema a ser resolvido e, geralmente, trazem explicações de como o participante deve proceder e dar suas contribuições. Quando aplicável, os desafios também trazem informações sobre qual será a recompensa para o usuário cuja ideia e/ou solução for vencedora (SHOYAMA *et al.*, 2014).

Com a definição e utilização do termo *crowdsourcing*, veio também a utilização do prefixo *crowd* para indicar processos específicos ocorridos na internet com a participação da multidão. Geralmente, o prefixo *crowd* é utilizado para indicar e classificar ações baseadas na construção coletiva, ou seja, de todos para todos, e que está "indispensavelmente aliada a uma infraestrutura digital em redes sociais interativas, sem barreiras" (MENDONÇA, 2007, p.18). São exemplos de termos que se utilizam deste prefixo: *crowdvoting* e *crowdfunding*. *Crowdvoting* refere-se ao processo de votação aberta, onde a multidão é ativa na escolha de uma, dentre as opções oferecidas. *Crowdfunding* corresponde ao financiamento coletivo que ocorre através da internet. Geralmente, os projetos submetidos ao processo de *crowdfunding* pertencem às áreas de música, design, literatura, cinema, dentre outras (BERHEND, *et al.*, 2011; ROBSON, 2012; BANNERMAN, 2013; DJELASSI e DECOOPMAN, 2013).

Tendo em vista as características dos processos de *crowdsourcing*, autores o apontam como sendo uma opção para as empresas que querem promover a inovação aberta (LIMA, 2011; RIBEIRO, 2011). Casos de utilização do *crowdsourcing* nesse contexto são citados por

Albors *et al.* (2008), Enkel *et al.* (2009) e Djelassi e Decoopman (2013). São casos sobre como as empresas FIAT (FIAT Mio), Starbucks, LEGO, Procter & Gamble, LAYs (batatas) dentre outras, utilizaram o *crowdsourcing* para promover desde um melhor relacionamento com o cliente, até inovação em produtos. A utilização do *crowdsourcing* por essas e outras empresas está no fato de esta ser uma maneira de abrir a empresa para ideias externas, sem precisar, necessariamente, contratar uma equipe de funcionários específica para isso.

Com relação às plataformas que operam os processos de *crowdsourcing* e suas derivações, muitas são as variedades. Há plataformas desenvolvidas para operar especificamente desafios de uma determinada empresa - como é o caso da LEGO Ideas[1] - e outras cujos desafios podem ser sugeridos por qualquer empresa e/ou pessoa - como é o caso das plataformas innonatives[2] e OpenIDEO[3].

A informação nas interfaces das plataformas e a avaliação pelos usuários

Tendo como referência o modelo de estrutura de elementos da experiência do usuário de Garrett (2003) - cujos níveis vão do abstrato ao concreto, a partir do plano estratégico, passando pelo plano de escopo, estrutura, esqueleto e superfície -, este estudo está focado no plano de estrutura, ou seja, o foco da análise comparativa refere-se ao design de interação e à arquitetura da informação. Porém, como o plano de esqueleto deste mesmo modelo de Garrett (2003) está diretamente relacionado ao plano de estrutura, também foram incluídas neste estudo análises com relação ao design da informação das plataformas, principalmente com relação à linguagem utilizada nas mesmas.

Com relação às informações disponíveis nas plataformas, o estudo de Shoyama *et al.* (2014) aponta para "o uso de linguagem verbal e visual convidativas, que [...] faz com que ele [o usuário] compreenda melhor o objetivo da plataforma e do desafio." Muitas plataformas utilizam, além das informações textuais, imagens e informações em vídeo. Desta forma, o usuário tem contato com vários tipos de linguagem para o entendimento do processo e do desafio nas plataformas.

O modelo de linguagem apresentado por Twyman (1985) na figura 01, facilita a compreensão dos canais e modos que a linguagem se manifesta. Nesse modelo, o autor distingue os canais entre auditivo e visual. Esses canais recebem informações através dos ouvidos (auditivo) e olhos (visual). A linha visual se divide em gráfico e não gráfico. A linguagem gráfica, produzida de forma manual ou mecânica, se subdivide em três modos: verbal (palavras escritas que incluem também números), pictórico e esquemático (gráficos que não são palavras, números ou figuras). Enquanto que a linguagem auditiva pode dividir-se simplesmente em verbal (palavras e números) e não verbal (sons que não são palavras). Neste artigo nos limitamos a análise da linguagem gráfica das plataformas.

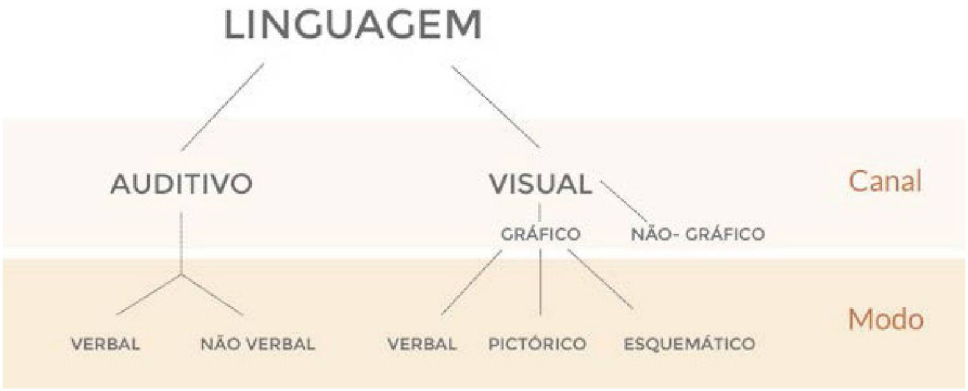
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1 www.ideas.lego.com

2 www.innonatives.com

3 www.openideo.com

Figura 01 - Modelo da linguagem de Twyman



Fonte: Dos autores, baseado em Twyman (1985).

Para saber quais são as informações gráficas contidas nas plataformas, e quais são os modos com os quais elas são apresentadas (de acordo com o modelo apresentado na figura 01), este estudo se utiliza do Design Centrado no Usuário como princípio norteador da coleta de dados e das análises. Travis (2003) diz que as avaliações desenvolvidas com o usuário, ou seja, testes de usabilidade, tem origem na psicologia experimental. O propósito desse tipo de teste é entender como o usuário interage com o sistema digital (no caso aqui, as plataformas de *crowdsourcing*), e executam tarefas determinadas.

3 Procedimentos Metodológicos

Seleção das plataformas para análise

As plataformas escolhidas para análise foram as plataformas innonatives e OpenIDEO. A plataforma innonatives, de acordo com sua própria descrição, é a "Primeira plataforma de inovação aberta do mundo para soluções sustentáveis, que combina Crowd Sourcing, Crowd Voting, Crowd Funding e loja online." (INNONATIVES, web, 2015). Nesta plataforma, é possível sugerir desafios, compartilhar ideias, comentar e votar, contribuir para soluções e colaborar com a multidão. Foi na plataforma innonatives que o *The Kitchen Challenge*, desafio piloto do Projeto *Sustainability Maker Brazil*[4], foi desenvolvido. Trata-se do primeiro desafio finalizado com resultados reais na plataforma.

A plataforma OpenIDEO também é uma plataforma de inovação aberta e foi escolhida para análise porque é parte da IDEO, "empresa de design e inovação que utiliza uma abordagem colaborativa centrada no ser humano [usuário] para resolver questões complexas, através da utilização da metodologia de *Design Thinking*" (OPENIDEO, web, 2015 - grifo nosso). Assim, a OpenIDEO permite que pessoas de qualquer parte do mundo colaborem no desenvolvimento de soluções inovadoras para desafios sociais e ambientais urgentes. Trata-se de uma das plataformas pioneiras e, portanto, referência em processos de *crowdsourcing* que visam a inovação aberta e a sustentabilidade - características também encontradas na plataforma innonatives.

[4] Projeto internacional, desenvolvido em parceria com o Sustainability Maker da Alemanha, no Núcleo de Design e Sustentabilidade da Universidade federal do Paraná. Para mais informações, consultar: www.designintothecrowd.com/sum-br/ e www.sustainabilitymaker.org.

O processo de crowdsourcing nas duas plataformas

A quantidade de etapas de um processo de *crowdsourcing* na plataforma innonatives pode variar de duas a três, dependendo do objetivo do desafio. Quando constituído das três etapas, o processo é considerado completo e possui a seguinte sequência de procedimentos: (1) envio da ideia; (2) envio do conceito, ou seja, aprofundamento da ideia enviada anteriormente; e (3) envio da solução. A plataforma innonatives também possui o processo de *crowdfunding*, porém, que acontece em momento separado do descrito anteriormente, e que ainda estava desativado no momento de escrita deste artigo.

Já na plataforma OpenIDEO, os desafios podem ter quantidades de fases variadas, dependendo do objetivo. A quantidade de fases pode ser dada a partir da combinação das seguintes fases: (a) envio de informação de pesquisa; (b) envio de ideias; (c) refinamento; (d) contribuição com comentários nas ideias selecionadas; e (e) financiamento coletivo.

Seleção dos participantes do estudo

Os usuários selecionados para o estudo atenderam ao critério de ter participado de um desafio em pelo menos uma das plataformas. Neste caso, três alunos do curso de graduação em Design da Universidade da Região de Joinville (UNIVILLE) que participaram do desafio *The Kitchen Challenge*, foram convidados a participar deste estudo. Portanto, o público do estudo foram estudantes de design com idades entre 21 e 27 anos e usuários de destreza média com interação com a internet. Importante destacar que os usuários nunca tinham participado de processos de *crowdsourcing* anteriormente, nem tinham conhecimento dos procedimentos necessários; ou seja, conheceram o processo de *crowdsourcing* e, consequentemente a plataforma innonatives, por causa da participação no desafio mencionado.

Análise comparativa

Para realizar a análise comparativa das plataformas de *crowdsourcing*, foi necessário seguir os procedimentos descritos no quadro 01. Os procedimentos de definição da tarefa e triangulação dos dados foram atribuições unicamente dos pesquisadores. Enquanto que para a análise da interface, pesquisadores e usuários tiveram suas atribuições.

A técnica do *Think Aloud*, por exemplo, foi utilizada para identificar possíveis problemas informacionais que dificultaram o entendimento na execução da tarefa. *Think Aloud*, portanto, é uma técnica que requer que os participantes verbalizem o que estão fazendo e pensando enquanto realizam uma tarefa, revelando os aspectos da interface que encantam, confundem e frustram (MARTIN e HANINGTON, 2012).

Junto com a técnica do *Think Aloud* foi utilizada a técnica do *Eye Tracking*, que consiste na captura dos movimentos os olhos dos participantes em elementos projetados na tela do computador (TULLIS e ALBERT, 2013). A sobreposição do movimento dos olhos com a interface observada gera um mapa de calor (*heatmap*) da movimentação dos olhos e dos pontos de fixação, que vão de azul (pouca fixação) até vermelho (muita fixação).

Quadro 01 - Procedimentos metodológicos para a realização da análise comparativa

Objetivo	**Procedimento** (denominação)	**Atribuições dos Pesquisadores**	**Atribuições dos Usuários**
Identificar os passos da tarefa que será analisada neste estudo.	Definição da tarefa	Decompor da tarefa de postar uma ideia num desafio proposto em cada uma das plataformas.	-X-
Identificar similaridades e particularidades dos elementos informacionais contidos nas plataformas.	Análise da interface	Identificar os elementos informacionais de acordo com a classificação de Twyman (1985).	-X-

Identificar possíveis problemas informacionais que podem dificultar o entendimento na execução da tarefa.		-X-	Ensaio de interação com a aplicação da técnica *Think Aloud* durante observação de uso com *Eye Tracking*.
Identificar os elementos informacionais que contribuem para uma melhor experiência de uso, na opinião dos usuários.	Triangulação de dados	Interpretar, através da análise cruzada dos dados coletados, os resultados do estudo.	-X-

Fonte: Dos autores.

A triangulação dos dados, portanto, se refere ao cruzamento de dois ou mais processos de medição independentes, como entrevistas e observações. O procedimento da triangulação permite reduzir a incerteza das interpretações (WEBB *et al.*, 2000).

4 O que dizem os usuários sobre a experiência de uso das plataformas analisadas

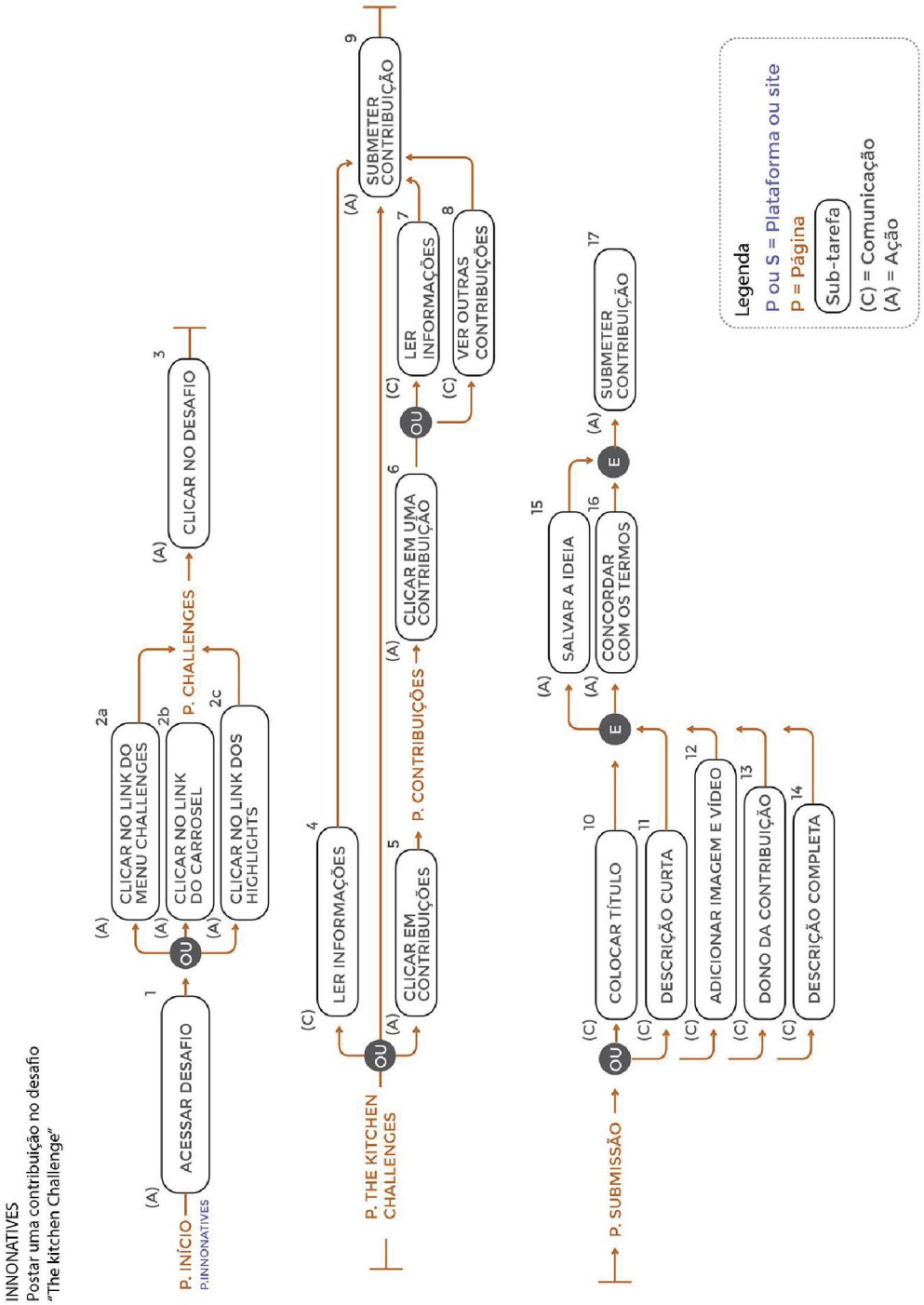
Definição da tarefa de acordo com o processo de *crowdsourcing* de cada plataforma

Antes de analisar a interface com os usuários, a decomposição da tarefa de postar uma ideia num desafio proposto em cada uma das plataformas foi realizada por especialistas[5].

Na plataforma innonatives, de maneira geral, o participante inicia a interação na página principal da plataforma; na sequência acessa a página de um desafio; lê as informações sobre o desafio; pode conhecer outras contribuições acessando a página das contribuições e, por último, submete sua contribuição na tela de submissão. Na figura 02, apresenta-se a decomposição da tarefa de postar uma contribuição no desafio *The Kitchen Challenge*, na plataforma innonatives.

[5] Por especialistas tem-se os autores deste artigo.

Figura 02 - Definição da tarefa executada na plataforma innonatives

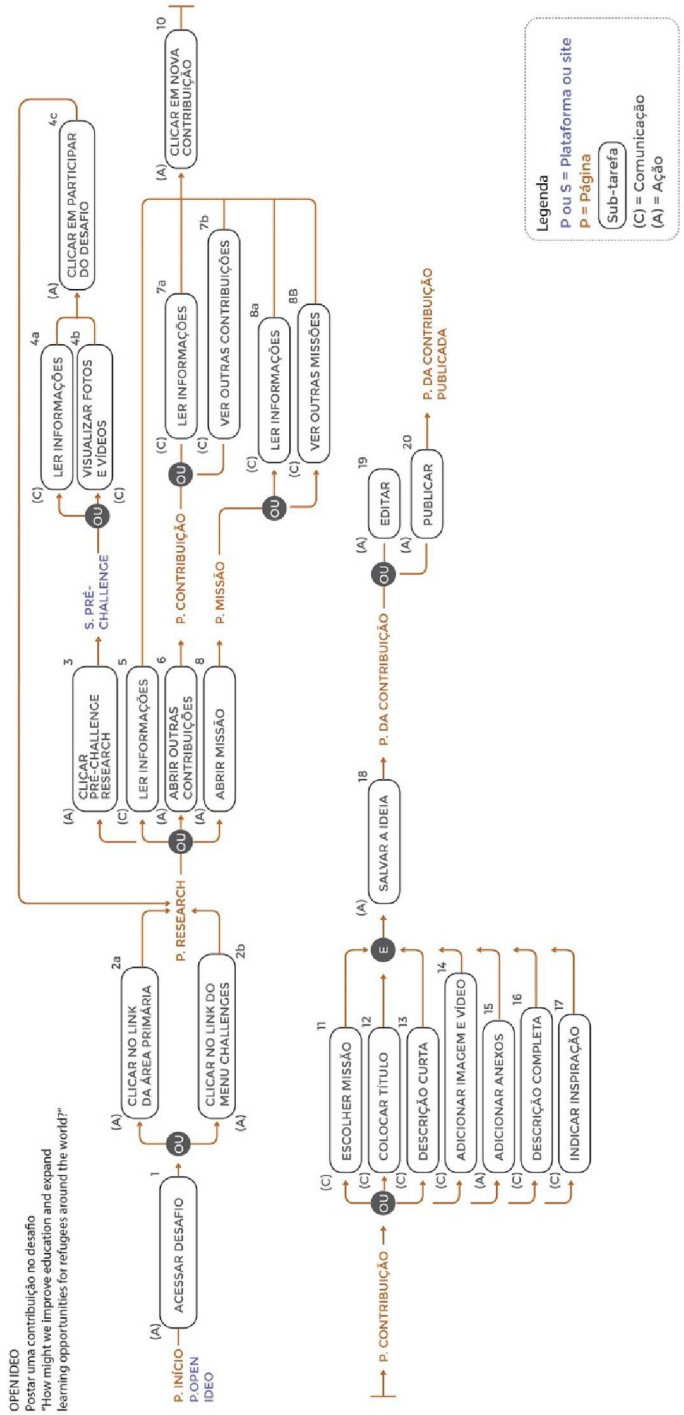


Fonte: Dos autores

Na plataforma OpenIDEO, de maneira geral, o participante inicia a interação na página principal; na sequência, acessa a página de um desafio e é direcionado para fase vigente do desafio. Lê as informações sobre a fase; pode ler as informações sobre o desafio acessando o link para página da pesquisa prévia do desafio (fora da plataforma); pode conhecer outras contribuições acessando a página das contribuições; deve escolher em qual missão

específicas contribuirá; para, então, submeter sua contribuição na página de submissão. Na figura 03 apresenta-se a decomposição da tarefa de postar uma contribuição no desafio "How might we improve education and expand learning opportunities for refugees around the world?", na plataforma OpenIDEO.

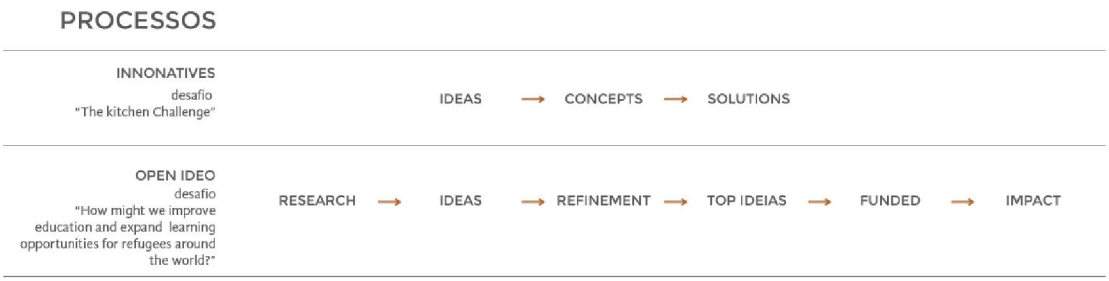
Figura 03 - Definição da tarefa executada na plataforma OpenIDEO



Fonte: Dos autores.

Percebe-se que os processos de *crowdsourcing* são diferentes em cada uma das plataformas: na plataforma innonatives, o desafio já inicia com a etapa de envio de ideias; enquanto que na plataforma OpenIDEO, a primeira etapa do desafio é a pesquisa, no qual os participantes devem compartilhar informações e referências a respeito do tema relacionado. Segundo consta na plataforma OpenIDEO, o início do desafio com a etapa de pesquisa é "para desenvolver empatia e entender as necessidades das pessoas antes de mergulhar em soluções." (OPENIDEO, web, 2015 - tradução livre). Além disso, a quantidade de etapas de cada processo de *crowdsourcing* nas plataformas pode variar dependendo do objetivo do desafio. Conforme a figura 4.

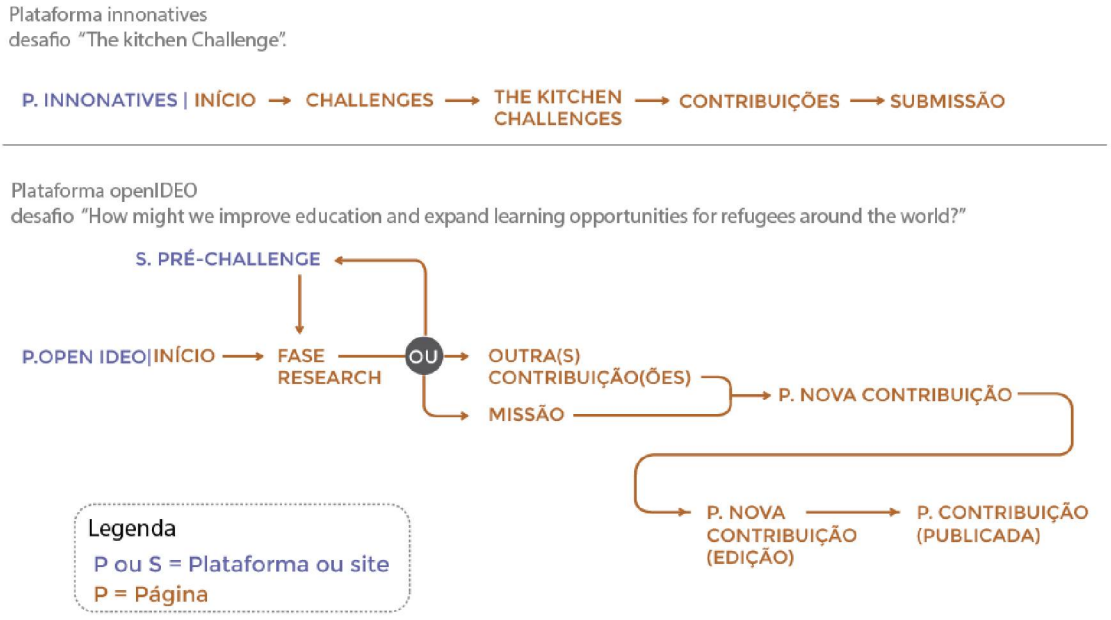
Figura 04 - Processos de Crowdsourcing de diferentes desafios nas plataformas de innonatives e OpenIDEO



Fonte: Dos autores

Embora existam essas diferenças, percebe-se que a plataforma innonatives tem menos níveis de sub-páginas (n=4) e sub-tarefas para concluir a tarefa (n=17), proporcionando um processo mais linear. Já na plataforma OpenIDEO há um número maior de níveis de sub-páginas (n=6) e sub-tarefas (n=20) para completar a tarefa geral. Além do mais, para acessar todas as informações sobre o desafio é necessário sair do processo linear tendo que acessar uma página externa (chamada de pré-desafio), como pode ser visto na figura 5.

Figura 05 - Páginas e subpáginas das plataformas innonatives e OpenIDEO



Fonte: Dos autores

Dos elementos informacionais das páginas do desafio de cada plataforma

Com relação aos elementos informacionais da interface da página do desafio das plataformas, o esquema na figura 06 apresenta a divisão das áreas de informação.

Figura 06 - Áreas informacionais das páginas do desafio das plataformas innonatives e OpenIDEO



Fonte: Dos autores, com base nas imagens das plataformas innonatives (2015) e OpenIDEO (2015).

Já no quadro 02 estão descritas as informações contidas em cada área da página do desafio de cada uma das plataformas. Além disso, atribuiu-se a classificação de Twyman (1985) com relação ao tipo de informação.

Quadro 02 - Tipo de informação contida em cada área da página do desafio, em cada uma das plataformas

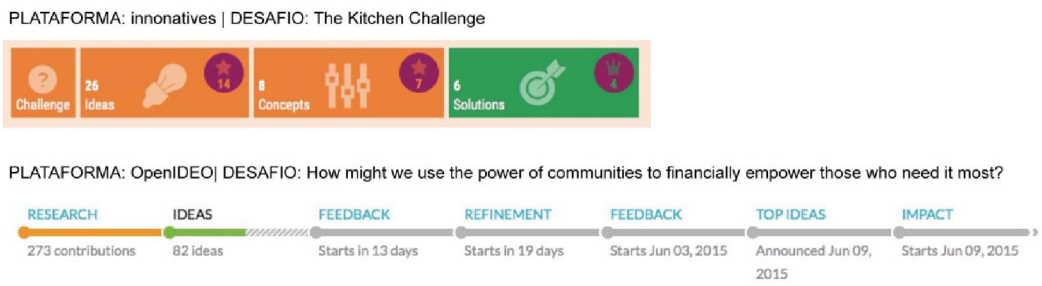
	innonatives		**OpenIDEO**	
Área	**Informação**	**Tipo de informação (de acordo com Twyman, 1985)**	**Informação**	**Tipo de informação (de acordo com Twyman, 1985)**
Cabeçalho	Links para *home*, *blog*, *faq*, *contact*, *register*, *login*.	Gráfica verbal	Links para *how it works*, *challenges*, *resources*, *blog*, *about us*, *impact*, busca e *log in*.	Gráfica verbal
Abas	*Links* para *Challenge*, *solutions*, *crowdfunding*, *implementation*, *shop*.	Gráfica verbal	NÃO SE APLICA.	
Primeira	Título do desafio.	Gráfica verbal	*Research*, *ideas*, *refinement*, *top ideias*, *funded*, *impact*.	Gráfica esquemática
Segunda	Linha do tempo das fases com número de contribuições.	Gráfica esquemática	Informação da fase vigente e link para pesquisa prévia (*pré-challenge research*).	Gráfica verbal
Terceira	"A": Descrição do desafio. Vídeo mais link e contato do dono do desafio, informações textuais e links para informações complementares. Box para comentários. "B": Botões de submissão de contribuição e visualização das outras contribuições já submetidas.	Gráfica verbal e pictórica	Destaque para a contribuição do dia.	Gráfica verbal e pictórica
Quarta	Comentários	Gráfica verbal e pictórica (foto do usuário)	Seleção/filtro da missão/ que a contribuição busca atender. (*Teaching approaches*, *Learning Spaces*, *Adult education*, *Skill exchange*, *student wellbeing*, *what's missing?*) - Prazo restante para fim da fase. - Botão para adicionar contribuição. - Barra de filtros das contribuições (*Newest*, *comments*, *applause*, *view*, *recently updated*). - Quadro de contribuições. - Botões de navegação nas páginas de contribuições.	Gráfica verbal e pictórica
Rodapé	Mesmos *links* do cabeçalho e *link* de informações sobre o projeto Sustainability Maker.	Gráfica verbal	*Links* do menu e *link* de informações sobre a plataforma OpenIdeo.	Gráfica verbal

Fonte: Dos autores.

Percebe-se que, considerando a página do desafio de ambas plataformas, a plataforma innonatives possui duas áreas de informação a mais do que a plataforma OpenIDEO (a área "abas" e duas colunas na terceira área). Já com relação ao tipo de informação, de acordo com a classificação de linguagem de Twyman (1985), a plataforma OpenIDEO possui conteúdo informacional majoritariamente pictórico, ou seja composto por mais imagens e menos texto, enquanto que a plataforma innonatives utiliza-se mais da linguagem verbal, principalmente na descrição do desafio.

Com relação às páginas onde se encontra o desafio, a plataforma OpenIDEO apresenta as informações relativas às fases através de informação esquemática; ou seja, em forma de linha do tempo. Apesar da plataforma innonatives também apresentar característica similar, o modo como a informação é apresentada na plataforma OpenIDEO é mais clara dado que os pictogramas da linha do tempo da plataforma innonatives podem confundir o usuário devido a possíveis erros de interpretação (figura 07).

Figura 07 - Informação esquemática - linha do tempo - de ambas plataformas



Fonte: Dos autores, com base nas imagens das plataformas innonatives (2015) e OpenIDEO (2015).

Ainda em relação à figura 07, percebe-se que na linha do tempo do desafio da plataforma innonatives não aparece a duração das etapas, enquanto que na linha do tempo da plataforma OpenIDEO, estas informações estão apresentadas de maneira explícita - ou seja, é informado ao usuário a quantidade de contribuições ou dias faltantes para iniciar a próxima etapa. Neste caso, é possível acompanhar o andamento do desafio sempre que acessar a página correspondente ao mesmo. Na plataforma innonatives, para que o usuário possa saber a duração das etapas, é necessário que posicione o cursor do *mouse* em cima da imagem correspondente à etapa, como mostrado na figura 08.

Figura 08 - Maneira como o usuário acessa a informação com relação ao tempo de duração das etapas do desafio.



Fonte: Dos autores, com base nas imagens da plataforma innonatives (2015).

Porém, apesar de apresentar esta informação - de duração das etapas - não é possível saber, por exemplo, quanto tempo falta para que a etapa comece ou termine.

Dificuldades encontradas na realização da tarefa na plataforma innonatives

Um dos três participantes do estudo, durante sua interação com a página inicial da plataforma innonatives, comentou sobre a troca constante das imagens no elemento carrossel, no item featured *challenges*. Segundo este usuário, o movimento chamou sua atenção. Já os dois outros participantes verbalizaram que o movimento desta mesma parte desviou o olhar quando da busca da aba para acessar o desafio.

A realização da tarefa de encontrar o desafio foi realizada com críticas verbalizadas por todos os três participantes. Para eles, a área está com muitos elementos agrupados bem próximos uns dos outros. O cabeçalho de cada desafio recebeu críticas devido a parte escrita estar com uma tipografia condensada e sobre um fundo com transparência. Para os usuários, isto dificultou a leitura do título. A figura 09 mostra a movimentação dos olhos dos participantes na página dos desafios. Percebe-se, neste caso, a dificuldade de leitura relatadas pelos usuários, visto que a parte do cabeçalho com o título do desafio está com área de cor laranja.

Figura 09 - Eye tracking da página de escolha dos desafios na plataforma innonatives



Fonte: Dos autores, com base nas imagens da plataforma innonatives (2015).

Nenhum dos participantes relatou ter dificuldade para encontrar a informação de como submeter uma ideia para o desafio. Segundo eles, a mesma estava destacada e com localização adequada. O mesmo foi verbalizado com relação às informações sobre o desafio.

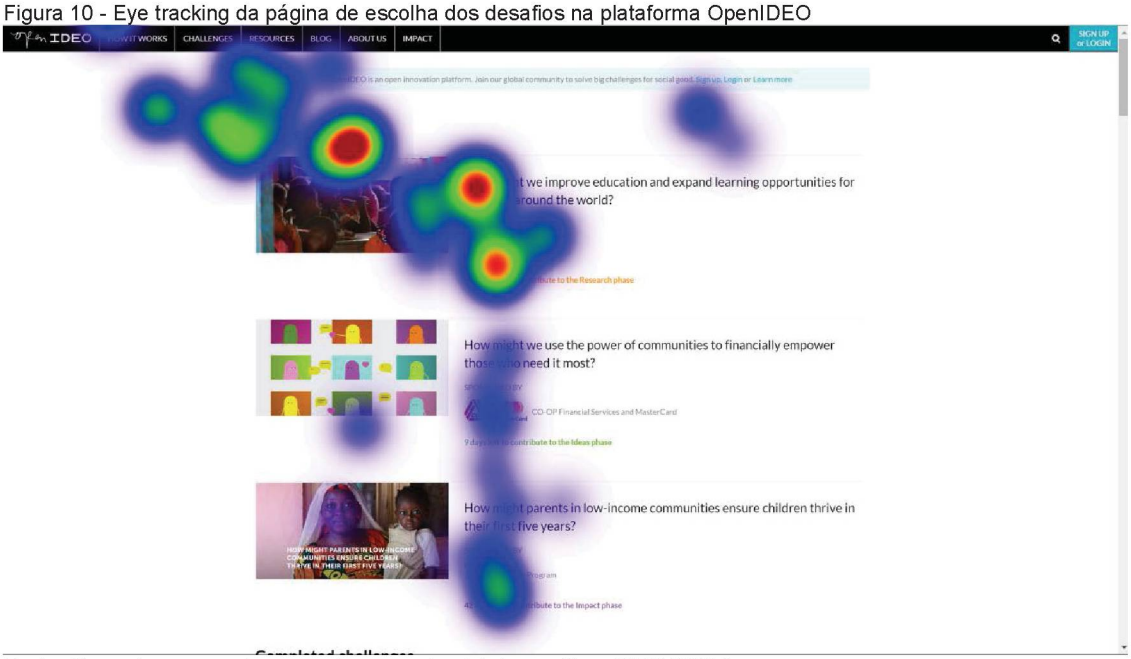
O passo de submissão das ideias gerou desconforto para os usuários. Todos os participantes relataram ter dificuldade no preenchimento dos campos para submissão da ideia, visto que os mesmos são para preenchimento por digitação, e não com a utilização de outro tipo de entrada de dados. Também, foi comentado que as ferramentas de edição de texto no campo “descrição da solução” são desnecessárias, visto que só é necessário inserir o texto, não havendo necessidade de tantas formatações.

Dificuldades encontradas na realização da tarefa na plataforma OpenIDEO

Todos os participantes do estudo (n=3) encontraram facilmente o desafio solicitado para a realização da tarefa. Foi verbalizado que o estilo visual utilizado na plataforma OpenIDEO facilitou a visualização da informação sobre os desafios, sendo os mesmos apresentados com

destaque e divisão bem demarcados separando-os. Na figura 08 tem-se a imagem do caminho percorrido pelos olhos dos participantes e os pontos em que focaram.

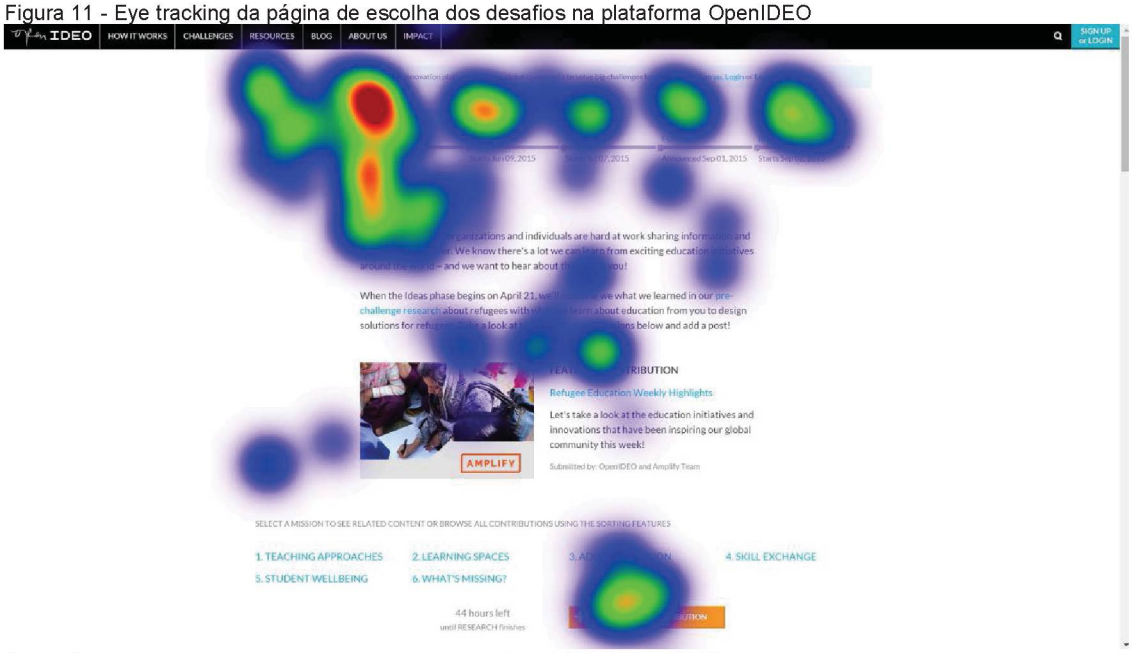
Figura 10 - Eye tracking da página de escolha dos desafios na plataforma OpenIDEO



Fonte: Dos autores, com base nas imagens da plataforma OpenIDEO (2015).

Na fase de envio de contribuição para o desafio, comentou-se a respeito do elemento esquemático em forma de linha do tempo da plataforma. Os participantes consideraram que a informação estava clara, podendo ser facilmente conhecida a fase em que o desafio se encontrava. Comentou-se, também, sobre o botão de submissão de contribuição, que está abaixo da primeira tela, só se tornando visível quando a página é rolada para baixo (figura 11). Porém, depois da rolagem a visualização ficou fácil, com cor diferente e entendimento de que o elemento era um botão.

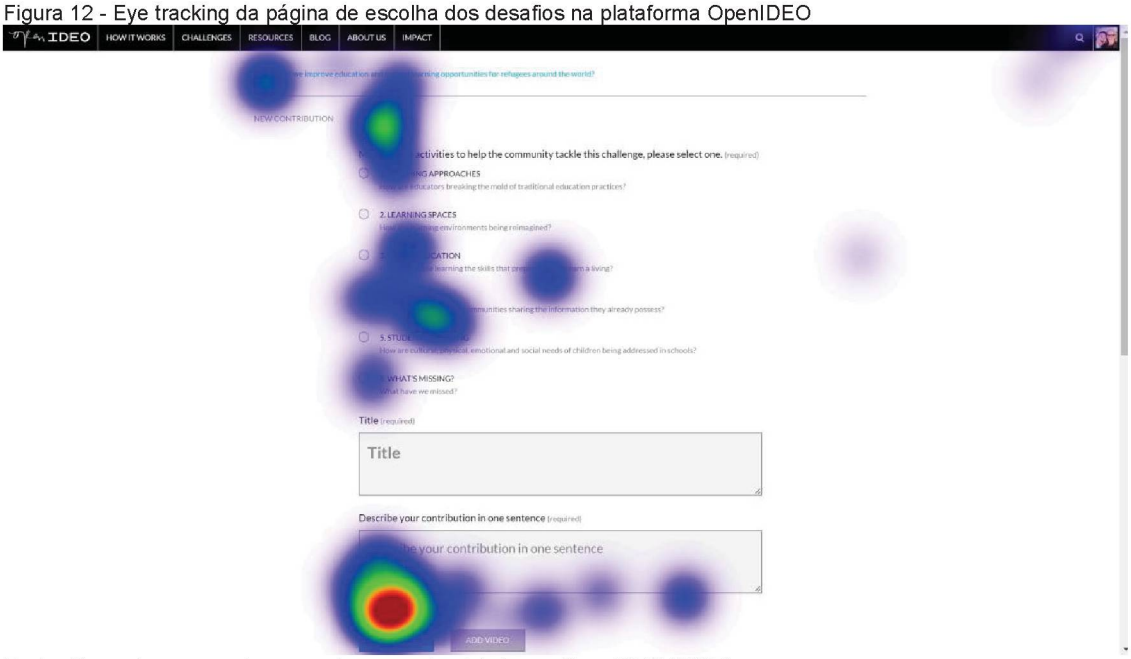
Figura 11 - Eye tracking da página de escolha dos desafios na plataforma OpenIDEO



Fonte: Dos autores, com base nas imagens da plataforma Open Ideo (2015).

A submissão da contribuição para o desafio deu-se de forma fácil. Como pode ser visto na figura 12, o caminho percorrido pelos olhos dos usuários fixou-se nas informações que seriam preenchidas. Os usuários reagiram positivamente nos campos superiores com botões de seleção de opções de contribuição.

Figura 12 - Eye tracking da página de escolha dos desafios na plataforma OpenIDEO



Fonte: Dos autores, com base nas imagens da plataforma OpenIDEO (2015).

Análise comparativa (triangulação dos dados)

Analisando a decomposição da tarefa, percebeu-se maior complexidade na plataforma OpenIDEO. Com um número maior de etapas e iniciado por um pré-desafio, bem como um número maior de subpáginas, a plataforma é mais completa quando comparada com a plataforma innonatives. Essa complexidade também pode ser entendida como maior ponto de contribuição de terceiros, visto que a tarefa é dividida em mais sub-tarefas, diminuindo o tamanho de cada uma.

A partir da aplicação das ferramentas *Think Aloud* e o *Eye Tracking,* percebe-se que essa complexidade é diminuída pela utilização de uma interface mais minimalista, com menos cores, layout marcadamente dividido, utilizando de forma mais intensa espaços em branco além de hierarquia tipográfica com a utilização de pesos e tamanhos diferentes.

Chamou atenção dos participantes a facilidade em encontrar o botão de submissão da ideia na plataforma innonatives - que fica em uma coluna lateral (na terceira área B - figura 4). Pode-se perceber que na plataforma OpenIDEO a rolagem da página dificultou a localização do botão para submissão, o que foi verbalizado pelos usuários.

Mesmo com um maior número de sub-páginas e mais passos no desafio, percebeu-se que a interface com menos elementos, com maior espaço branco e tipografia com maior facilidade de percepção da hierarquia, auxiliou os usuário a desempenharem a tarefa de envio das contribuições mais facilmente – ou seja, a plataforma OpenIDEO.

5 Considerações finais

Este estudo apresentou uma análise comparativa da tarefa de contribuir com a primeira fase de um desafio em duas plataformas distintas de *crowdsourcing*, a partir da perspectiva do usuário. Para tanto, foram realizados os procedimentos de: (1) definição da tarefa; (2) análise da tarefa - onde foram aplicadas as técnicas *Think Aloud* e *Eye Tracking* -; e (3) triangulação dos dados.

A partir da definição da tarefa, realizada pelos pesquisadores, percebeu-se que as duas plataformas analisadas - innonatives e OpenIDEO – apresentam vários elementos similares no âmbito das etapas do processo de *crowdsourcing*. Contudo, a quantidade de etapas são marcadamente diferentes, bem como a quantidade, qualidade e modo de apresentação das informações envolvidas ao longo de um "desafio". Para completar a realização da tarefa, por exemplo, notou-se que - em relação a plataforma innonatives - a plataforma OpenIDEO tem um número maior de sub-páginas (n=2); e isto pode ser o resultado do menor número de áreas de informação por página e maior número de informações pictóricas apresentadas.

A análise comparativa mostrou que, na perspectiva do usuário, a preferência para a realização da tarefa foi na plataforma OpenIDEO. Porém, tendo em vista que os participantes foram estudantes de design, notou-se que muitas das suas verbalizações eram sobre o plano de superfície (de acordo com Garrett, 2003).

Dessa forma, como sugestão para estudos futuros, faz-se necessário expandir o número de usuários participantes para, assim, avaliar a eficiência das plataformas tendo em vista a quantidade e tipo de informação com relação ao número de sub-páginas. Também, entende-se como necessário análisar as variáveis gráficas de acordo com os níveis de hierarquia propostos por Mijksenaar (1997).

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CROWD-DESIGN COMO ALTERNATIVA DE PRODUÇÃO DISTRIBUÍDA: UM ESTUDO DE CASO *EX-POST-FACTO* EM EMPRESA DE MÓVEIS EM PALLET

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Resumo: Este artigo apresenta um estudo de caso *ex-post-facto* do projeto Sustainability Maker Brazil, onde foi possível analisar criticamente a participação de uma empresa do setor moveleiro com relação às práticas e às diretrizes da produção distribuída. Para tanto, além de uma Revisão Bibliográfica Sistemática através da qual foi possível conhecer e estabelecer estas práticas e diretrizes, também foram analisados os relatórios do projeto SuM/BR e suas referentes etapas no desenvolvimento de um novo produto. Como resultado, é possível observar que o Crowd-Design pode ser considerado como uma opção para a produção distribuída.

Palavras-chave: Crowd-Design; inovação aberta; produção distribuída.

Abstract: *This paper presents an ex-post-facto study case made at Sustainability Maker Brazil's project. It was possible to critically analyze the participation of a furniture company with regard to practices and guidelines of distributed production. To this end, in addition to a Systematic Literature Review through which it was possible to meet and establish these practices and guidelines, were also analyzed the SuM/BR project reports and know the product development phases. As a result, it is possible to observe that the Crowd-design can be considered as an option for distributed production.*

Key-words: *Crowd-Design; open innovation; distributed production.*

1. **INTRODUÇÃO**

O presente artigo analisa o caso de desenvolvimento de novos produtos através do processo aberto de Crowd-Design, no âmbito do projeto *Sustainability Maker Brazil* (SuM/BR), através de um estudo de caso *ex-post-facto*. O projeto *Sustainability Maker* é uma iniciativa internacional que, a partir de uma plataforma online baseada nos princípios da inovação aberta, busca facilitar a conexão de pessoas que podem contribuir de maneira significativa na resolução de problemas relacionados à sustentabilidade. Este projeto é liderado pela E-Concept (Alemanha) e o desenvolvimento da plataforma é financiada pela Comunidade Européia através do programa LIFE (LIFE11 ENV/DE/000342). No Brasil este projeto está sendo desenvolvido pelo Núcleo de Design e Sustentabilidade da Universidade Federal do Paraná (NDS/UFPR).

O SuM/BR - o caso brasileiro do projeto - conta com a participação de duas empresas parceiras cuja função é apoiar todas as etapas de desenvolvimento e de produção da solução - neste caso, a Soliforte e a EcoDesign. A primeira atua no desenvolvimento de produtos oriundos da reciclagem de materiais da construção civil e a segunda desenha, produz e comercializa móveis em madeira fabricados a partir de pallets reutilizados. O presente artigo avalia de forma crítica a participação desta segunda empresa - a Eco-Design - tendo como base as práticas e as diretrizes levantadas por uma revisão bibliográfica sistemática (RBS) acerca da produção distribuída por meio do Crowd-Design.

Nesse sentido, Crowd-design é uma modalidade de *crowdsourcing*, para o desenvolvimento de novos produtos e ideias na área do Design. O Crowd-Design utiliza os conhecimentos e recursos disponíveis na multidão para a resolução de problemas ou criação de conteúdo, geralmente pela internet, sendo esta participação podendo ser remunerada ou não (DICKIE et. al, 2014).

Como dito, este modelo de processo se origina do *crowdsourcing*, que de acordo com Estellés-Arolas e González-Ladrón-de-Guevara (2012), é um tipo de atividade participativa e online no qual um indivíduo, instituição ou organização propõe uma tarefa a um grupo heterogêneo e indefinido, via chamada aberta. O cumprimento dessas tarefas sempre traz um benefício para ambas as partes, podendo este benefício ser de variadas formas.

O *crowdsourcing* possui variações que dependem da atividade desenvolvida. O Crowd-Design é um deles, e que por sua vez, pode utilizar-se de outras duas variações, a saber:

- *Crowdfunding*: que corresponde ao financiamento de projetos por meio da multidão. Consiste em uma solicitação pública para o financiamento específico de um projeto. Com isso, pequenas contribuições feitas por indivíduos isolados são adicionados ao todo para a implementação do projeto (BANNERMAN, 2013);
- *Crowdvoting*: que corresponde ao processo de seleção de alternativas feitas pela multidão que geralmente ocorre de forma online buscando a opinião de um grande número de pessoas sobre um tópico específico (BEHREND et al., 2011).

Assim como as atividades do *crowdsourcing*, a produção distribuída aumentou a capacidade dos usuários interferirem no que é produzido, desde a personalização de produtos até a fabricação pessoal (KOHTALA, 2015). O termo “produção distribuída", na engenharia, traz a perspectiva de um planejamento de produção entre uma rede de empresas visando agilidade, flexibilidade, fabricação voltada ao consumidor, entre outros (Bruccoleri et al., 2005; Leitão, 2009; Tuma, 1998).

De acordo com Kohtala (2015), "produção distribuída" é um termo usado mais ideologicamente do que epistemológicamente quando se trata de modelos alternativos de negócios e oportunidades socialmente benéficas para produção e um consumo mais responsivo. No Design, Kohtala (2015) defende que este conceito está diretamente ligado à participação do usuário no desenvolvimento do projeto ou no fato deste ser orientado para o consumidor final.

O conceito de produção distribuída ainda é difuso e muitas vezes é definido por ações pontuais como o ato do consumidor fazer parte da produção, conhecido como *prosumption* (Benkler, 2006). Kohtala (2015) traça uma revisão bibliográfica da produção distribuída a partir da sustentabilidade e Lin et al. (2012) analisa a "produção colaborativa" em pequenas e médias empresas. Outros termos como "personal manufacturing" (Bauwens et al., 2012) ou "making" (Gauntlett, 2013) também são citados no contexto de alusão à produção distribuída.

2. PROCEDIMENTOS METODOLÓGICOS E DESENVOLVIMENTO

2.1 Procedimentos da pesquisa

Como mencionado anteriormente, este estudo refere-se a um estudo de caso *ex-post-facto*, cujos dados coletados são, majoritariamente, de cunho qualitativo. Para tanto, foram utilizados os seguintes procedimentos: (1) Revisão Bibliográfica Sistemática (RBS), que auxiliou no levantamento de informações para maior entendimento e elucidação das etapas no que tange a produção distribuída e o Crowd-Design; (2) Coleta de documentos, como relatórios do projeto SuM/BR, fornecidos pela equipe do NDS/UFPR que participou do SuM/BR; (3) Análise comparativa das ferramentas e métodos utilizados no projeto SuM/BR a partir dos dados fornecidos pela RBS afim de avaliar o processo.

Utilizando o método da RBS proposto por Conforto et al. (2011), objetivou-se conhecer estudos sobre as práticas de desenvolvimento de novos produtos por meio do Crowd-Design e *crowdsourcing* em organizações, assim como a relação das etapas dentro do processo de desenvolvimento de produtos (PDP). Também foi usada a RBS para levantar informações sobre produção distribuída e suas práticas no processo de desenvolvimento de novos produtos (PDP).

De acordo com Conforto et al. (2011), a primeira etapa de uma RBS é a definição do problema no qual se busca responder uma ou mais perguntas. Após o estudo de caso feito com o projeto SUM/BR e a EcoDesign, houve a necessidade de se obter informações de cunho comparativo para analisar e entender quais práticas foram as mais eficientes e quais os pontos positivos e negativos no projeto. Logo, a principal questão seria avaliar de forma crítica as práticas no estudo de caso deste modelo de Crowd-Design para o desenvolvimento de novos produtos. Como objetivos específicos: procurou-se a definição de uma estrutura no PDP das organizações usando a multidão como fonte criativa, para servir de base comparativa ao caso estudado; e de que forma o Crowd-Design pode ser uma alternativa sustentável de produção distribuída para as organizações.

Após esclarecidos os objetivos e tendo como fonte primária os relatórios do projeto SUM/BR (2014) e suas referências subsequentes, houve a definição dos *strings* de busca, assim como proposto por Conforto et al. (2011). Os *strings* de busca foram divididos em duas categorias. A primeira foi para se entender o processo de desenvolvimento de produtos por meio do Crowd-Design nas organizações e a segunda categoria de *strings* buscou-se a abordagem da produção distribuída no PDP das organizações. A relação dos strings usados, assim como a classificação e o número de artigos encontrados está no Apêndice A.

Os critérios de inclusão e qualificação, de acordo com Conforto et al. (2011), são importantes para verificar similaridade e rigorosidade nas referências buscadas. Para isso, como critérios de inclusão foi definido que seria usada a plataforma ScienceDirect (2015). Os seguintes critérios foram considerados: "em qualquer local da publicação" que "contém" os *strings* de busca; no recorte de tempo foram considerados os trabalhos "publicados nos últimos 10 anos"; "somente artigos"; "somente no idioma inglês". Os critérios de qualificação, que atestam a importância do artigo, foram levados em consideração pelo interesse em publicações que descrevessem os métodos de desenvolvimento de produtos usando o Crowd-Design e a multidão, estudos de caso na área e exemplos práticos.

A seleção dos artigos para a RBS foi feita da seguinte forma: leitura do título, resumo e leitura completa dos artigos, verificando entre cada etapa a congruência dos dados em razão aos critérios supracitados assim como propõe Conforto et al. (2011).

2.2 **Crowd-Design como opção para a produção distribuída**

Dos 24 artigos encontrados e analisados na RBS, nenhum menciona o termo "Crowd-Design" como modalidade de desenvolvimento de novos produtos via *crowdsourcing*. Apenas a fonte primária define como Crowd-Design o PDP com a multidão. Entretanto, Djelassi e Decoopman (2013) citam que a prática do *crowdsourcing* no desenvolvimento de produtos nas empresas primeiramente consiste em integrar o consumidor (ou desenvolvedor externo) no processo de inovação, ou seja, trazer a figura do consumidor para fazer parte do processo de produção. Toffler (1980) denomina este sujeito participante de "*prosumer*".

Kohtala (2015) em sua revisão bibliográfica acerca da produção distribuída e sustentabilidade cita que a maioria dos autores voltados para o design de produto abordam o assunto pelo prisma da personalização de produtos via produção digital, com diversas aproximações. Dentre elas, o design aberto (*open source*) para os próprios consumidores modificarem seus produtos e o fornecimento de medidas corpóreas para a customização focada no consumidor. Nesta RBS, a maioria dos artigos (07 de 11) também trata destes temas, e principalmente em como a produção voltada às necessidades do consumidor podem gerar produtos menos efêmeros consumidos pelos usuários e consequentemente com maior proximidade à sustentabilidade (Diegel et al. 2010).

Partindo desta proposição, alguns autores como Kohtala (2015) citam a co-criação como fonte de produção distribuída, porém, em nenhum deles cita o *crowdsourcing* ou o Crowd-Design como alternativa.

Djelassi e Decoopman (2013) citam que o fato da empresa confiar em seus clientes no PDP traz para estes uma sensação de importância e auto-estima, se orgulhando de fazer parte no processo e de saber que a empresa está contando com suas soluções. Os mesmos autores defendem que um produto desenvolvido por meio da multidão resulta em produtos mais adaptados à necessidade do consumidor e consequentemente produtos mais longevos.

No crowdsourcing, Brabham (2010) defende que a boa prática desta modalidade começa na elaboração de uma tarefa (ou desafio) bem planejada. O mesmo autor define nove princípios norteadores para a elaboração de uma tarefa e a boa execução de um projeto que envolve a multidão como fonte criativa ou solucionadora:

1) definição clara do problema e comunicar as soluções que são esperadas;
2) determinar o nível de comprometimento da empresa com os resultados obtidos, no sentido de explicitar o tipo de solução que será produzido e porquê;
3) entender a motivação para a participação dos usuários;
4) investir em um site ou plataforma que é utilizável, interessante e bem concebido;

5) ter um plano promocional e um plano para o crescimento da comunidade;
6) ser honesto, transparente e ágil;
7) não controlar o comportamento da multidão, pois ela não está sendo consultada para realizar os objetivos organizacionais e sim convidada a se envolver no processo de desenvolvimento de produtos;
8) reconhecer os usuários com as premiações que lhe foram prometidas; e
9) avaliar o projeto sob vários ângulos, solicitando sempre o *feedback* dos participantes.

Ainda sobre a elaboração da tarefa, Djelassi e Decoopman (2013) ressalta que para qualquer operação dentro do *crowdsourcing*, a organização deve explicar claramente as regras e o que se busca com tal prática para não haver nenhum desentendimento e consequentemente a sensação de trapaça ou exploração por parte dela. Esta sensação deve ser evitada em todo o processo de desenvolvimento.

O processo de crowdsourcing, no ponto de vista das organizações, se for bem conduzido pode trazer diversos benefícios às empresas. Alonso (2013) salienta que esta prática oferece uma flexibilidade em projetos e que deveria fazer parte do processo de desenvolvimento. Zhao e Zhu (2011) enfatiza que a organização participante precisa definir claramente o que ela está buscando com este tipo de modelo e Malone et al. (2010) propõe a visualização prévia de como esta organização vai obter os resultados esperados. Tais ações podem influenciar no tipo de interação que a mesma terá com a multidão e que tipo de aproximação ela terá.

2.3 **As etapas do processo de Crowd-Design aplicadas ao projeto SuM/BR e a participação da empresa parceira**

A análise dos relatórios do projeto SuM/BR foi realizada pelos três autores deste artigo, sendo o conteúdo analisado, principalmente, as etapas do processo de Crowd-Design e a relação e a participação da empresa parceira, a EcoDesign. Na figura 01 é possível visualizar as etapas do processo de Crowd-Design tal como aconteceram no caso estudado. Estas etapas são sugeridas pelo projeto Sustainability Maker.

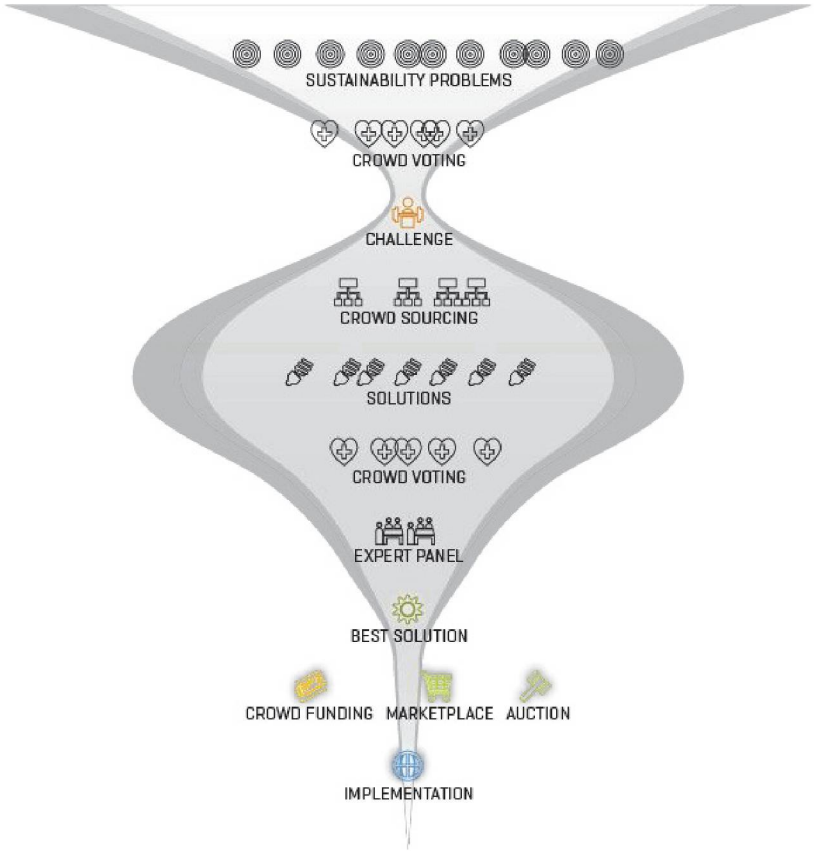


Figura 01 - Etapas do processo de Crowd-Design do projeto SuM/BR
Fonte: *Sustainability Maker Project* (2015, web).

De acordo com o apresentado na figura 01, a etapa inicial do processo de Crowd-Design corresponde ao levantamento do problema. Para isso, a equipe do projeto SuM/BR foi a campo coletar dados sobre a Comunidade Águas Claras, em Piraquara/PR. Esta comunidade serviu de fonte de dados para a descoberta do desafio - ou seja, qual seria o problema que seria levado para a multidão solucionar, através da plataforma Innonatives (2015). Neste tipo de abordagem do problema, prioriza-se o modelo *botom-up*, onde procura-se entender as reais necessidade dos usuários, adaptando-a a estratégia de negócios da empresa. Assim, nesta etapa a empresa EcoDesign foi consultada e mostrou-se interessada em direcionar seus produtos também para o público de baixa-renda. A etapa seguinte foi a de votação. A equipe do projeto SuM/BR após analisar os dados coletados, voltou à comunidade de Águas Claras e apresentou quatro principais problemas evidenciados pela coleta de dados. A comunidade, então, pode votar naquele que mais lhe era relevante; no caso, melhorar a socialização nas cozinhas de suas casas. É importante ressaltar que, sem o auxílio da equipe do projeto SuM/BR, a empresa EcoDesign talvez não tivesse oportunidade para investir (tempo e dinheiro) num estudo aprofundado, tal qual o realizado junto à comunidade de baixa-renda. A figura 02 apresenta as etapas da coleta de dados e da votação desta primeira etapa do processo de Crowd-Design.

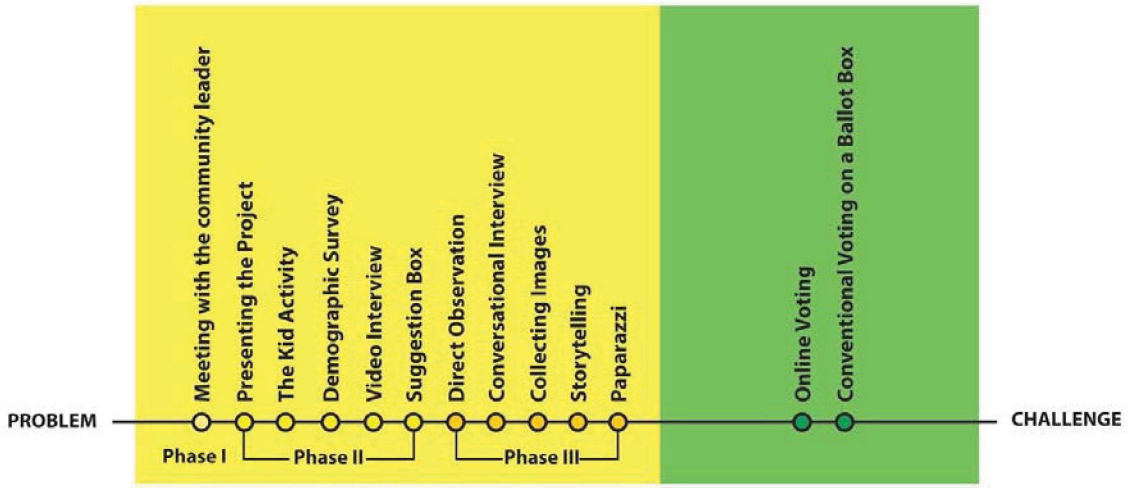


Figura 02 - Etapas da Fase de Coleta de Dados do processo de Crowd-Design do projeto SuM/BR
Fonte: Relatório do projeto SuM/BR (2015, web).

Assim, com o problema escolhido pela comunidade, o próximo passo foi o de definir o desafio, de maneira a gerar um briefing para disponibilizar na plataforma Innonatives. A figura 03 mostra o briefing disponibilizado na plataforma para os participantes.

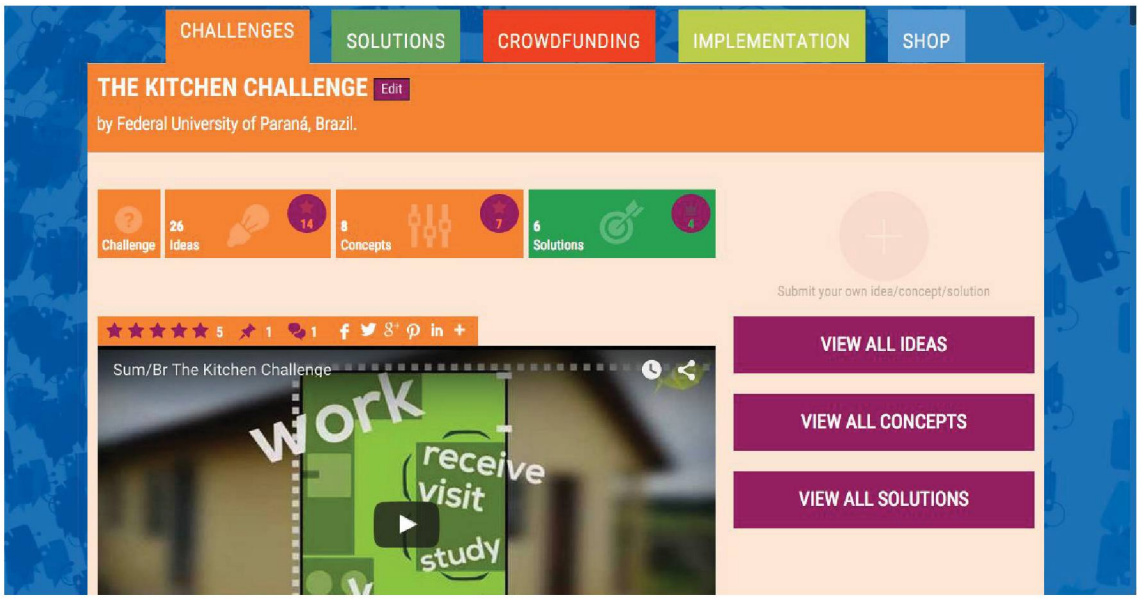


Figura 03 - Briefing do projeto SuM/BR.
Fonte: Innonatives platform (2015, web).

Para a realização do briefing, a empresa EcoDesign foi novamente envolvida, sendo de extrema importância as informações fornecidas pela mesma com relação ao seu processo de fabricação. Pois, tendo em vista que o desafio consistiu no desenvolvimento de um produto para auxiliar na socialização em cozinhas de famílias de baixa-renda, o mesmo deveria ser desenvolvido de maneira a ser produzido pela empresa parceira.

As etapas seguintes consistiram do envio da ideia, conceito e solução ao desafio proposto. Ao final de cada uma das etapas, foi realizada a votaçao online - *crowdvoting* - e também a postagem de comentários em cada ideia, conceito e solução enviada. Em todas estas etapas, a empresa EcoDesign também foi envolvida, realizando votos e comentando, como pode ser visto na figura 04.

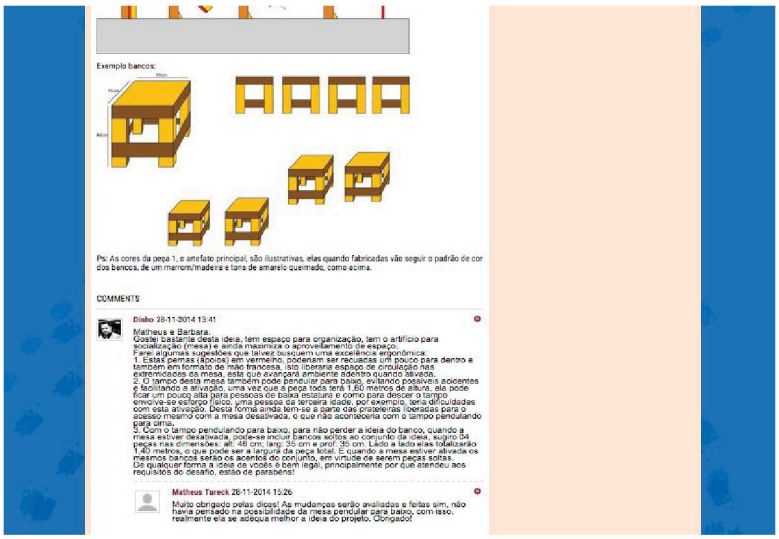


Figura 04 - Comentário em uma das ideias enviadas para o desafio do projeto SuM/BR pela empresa parceira EcoDesign.
Fonte: Innonatives platform (2015, web).

Do *crowdvoting* da solução, ou seja, a última etapa de votação para a escolha do vencedor, sairam quatro vencedores: um terceiro lugar, dois segundo lugares e um primeiro lugar. O produto que ganhou em primeiro lugar foi o produzido pela empresa EcoDesign. A figura 05 mostra o projeto do produto e o mesmo após ser produzido.



Figura 05 - Rendering do móvel (esquerda); móvel produzido pela empresa EcoDesign (direita).
Fonte: innonatives platform (2015, web).

No caso do projeto SuM/BR, por se tratar de um piloto, e por ter desde o início o suporte de duas empresas parceiras - sendo uma delas a EcoDesign que produziu a solução vencedora do desafio - não foi necessário utilizar a etapa de *crowdfunding*, bem como o *marketplace* ou *auction*, como previsto no processo original do projeto *Sustainability Maker* e na plataforma innonatives.

Com relação a implementação da solução, a empresa EcoDesign fez a doação de um exemplar para ser sorteado na comunidade de Águas Claras como forma de agradecimento pela participação no projeto. A figura 06 mostra como o móvel já está sendo utilizado pela família contemplada no sorteio.

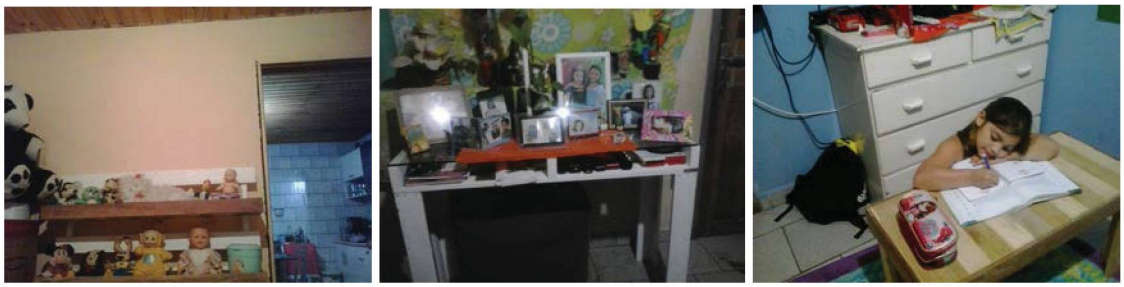


Figura 06 - Utilização do móvel pela família de baixa-renda contemplada pelo sorteio.
Fonte: Arquivo pessoal.

Interessante perceber que, mesmo tendo sido planejado para a cozinha, o móvel, quando implementado, recebeu outro fim; na verdade, está sendo utilizado para três novas funções: a parte das prateleiras está sendo utilizada para guardar brinquedos; a parte da mesa (ou do balcão) está sendo utilizada como aparador para suporte a objetos pessoais, como porta retratos; e o banco está servindo de mesa para a criança estudar.

3. CONCLUSÃO

Este artigo apresentou um levantamento de diretrizes para as práticas e competências do crowdsourcing em projetos crowd-design nas organizações. O levantamento das informações trouxe características que definem o que é uma boa conduta para as empresas quando se trata desta nova modalidade de desenvolvimento de produtos e soluções. Para isso, o método usado foi a Revisão Bibliográfica Sistemática, que se mostrou eficaz tanto na organização quanto na seleção das pesquisas para este trabalho. A sistematização das etapas facilita o manuseio de dados na quantidade que foi gerada e analisada, evitando o retrabalho e agilizando a pesquisa.

A multidão como fonte de ideias e soluções é a premissa para que o Crowd-Design funcione de maneira a se obter melhores resultados para os consumidores (que participam ou não do processo) e para as organizações. Resultados que podem variar de um produto mais adaptado às necessidades do consumidor para um produto mais econômico no ponto de vista do PDP das organizações, entre diversas outras situações. Tal afirmação pôde ser analisada no estudo de caso estudado: o processo de Crowd-Design no projeto SuM/BR gerou um produto que foi amplamente usado pelo público-alvo, público este que participou do desenvolvimento.

De acordo com as etapas levantadas na RBS para uma boa execução no processo de *crowdsourcing*, cabe salientar que no projeto SuM/BR as fases de definição do desafio e a parte informacional do projeto (diretrizes 1 e 2) foram bem executadas pela equipe. O processo descrito de coleta de necessidades com diversas entrevistas e análises intensifica o papel da organização em tentar entender o que o consumidor precisa e o que a empresa define como essencial na produção. Mesmo este consumidor sendo um *prosumer,* é papel das organizações entender quais necessidades e problemas são relevantes para a sua produção e consequentemente oferta. Por isso, é importante e necessário o papel de ambas as partes no processo de desenvolvimento de produto voltado às necessidades do consumidor: uma para definir o que se precisa (usuário) e outro para definir parâmetros de produção e consumo (organizações).

Nas etapas de desenvolvimento da ideia e avaliação, o papel da empresa EcoDesign deu-se não apenas pela aceitação ou rejeição de soluções, mas sim com avaliações de modo

a adaptar as ideias ao processo produtivo da organização ou demonstrando maleabilidade e abertura às soluções excêntricas ou dissonantes ao habitual no setor moveleiro.

Em nenhum momento foi explicitado a posição estratégica ou a visão da empresa em relação ao projeto. No briefing, as informações acerca da empresa eram somente de origem produtiva. Informações como o posicionamento de mercado desta empresa ou o que ela almeja com um tipo de processo deste cunho não foi passado para os participantes do desafio. Por mais que a interação e a construção coletiva tenha ocorrido por meio da plataforma Innonatives, esta conduta da empresa foi de caráter passivo, ou seja, em resposta às informações que vieram até a mesma.

Dentre todos os artigos sobre produção distribuída, nenhum cita o *crowdsourcing* como alternativa, entretanto, se os consumidores forem tratados como "multidão", o que de fato são, é possível transportar o conceito de Crowd-Design para o PDP de novos produtos sendo uma alternativa de produção distribuída.

Ainda que o crowdsourcing seja uma nova modalidade de geração de novas ideias e soluções e que muitas empresas estejam usufruindo disto, diferenciações de princípios heurísticos ainda devem ser explanados. Necessita-se elaborar o assunto no sentido de qual tipo de crowdsourcing e qual atividade dentro desta prática pode ser mais vantajosa em casos específicos na indústria de acordo com sua área de atuação, porte, e tipo de desenvolvimento que se almeja. E assim a própria organização poder comunicar aos participantes quais são os seus anseios e suas estratégias, dando mais base informacional para o desenvolvimento de novos produtos.

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APÊNDICE A - RESULTADOS DOS STRINGS DE BUSCA

Strings de busca utilizados	Total	Selecionados
Crowdsourcing + design	1268	19
Crowd-design	11	0
Crowdsourcing AND design + "product design"	68	2
Crowdsourcing AND design + SME	76	3
Crowdsourcing AND design + industry	552	1
Crowdsourcing AND design + enterprise	348	1
"distributed production"	454	6
"distributed manufacturing"	368	3
"peer production"	132	1
prosumption	47	1
Total	3.324	27 (10 recorrentes)

arcos DESIGN

Projetando soluções sustentáveis para habitações de interesse social através do crowd-design: uma abordagem para o levantamento de problemas

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Projetando soluções sustentáveis para habitações de interesse social através do Crowd-Design: uma abordagem para o levantamento de problemas

Resumo: Este trabalho apresenta um protocolo visando a identificação de questões relevantes a serem abordadas num processo de crowd-design do Projeto Sustainability Maker. A partir de pesquisa-ação o artigo relata em detalhe o processo para elucidação do problema durante o estudo de campo em uma comunidade de baixa renda na Região Metropolitana de Curitiba, Brasil.
Palavras-chave: Políticas de Design, Promoção de Design, Design e Desenvolvimento.

Designing sustainable solutions for low-income households through by means of Crowd-Design: an approach for problem scouting

Abstract: This paper presents a protocol for the identification of relevant issues to be addressed in a crowd-design process of the Sustainability Maker Project. From action research this paper recounts in detail the process for the problem elucidation during the field study in a low-income community in the Metropolitan Region of Curitiba, Brazil.
Keywords: Design Policies, Design Promotion, Design and Development.

1. Introdução

A Internet tem proporcionado uma série de oportunidades para promover inovações que visam a melhoria do bem-estar em comunidades no geral. Assim, a Internet pode ser vista como uma plataforma que permite a conexão de um "cérebro enorme" com o poder financeiro da comunidade mundial com o processo de desenvolvimento de soluções para os problemas locais. Uma abordagem disruptiva para implementar tais conexões é chamada de Crowd-Design, que pode ser definido como o processo de desenvolvimento de sistemas, produtos ou serviços, solicitando contribuições de um grande grupo de pessoas e, especialmente, através da web, ao invés de empregados tradicionais ou fornecedores.

No Brasil, a adoção do Crowd-Design em comunidades de baixa renda tem um contexto favorável, devido à rápida penetração da Internet. Em 2014, o país ocupou a 5ª posição no ranking mundial de uso de Internet, de acordo com a Internet Live Stats (2014), com uma estimativa de 110 milhões de usuários. Entre a população de baixa renda a proporção de usuários cresceu de 25% em 2005 para 65% o em 2011 de acordo com o IBGE (2011).

A colaboração em massa traz o potencial para uma melhor abertura (padrões abertos, maior transparência, atitude aberta aos ideais externos e recursos); a possibilidade de substituir os modelos hierárquicos com uma abordagem mais colaborativa; a possibilidade de promoção de estratégias de partilha em vez de abordagens proprietárias de conhecimento; as pessoas podem realmente agir globalmente ignorando fronteiras geográficas, tanto a nível corporativo e individual (Tapscott & Williams, 2008).

No presente artigo é relatada a primeira fase de um estudo piloto sobre a utilização de uma plataforma de Crowd-Design para fornecer soluções sustentáveis para os problemas identificados em uma comunidade de baixa renda. O estudo é parte do Projeto Sustainability Maker, um projeto de inovação apoiado pelo Programa Europeu LIFE, que irá criar através de processos de inovação aberta na Plataforma innonatives.com, como crowdsourcing, crowdvoting, e crowdfunding, um mercado online de soluções sustentáveis.

2. O processo de Crowd-Design e a plataforma innonatives

O processo de Crowd-Design do Projeto Sustainability Maker inicia com o levantamento de problemas, como pode ser visualizado na figura 1.

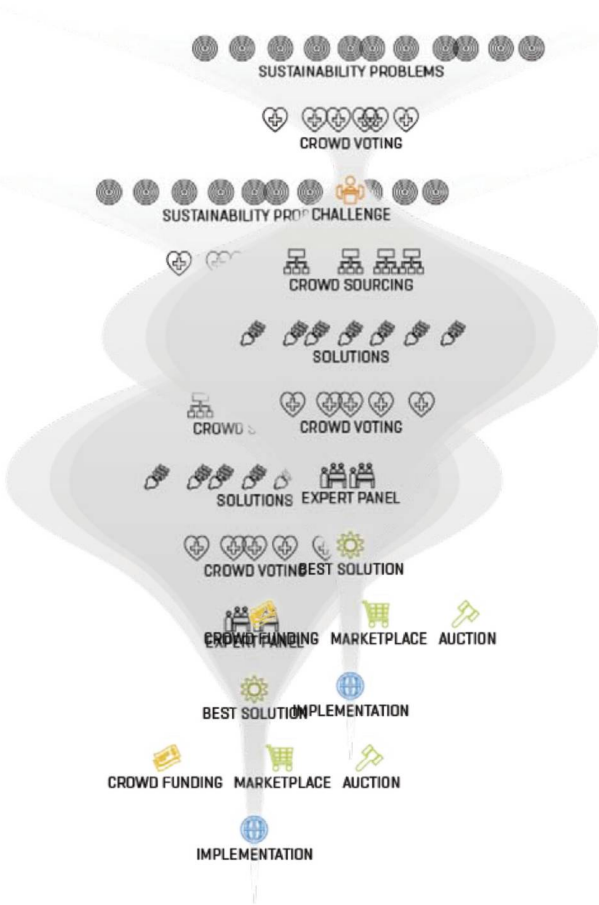


Figura 1. O processo de Crowd-Design do Projeto Sustainability Maker (fonte: SuM/BR, 2014)

Após o levantamento de problemas, é realizado o primeiro processo de crowdvoting, para a escolha do problema que será postado como Desafio na plataforma innonatives.com.

innonatives.com (com "i" minúsculo) é uma plataforma de Inovação Aberta, que combina crowdsourcing, crowdvoting e crowdfunding em uma única plataforma online. O objetivo desta plataforma é conectar pessoas que identificaram problemas relacionados à sustentabilidade com aqueles que podem resolvê-los de forma criativa. A plataforma innonatives também tem intenção de ajudar as pessoas a organizar o financiamento e colaboração adequada para suportar as suas ideias de soluções para a sustentabilidade. Apoios às iniciativas de sustentabilidade através desta plataforma podem ser gerados através do acesso a uma grande rede internacional, incluindo os públicos, especialistas da área, empresas e organizações. Innonatives também é um mercado online de soluções voltadas para a sustentabilidade.

Qualquer pessoa pode se envolver com innonatives.com como Seeker, Solver, Voter, Funder, Trader, Expert, ou uma combinação ou todos os tipos. No quadro 1 estão as definições para cada tipo de envolvimento.

Tipo de Envolvimento	Definição
Seeker	É alguém que identifica um problema de sustentabilidade e tem necessidade de uma solução. *Seekers* podem propor Desafios que estejam de acordo com o escopo da plataforma.
Solver	É alguém que gostaria de desenvolver ou já desenvolveu soluções relacionadas à sustentabilidade em conjunto com um grupo de outros agentes ou individualmente.
Voter	É alguém que participa de votação nos Desafios, ajudando a eleger as melhores soluções.
Funder	É alguém que investe ou doa dinheiro para que as melhores soluções possam ser implementadas.
Trader	É alguém que oferece ou compra produtos sustentáveis, serviços ou soluções no mercado online da plataforma.
Expert	É alguém a quem se consulta sobre o desenvolvimento e implementação de soluções.

Quadro 1. Tipos de envolvimento nos processos da plataforma innonatives (fonte: SuM/BR, 2014)

A plataforma innonatives oferece cinco funções principais: Desafios, Soluções, Crowdfunding, Implementação e Compra, conforme descrito no quadro 2.

Função	Descrição
Desafios	Projetos de inovação e design que buscam soluções sustentáveis convidam contribuições de todos (ou específicos) membros da comunidade innonatives. As pessoas podem participar de desafios de sustentabilidade existentes iniciados por outros e desenvolver soluções inovadoras para resolvê-los individualmente ou em

	equipes. Cada desafio passa por fases a partir da ideia inicial de soluções definitivas. Cada desafio tem termos específicos, condições e recompensas, que os usuários precisam aceitar antes de participar no projeto.
Soluções	Uma biblioteca de soluções vencedoras dos desafios específicos, com informações detalhadas sobre eles e como cada um pode se envolver na sua execução. Este espaço também pretende oferecer uma gama de soluções pré-definidas, sem responder a desafios específicos. Essas soluções disponíveis na plataforma permitem que outras pessoas comentem, votem, adicionem ideias ou sugestões, colaborem e estimulem o seu desenvolvimento, incluindo a possibilidade de inseri-lo no módulo Crowdfunding.
Crowdfunding	Este módulo é utilizado para levantar dinheiro para apoiar a implementação de soluções. No momento da escrita deste documento havia duas opções: (a) o financiamento público baseado doação, (b) o financiamento público baseado recompensa, por exemplo pré-venda (para pré-compra do produto ou serviço e recebê-la, uma vez que é implementado).
Implementação	Na guia de implementação, o usuário deve encontrar um arquivo de soluções sustentáveis que foram implementadas na prática. Não haverá estudos de caso detalhados sobre o processo de soluções específicas e seu sucesso no mundo real implementação.
Compra	Loja on-line da innonatives que pretende oferecer um catálogo de produtos, serviços e soluções verdadeiramente sustentáveis. De acordo com sua descrição, o usuário será capaz de percorrer e comprar soluções sustentáveis novos e inovadores de todo o mundo, podendo também vender seus produtos na loja.

Quadro 2. Principais funções da Plataforma innonatives (fonte: SuM/BR, 2014)

O principal diferencial da plataforma innonatives é o seu foco na criação de inovação radical para a Sustentabilidade. Uma solução voltada para a sustentabilidade é inserida na plataforma, uma vez que é ambientalmente

amigável, benéfica para a sociedade e apoia o desenvolvimento econômico a longo prazo.

3. Procedimentos metodológicos

A coleta de dados para este trabalho foi realizada com base nos princípios de Thiollent (1985), Mello e Turrioni (2011) e Robson (1993) para a pesquisa-ação. Para tanto, a pesquisa de campo seguiu, desta forma, um processo cíclico, conforme ilustra a figura 2.

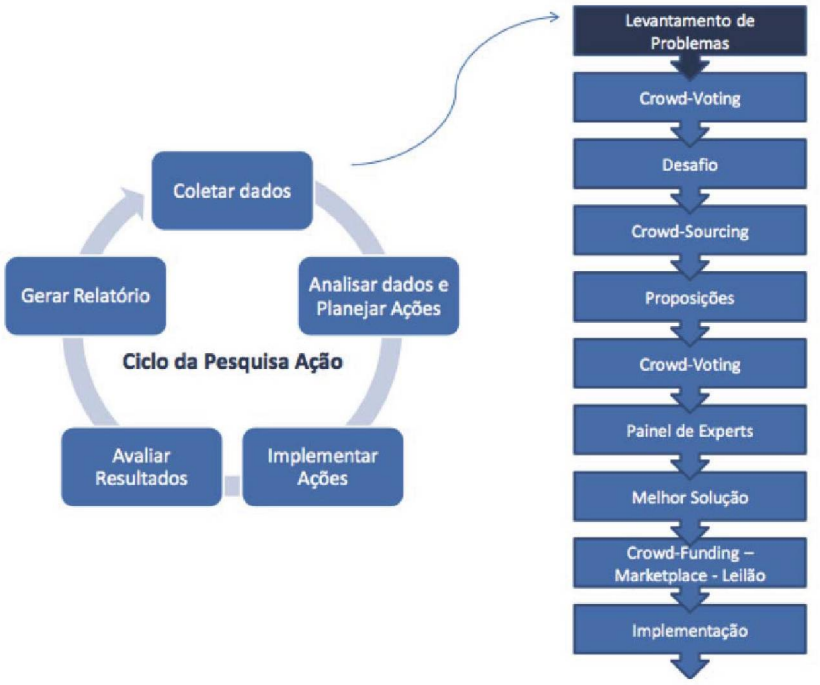


Figura 2. Ciclo da Pesquisa Ação e o Contexto da Fase do Projeto Sustainability Maker (fonte: dos autores)

A escolha da comunidade de baixa renda deu-se em função deste trabalho ter sido desenvolvido no âmbito das pesquisas do Núcleo de Design e Sustentabilidade da UFPR (NDS-UFPR), o qual vem trabalhando com a Comunidade de Águas Claras, localizada na cidade de Piraquara, próximo à Curitiba/PR. A coleta de dados junto à comunidade de baixa renda, entretanto, ocorreu em três fases distintas, conforme mostrado no quadro 3.

FASE	OBJETIVOS	TÉCNICAS UTILIZADAS
Fase I Sensibilizar	Iniciar o contato com a Comunidade; conhecer o local - Águas Claras; coletar material para a elaboração do vídeo teaser.	(1) Reunião com a líder comunitária; (2) Gravação de vídeo teaser.
Fase II Criar Empatia	Explicar os objetivos do projeto, bem como criar empatia com os moradores da comunidade.	(1) Reunião com os moradores; (2) Questionário sócio-cultural; (3) Entrevista com os moradores com gravação de vídeo; (4) Atividade com as crianças da comunidade; (5) Caixa de Sugestões.
Fase III Conhecer e Entender	Coletar dados em amostras de residências da Comunidade.	(1) Observação direta; (2) Storytelling; (3) Paparazzi; (4) Elucidação do Problema.

Quadro 3. Fases da coleta de dados para o levantamento de problemas (fonte: dos autores)

A execução destas três etapas foi importante para a condução do levantamento dos problemas, principalmente por se tratar de uma maneira gradativa de aproximação com a comunidade. Desta maneira, a equipe pode ganhar a confiança dos participantes, essencial para o desenvolvimento do projeto. A seguir, estão detalhados os procedimentos envolvidos em cada uma das três fases. Na sequência, são apresentados os procedimentos adotados para a análise dos dados (tópico 3.4).

3.1 Fase I - Sensibilizar

No dia 06 de abril de 2014, o Projeto Sustainability Maker Brazil (SuM/BR) foi apresentado à líder da comunidade Águas Claras, a Srª Lenira Rodrigues. Apoiada por uma apresentação de slides, a equipe explicou, em linguagem acessível (isto é, não acadêmica) o conceito de crowd-design, os objetivos do projeto, bem como a importância da participação da comunidade. Após o

entendimento dos termos de participação e da aceitação para participar do projeto, a próxima reunião foi agendada para o dia 26 de abril. Neste dia, a equipe iria se encontrar com moradores da comunidade. Depois desta conversa, a equipe seguiu Srª Rodrigues em uma caminhada pelas ruas da comunidade, onde foi possível entender melhor as características do ambiente urbano, onde a pesquisa do SuM/BR ocorreria.

A fim de testar um formato de vídeo para reunir informações para a criação de um desafio apropriado, um vídeo teaser foi gravado com a líder da comunidade. Este vídeo trouxe o ponto de vista do líder sobre um problema que a comunidade enfrenta. Durante a mesma visita, a equipe também filmou os arredores da comunidade, a fim de registrar as condições gerais de suas casas e ruas. Posteriormente, os vídeos foram editados e resultou em uma pequena vinheta, a fim de contextualizar a pesquisa do SuM/BR. Este vídeo foi apresentado à reunião do Conselho Consultivo do projeto, em 22 de abril de 2014, em Amsterdã. O vídeo está disponível no youtube:
https://www.youtube.com/watch?v=5xQ9tDbsFqs&feature=youtu.be.

Finalmente, a equipe acordou um dia para apresentar o projeto para toda a comunidade Águas Claras. A Srª Rodrigues sugeriu sábado, dia 26 de abril de 2014. A escolha do sábado não foi casual: é o dia em que as pessoas na comunidade estão em casa e, portanto, é quando há uma maior probabilidade de ter uma comunidade mais ampla participando do evento. A equipe perguntou se era necessário criar alguns panfletos ou material visual para distribuir na comunidade, mas a Srª Rodrigues disse que não era necessário: "A melhor maneira de espalhar uma informação aqui é boca a boca", disse ela.

3.2 Fase II - Criar empatia

A equipe teve duas semanas para organizar a segunda visita à comunidade. A principal importância desta visita foi o de estabelecer empatia com as pessoas, tornando-os mais familiarizados com os conceitos de Crowd-Design, com os objetivos do projeto e com os resultados esperados. A maior preocupação nesta fase foi a de evitar que as pessoas misturassem as possíveis ações do SuM/BR com ações que estavam sob a responsabilidade do Conselho Municipal e Governo do Estado. Na verdade, muitos dos problemas da comunidade não exigem um processo de Crowd-Design, e sim o uso de ferramentas e recursos existentes no município. Assim, a equipe teve que enfatizar a dimensão exata do Projeto SuM/BR, a fim de evitar o excesso de expectativas.

Foi preparado um encontro de 3 horas com a comunidade. Cada participante assinou um "termo de consentimento livre e esclarecido". As atividades planejadas para este encontro com a comunidade foram: apresentação do projeto; atividade com crianças; aplicação de questionário sócio-demográfico; entrevista em vídeo com os moradores com foco na sua percepção dos problemas-chave de suas habitações, e caixa de sugestões.

Sobre este encontro, o conteúdo da apresentação visual foi organizada da seguinte maneira: (1) apresentar uma visão geral do Projeto SuM/BR; (2) apresentar o âmbito das possíveis soluções que poderiam fazer parte do projeto; (3) uma breve agenda das principais etapas. Nesta fase, além de criar empatia entre pesquisadores e comunidade, entendeu-se que o evento ofereceu uma boa oportunidade para iniciar a coleta de informações que poderiam servir para uma melhor compreensão dos problemas locais.

Uma das principais preocupações neste encontro foi tornar mais fácil o entendimento do projeto pelas pessoas da comunidade. Por isso, na apresentação, a equipe se preocupou em evitar, tanto quanto possível, chavões, excesso de linguagem técnica e possíveis mal-entendidos. Crowd-Design é um tema difícil de explicar até mesmo para Designers, de modo que as palavras e as definições utilizadas nesta apresentação foram cuidadosamente formuladas.

A equipe partiu do princípio de que alguns moradores que compareceriam a visita levariam junto os seus filhos. Assim, a atividade com as crianças foi concebida principalmente como uma distração para mantê-los em um lugar diferente, permitindo que toda a atenção dos participantes estivessem nas atividades do Projeto SuM/BR. A atividade com as crianças consistiu em uma sessão de desenho, com base em um conjunto de ferramentas proposta pela iniciativa Design for Change (disponível no link http://www.dfcbrasil.com.br/).

Após a apresentação do projeto a equipe aplicou uma pesquisa para coletar o perfil demográfico global da comunidade. O questionário inclui perguntas como: quantas pessoas vivem na mesma casa; a quantidade de filhos por família; quantos quartos há em suas casas, etc. O questionário adotou a estrutura do IBGE (2010) para classificar as famílias de baixa renda. Todos os adultos que participaram da reunião da comunidade foram convidados a responder o questionário.

A entrevista em vídeo foi aplicada após os presentes responderem a pesquisa sócio-demográfica. A equipe quis capturar a própria voz das pessoas em relação a sua percepção sobre os principais problemas em suas habitações. Os pesquisadores propuseram duas perguntas a cada participante como o ponto de partida de cada gravação de vídeo: "O que

você gosta e o que você não gosta em sua casa? O que você priorizaria, se você pudesse modificar sua casa?".

Os pesquisadores notaram que toda a comunidade tem acesso a apenas uma caixa de correio. Portanto, a equipe entendeu que o uso de uma caixa de sugestões poderia oferecer um canal viável para recolher a opinião dos membros da comunidade. Como resultado, no final da visita da equipe uma caixa de sugestões feita de papelão foi deixada na casa da líder comunitária durante um mês.

3.3 Fase III - Conhecer e entender

Os resultados da Fase II (apresentados no tópico 4.1 deste documento) apontaram a necessidade de uma abordagem mais aprofundada e criteriosa para envolver efetivamente a comunidade a apresentar seus pontos de vista sobre o que seriam problemas pertinentes no escopo do Projeto SuM/BR. Os contatos coletados durante o evento da Fase II permitiram que a equipe agendasse visitas domiciliares individuais com alguns membros da comunidade. Devido à profundidade e conotação qualitativa da abordagem, a equipe optou por uma amostra composta por cinco a sete unidades de resposta (cinco a sete famílias/habitações), todas elas dentro do critério "baixa renda" (ou seja, ganhar menos de 3 salários mínimos por família).
As visitas foram planejadas a fim de proporcionar à equipe informações diretas e aumentar o envolvimento membros da comunidade no projeto. O fato do projeto ser um piloto de um processo de Crowd-Design faz do envolvimento comunitário crucial para manter a empatia e criar "entusiasmo" sobre as próximas etapas do projeto. As visitas foram planejadas para serem realizadas em uma hora cada. Os materiais utilizados em cada visita foram: (1) gravador de áudio; (2) câmera fotográfica e de vídeo; (3) roteiro de observação; (4) cartas para atividade de Storytelling; e (5) câmera fotográfica descartável para ser entregue ao morador (técnica paparazzi).

3.4 Estratégia de análise dos dados

O objeto da análise foi a definição de um conjunto de problemas partilhados pelos membros da comunidade. No total, o estudo de campo resultou em 10 entrevistas, com sete horas de entrevistas gravadas, cinco horas de filmes e 312 fotos. O processo analítico foi dividido em duas etapas e priorizou a análise dos arquivos de áudio, que eram os dados brutos mais completos disponíveis. A análise dos outros dados brutos seguiu em paralelo a análise

dos arquivos de áudio, para apoiar e integrar o processo de identificação do problema-chave desta comunidade.

Assim, cada técnica de coleta de dados recebeu sua própria análise individual, seguida de uma análise cruzada. A análise individual adotou o "esquema de código" a partir da análise dos arquivos de áudio. Os arquivos de áudio das entrevistas foram parcialmente transcritos, enfocando as passagens mais significativas. Para ser selecionada, uma passagem deveria conter teor associado a um problema relativo à habitação, expressa diretamente ou indiretamente. Foi gerado um arquivo para cada áudio analisado. Cada um destes arquivos foi, então, compartilhado com toda a equipe no GoogleDrive. Assim, cada membro poderia fornecer seus comentários. As transcrições parciais foram então analisadas pela equipe seguindo a codificação técnica (Charmaz, 2006). O quadro 4 mostra um exemplo de processo realizado.

Transcrição parcial (a partir de arquivos de áudio)	**Codificação Inicial**
"Nós não temos espaço e continuamos a acumular quantidade de coisas ... você acumula, e se acumulam ..." (A mulher estava mostrando uma grande quantidade de pertences que foram armazenados em caixas de papelão no corredor da sua casa).	[Pesquisador 01] Falta de planejamento, falta de espaço para armazenamento. [Pesquisador 02] Falta de planejamento / falta de espaço para guardar. [Pesquisador 03] Acumulação. [Pesquisador 04] Desordem / falta de espaço.

Quadro 4. Processo de Codificação dos Arquivos de Áudio (fonte: dos autores)

Os códigos são "etiquetas" que são aplicadas a cada parte da transcrição, a fim de transformar expressões e declarações em uma estrutura padrão para a categorização. Cada pesquisador analisou separadamente as transcrições e apresentou sua interpretação, comentários e códigos propostos ao lado da parte transcrita (codificação inicial). Em uma segunda fase (foco de codificação), estes códigos iniciais foram triangulados com o resto da equipe e condensado em um esquema de codificação final, único.

A abordagem "on the wall" (Visser *et al.*, 2005) foi usada para analisar os dados resultantes da análise anterior, a fim de criar ligação, intercalar conteúdos semelhantes e criar uma lista final de problemas. As

imagens selecionadas na fase anterior foram impressas e um mapa mental visual foi criado. O mapa continha frases retiradas dos arquivos de áudio e códigos finais provenientes das transcrições, que foram selecionados durante a atividade de codificação; estes foram impressos e colocados como principais guias para a composição do mapa. Além disso, essas frases foram combinadas com imagens e comentários para a elaboração das relações e conexões entre os vários *insights*. As notas de campo feitas durante as visitas foram incluídas na elaboração do mapa.

4. Resultados e análises

A partir dos procedimentos realizados, os resultados da coleta de dados foram separados de acordo com as fases. Com relação aos resultados da Fase I, os mesmos encontram-se relatados no tópico 3.1, apresentado anteriormente. Por se tratar de uma fase incial e envolver somente a equipe do projeto e a líder comunitária, pode-se inferir que o principal resultado desta fase foi o aceite em participar do projeto e o auxílio da líder comunitária em fazer a convocação para a reunião, cujos resultados são apresentados nos tópicos a seguir.

4.1 Criando empatia com a Comunidade

No dia 26 de abril a equipe do Projeto SuM/BR foi para a Comunidade Águas Claras para apresentar o projeto. A reunião ocorreu na sede da Associação Comunitária, que consiste numa casa alugada na própria comunidade (figura 03). Cerca de 40 pessoas participaram da reunião. Dessas, cerca de dez eram crianças.

Os membros da equipe foram introduzidos para as pessoas e, em seguida, a apresentação começou. Ao longo da apresentação dos participantes pareciam interessados e receptivos. Mesmo que o assunto não fosse tão familiar ao seu repertório, as pessoas pareciam gostar da ideia. Apenas um homem fez uma pergunta no final da apresentação: sobre qual o tipo de problemas de o Projeto SuM/BR deveria ajudar a resolver. Ele trouxe um exemplo simples para nós: se tivesse que pensar sobre um dos maiores problemas de Águas Claras, é que as ruas não têm identificação de endereços e as pessoas não têm CEP (Código de Endereçamento Postal), então eles não poderiam receber cartas diretamente em suas casas. O segundo, que veio a sua mente, foi a organização resíduos de lixo. Em resposta às suas perguntas, a equipe entendeu que aqueles eram problemas urgentes para a comunidade, mas que estavam fora do alcance do Projeto

SuM/BR, pois eram de responsabilidade da Prefeitura da Cidade de Piraquara-PR. As outras pessoas que estavam presentes na reunião concordaram com o homem que fez as perguntas. Eles também queriam saber que tipos de problemas poderiam ser parte do escopo do projeto.

A equipe teve, então, de enfatizar que o escopo dos problemas inclui aqueles relacionados à habitação, e que poderiam usar as competências de ambas as empresas parceiras ao Projeto SuM/BR (Soliforte e EcoDesign). Não houve perguntas com relação a que tipo de benefícios resultariam para as empresas ou o que aconteceria com a comunidade, se a ideia gerada através do processo de Crowd-Design fosse um sucesso comercial.

Quando a reunião começou, todas as crianças foram imediatamente levadas para a varanda da casa para iniciar a atividade, de modo que o resto da equipe pôde começar a apresentar o Projeto SuM/BR. Havia cerca de dez crianças.

Após a apresentação do Projeto, a equipe começou a aplicar o questionário. A maioria das pessoas preencheu o questionário sem necessitar de ajuda. Das 30 pessoas presentes na reunião, 20 responderam ao questionário. Os principais resultados obtidos com o questionário estão apresentados no quadro 5.

Importante destacar que cerca de 60% dos participantes têm acesso a internet, o que está em sintonia com os resultados da pesquisa nacional, realizada pelo IBGE (2011), que mostrou que em 2011 cerca de 65% das pessoas têm acesso a internet. Esta situação vai exigir uma abordagem híbrida para permitir o crowdvoting (próxima etapa do projeto), misturando abordagem baseada na web com abordagens físicas.

Vale ressaltar também que esse levantamento demográfico mostrou que a maioria das casas tem apenas três cômodos: quarto, banheiro e cozinha. Isto significa que as casas que não têm uma sala de estar. Uma grande quantidade de atividades, como estudar e receber visitas são realizadas na cozinha.

Quesito	**Resultados**
Tipo de material usado na construção da casa	58% mora em casa de alvenaria. 40% mora em casa mista (alvenaria e madeira). 2% mora em casa de madeira.
Quantidade de quartos	10 respondentes moram em casa com dois quartos;

	7 respondentes moram em casa com um quarto; 3 respondentes moram em casa com três quartos.
Quantidade de banheiros	17 respondentes moram em casa com apenas um banheiro; 2 respondentes moram em casa com dois banheiros. 1 respondente mora em casa sem banheiro.
Configuração dos espaços da casa	A maioria dos respondentes moram em casa onde a cozinha também é a sala de estar/jantar (23 respondentes).

Quadro 5. Principais resultados obtidos com a aplicação do questionário (fonte: dos autores)

Cada participante da reunião foi convidado a se voluntariar para a entrevista em vídeo. No início, eles pareciam estar um pouco ressabiados e tímidos, de maneira que relutantemente alguns aceitaram o convite. A gravação do vídeo da entrevista ocorreu em um canto do salão onde foi a apresentação do Projeto SuM/BR. A equipe organizou duas mesas de entrevista, cada uma com duas cadeiras. O entrevistado foi convidado a sentar-se na frente da câmera e o pesquisador sentou-se de lado. Inicialmente, os entrevistados mostraram-se embaraçados para falar livremente sobre os problemas com suas habitações na frente da câmera. No entanto, eles gradualmente ignoraram a presença e começaram a ser mais confiantes, fornecendo respostas às questões colocadas a cada um deles.

Apenas cinco pessoas quiseram participar da entrevista em vídeo. Os principais problemas que estas pessoas apontaram foram dois: (1) falta de espaço na cozinha; e (2) a falta de acabamento no banheiro, por exemplo, azulejos nas paredes e também no chão. Todo o evento durou três horas e a equipe agradeceu pessoalmente a cada participante, durante um lanche oferecido pelos pesquisadores ao final.

Passado um mês desta reunião, a caixa de sugestões foi coletada. Infelizmente, não houve uma sugestão. A equipe do Projeto SuM/BR acredita que isso aconteceu devido à, apesar de ter sido apresentado na reunião, nenhum lembrete foi feito para as pessoas da comunidade sobre a oportunidade de apresentar sugestões através da caixa. Talvez seja por isso que as pessoas se esqueceram dessa ferramenta. Mas isso não significa que a ferramenta não é adequada para este tipo de situação.

4.2 Aprofundando o conhecimento e o entendimento dos problemas

Cada visita iniciou com a equipe fazendo uma breve introdução para relembrar ao morador sobre os objetivos do projeto. Após a introdução, o morador levou a equipe em uma visita guiada em sua casa; simultaneamente, os pesquisadores pediram permissão aos entrevistados para tirar fotos, gravar vídeos e a entrevista não estruturada (conversação).

Apenas uma das sete casas visitadas tinha apenas um quarto, e não tinha banheiro. Duas outras casas foram construídas em alvenaria completa, mas apenas uma foi totalmente planejada e projetada por seus proprietários.

No total, dez pessoas participaram das entrevistas: em quatro das sete casas visitadas, apenas uma pessoa foi entrevistada. Durante a conversa, a equipe perguntou sobre as principais atividades que os moradores desenvolviam em cada um dos cômodos da casa e se o tamanho e os objetos/móveis eram suficientes para a realização das atividades. Ao todo, foram mais de sete horas de entrevistas gravadas.

Posteriormente, (como explicado no tópico 3.4 deste documento) o áudio das entrevistas foi distribuído entre a equipe para fazer a transcrição. Depois de uma primeira fase de "codificação inicial" uma fase triangulada de "foco de codificação" foi realizada. Os pesquisadores discutiram coletivamente a interpretação e os códigos iniciais das transcrições (apoiando a discussão com as imagens selecionadas). Essa operação levou a uma compreensão compartilhada que resultou em um esquema de código final que identificou o problema de uma forma única. Tal procedimento foi realizado para cada transcrições, resultando em um "esquema de codificação" final.

Assim como ocorreu com os arquivos de áudio, a análise das fotografias seguiu o mesmo esquema de código, incluindo as fotografias recolhidas através da abordagem Paparazzi. Assim, cada membro da equipe selecionou algumas imagens das casas e as associou um código. O resultado, foi um "moodboard" para cada casa, mostrado na figura 4.



Figura 3. "Moodboard" resultante da associação dos dados de cada casa. (fonte: dos autores)

Após a visita guiada, o morador foi convidado a participar da atividade de Storytelling. Os cartões utilizando nessa atividade levaram os moradores a fornecer descrições mais detalhadas sobre as suas percepções sobre os problemas nas habitações. A partir das histórias, as informações mais relevantes para esta pesquisa foram:

- Sobre as cozinhas: de acordo com as histórias, os problemas que podem ser extraídos são a falta de espaço para realizar atividades como cozinhar, comer, estudar, brincar e trabalhar; e acesso a materiais de revestimento para as áreas laváveis como a pia.
- Sobre o banheiro: os problemas relacionados foram sobre a falta de acesso aos materiais de revestimento para revestir todo o banheiro, não só para as áreas laváveis como pia e chuveiro. De acordo com as pessoas, se todas as paredes foram revestidas com um material lavável, seria mais fácil de limpar.

A análise cruzada dos dados foi realizada por meio de triangulação, durante um seminário da equipe de pesquisa. Uma combinação visual das entrevistas transcritas, códigos, imagens, notas e conexões facilitou a identificação das dimensões das questões possíveis de condensar em uma lista final de problemas. A lista final, no entanto, resultou em oito problemas principais. O processo de identificação dos principais problemas utilizou os seguintes critérios:

- A frequência com que cada questão foi codificado;
- A ênfase dada a partir do entrevistado para a questão específica;
- A frequência com que cada problema foi observado.

A lista final dos principais problemas foi então escolhida, considerando-se as questões em que as dimensões acima mencionadas foram fortemente combinadas (frequentemente observadas e codificadas):

- A falta de flexibilidade nos espaços dentro da casa (espaço de estar/armazenamento): Uma vez que não existe a possibilidade de aumentar o tamanho da casa e, por conseguinte, o tamanho dos quartos, o mobiliário existente não permite flexibilidade na utilização do espaço, tal como a cozinha, que é utilizada para diversas atividades, para além de cozinhar e comer.
- Falta de acabamentos adequados (materiais do sistema elétrico e hidráulico): Esta questão foi mais observada pela equipe do que relatada

pelos moradores. Mas ele se refere à segurança, limpeza e também questões estéticas. Realizar a própria construcão da habitação é uma prática comum entre as pessoas de baixa renda. Por isso, algumas instalações - como a hidráulica e elétrica - não tem acabamento adequado. Isso pode não ser seguro, causando vazamentos (encanamento); choque elétrico ou incêndio (instalações elétricas). Além disso, poderia causar algum desconforto em relação ao aspecto da casa. Ao mesmo tempo, algumas áreas, tais como banheiros e cozinhas precisam ter acabamento com materiais laváveis.

Além da lista final dos problemas que resultou da análise, um resultado concreto do processo desenvolvido foi a consciência da comunidade e o sentimento de participação que eles tiveram durante a pesquisa de campo.
A lista dos principais problemas não foram uma surpresa para a equipe do projeto, uma vez que confirmam os resultados de pesquisas anteriores. No entanto, a equipe entende que essa fase não pode ser ignorada. O envolvimento da comunidade em apresentar os seus problemas, com o sentimento de participação foram primordiais para preservar a conotação bottom-up, e criar a compreensão em profundidade da equipe sobre a dinâmica dos problemas em habitações da comunidade, com uma visão ampla de todas as variáveis que o afetam.

5. Considerações finais

Este artigo apresentou o estudo realizado no âmbito do Projeto Sustainability Maker, que consiste em um projeto de Crowd-Design a ser disponibilizado na plataforma innonatives.com. A partir da pesquisa-ação para a coleta de dados junto à comunidade Águas Claras, foi possível dividir a coleta de dados em três fases. Com relação às técnicas e procedimentos utilizados em cada etapa, vale ressaltar:

(a) A aplicação do questionário sócio-demográfico foi uma boa ferramenta para coletar dados iniciais sobre os moradores, mas requer melhorias. A linguagem utilizada foi muito técnica e, como resultado, algumas pessoas preencheram o questionário parcialmente.

(b) A entrevista em vídeo foi uma ferramenta muito boa para "quebrar o gelo" para as pessoas começarem a falar dos problemas de suas habitações. Porém, colocar as pessoas fora do seu contexto (sua própria habitação) reduziu a capacidade de refletir sobre as questões e, portanto, não se mostrou eficaz para obter informações relevantes.

(c) O Storytelling mostrou grande potencial para uso no levantamento de problemas. No entanto, são necessárias melhorias para uma abordagem mais eficaz. No campo, os pesquisadores realizaram ajustes em tempo real, principalmente em relação à quantidade de cartões "provocantes" mostrados em cada ciclo.

(d) Especial atenção deve ser dirigida para a qualidade de captação de áudio. No que diz respeito à qualidade dos dados, alguns apresentaram má qualidade, quer devido à qualidade do equipamento ou devido às circunstâncias do processo de gravação em campo.

(e) A equipe concluiu sobre a necessidade de mudar a "entrevista de conversação" para uma "entrevista semi-estruturada". De fato, a quantidade de informação recolhida em uma entrevista de conversação expande a complexidade de separar o que é verdadeiramente útil para o objetivo do projeto.

(f) A equipe esperava que os moradores usassem o papel/lápis para descrever/desenhar as questões que consideravam relevantes dentro de sua casa. Isto não deu certo, uma vez que nenhum dos moradores devolveram anotações. Talvez uma alternativa seria a de substitui-lo com uma imagem de sua própria casa, com um esquema de seu layout interno. Isso teria dado os moradores a oportunidade de manipular diretamente algo que está dentro de seu domínio.

Por fim, o estudo mostrou a importância de ter o líder da comunidade apoiando o projeto. Assim, os demais moradores puderam ser colaborativos, envolvendo-se de tal maneira a não ser reticentes em fornecer informações para a equipe do projeto. O fluxo da conversa foi natural e contínua, e a participação ativa das famílias facilitou o trabalho dos pesquisadores.

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REGULAMENTO DO PROGRAMA CRIATIGRE

1. DEFINIÇÕES

1.1. Programa: CRIATIGRE.

1.1.1. Programa Piloto: Atividade experimental cujas conclusões servirão de parâmetro para melhorias e definição sobre a continuidade do programa.

1.2. Promotora: TIGRE - Tigre S.A. – Tubos e Conexões.

1.3. **Crowd-Design**: Refere-se a uma modalidade emergente de sistemas de projeto e produção que utiliza os conhecimentos e recursos disponíveis na multidão ou grupo de pessoas, geralmente através da internet, com o propósito de resolver problemas e/ou criar conteúdo.

1.4. **Crowd Voting** (ou votação *on-line*): Refere-se ao processo de seleção de alternativas em ambientes virtuais voltados à participação da multidão ou grupo de pessoas.

1.5. **Crowdsourcing**: Consiste no ato de compartilhar uma necessidade com a multidão ou grupo de pessoas, para que estes possam, de maneira voluntária, aberta e colaborativa, auxiliar a solucioná-la. Este compartilhamento acontece sob a forma de um convite aberto, e geralmente é realizado a partir da internet.

1.6. **Plataforma Innonatives** (www.innonatives.com): É uma plataforma internacional de inovação aberta que tem por objetivo criar inovação radical para a Sustentabilidade.

1.8. **Garras:** São as moedas virtuais da TIGRE, utilizadas no processo de gamificação deste Programa, portanto, não possuem valor monetário, apenas representam a pontuação dos participantes.

1.9. **Desafio TIGRE**: Corresponde à pergunta relacionada à necessidade que vai estimular a geração de ideias e o engajamento dos participantes na proposição de soluções sustentáveis.

1.10. ***Briefing***: Conjunto de informações e instruções sobre o **Desafio TIGRE**.

1.11. **Grupo de usuários TIGRE**: Grupo de usuários que terá acesso exclusivo ao Desafio TIGRE, na plataforma Innonatives.

1.12. **Especialistas**: Grupo formado por integrantes da área de Inovação da TIGRE e outros profissionais voluntários, que serão selecionados e participarão: (i) analisando a viabilidade dos Conceitos e Soluções; (ii) postando comentários; (iii) no processo de votação de Ideias, Conceitos e Soluções.

1.13. **Produto**: Para este programa, considera-se "produto" o conjunto de atributos, tangíveis, constituído através de processos de produção e que possa ser oferecido ao mercado.

1.14. **Sistema**: Para este programa, considera-se "sistema" o conjunto de elementos que, integrados, compõem um produto.

1.15. **Sistema Produto-Serviço**: Para este programa, considera-se "sistema produto-serviço" os produtos com oferta de serviço agregado (produto orientado ao serviço), ou a disponibilização do produto para utilização, sem aquisição (uso orientado ao serviço).

2. OBJETIVO

2.1. O Programa tem por objetivo estimular a cultura de inovação na TIGRE, fomentando a participação na geração de soluções de forma coletiva, através de ferramentas associadas ao *Crowd-Design*.

2.2. O objetivo do Desafio TIGRE é disponibilizar um tema central, que pautará a participação e envio de ideias por parte dos participantes. O tema priorizado no Desafio TIGRE está alinhado às estratégias de negócio da empresa e visa direcionar os esforços de geração de ideias. O Desafio TIGRE será disponibilizado através da plataforma *on-line* de inovação aberta (Plataforma Innonatives).

2.3. O tema do presente desafio aborda a pergunta abaixo:

Como podemos promover o consumo sustentável da água através de novos produtos?

2.4. Dentro do tema proposto, as ideias deverão estar alinhadas às práticas do consumo sustentável, bem como enquadradas em uma ou mais categorias baseadas na regra dos 3Rs:

1. Reduzir
2. Reutilizar
3. Reciclar

3. PÚBLICO ALVO

3.1. Poderão participar do Programa todos os colaboradores do Centro Administrativo de Joinville (CAJ) da TIGRE.

3.2. Não participarão deste Programa os colaboradores da TIGRE que pertençam à Força de Vendas e/ou que tenham ligação direta com a organização/execução deste Programa. Esta determinação poderá ser revista nas próximas edições do Programa.

4. PRAZO DO PROGRAMA

4.1. O Programa será realizado em 05 (cinco) etapas, com o início previsto para a segunda quinzena de Agosto/2015 e término previsto para a primeira quinzena de Dezembro/2015, tendo duração total de aproximadamente 04 (quatro) meses.

4.2. Durante a realização do Programa, serão divulgadas aos participantes as datas de realização das etapas e atividades inerentes a cada uma.

4.3. O Programa poderá, eventualmente, ser prorrogado ou passar por alterações por decisão da TIGRE.

7. PARTICIPAÇÃO NO PROGRAMA

7.1. A participação no Programa CRIATIGRE é individual e voluntária. O colaborador interessado em participar do Programa deverá se inscrever no Workshop I (evento de lançamento do programa) e se registrar na plataforma Innonatives, conforme itens 7.2 e 7.3.

7.2. **Inscrição no Workshop I**: O colaborador deverá enviar um e-mail para criatigre@tigre.com, informando: (i) nome completo, (ii) e-mail de contato, e (iii) setor, e solicitar a sua inscrição. O colaborador receberá um e-mail de confirmação da inscrição, bem como o *link* para o registro na plataforma Innonatives.

7.3. **Registro na plataforma Innonatives**: O colaborador deverá acessar o link recebido por e-mail ou o site www.innonatives.com e realizar o procedimento de registro na plataforma Innonatives informando os dados conforme formulário pré-estabelecido. Após registro na plataforma, a equipe responsável pela administração do Programa enviará ao inscrito um e-mail com a confirmação da sua inclusão no Grupo de usuários TIGRE. O detalhamento ilustrado deste procedimento encontra-se no ANEXO 1 deste regulamento.

7.4. Caso haja problemas de acesso, o inscrito deverá enviar um e-mail para criatigre@tigre.com, que providenciará a liberação ou justificará o motivo do eventual bloqueio.

7.5. Todos os colaboradores que procederem conforme o disposto nos itens 7.2 e 7.3. serão considerados participantes, estando assim, inscritos voluntariamente no Programa.

7.6. Somente após o recebimento da confirmação de inclusão no Grupo de usuários TIGRE, o participante poderá acessar o Desafio TIGRE na plataforma Innonatives, tendo acesso ao formulário para envio das ideias, conceitos e soluções, eventuais materiais de apoio e maiores detalhes do Desafio TIGRE e do Programa CRIATIGRE.

7.7. A participação do colaborador neste Programa implica na aceitação irrestrita deste Regulamento. Ao confirmar a participação, o colaborador autoriza a utilização de seu e-mail para fins de recebimento de comunicação interna de atualização do Programa.

7.8. **Tipos de participantes/participação no Programa**: Os colaboradores poderão participar do Programa das seguintes maneiras:

7.8.1. **Solucionador**: Participante que envia ideia(s), conceito e solução nas etapas de Ideação, Conceituação e Solução, respectivamente.

7.8.2. **Comentarista**: Participante que envia comentários sobre as ideias, conceitos e soluções que constam no Desafio TIGRE dentro da plataforma.

7.8.3. **Votante**: Participante que, com seu voto, ajuda a eleger as melhores ideias, conceitos e soluções.

7.8.4. Os colaboradores poderão participar de uma ou todas as maneiras expostas acima.

7.9. O desligamento, por qualquer motivo, de um colaborador da TIGRE no decorrer deste Programa ocasiona automaticamente sua exclusão do Programa e perda do direito à premiação ou brindes, sem prejuízo dos direitos da TIGRE decorrentes da participação do colaborador.

7.9.1. A premiação somente será devida quando o desligamento ocorrer após o colaborador ter sido considerado um solucionador vencedor, nos termos da cláusula 11.

8. FUNCIONAMENTO DA PLATAFORMA INNONATIVES

8.1. Sobre o **Desafio TIGRE**: A plataforma Innonatives comporta vários desafios simultâneos, nas modalidades aberta e fechada, e cada um limita-se ao objeto selecionado como foco do desafio, sem influência aos demais desafios coexistentes no site. O Desafio TIGRE será na modalidade fechada e restringir-se-á ao desafio escolhido como objeto de estímulo à geração de ideias e soluções sustentáveis.

8.2. Sobre o **Grupo fechado TIGRE**: Somente os participantes TIGRE inscritos e os definidos como administradores e especialistas, poderão ter acesso às informações do Desafio TIGRE dentro da plataforma.

8.2.1. O acesso pessoal ao **Desafio TIGRE** na plataforma Innonatives, somente será possível através de *login* e senha, definidos pelo próprio colaborador quando da realização do registro, de acordo com os procedimentos dos itens 7.2 e 7.3.

8.3. Sobre a **plataforma Innonatives**: Apesar da plataforma ter informações escritas em língua inglesa, todas as interações *on-line* dos participantes, administradores e especialistas dentro do Desafio TIGRE, deverão ser escritas em língua portuguesa.

8.4. Todos os direitos decorrentes do Programa serão exclusivos da TIGRE, sendo a plataforma Innonatives apenas uma ferramenta de apoio, sem direitos de qualquer natureza em relação ao Desafio TIGRE.

9. PROCEDIMENTOS DO PROGRAMA

O Programa será realizado em 05 (cinco) etapas, sendo cada uma delas constituída de procedimentos *on-line* (na plataforma Innonatives), procedimentos *off-line* e workshops presenciais, conforme explicação a seguir:

9.1. ETAPA 01 – CONHECIMENTO E INSPIRAÇÃO

O lançamento do Programa CRIATIGRE acontecerá por meio de campanha interna, através da utilização dos canais internos de comunicação. A apresentação do Programa CRIATIGRE aos colaboradores acontecerá quando da realização do **Workshop I – "Inovação Aberta através de Crowd-Design"**, que abordará práticas de *crowdsourcing* voltadas à inovação aberta. Na ocasião, serão explanados os objetivos e funcionamento do Programa, bem como o Desafio TIGRE. Os colaboradores interessados em participar deverão proceder conforme descrito no item 7.2 e 7.3 deste regulamento.

9.2 **ETAPA 02 – IDEAÇÃO**

A etapa de ideação refere-se ao pensamento inicial sobre como o Desafio TIGRE poderá ser resolvido. Esta etapa acontecerá na plataforma Innonatives e se refere ao compartilhamento das ideias e comentários entre todos os participantes.

9.2.1. **Envio das Ideias e Comentários:** O participante denominado solucionador deverá acessar o Desafio TIGRE na plataforma Innonatives com seu *login* e senha, analisar o *briefing* e postar a sua ideia para o tema proposto e/ou comentários sobre outras ideias enviadas. Não há limite máximo de envio de ideias, porém, os participantes deverão observar as ideias já postadas e não repeti-las, pois o critério de exclusão de ideias em duplicidade ou similares será a data de sua postagem, permanecendo apenas a mais antiga. Os participantes denominados comentaristas deverão acessar a plataforma com seu *login* e senha, e postar seus comentários nas ideias enviadas. No ANEXO 02, consta a descrição ilustrada de como realizar a postagem das ideias, bem como a postagem de comentários na plataforma Innonatives.

9.2.1.1. As ideias deverão ser submetidas na plataforma por meio de:

(i) Título da ideia
(ii) Slogan
(iii) Descritivo breve da ideia
(iv) Representação visual da ideia

9.2.1.2. O solucionador receberá suporte para elaborar suas ideias, bem como para representá-las visualmente através do Workshop II **"Ferramentas de Geração de Ideias"** que será realizado nas dependências da TIGRE, com data a ser comunicada previamente de acordo com o cronograma do Programa.

9.2.1.3. Caso o solucionador tenha dúvidas de como proceder ou necessite apoio para desenvolvimento da ideia, deverá solicitar suporte através do e-mail criatigre@tigre.com.

9.2.2. **Votação das Ideias (crowd voting):** Os participantes deverão acessar o Desafio TIGRE na plataforma Innonatives e avaliar todas as ideias enviadas, atribuindo de 1 a 5 estrelas para cada uma, a fim de classificar as melhores ideias enviadas pelos solucionadores. O mesmo procedimento será adotado pelos Especialistas. No ANEXO 03 consta a descrição ilustrada de como realizar a votação *on-line* na plataforma Innonatives.

9.2.4. **Avaliação das Ideias**: As ideias enviadas pelos solucionadores na plataforma serão avaliadas pelos Especialistas a fim de garantir o alinhamento dentro dos seguintes critérios:

(i) Clareza das informações
(ii) Envio dentro do padrão estabelecido no item 9.2.1.1
(iii) Aderência ao tema do Desafio TIGRE
(iv) Enquadramento das ideias em uma ou mais categorias pré-definidas (3Rs)
(v) Ideias de produto, sistemas ou sistema produto-serviço (PSS)
(vi) Ineditismo ou derivação

9.2.5. **Classificação para próxima etapa:** Estarão classificados para a etapa seguinte as ideias que obtiverem média igual ou superior a 3,0 estrelas (resultado da votação *on-line*) e estiverem dentro dos critérios de avaliação conforme item 9.2.4.

9.2.5.1. A divulgação das ideias classificadas para a próxima etapa acontecerá através da plataforma Innonatives e dos meios de comunicação interna.

9.2.5.2. Os solucionadores cujas ideias não forem selecionadas para a etapa seguinte, poderão continuar participando do programa como comentaristas e votantes.

9.2.5.3. Não serão classificadas cópias de produtos existentes de concorrentes nacionais e/ou internacionais.

9.3. ETAPA 03 – CONCEITUAÇÃO

A etapa de conceituação refere-se ao refinamento da ideia inicial através do detalhamento das funcionalidades do produto/sistema, estrutura e ou atributos associados, que irão atrair e satisfazer os consumidores. Esta etapa acontecerá na plataforma Innonatives e se refere ao compartilhamento dos conceitos e comentários entre todos os participantes. Serão convidados a participar desta etapa somente os solucionadores que tiverem suas ideias classificadas na etapa 02, conforme item 9.2.5.

9.3.1. **Envio dos Conceitos e Comentários:** O participante denominado solucionador deverá acessar o Desafio TIGRE na plataforma Innonatives com seu *login* e senha, e postar o seu conceito para o tema proposto e/ou comentários sobre outros conceitos enviados. Os participantes denominados comentaristas deverão acessar a plataforma com seu *login* e senha, e postar seus comentários nos conceitos enviados. No ANEXO 04, consta a descrição ilustrada de como realizar a postagem dos conceitos, bem como postar comentários na plataforma Innonatives.

9.3.2.1. Os conceitos deverão ser submetidos na plataforma por meio de:

(i) Título do conceito
(ii) Slogan
(iii) Detalhamento da ideia
(iv) Contextualização da problemática relacionada
(v) Vantagens e diferenciais frente aos produtos e soluções existentes (se houver)
(vi) Representação visual do funcionamento - *storyboard*

9.3.2.2. O solucionador receberá suporte para elaborar seu conceito, bem como para representá-lo visualmente através do Workshop III **"Da Ideia ao Desenvolvimento do Conceito"** que será realizado nas dependências da TIGRE, com data a ser comunicada previamente de acordo com o cronograma do Programa.

9.3.2.3. Caso o solucionador tenha dúvidas de como proceder ou necessite apoio para desenvolvimento do conceito, deverá solicitar suporte através do e-mail criatigre@tigre.com.

9.3.3. **Votação dos Conceitos (crowd voting):** Os participantes deverão acessar o Desafio TIGRE na plataforma Innonatives e avaliar todos os conceitos enviados, atribuindo de 1 a 5 estrelas para cada um, a fim de classificar os melhores conceitos enviados pelos solucionadores. O mesmo procedimento será adotado pelos participantes denominados Especialistas. No ANEXO 05, consta a descrição ilustrada de como realizar a votação *on-line* dos conceitos na plataforma Innonatives.

9.3.4. **Avaliação dos Conceitos**: Os conceitos enviados pelos solucionadores na plataforma serão avaliados pelos Especialistas a fim de garantir o alinhamento dentro dos seguintes critérios:

(i) Clareza das informações
(ii) Envio dentro do padrão estabelecido no item 9.3.2.1
(iii) Adequação aos objetivos do desafio
(iv) Viabilidade funcional
(v) Ineditismo ou derivação

9.3.5. **Classificação para a próxima etapa:** Estarão classificados para a etapa seguinte os 10 (dez) conceitos que obtiverem média igual ou superior a 3,0 estrelas (resultado da votação *on-line*) e estiverem dentro dos critérios de avaliação conforme item 9.3.4.

9.3.5.1. A divulgação dos solucionadores classificados para a próxima etapa acontecerá através da plataforma Innonatives e dos meios de comunicação interna.

9.3.5.2 Os solucionadores cujos conceitos não forem selecionados para a etapa seguinte, poderão continuar participando do programa como comentaristas e votantes.

9.3.5.3. No caso de enquadramento de mais de 10 conceitos aos critérios de classificação, será utilizado como critério de desempate a quantidade de votos recebidos. Se o empate persistir, será utilizado como critério de desempate a viabilidade técnica do conceito.

9.3.5.4. Não serão classificadas cópias de produtos existentes dos concorrentes nacionais e/ou internacionais

9.4. ETAPA 04 – SOLUÇÃO

Na etapa de solução, o conceito do produto/sistema deverá ser traduzido em premissas mais concretas até a construção de modelos físicos não funcionais de baixa fidelidade. Esta etapa acontecerá na plataforma Innonatives e se refere ao compartilhamento das propostas de solução e comentários entre todos os participantes. Serão convidados a participar desta etapa somente os solucionadores que tiverem seus conceitos classificados na etapa 03, conforme item 9.3.5.

9.4.1. **Envio da Solução e Comentários:** O participante denominado solucionador deverá acessar o Desafio TIGRE na plataforma Innonatives, com seu *login* e senha, e postar sua proposta de solução. As propostas de solução serão submetidas a avaliação preliminar dos Especialistas antes de serem compartilhadas na plataforma *on-line*. Os participantes denominados comentaristas deverão acessar a plataforma com seu *login* e senha, e postar seus comentários nas soluções enviadas. No ANEXO 06, consta a descrição ilustrada de como realizar a postagem das soluções, bem como postar comentários na plataforma Innonatives.

9.4.1.1. As soluções deverão ser submetidas na plataforma por meio de:

(i) Título da Solução
(ii) Slogan
(iii) Representação tridimensional digital (*rendering*)
(iv) Descrição detalhada do funcionamento
(v) Especificações do produto/sistema
(vi) Modelo físico de baixa fidelidade

9.4.1.1. O solucionador receberá suporte para elaborar sua solução, bem como para representá-la visualmente através do Workshop IV **"Modelagem da Solução"** que será realizado nas dependências da TIGRE, com data a ser comunicada previamente de acordo com o cronograma do Programa.

9.4.1.2. Caso o solucionador tenha dúvidas de como proceder ou necessite apoio para desenvolvimento da proposta de solução, deverá solicitar suporte através do e-mail criatigre@tigre.com .

9.4.2. **Votação das Soluções (crowd voting):** Os participantes deverão acessar o Desafio TIGRE na plataforma Innonatives e avaliar todas as soluções enviadas, atribuindo de 1 a 5 estrelas para cada uma, a fim de classificar as melhores propostas enviadas pelos solucionadores. O mesmo procedimento será adotado pelos participantes denominados Especialistas. No ANEXO 07, consta a descrição ilustrada de como realizar a votação dos conceitos na plataforma Innonatives.

9.4.3. **Avaliação das Soluções**: As soluções enviadas pelos solucionadores na plataforma serão avaliadas pelos Especialistas a fim de garantir o alinhamento dentro dos seguintes critérios:

(i) Clareza das informações
(ii) Envio dentro do padrão estabelecido no item 9.2.1.1
(iii) Potencial de fabricação
(iv) Potencial de atendimento à necessidade de mercado
(v) Funcionalidade do produto ou sistema

9.4.5. **Classificação para próxima etapa:** Estarão classificados para a etapa seguinte as 03 (três) propostas de solução que obtiverem nota média igual ou superior a 4,0 (resultado da votação *on-line*) e estiverem dentro dos critérios de avaliação conforme item 9.3.4.

9.4.5.1. A divulgação dos solucionadores classificados para a próxima etapa acontecerá através da plataforma Innonatives e dos meios de comunicação interna.

9.4.5.2. No caso de enquadramento de mais de 03 (três) propostas de solução aos critérios de classificação, será utilizado como critério de desempate a quantidade de votos recebidos. Se o empate persistir, será utilizado como critério de desempate a viabilidade técnica da solução.

9.4.5.4. Não serão classificadas cópias de produtos existentes dos concorrentes nacionais e/ou internacionais

9.5 **ETAPA 05 – FINAL**

A etapa final consiste na consolidação de todas as informações trabalhadas ao longo do programa, para apresentação ao Time de Liderança TIGRE. Esta etapa acontecerá fora da plataforma Innonatives. Serão convidados a participar desta etapa somente os solucionadores que tiverem suas propostas de solução classificadas na etapa 04, conforme item 9.4.5.

9.5.1. **Apresentação ao Time de Liderança**: Cada solucionador finalista deverá elaborar o material para apresentação da sua proposta de solução ao Time de Liderança TIGRE, com base em todas as fases de desenvolvimento da ideia ao longo do programa. As propostas deverão ser apresentadas presencialmente pelos seus autores, utilizando-se de recursos visuais disponíveis.

9.5.1.1. O solucionador finalista receberá suporte para preparar a apresentação da sua proposta através do Workshop V **"Como Apresentar sua Proposta de Solução"** que será realizado nas dependências da TIGRE, com data a ser comunicada previamente de acordo com o cronograma do Programa.

9.5.2. **Avaliação das Propostas de Solução**: O Time de Liderança TIGRE avaliará as propostas apresentadas pelos solucionadores finalistas, elegendo a primeira, segunda e terceira colocação das soluções, com base no critério descrito abaixo:

(i) Proposta de solução com maior potencial inovador
(ii) Potencial de viabilização como projeto de Inovação

9.5.2.1. As propostas de solução apresentadas nesta etapa poderão ser encaminhadas para apresentação ao Comitê Técnico de Oportunidades para viabilização de estudo técnico e mercadológico.

9.5.2.2. A decisão sobre a colocação dos vencedores caberá ao Time de Liderança TIGRE.

10. RECEBIMENTO DE GARRAS (MOEDAS VIRTUAIS)

Ao longo do Programa, os participantes receberão Garras de acordo com suas atividades e interações na plataforma Innonatives, conforme exposto no quadro abaixo:

ETAPAS	ATIVIDADES	QUANTIDADE DE GARRAS
ETAPA 01 Conhecimento e Inspiração	Participação no Workshop I	100
	Inscrição na plataforma Innonatives	100
ETAPA 02 - Ideação	Participação no Workshop II	100
	Envio de ideia	500
	Comentário nas ideias enviadas pelos outros participantes	1 a 3 comentários: 50 4 a 6 comentários: 100 Acima de 6 comentários: 200
	Classificação para a Etapa 03	500
ETAPA 03 – Conceito	Participação no Workshop Presencial III	100
	Envio do Conceito	500
	Comentário/contribuição nos conceitos enviados	1 a 3 comentários: 50 4 a 6 comentários: 100 Acima de 6 comentários: 200

	Classificação para a Etapa 04	500
ETAPA 04 – Solução	Participação no Workshop Presencial IV	100
	Envio da proposta de solução	500
	Comentário/contribuição nas propostas de solução enviadas pelos outros participantes	1 a 3 comentários: 50 4 a 6 comentários: 100 Acima de 6 comentários: 200

10.1. **Saldo de Garras:** A contabilização das Garras recebidas por cada participante será realizada fora da plataforma Innonatives pelos administradores do Desafio TIGRE. Periodicamente, os participantes receberão por e-mail a atualização da quantidade de Garras recebidas, de acordo com sua participação.

10.2. **Troca por brindes**: Ao final do Programa, os participantes serão reconhecidos pela sua participação, podendo realizar a troca do valor virtual equivalente por brindes, conforme catálogo e valores a serem divulgados através dos canais de comunicação internos. As entregas acontecerão em data a ser comunicada previamente, de acordo com o cronograma do Programa.

10.2.1. A troca das Garras por brindes somente poderá ser realizada pelos participantes que não tiverem seus projetos classificados na etapa final, conforme item 9.5 deste regulamento.

10.2.2. Colaboradores desligados, por qualquer motivo, perdem o direito às garras e brindes, conforme cláusulas 7.9 e 7.9.1.

11. PREMIAÇÃO

11.1. Será anunciado como vencedor do programa, o solucionador cujo projeto for premiado com o primeiro lugar por meio da avaliação do Time de Liderança da TIGRE, conforme descrito na Etapa Final, item 9.2.5.

11.2. Os solucionadores finalistas serão premiados de acordo com a classificação estabelecida abaixo:

11.2.1. Para o 1º lugar: Oportunidade de aperfeiçoamento no valor de até R$ 7.000,00
11.2.2. Para o 2º lugar: Oportunidade de aperfeiçoamento no valor de até R$ 5.000,00
11.2.3. Para o 3º lugar: Oportunidade de aperfeiçoamento no valor de até R$ 3.000,00

11.3. O valor da premiação deverá ser convertido em qualquer modalidade educacional que caracterize capacitação ou aperfeiçoamento profissional, estando alinhada ao desenvolvimento individual do colaborador dentro ou não de sua área de atuação, desde que adequada ao negócio da TIGRE.

11.4. Os solucionadores premiados deverão submeter sua solicitação para pagamento do prêmio, à avaliação das áreas de Inovação e Recursos Humanos, que providenciarão o pagamento dos valores diretamente à instituição educacional.

11.5. Os valores dos prêmios serão distribuídos durante o ano de 2016, e deverão ser solicitados com antecedência mínima de 30 (trinta) dias.

11.6. Os prêmios são pessoais e não poderão em hipótese alguma, ser transferidos a terceiros.

11.7. Em caso de desligamento de colaborador, observar as cláusulas 7.9 e 7.9.1.

11.8. Na impossibilidade de utilização do prêmio concedido, em decorrência de qualquer impedimento gerado por exclusiva culpa do colaborador participante, este fica ciente desde já, que perderá o direito à respectiva premiação, não cabendo nenhuma reclamação à TIGRE quanto à eventual indenização, pagamento ou qualquer tipo de reembolso.

11.9. A recusa em receber o prêmio implicará em renúncia imediata a ele, passando o direito de premiação àquele que estiver em posição de classificação imediatamente posterior.

12. DIVULGAÇÃO DO RESULTADO DO PROGRAMA CRIATIGRE

12.1. A divulgação do vencedor e a entrega simbólica dos prêmios ocorrerá em evento interno, em data a ser definida e divulgada com antecedência pela área de Inovação, e através dos meios de comunicação interna.

12.2. Todos os participantes do Programa ficam cientes de que, desde já, cedem o direito de uso de sua imagem por prazo indeterminado, para divulgação em qualquer tipo de mídia interna, quanto aos assuntos referentes ao presente Programa.

13. DA PROPRIEDADE INTELECTUAL

13.1. As ideias enviadas deverão ser do próprio participante, que deve garantir a respectiva originalidade, não sendo aceitas cópias de produtos existentes ou quaisquer ideias que sejam de terceiros ou que violem direitos alheios, declarando-se desde já o participante ciente e de acordo que as ideias não serão passíveis de qualquer proteção autoral senão em favor da TIGRE.

13.2. Ao aceitarem este Regulamento no ato de inscrição no Programa, os colaboradores estarão concordando em ceder e transferir à TIGRE de forma ampla, irrestrita, permanente e gratuita, todos os direitos de propriedade intelectual sobre todo o material elaborado e postado na plataforma Innonatives ou fornecido por outro meio, e comprometem-se a assinar todos os termos de cessão específicos ou quaisquer outros documentos que se fizerem necessários à comprovação dos direitos cedidos à TIGRE em razão deste Programa.

13.2.1. Este Regulamento constituir-se-á Instrumento de Cessão de Direitos automaticamente partir de sua aceitação pelo colaborador no ato de inscrição no Programa.

13.3. Quando identificado que uma ideia viola a propriedade de terceiros ou que manifesta conteúdo impróprio, será ela desclassificada, assim como qualquer ideia que sugira ou encoraje atividade ilegal ou divulgação de informações que não possam ser transmitidas por motivos legais ou de regimento corporativo interno.

13.3.1. A TIGRE estará atenta quanto às violações a direitos de terceiros, mas não possui a obrigação de identificá-las, devendo o participante agir sempre com boa fé, e ressarcir todos

os danos e prejuízos que sua eventual má fé na participação deste Programa vier a ocasionar à TIGRE.

13.4. Salvo os prêmios estipulados neste Regulamento, não será devida nenhuma remuneração, royalties ou pagamento de qualquer espécie, a qualquer título, pelas ideias enviadas pelos participantes no Programa e/ou eventualmente utilizadas pela empresa, sejam elas implementadas ou não.

13.5. Aos participantes, fica expressamente proibido divulgar, comercializar, fornecer ou tornar disponível quaisquer informações, dados ou trabalhos, exclusivos e/ou confidenciais relativos às ideias cadastradas no Programa, não podendo sob qualquer pretexto, utilizar ou dar conhecimento a terceiros, mesmo após o encerramento do Programa ou em caso de desligamento.

13.6. A desistência ou desligamento de colaborador participante não prejudica os direitos de propriedade intelectual/industrial cedidos à TIGRE a partir do ato de inscrição no Programa, os quais serão resguardados à TIGRE independentemente da permanência do participante.

14. DAS DISPOSIÇÕES GERAIS

14.1. Qualquer proveito econômico ou direitos oriundos deste Programa, independentemente do envolvimento de quaisquer dos participantes, pertencerá única e exclusivamente à TIGRE.

14.2. Não existe, por parte da TIGRE, obrigatoriedade de adotar internamente ou lançar no mercado a solução vencedora.

14.3. Em caso de dúvidas, contatar a Equipe da Área de Inovação, através do e-mail: criatigre@tigre.com ou ramal 5527 com Francine Ferreira.

14.4. O Programa e, consequentemente, o presente Regulamento, podem ser alterados, suspensos ou cancelados a qualquer momento e por qualquer motivo, sem aviso prévio, a exclusivo critério da TIGRE, sendo que, nestas situações, a TIGRE comunicará aos participantes por meio da plataforma e/ou comunicação interna.

14.5. A TIGRE utilizará programas ligados ao ambiente da Internet, não havendo, portanto, garantia de que o acesso ao site esteja imune a invasões e paradas de funcionamento, causadas por casos fortuitos, internos ou externos, de força maior ou por outros casos não inteiramente submetidos ao seu controle, se eximindo de qualquer responsabilidade proveniente de tais situações, fatos e/ou atos. A TIGRE não se responsabiliza por problemas na transmissão de dados no servidor, nas linhas telefônicas ou em provedores de acessos dos usuários, por erros na leitura, ou ainda, por falta de energia elétrica, sem exclusão das demais situações decorrentes de caso fortuito ou força maior.

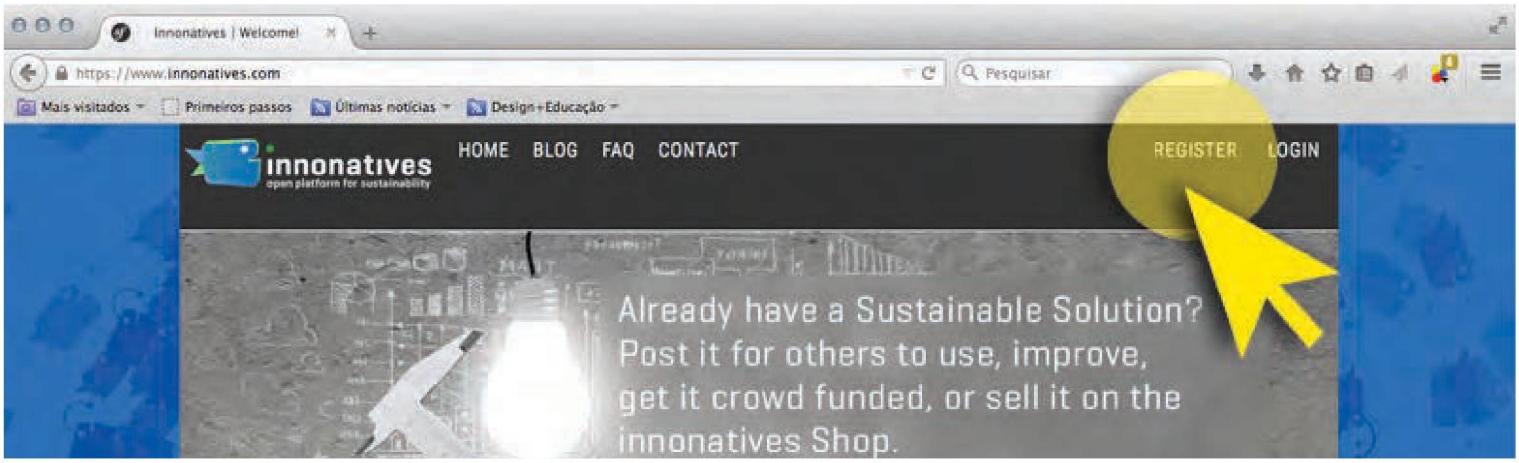
14.6. Fica, desde já, eleito o foro da comarca de Joinville, Estado de Santa Catarina, com plena concordância de todos os participantes, com exclusão de qualquer outro, por mais privilegiado que venha a ser, para dirimir quaisquer controvérsias advindas deste Regulamento ou do Programa.

14.7. Casos não tratados ou contemplados neste Regulamento serão analisados e decididos pela TIGRE.

Joinville, Agosto de 2015.

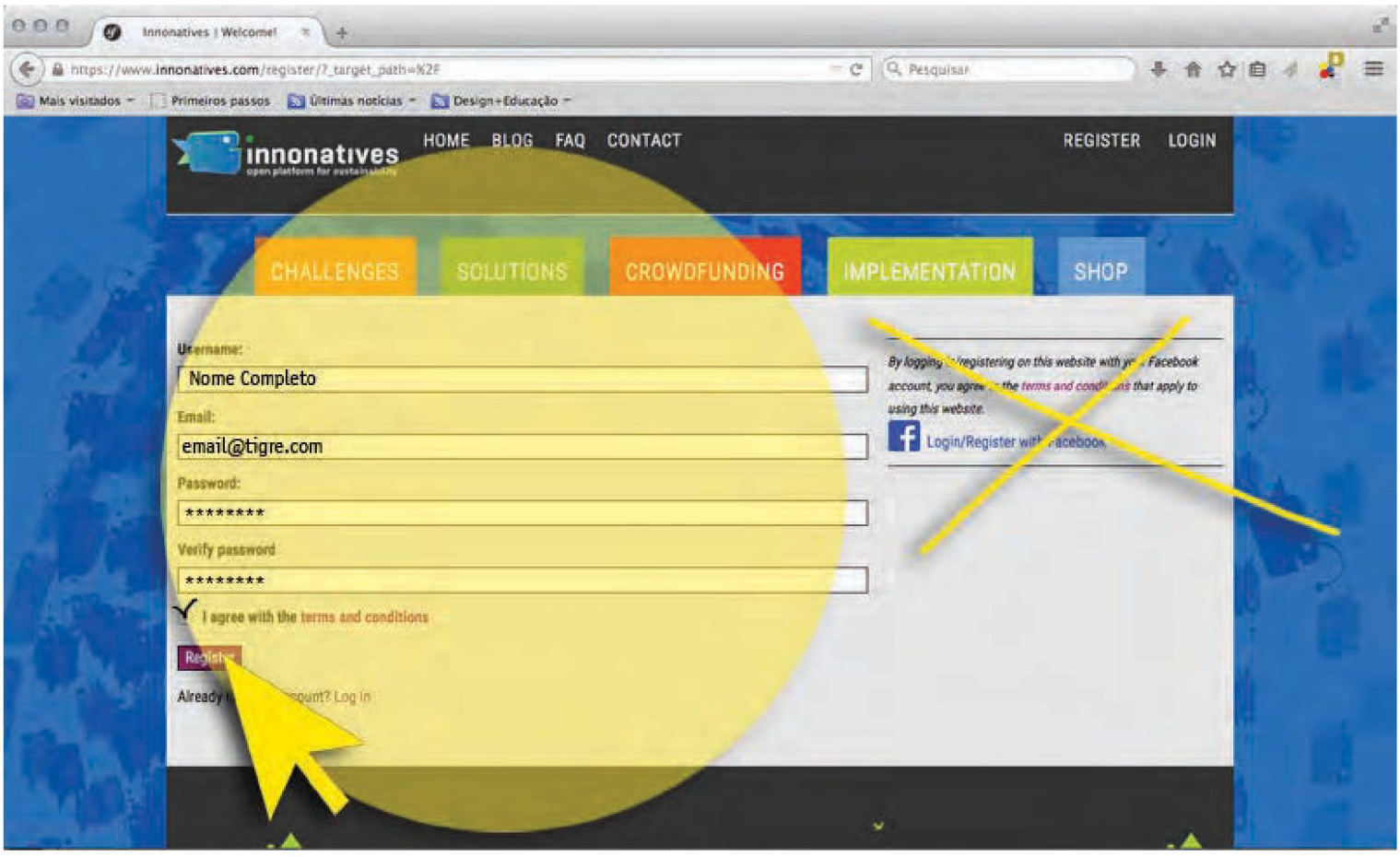
ANEXO 01 - Como se inscrever na plataforma innonatives

1 | Acesse a plataforma www.innonatives.com;
2 | Clique no botão "Register".



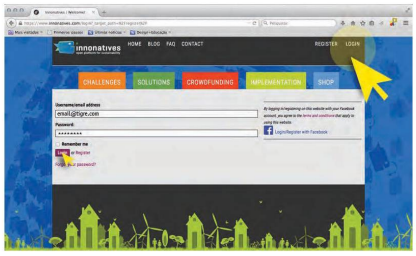
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3 | Preencha os campos do formulário, como indicado abaixo.

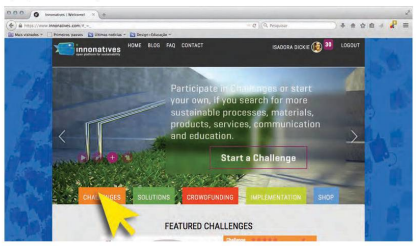


IMPORTANTE:
Registre-se na plataforma com o e-mail da Tigre. Isso facilitará a identificação e inclusão no grupo fechado do Desafio Tigre. Após a inscrição na plataforma, a inclusão do seu registro no grupo fechado deve ocorrer em 24h. Passado este período, caso não consiga acessar o Desafio Tigre, envie um e-mail para criatigre@tigre.com.

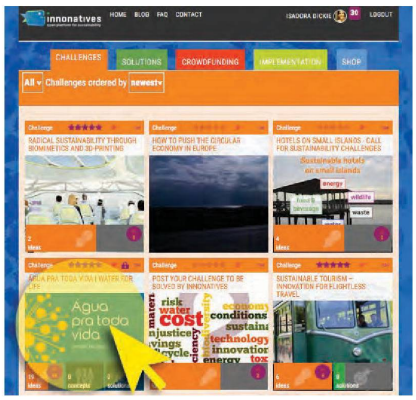
1 | Acesse a plataforma www.innonatives.com;
2 | Clique no botão "Login";
3 | Preencha seus dados de acesso como mostra a figura abaixo.



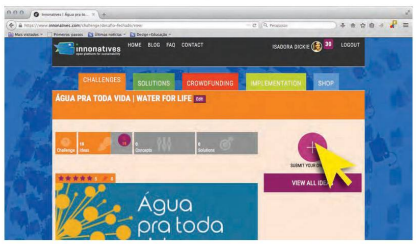
4 | Clique na aba "Challenges".



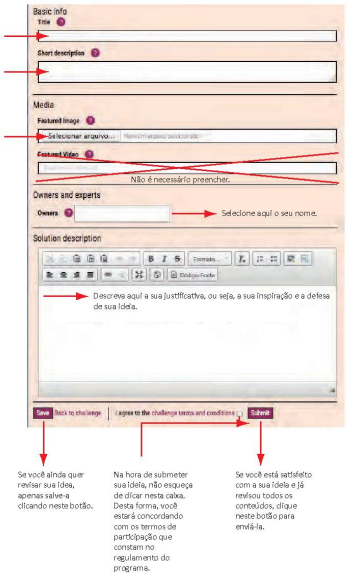
5 | Encontre o Desafio TIGRE.



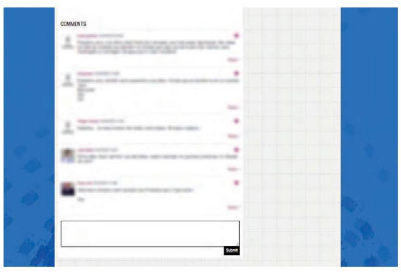
6 | Clique no botão "Enviar Ideia", como mostrado na imagem abaixo.



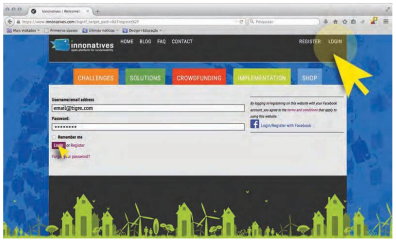
7 | Preencha os campos do formulário como indicado na imagem abaixo.



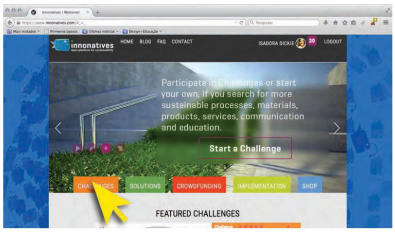
Para postar comentários, faça o login, entre no desafio fechado, escolha uma das ideias enviadas e escreva seu comentário no formulário, como o mostrado a seguir.



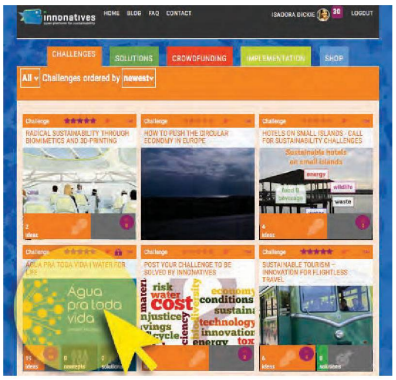
1 | Acesse a plataforma www.innonatives.com;
2 | Clique no botão "Login";
3 | Preencha seus dados de acesso como mostra a figura abaixo.



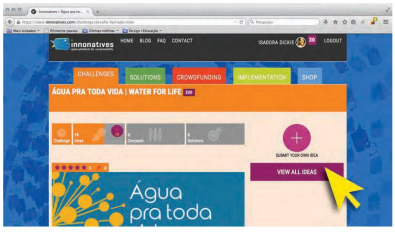
4 | Clique na aba "Challenges".



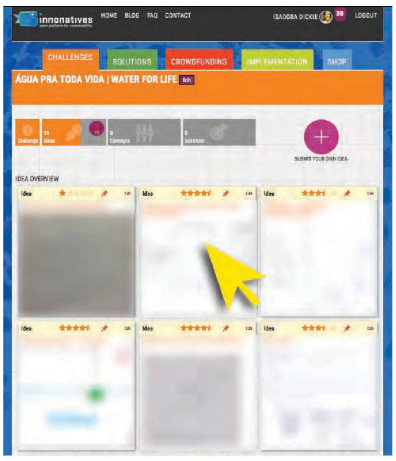
5 | Encontre o Desafio TIGRE.



6 | Clique no botão "Visualizar todas as Ideias", como mostrado na Imagem abaixo.

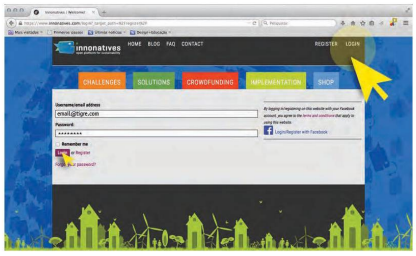


7 | Selecione as Ideias, uma a uma, e atribua de 01 a 05 estrelas, como mostram as Imagens abaixo.

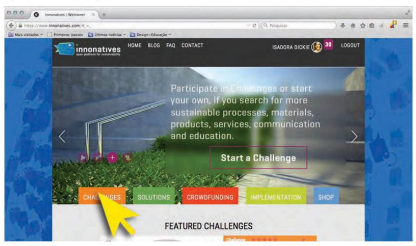




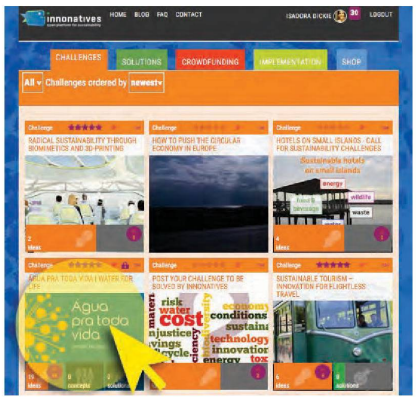
1 | Acesse a plataforma www.innonatives.com;
2 | Clique no botão "Login";
3 | Preencha seus dados de acesso como mostra a figura abaixo.



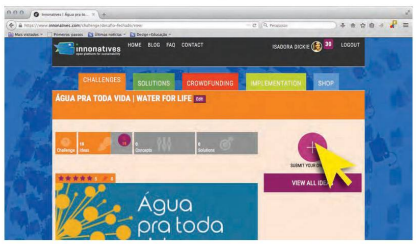
4 | Clique na aba "Challenges".



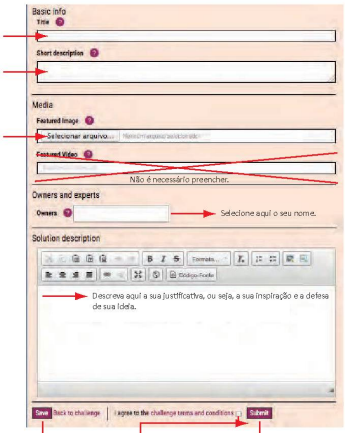
5 | Encontre o Desafio TIGRE.



6 | Clique no botão "Enviar conceito", como mostrado na imagem abaixo.



7 | Preencha os campos do formulário como indicado na imagem abaixo.

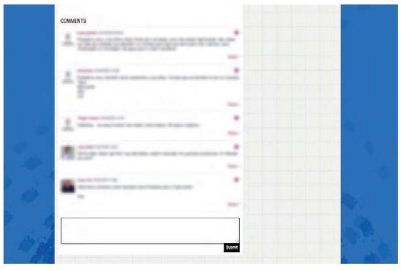


Se você ainda quer revisar seu conceito, apenas salve-o clicando neste botão.

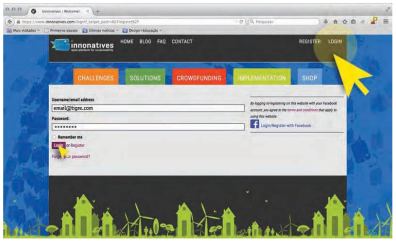
Na hora de submeter seu conceito, não esqueça de clicar nesta caixa. Desta forma, você estará concordando com os termos de participação que constam no regulamento do programa.

Se você está satisfeito com o seu conceito e já revisou todos os conteúdos, clique neste botão para enviá-lo.

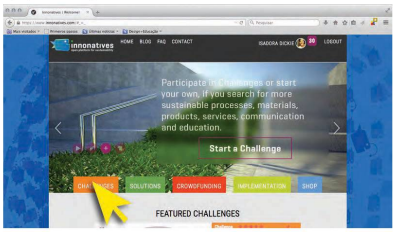
Para postar comentários, faça o login, entre no desafio fechado, escolha um dos conceitos enviados e escreva seu comentário no formulário, como o mostrado a seguir.



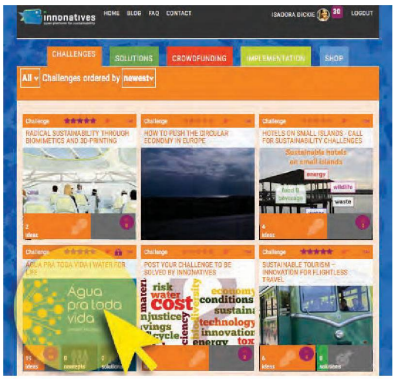
1 | Acesse a plataforma www.innonatives.com;
2 | Clique no botão "Login";
3 | Preencha seus dados de acesso como mostra a figura abaixo.



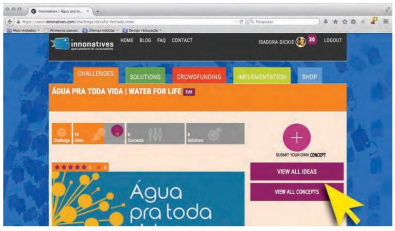
4 | Clique na aba "Challenges".



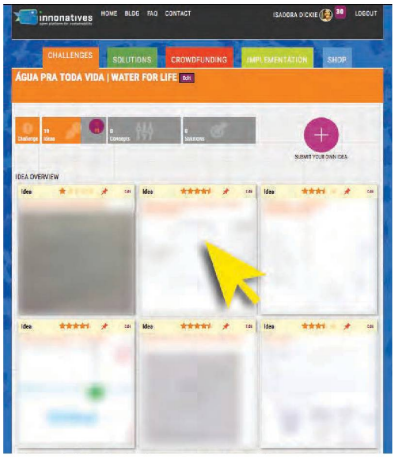
5 | Encontre o Desafio TIGRE.



6 | Clique no botão "Visualizar todos os conceitos", como mostrado na Imagem abaixo.

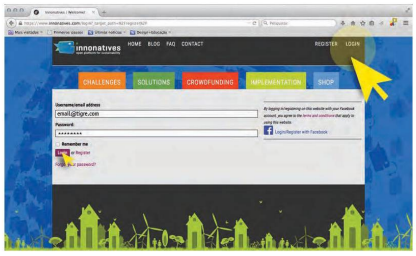


7 | Selecione os conceitos, um a um, e atribua de 01 a 05 estrelas, como mostram as Imagens abaixo.

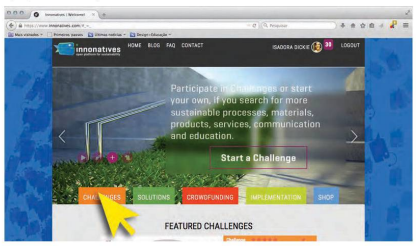




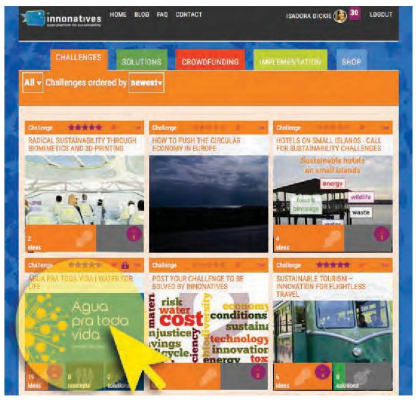
1 | Acesse a plataforma www.innonatives.com;
2 | Clique no botão "Login";
3 | Preencha seus dados de acesso como mostra a figura abaixo.



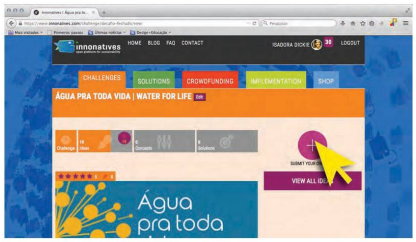
4 | Clique na aba "Challenges".



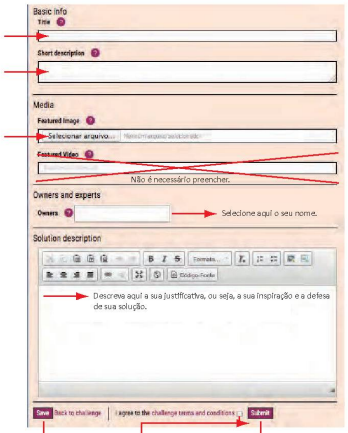
5 | Encontre o Desafio TIGRE.



6 | Clique no botão "Enviar solução", como mostrado na imagem abaixo.



7 | Preencha os campos do formulário como indicado na imagem abaixo.

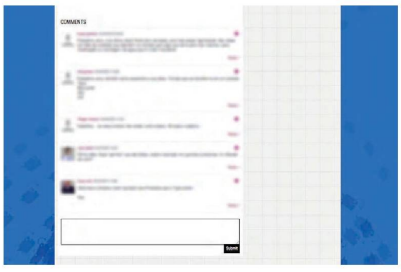


Se você ainda quer revisar sua solução, apenas salve-a clicando neste botão.

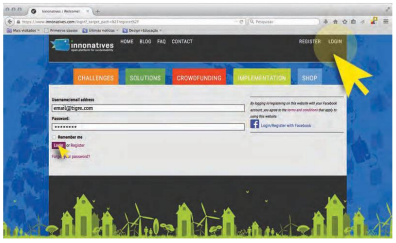
Na hora de submeter sua solução, não esqueça de clicar nesta caixa. Desta forma, você estará concordando com os termos de participação que constam no regulamento do programa.

Se você está satisfeito com a sua solução e já revisou todos os conteúdos, clique neste botão para enviá-la.

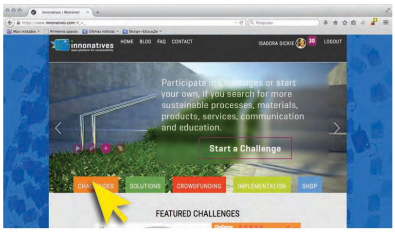
Para postar comentários, faça o login, entre no desafio fechado, escolha uma das soluções enviadas e escreva seu comentário no formulário, como o mostrado a seguir.



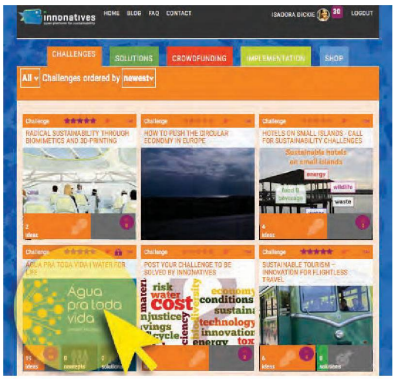
1 | Acesse a plataforma www.innonatives.com;
2 | Clique no botão "Login";
3 | Preencha seus dados de acesso como mostra a figura abaixo.



4 | Clique na aba "Challenges".



5 | Encontre o Desafio TIGRE.



6 | Clique no botão "Visualizar todas as soluções", como mostrado na imagem abaixo.



7 | Selecione as soluções, uma a uma, e atribua de 01 a 05 estrelas, como mostram as imagens abaixo.

