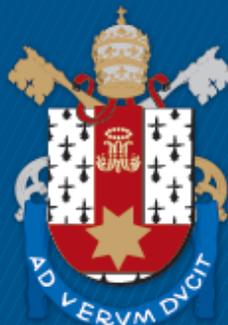ESCOLA POLITÉCNICA
PROGRAMA DE PÓS-GRADUAÇÃO
MESTRADO EM CIENCIA DA COMPUTAÇÃO

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THE USE OF GAMIFICATION TO SUPPORT THE ONBOARDING OF NEWCOMERS IN OSS

Porto Alegre
2018

Pontifícia Universidade Católica
do Rio Grande do Sul

THE USE OF GAMIFICATION TO SUPPORT THE ONBOARDING OF NEWCOMERS IN OSS

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Thesis submitted to the Pontifical Catholic University of Rio Grande do Sul in partial fullfillment of the requirements for the degree of Master in Computer Science.

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O Uso da Gamificação para Apoiar a integração de Novatos em Projetos de Software Livre

Dissertação apresentada como requisito parcial para obtenção do grau de Mestre em Ciência da Computação do Programa de Pós-Graduação em Ciencia da Computação, Escola Politécnica da Pontifícia Universidade Católica do Rio Grande do Sul.

Aprovado em 26 de março de 2018.

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ACKNOWLEDGMENTS

O USO DA GAMIFICAÇÃO PARA APOIAR A INTEGRAÇÃO DE NOVATOS EM PROJETOS DE SOFTWARE LIVRE

RESUMO

Os projetos de Software Livre dependem das contribuições de voluntários e precisam de um influxo contínuo de novatos para sua sustentabilidade. No entanto, os novatos enfrentam muitas barreiras ao fazer sua primeira contribuição. Em um trabalho anterior, um portal web chamado FLOSSCoach foi proposto para apoiar a primeira contribuição desses aos projetos de Software Livre. A avaliação preliminar do portal indicou que o FLOSSCoach desempenhou um papel importante na orientação desses novatos e na redução das barreiras relacionadas aos processos de contribuição. Por outro lado, a gamificação é amplamente utilizada para envolver e motivar as pessoas a realizar tarefas a melhorar seu desempenho. Esta pesquisa sugere uma proposta de gamificação para o portal FLOSSCoach com o objetivo de apoiar as primeiras contribuições dos novatos em projetos de Software Livre. Um framework para auxiliar a gamificação em ambientes genéricos foi escolhido na literatura para guiar a escolha dos elementos. Deste processo, oito elementos de jogos foram escolhidos e uma proposta preliminar de gamificação FLOSSCoach foi construída para o FLOSSCoach. Uma avaliação preliminar do projeto foi realizada com wireframes e, depois do refinamento da proposta, outra avaliação com protótipos de alta fidelidade, durante a fase de Refinamento do FLOSSCoach. Como resultado deste processo, temos a proposta de gamificação do FLOSSCoach.

Palavras-Chave: gamification, novatos, software livre, colaboração, qualitativo.

THE USE OF GAMIFICATION TO SUPPORT THE ONBOARDING OF NEWCOMERS IN OSS

ABSTRACT

Open Source Software (OSS) projects depend on volunteers' contributions and need a continuous influx of newcomers for their sustainability. However, newcomers face many barriers when making their first contribution. In a previous work, a web-based portal called FLOSSCoach was proposed to support the first contribution of newcomers to OSS. The preliminary evaluation of the portal indicated that FLOSSCoach has played an important role in guiding newcomers and in lowering barriers related to the orientation and the contribution processes. On the other hand, gamification is widely used to engage and motivate people to accomplish tasks and improve their performance. The main goal of this research is to gamify the FLOSSCoach portal aiming to identify how gamification can support the newcomers first contributions in OSS projects. We used a Generic Framework for apply gamification in environments to guide the gamification, that result eight game elements. From these results, a preliminary FLOSSCoach gamification proposal was built in the and the proposal evaluation was conducted with wireframes FLOSSCoach Gamification Proposal phase. Changes and a second evaluation with high-fidelity prototype in the second, during the Proposal Refinement. As a result of this process, we have the FLOSSCoach gamification proposal.

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CSCW – Computer-Supported Cooperative Work and Social Computing

HCI – Human Computer Interface

OSS – Open Source Software

RQ – Research Question

CONTENTS

1.   INTRODUCTION

Open Source Software (OSS) projects depend on voluntary contributions and need the continuous entry of newcomers for their sustainability [44]. Newcomers are developers who decided to place their first code contribution into a OSS project and not made any contribution yet. The viability and success of these projects depend mainly on the contributions of the active members as well as the entry and retention of newcomers [34].

Steinmacher et al. [55] listed onboarding barriers encountered by newcomers who haven't had their code accepted yet in the shared repository of the project, meaning that they have not made their first contribution yet. Later, they conducted a study on the web-based portal named FLOSSCoach [22] (currently available as a Free Software [27]), in which barriers faced by newcomers have been consolidated into a contribution flow in sections, which are *"About"*, *"How to Start"*, *"Configure Workspace"*, *"Know the code"*, and *"Send Contribution"* to support newcomers during the process of their first contribution. Their preliminary evaluation showed that the portal played an important role in reducing barriers related to orientation and contribution processes[53].

Based on these results, we identified the opportunity to use gamification as a way to support the onboarding of newcomers to OSS projects, with the intention to evaluate the potential of how this can help these newcomers. The main idea behind the concept of gamification is to motivate people by bringing a different approach to regular or common activities and tasks. This is due to the use of game's element in the support or as motivator for the accomplishment of activities. For example, the work of Singer and Schneider [49] used a leaderboard as a way to disclose commits made by members of a software team as a way to motivate developers to use such a resource more appropriately. Therefore, this thesis aims explore A Gamification Proposal to Support the Onboarding of Newcomers in the FLOSScoach Portal.

The research methodology was organized into three phases: theoretical foundation, FLOSSCoach Gamification proposal and proposal refinement. In Theoretical Foundation phase, we reviewed concepts from the literature and chose a framework for apply gamification. From these results, the Gamification process was guided by the study of Marache-Francisco and Brangier [38], which suggests toolboxes for the design of gamification. In the FLOSSCoach Gamification Proposal phase, a preliminary FLOSSCoach gamification proposal was built. We defined objectives, tasks, personas, and game elements for portal. We first evaluated the wireframes with newcomers in OSS projects and for domain experts to analyze the potential of this gamification design, related to motivation and support to perform tasks and a second round of interviews guided by questionnaire with the same public. In the Proposal Refinement, we make changes to the FLOSSCoach gamification proposal. Lastly, We made a final evaluation with high-fidelity prototypes. In the evaluation of the low

fidelity and high fidelity interfaces, semi-structured interviews were used, with the help of a questionnaire to obtain more details about the participants' perception of the evaluated interface.

1.1   RESEARCH GOAL

This section presents the main research goal of this thesis as well as the related objectives to achieve the intended goal.

Newcomers in OSS projects face many barriers during the onboarding process of a project. Therefore, it is necessary to think of ways to help them continue in the process of first contribution. On the other hand, gamification has been used by several areas, to motivate people to performed their activities. Our proposal is to use the FLOSSCoach portal, since it's available as a free software and its preliminary evaluation has brought positive results [52] for the creation of a FLOSSCoach gamification proposal. The main goal of this research is to gamify the FLOSSCoach portal aiming to identify how gamification can support the newcomers first contributions in OSS projects. This gamification proposal will be represented first by wireframes and after by high-fidelity prototypes. To create these prototypes based on a framework chosen based on the literature and we are going to analyze the potential of this gamification design through an evaluation involving the newcomers in OSS projects, domain experts and OSS collaborators. To accomplish that, the following research question will be used to drive this research:

> **Research Question (RQ):**
> How can Gamification Proposal support the onboarding of newcomers in Open Source Software projects?

Objectives

To achieve the main goal and answer the intended research question, we defined the following objectives:

Obj1. To gather knowledge on the: barriers faced by newcomers in OSS projects, on the understanding of the FLOSSCoach portal, about gamification, the gamification frameworks,of personas, the low-fidelity and high-fidelity interfaces.

Obj2. To define a set of game elements to compose the FLOSSCoach portal gamification proposal.

Obj3. To develop a prototype of the FLOSSCoach portal gamification proposal.

Obj4. To evaluate the FLOSSCoach portal gamification proposal by high-fidelity prototype with newcomers in OSS projects and domain experts of this gamification design, related to motivation and support to perform tasks.

1.2   SCOPE

In this Section, we describe the scope of this research. We limited this proposal research to OSS projects. When we refer to "OSS projects" mean open collaboration [23] and community-based open source projects [15].

In this work, the term newcomer refer to developers (i.e., people with a development background) who want to place their first code contribution into a Open Source Software project.

We aim to understand how gamification can support the onbording of newcomers. Onboarding contemplates the moment that the developer decides to contribute to a project up to the point when the community accepts their code in the shared repository of this project.

1.3   CONTRIBUTIONS

This research has contribution a gamification proposal to the FLOSSCoach portal. We analyzed the potential of this gamification design through two evaluations involving newcomers in OSS projects, and specialists in CSCW, gamification, and HCI. We used high and low-fidelity prototypes for evaluation. With this, we intend to find new forms to decrease the barriers faced by these newcomers.

1.4   TEXT OUTLINE

The remainder of this thesis is organized as follows: Chapter 2 describes the theoretical foundation on newcomers to OSS projects, newcomers barriers to OSS projects, gamification, process of gamification framework, personas, and prototypes. Chapter 3 presents the research methodology we followed in our study. Chapter 4 presents the FLOSSCoach portal gamification preliminary proposal with wireframes and describes the results from the evaluation of this version. Chapter 4.5 describes the changes in the FLOSSCoach gamification final proposal and evaluation with high-fidelity prototype. Chapter 5 presents the final considerations and future work of this research.

2.   THEORETICAL FOUNDATION

OSS projects are formed by volunteers that contributes and collaborates on it, and sometimes they are distributed over the world [59]. Several OSS projects have engaged communities, such as Apache [4], GitHub [25], and Libre Office [35]. Community members share a common interest in the project and regularly interact with each other to share knowledge and to collaborate in pursuit of solutions to a common class of problems [61]. In OSS projects, one of the key elements related to the quality of the product is the group of members. The number of people involved is relevant, due to the fact that this people provides a critical mass of contributions, fixing bugs or adding new features. Therefore, without people to contribute, the project dies. As it remains inactive, the project becomes non-attractive for people in general.

Nagakoji et al. [43] studied four different models of OSS projects and proposed a general structure of roles in OSS Communities: the Onion Model. In Figure 2.1, this model is represented with a set of concentric layers (like the layers of an onion), which show how actors are positioned in communities. Project Leaders are often the initiators of the projects, those who will give the project directions. Core Members (also mentioned as Maintainers) give significant contributions to a project over the time. Active Developers are the ones that regularly contribute by helping in the development of new features or by fixing bugs. Peripheral Developers contributes irregularly, and in short and sporadic period. Bug Fixers solve errors, which are reported by Bug Reporters, or discovered by other people. Readers are active users that try to understand the project, by studying the source code. Passive Users use the system likewise most people utilize commercial software; they are attracted to OSS for high quality and the potential of being changed when needed. It is important to note that Nagakoji et al.'s work focuses on the definition of the roles once the onboarding has taken place.

A newcomer is a person who has recently arrived somewhere or who has recently started a new activity [40]. Zhu et al.[64] reported that one of the most significant challenges for online communities is to increase members' contributions over time. The viability and success of OSS projects rely, mainly, on the contributions of the active members, as well the sustainable community registration of newcomers [34].

Previous work related to newcomers' joining process, examined the dynamics driving OSS contributors. Schilling et al. [47] focus on motivations for becoming a member. Jergensen, Sarma, and Wagstrom [30] investigate the Onion Model in Open Source Ecosystems and ways for a newcomer to become a core developer. In another study, Zhou and Mockus [63] proposed indicators of a potential newcomer to become a long-term contributor. A consistent challenge is newcomers socialization in OSS projects [23]. Kraut et al. [33] claim that successful OSS projects must deal with challenges related to attracting new-

Figure 2.1: Onion Model. Source: [43]

comers, choosing among the newcomers, retain them, socialize, and protect older members from potential problems newcomers may bring.

The following sections describes the theoretical concepts related to this thesis preparation. Those concepts includes: Newcomers Barriers to OSS Projects, FLOSSCoach Portal, gamification, gamification frameworks, and prototypes.

2.1   Newcomers Barriers to OSS Projects

Steinmacher [51] empirically studied newcomers in OSS projects. His studies identify an input model for the projects, the barriers that newcomers face, and proposing the FLOSSCoach portal to help overcome the identified barriers. Our study will add to his previous research by applying gamification on this portal aim to support the onboarding of newcomers in OSS.

In 2014, Steinmacher et al. [54] proposed a developer joining model that represents the stages that are common and the forces that influence the joining process of a developer to an OSS project. (see Figure 2.2). The stages are: Outsider, Newcomer, Developer, and Core Developer. An Outsider is a potential contributor to the project. Newcomers are developers who have not contributed to the project yet, and are trying to make their first code contribution. Developers are the ones who have already contributed to the project, but they do not have commit privileges in shared repository. Core developers are developers recog-
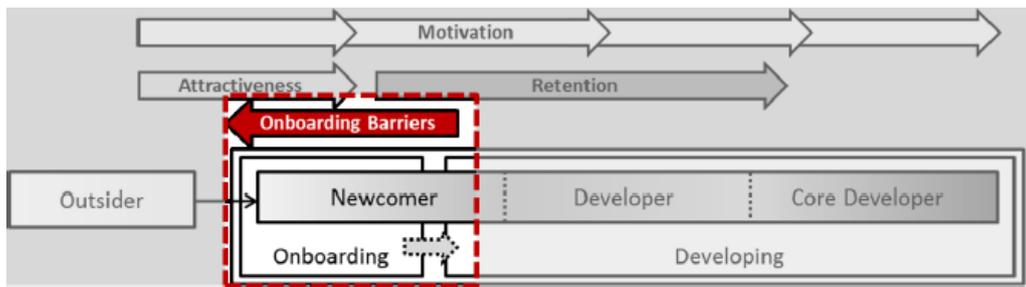
Figure 2.2: Model of developer joining process. Source: [51].

nized by the community as formal contributors, or those ones that have commit privileges in the shared repository.

The model has four different forces that influence the individual progress from one stage to the following. **Motivation forces** means internal (e.g., learning, self-marketing, and recognition) and external (e.g., scholarship, course assignment, and need resources) reasons that motivates a developer to join and continue to contribute to a project. Consequently, motivation forces are present in the whole joining model, since the lack of motivation leads the developers to give up. **Attractiveness forces** means the characteristics and actions the project presents for engaging new users and developers. These forces can include project visibility and some kind of license. **Retention Forces** represent the characteristics and actions that a project presents to bring in more contributors. Other mechanisms for engaging represent forces contributing to contribute more, inducing, in some cases, a change in the behavior (e.g., using gamification).

The transition from outsider to a newcomer, when a developer decides to contribute to a project and starts onboarding, motivation forces continuing encouraging the developer to keep on, and some **Opposite forces or Onboarding Barriers** can influence in this joining process [54]. Since these barriers can be powerful enough to lead developers to give up contributing to the project, understanding how to deal with them is critical to the joining process. An important observation is that these barriers influence both developers willing to make a single contribution and those willing to "climb" higher and become a project member [56].

In 2014, Steinmacher et al. [55] performed a systematic literature review that aimed at identifying the barriers that a newcomer can face when contributing to an OSS project. This study resulted in a preliminary model of barriers. The original list of 58 barriers includes 13 social barriers, organized into six categories: cultural differences, documentation problems, newcomers' characteristics, newcomers' orientation, reception issues, and technical hurdles. Figure 2.3 presents the final list of barriers that compose the current version of the model.
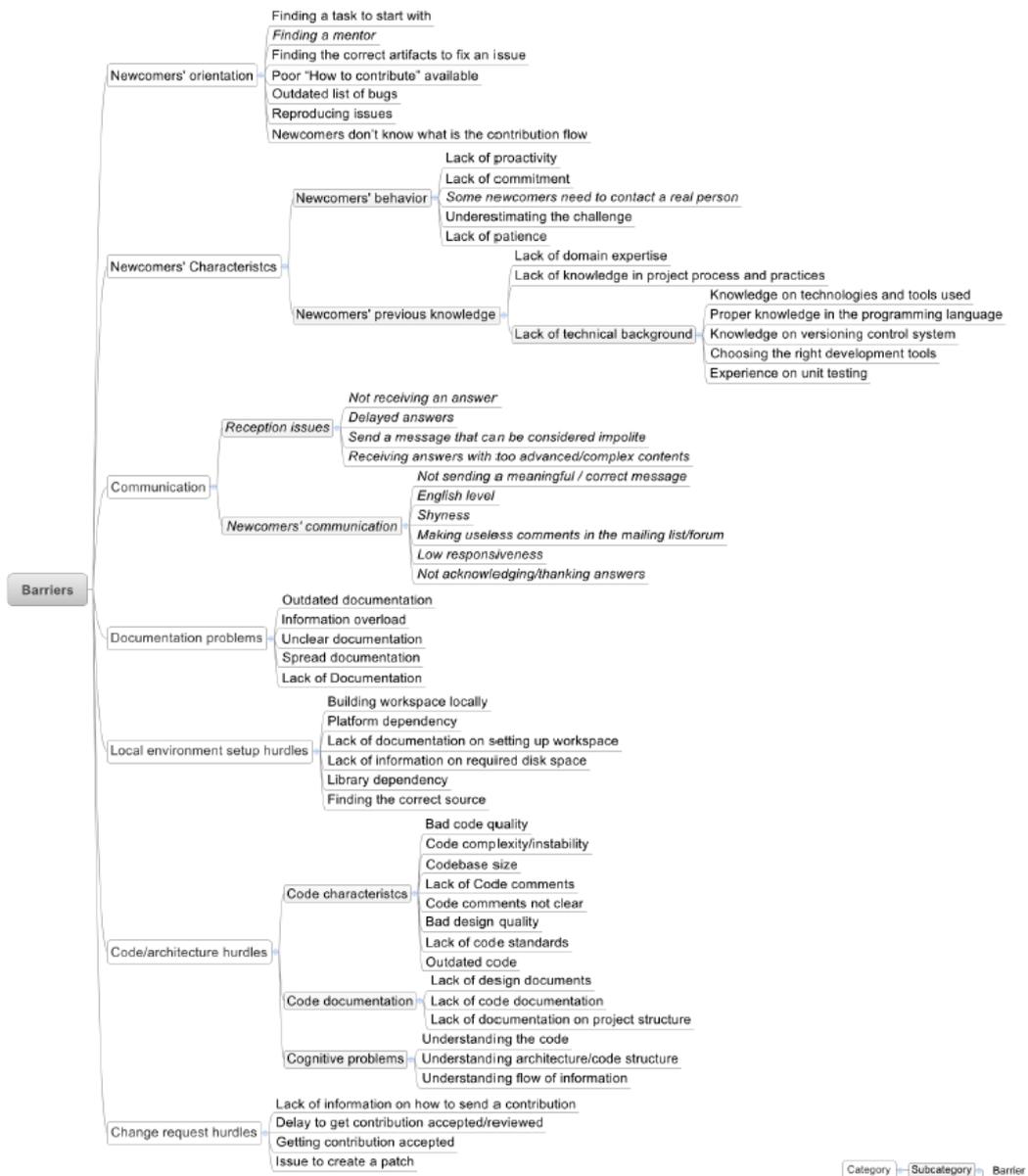
Figure 2.3: Barriers Model Proposed by Steinmacher et al. (2014) Source: [55]

2.2 FLOSSCoach Portal

Later, in 2016, Steinmacher et al. [53] proposed the FLOSSCoach portal [22] (currently available as a Free Software [27]) that allows newcomers to map these barriers. The portal also supports these new members during the first contribution. The Figure 2.4 shows a Contribution Flow for the newcomer's orientation. This flow begins with "Learn about projects and skills" section, where project related information and skills needed to contribute are displayed. Next, we have the "Set up your local workspace" section, where there is information about the project repository. It is followed by "Find a task to get start with" section, that shows the project available tasks. Then, the "Study and change the code" section shows the task implementation phase. And, finally, "Submit your Contribution" section de-
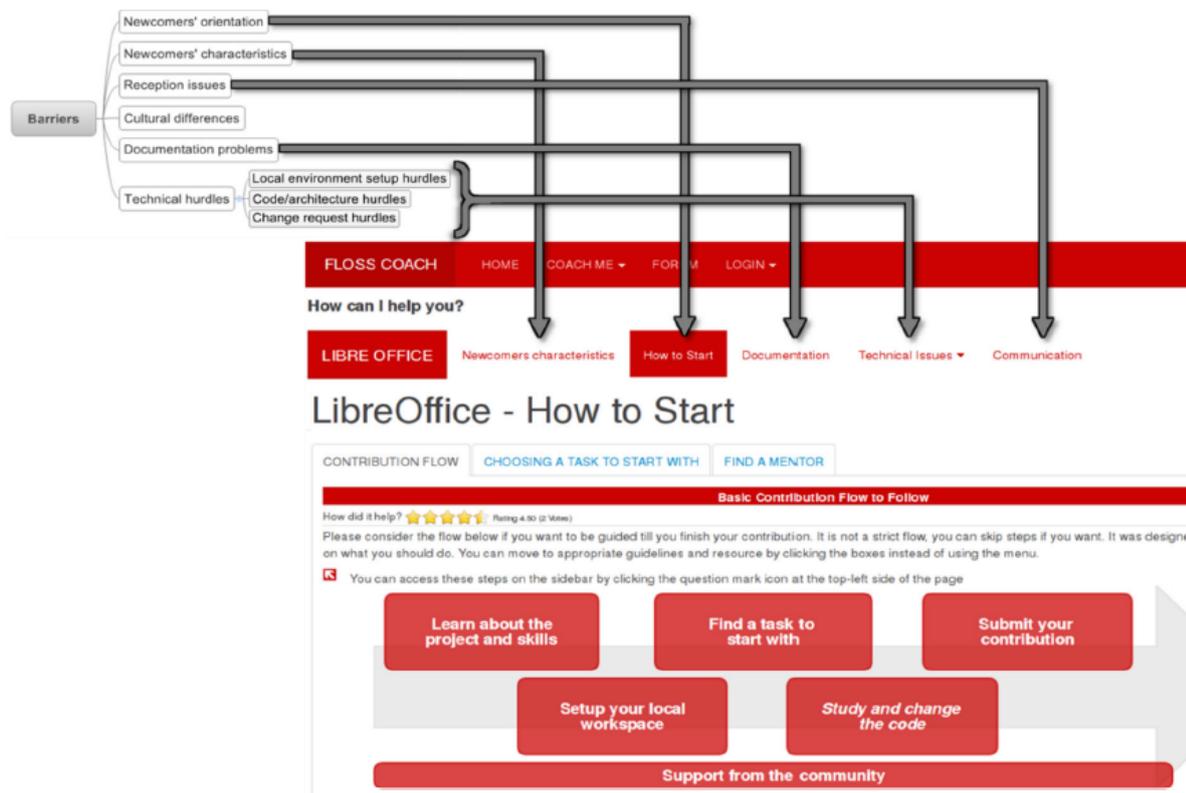
Figure 2.4: Newcomers Barriers categories mapped to FLOSSCoach Portal ("How to Start") section. Source: [53].

scribes how to submit a contribution to a project. Also, Figure 2.4 shows the mapping of the barriers to the sections, as detailed below:

- **Cultural differences.** There are two barriers in Cultural differences category: the necessity of being in contact with a real person, and messages that are considered rude. The FLOSSCoach portal, a message template, and links for mailing lists (when available) are under the section "Communication".

- **Documentation problems.** In order to be able to contribute to the project, the new-comer has to learn about technical and social aspects in which it was inserted. There are six barriers under the category: Outdated Documentation, information Overload, Unclear Documentation, Spread Documentation, Code Comments Unclear, and Lack of Documentation. The authors created a section called "Documentation" in FLOSS-Coach portal and made the documentation available by project, organizing it in sub-sections.

- **Newcomers' characteristics.** The authors created a section called "Newcomers char-acteristics" in the FLOSSCoach portal, which provided a list of the skills expected to contribute to project, and links to tutorials available by the community.

- **Newcomers' orientation.** Newcomers need proper orientation to find their way and correctly make their contributions. There are seven barriers in this category: Finding

a task to start with, Finding a mentor, Finding the correct artifacts to fix an issue, Poor "How to contribute" available, Outdated list of bugs, Reproducing issues, and Newcomers don't know what is the contribution flow.

- **Reception issues.** This category consists of barriers related to the reception of newcomers by the community. There are four barriers in this category: Not receiving an answer, Delayed answers, Impolite answers, and Receiving answers with too advanced/complex contents. The authors mapped these barriers in the section "Communication" in FLOSSCoach portal. This section includes links to the mailing list, an embedded tool to connect the project's IRC channel (when available), guidelines on how to interact with the community, and a suggested message template to guide the newcomer's first interactions.

- **Technical hurdles.** This category refers to the technical barriers when newcomers are building the code. They are organized into three subcategories: Code/architecture hurdles, Change Request Hurdles and Local Environment Setup Hurdles. These are presented in the section called "Documentation" in FLOSSCoach portal, with an available mailing list archive search and links to tutorials, code search engines, code standards, and code related documentation.

To evaluate the FLOSSCoach portal, the authors conducted a study with 65 students, based on qualitative diary data, self-efficacy questionnaires, and the Technology Acceptance Model [18]. The results indicate that FLOSSCoach played an important role in guiding newcomers and reducing barriers related to the orientation and the contribution processes, while it has not been effective for reducing technical barriers. Based on these results, we identified the opportunity to use gamification as a way to support the onboarding of newcomers to OSS projects, with the intention to evaluate the potential of how this can help these newcomers.

2.3   Gamification

Deterding et al. [19] proposed a widely spread definition of gamification as "the use of game (design) elements in a non-game context.". In this study, they also explained that gamification is related to games, but it is not the same as a complete game. The main goal of applying gamification is to motivate users with popular game elements, e.g., point, levels, and badges, towards the desired activity. One of the biggest success stories of gamification in software development is Stack Overflow [50], an online platform that motivates the users with badges and levels in a global and collaborative issue management like style.

Hamari, Koivisto and Sarsa [28] reported a literature review on empirical studies in gamification and concluded that gamification provides positive effects, but these effects

depend on the context in which gamification is being applied as well as on the users using the system. They examined motivational approaches, psychological and behavioral outcomes of gamification, as well as the contexts of gamification, and the types of studies performed in gamification systems. The study also examined the current state of research on the topic and pointed out gaps in the existing literature.

Singer and Schneider [49] proposed the gamification of a version control system aiming to encourage students to make commits more often using a social software application. The experiment used a web-based newsfeed display for each team and a leaderboard that shows the commits count for each team member. In addition, the portal sent a weekly summary for each student, informing how many commits were made the previous week, and also commits of others members. They conducted an experiment with 37 students and the study revealed some ideas about the use of gamification in improving software engineering practices, stating that students claimed that "The commits number per person, metric - can be very simplistic and useless".

Lotufo et al. [36] investigated the use of game elements in Stack Overflow [50] to apply in a Quality and Assurance system, as a way of encouraging team members to increase their contributions frequency and quality. They raised the reputation for good contributions, reduced reputation for precarious contributions, and granted privileges to users as they reached certain reputation levels. They used OSS projects and found that most mechanisms and game elements can be applied to the same context.

Moccozet et al. [41] proposed an online community using game elements for students to improve group work among them. To achieve a common goal, students shared content resources in a space and used those resources. All possible actions on the platform were scored. They analyzed the use of the platform for 244 students. The results indicated that gamification encouraged students to contribute and collaborate more.

Shelth, Bell and Kaiser [48] proposed the use of game elements of Massively Multiplayer Online Games (MMOGs) to support the software development process called HALO (Highly Addictive, Socially Optimized). HALO is built upon the properties found in popular games, by turning work into a game environment. It shows everyday tasks as quests with social rewards to motivate developers to achieve them.

Fernandéz-Luna et al. [21] proposed an enhanced engagement mechanism to collaborative search systems using gamification. Collaborative search systems require making sense of the information to achieve shared goals and reduce additional costs. The study presents a set of elements to gamify collaborative search systems.

Another example is the work of Diniz et al. [20] that proposed gamification to motivate graduate students to contribute to OSS projects. In the GitLab [26] environment, rules for using some game elements have been defined: quest, rank, point, and levels were used to motivate players. To evaluate the use of the elements, a study was conducted with 17 students, using a real OSS project. The students assessed their experience using a struc-

tured questionnaire. Responses have shown that these game elements can motivate and support newcomers in OSS projects. Mainly, the Quest and Points elements were found to be suitable to assist newcomers in overcoming lack of orientation and feedback.

Vasilescu [57] studied how human aspects, gamification and social media impact on collaboration in OSS projects. He checked activity histories on version control systems, problem trackers, mailing lists, and systems such as GitHub and Stack Overflow. Preliminary results indicated that developers are indeed attracted to gamed-out social environments, such as that offered by Stack Overflow, access to specialized knowledge has a positive influence on their productivity in OSS development.

Webb [58] presented some studies in which gamification can be successful and others in which it can fail. She argues that games have goals that are specific, measurable, achievable, realistic, and time-bound, but in some cases, companies tried to apply gamification without considering this. So she proposed factors that make gamification appliance successful: understand the business goals behind gamification; measure the progress; understand the users; bring business goals and user perceptions together; and test and iterate the gamification project. These previous studies exemplify how gamification has been used to motivate users to perform tasks and how the choice of game elements is also relevant.

2.3.1 Gamification Frameworks

Choosing appropriate game elements is not a simple task. Some frameworks have been proposed to assist systems gamification in different contexts. Mora et al. [42] conduct a literature review to identify the state of art in gamification designs, to analyze the relationship between gamification and game design, and to identify and classify existing frameworks or methods through the following five categories: Economy, Logic, Measurably, Psychology, and Interaction. Eighteen frameworks were selected and categorized into two types: frameworks for the purpose of engagement with generic context and frameworks specific to the business context. Among the generic frameworks, we will present some, since this work is related to the context.

Werbach and Hunter [60] proposed the "6D Framework", consisting of two main steps: the definition of business objectives and how to achieve the expected behaviors. The framework includes the use of distinct game elements based on the player's experience (e.g., guiding newcomers and keeping experienced users motivated), the engagement cycle, and the rules that coordinate all elements used. Also, it identifies the user experience, the most appropriate game elements, and their rules to generate an engagement cycle tailored to each user.

The framework "Octalysis", proposed by Chou [16], is centered on human motivations, the octagon-based approach in which each side represents relevant user characteris-

tics for gamification. The author describes two important facts for gamification: generate a sense of accomplishment and development for users and encourage social elements existing in an environment. The approach is based on an octagon shape with eight core drives represented by each side: epic meaning and calling, development and accomplishment, creativity and feedback, ownership and possession, social influence and relatedness, scarcity and impatience, unpredictability and curiosity and loss and avoidance.

Aparício et al. [5] proposed a method to apply gamification as a tool to motivate people on participating in the overall activities based on Self-determination Theory, in particular, the concepts of autonomy (personal will to action), competence, and social relatedness. The framework is organized into four parts. The first is "identification of the main objective", or outlining the reasons behind the use of gamification. The second is "identification of the transversal objective", or what intrinsically motivating factors the system seeks to provide. The third involves "determining what game mechanics will be used" based on how they relate to the concepts of self-determination. The final part of the framework involves "how to evaluate the framework in applied systems". The authors did not validate or applied the framework empirically by the time we finished our research.

The generic framework "5W2H" is focused on User-Centered Design. The framework covers seven dimensions arranged as follows: "Who?","Why?","What?","When?","How?", "Where?", and "How much?". From these questions, the game elements are applied. The work is about an adaptive gamification, presenting most recommended elements for each user individually [32].

Another important study is the work of Bista et al. [12]. The authors proposed a gamification model of online communities. In this study, they identified three main challenges to engage members in new online communities: (a) *bootstrapping*- how to bring the members to the community and keep them engaged during the initial phase of the community, (b) *monitoring* - how to monitor community activities in different categories like reading, rating commenting, etc., and (c)*sustainability* - how to sustain the engagement of the members a long-term. In their work, they decided to apply gamification approach as one way to tackle these challenges. They also presented a specific instance of their model in the context of their online community and report the initial results of its deployment. They proceeded to implement a gamified online service for welfare recipients transitioning back to work. The purpose of the study was to encourage positive and more frequent contributions for members. For implementation, they have chosen points and badges as their main design elements.

The aforementioned frameworks are not suitable to the context of the requirements that we want to apply. The "6D Framework" [60] not provided an ethics guide that involves systematizing, defending and recommending concepts of right and wrong conducts. This is important to guided to project and avoid mistakes like loss of feeling of credibility. The framework of Aparício et al [5], the "5H2H" framework [32], the Gamification model of Bista

et al. [12], and the "Octalysis" framework [16] not provided to game mechanics combined with reinforcement and feedback in order to engage the player in the main system activities, and neither rules to a logic guide by the designer. These are important in FLOSSCoach portal context because reinforcement and feedback are important to motivate newcomers. A guide for the design of the project to facilitate the choice of elements.

However, Marache-Francisco and Brangier [38] define a Gamification Design Process based on Human-Computer Interaction (HCI) principles. They identify three categories outside the gamification components and practices which can be used to define a clear framework. Three categories are attractiveness, task support, and motivation accomplishment and motivation expression and relationship. Based on these, the design process consists of two major iterative steps: the context analysis and the iterative conception of the gamification experience. Moreover, a toolbox for gamification (named Core Principles) to help designers through the process is referenced. We decided to choose this framework because it attends the requirements to guide us to conceive the FLOSSCoach gamification proposal: a guideline to ethics, the body of regulations prescribed by the design, refers to everything designed into the gamified system which a player being may interact and the player's behaviors, attitudes, and emotions. and also, logic in order to engage the player system actions.

2.3.1.1 Gamification Design Process

The "Gamification Design Process" framework [38] consists of two main steps: a Context Analysis and Iterative Conception (see Figure 2.5). The authors believe that gamification can only be effective if it is designed based on an understanding of who the users are and the context of the use. First, Context Analysis, the intentions when applying gamification should be analyzed and considered in the use context, activities that need to be performed in the environment, as well as the person that will be using it. To assist these decisions, this process provides a toolbox with a Context Analysis Guide to assist the designer during this phase and Gamification core principles to be considered during all the design phases. This guide helps to identify the goals that one wishes to achieve in applying gamification, the activities that need to be performed in the environment.

Tools Boxes for Gamification: Information To Be Integrated Into The Gamification Design Process:

A. Gamification core principles

The first design tool standardizes the conception process. It comprises six principles which have to be considered during all the design phases:
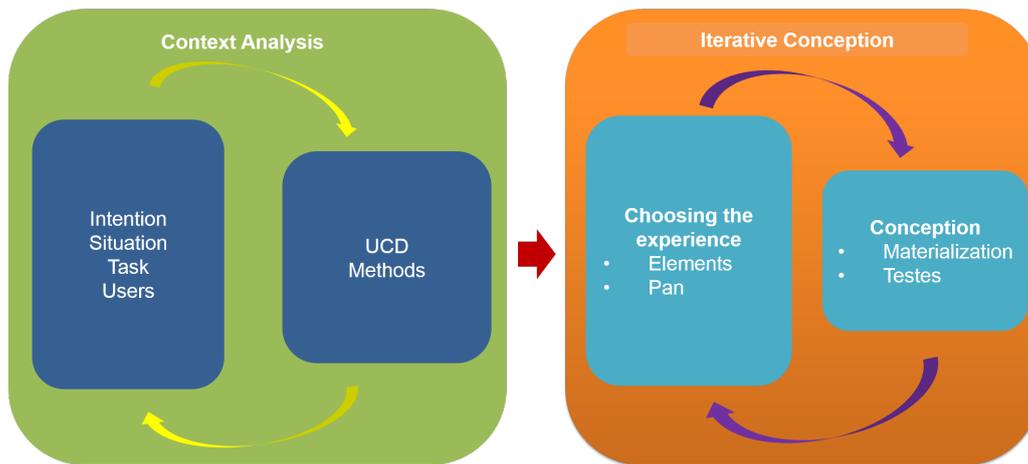
Figure 2.5: Gamification Design Process. Source: [38]

- **Freedom of choice:** giving the user the freedom to exercise the user's own will, e.g., being allowed to disable functionalities, or to opt out of the gamified system;

- **Benefits and meaningfulness:** The gamification influences must be relevant both to the system owners, who expect positive consequences, and to the end users themselves. Otherwise, non-meaningful elements will either have a bad influence on the perception of the system by the end users or be ignored by them;

- **Personalized experience:** Different user profiles can lead to several different designs. This is where the added value of gamification comes from, through tailored triggers;

- **Long-term interaction:** Designing with the interaction evolution in mind, especially concerning the motivational elements;

- **Unwanted secondary effects anticipation:** Unwanted effects can include stress induced by pressures from efficiency requirements, loss of the feeling of privacy and credibility, gaming the rules of the system, or focus on quantity over quality to obtain some reward;

- **Legal and ethical matters:** They take into account the existing legal context, for example, data and privacy, and the interest of the end users.

B. Context Analysis Guide

Second tool indicates factors, which have an impact on the perception and the efficacy of the gamification elements. The toolbox provides a context analysis guide to help the designer during Context Analysis phase.

- **Intent:** Goal (task or motivation-centered);

- **Situation:** (a) Context (for example, work or leisure); (b)Social Environment; (c) Motivators and Pain points;
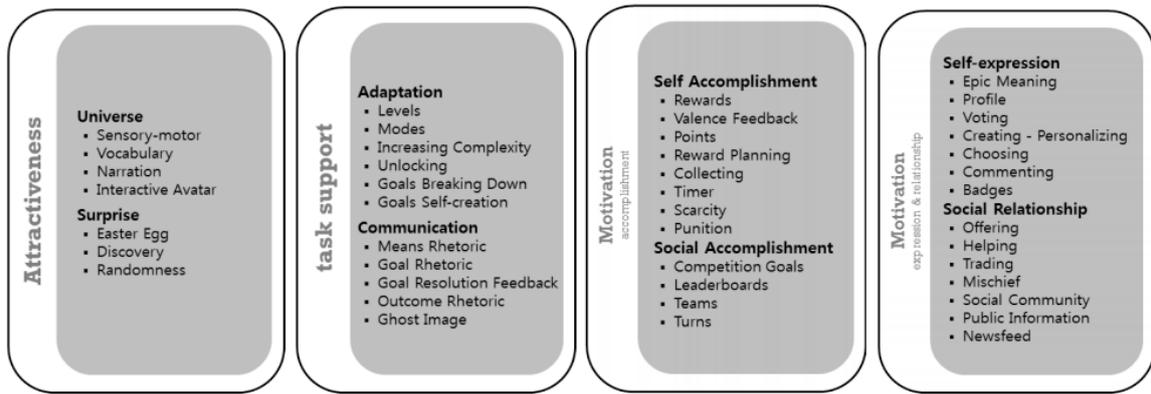
Figure 2.6: Gamification Elements Cards. Source: [38]

- **Task:** (a) Goal; (b) Structure; (c) Other actors involved;

- **User(s)**: (a) Characteristics (for example: gender, age); (b) Personality; (c) Culture; (d) Experience/Competency/Knowledge; (e) Motivators or Pain points.

During the Iterative Design phase, the desired gamification experience is chosen. To achieve that, game elements cards are used, which were identified and evaluated in a previous study [37], and also decision trees. The game elements are organized in three categories: Attractiveness, Task Support, and Motivation. The elements of the category Attractiveness are used to generate positive emotions through immersion in a universe of games, interactions with the user and the use of Surprises. The Task Support elements are used to adapt the user to the environment, such as levels, modes and unlocks, as well as elements for communication. The elements of Motivation category are used to create the feeling of self-realization, self-expression and persuasive elements.

Decision trees are used to guide the choice of elements within the three categories. The process provides five decision trees, which are to assist in choosing the elements by analyzing the intention when using gamification depending on the type of intent or motivation (see Figure 2.7), to encourage social elements and elements for accomplishment (see Figure 2.8). Figure 2.9 presents a decision tree, depending on the type of task 2.9. The choice of these elements should be evaluated through the use of low fidelity prototypes, such as wireframes and high-fidelity, such as mockups, as well as user testing.

2.4   Prototypes

The use of prototypes is commonplace in the project and design interface of a software. Berkun [11] defines prototype as any representation of the idea about a product in design. Also, a prototype is the step among the formalization and the evaluation of this idea. A prototype is usually to involve users and stakeholders during the process of evaluating a
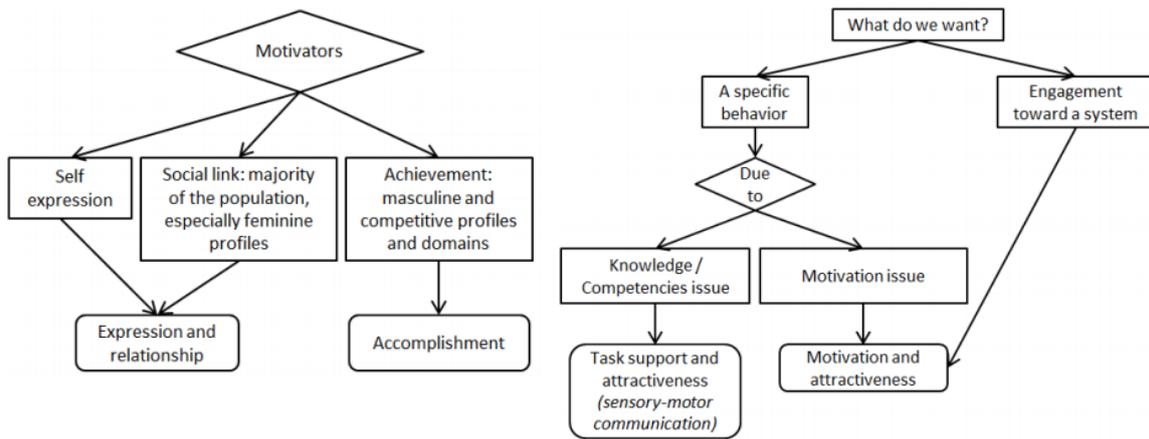
Figure 2.7: Decision trees Motivators and Decision tree Intent. Source: [38]
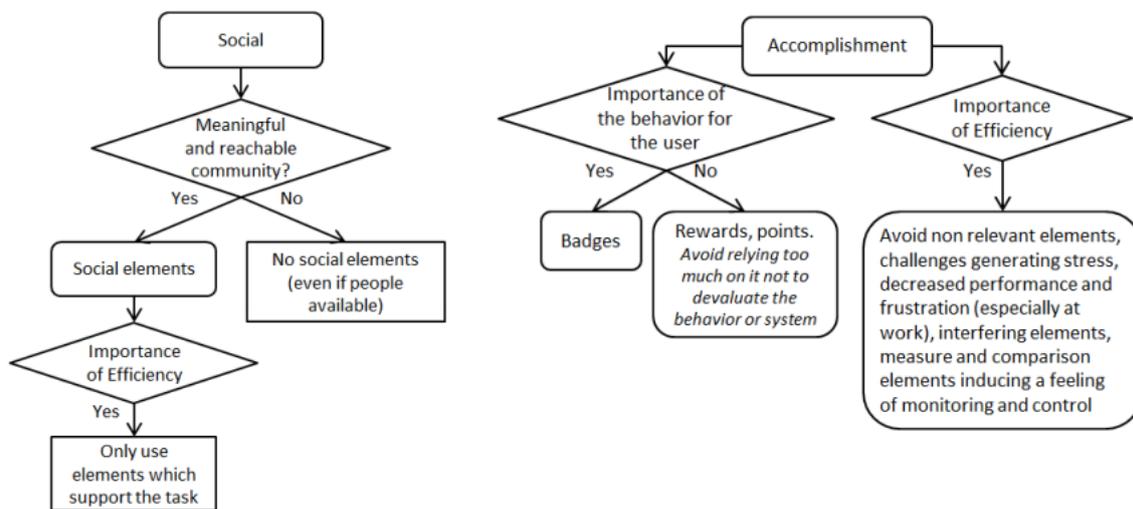
Figure 2.8: Decision trees Social elements and Decision tree Accomplishment. Source: [38]

new design. For Barbosa and Silva [9], prototypes can be understood as a graphical representation, not necessarily functional, of systems in the project phase, whether construction or re-engineering. The construction of prototypes allows you to think about ideas for the software before spending time and resources on systems development, making it possible to create solutions to the problems encountered.

The prototype classification is performed at fidelity, analyzing the similarity aspect among the prototype and the interface of the final product, considering characteristics such as interaction methods, visual aspects, another variant is the level of detail and the materials used in the designs of the prototypes. So, the called low-fidelity prototypes are generally those that use materials different from those used in the final product version (e.g. a paper prototype of a bank website). This type of prototype tends to be simple, inexpensive and quickly crafted. In contrast, high-fidelity prototypes having the look and feel of the final product and are characterized by being fully interactive, containing a clear definition of navigation in the system [45]. Following sections described wireframes (low-fidelity prototype)
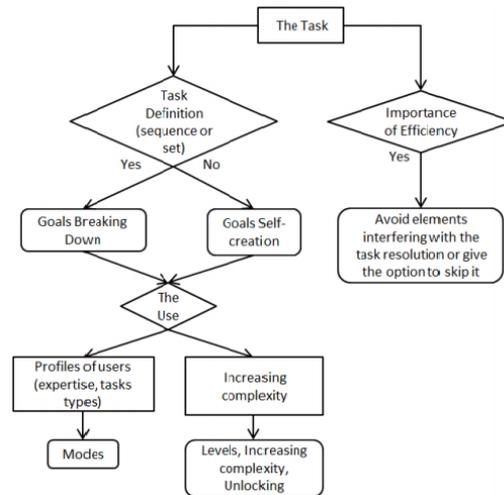
Figure 2.9: Decision tree for task. Source: [38]

and high-fidelity prototypes that we used for evaluation of FLOSSCoach gamification portal proposal.

2.4.1   Wireframes

A wireframe is a graphical representation of the low-fidelity interface that shows where interface elements (texts, images, interactive objects, navigation menu, etc.) should be located, in other words, it shows the structuring of the content of each screen. It has three simple objectives; the clear presentation of: main groups of information, Layout/structure of information, Core visualization and descriptions of user interface interactions. Normally, wireframes are quick and cheap to produce, they should be used right at the beginning of the design process. Because people can focus more on function, information architecture, user flow, user interactions, and so on, rather than carrying about the visual aspects [9]. It can be done manually or with the help of graphical tools (e.g. Cacoo [13] and Balsamiq [8]). Figure 2.10 shows an example of a mobile application wireframe built in cacoo. This wireframe showing site page flow and mobile elements.

2.4.2   High-fidelity Prototypes

High-fidelity (hi-fi) prototypes appear and function are as similar as possible to the real product. Development teams usually create high-fidelity prototypes when they have a solid understanding of what they are going to build, then, they need to either test it with real users. The basic characteristics of high-fidelity prototypes include realistic and detailed design. All interface elements (e.g. spacing, and graphics) need to look like a real product,
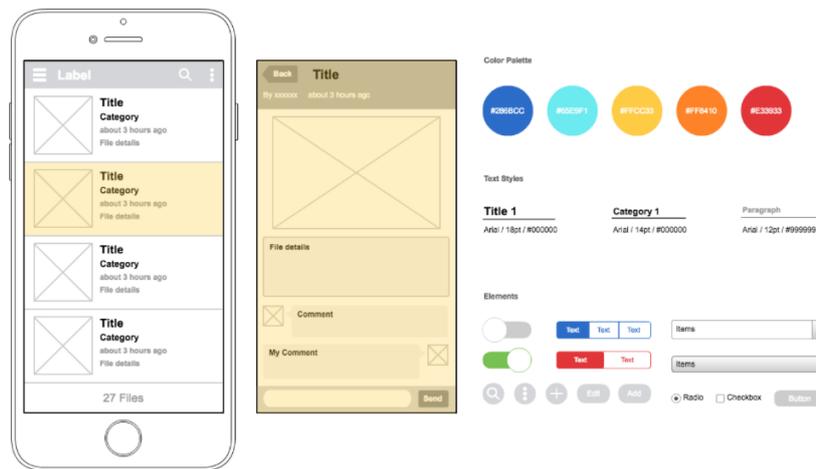
Figure 2.10: Mobile application wireframe built in Cacoo. Source: [13]
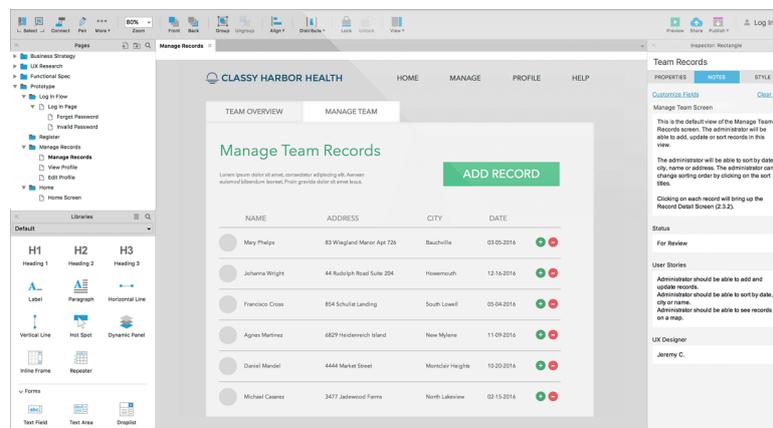
Figure 2.11: Web-based application high-fidelity prototype built in Axure Rp. Source: [7]

thus, the prototype includes most or all of the content that will appear in the final design, and they are highly realistic in their interactions [9]. It is often a crucial stage in customer acceptance. It is a kind of final design document with which the customer needs to agree before the final version of the product [10]. Moreover, in comparison with low-fidelity prototypes, creating high-fidelity prototypes implies higher costs, both temporal and financial [9]. Some examples of tools are Axure Rp [7], Just in Mind[2], and Adobe Xd[1]. Figure 2.11 shows an example of a web-based application high-fidelity prototype built in Cacoo. This prototype showing site page realistic and detailed design.

3.   RESEARCH METHODOLOGY

To accomplish the proposed research goal "How can gamification support the on-boarding of newcomers in Open Source software projects?", we followed a qualitative research approach [62] and organized our research design in three major phases as follows:(1)Theoretical Foundation, (2)FLOSSCoach Gamification Proposal and (3)Proposal Refinement, as shown in Figure 3.1. The phases and their main activities are presented next.

3.1   Phase 1 - Theoretical Foundation

In this research phase, we conduct a review of the theoretical basis. Chapter 2 was written based on the knowledge acquired in this review. We aimed to identify studies related to: barriers faced by newcomers to OSS projects, the understanding of FLOSSCoach portal, the gamification, low-fidelity and high-fidelity prototypes, best practices and definitions. During this phase, we conducted a survey of existing techniques of gamification in order to identify them and creating a base of knowledge about options. The main goal of Phase 1 is to choose a Gamification framework to support our implementation of the FLOSSCoach portal proposal.

3.2   Phase 2 - Gamification Proposal

During the second phase, we defined a set of game elements and how it would be applied to the FLOSSCoach portal proposal. The choice of game elements was guided by "Gamification Design Process" framework by Marache-Francisco and Brangier [38] that was chosen on Phase 1. Following this framework, Context Analysis was first performed, and after, Iterative Design.

In the Context Analysis, we used the Toolbox A, called Gamification Core Principles, to drive this proposal and Toolbox B, called Context Analysis Guide, to indicate factors which an impact on the perception and efficacy of the game elements. Following Toolbox A, we gave the user the allowed to disable some functionalities, for example, disable all padlocks in the Gameboard. The selected game elements have relevance for the users and administrators of this portal. We designed the motivational category game elements thinking in the evolution of interaction, for example, most valuable badges for more important interactions. We predict some effects like focus on quantity over quality to obtain a reward. For example, the number of commits not be considered for the system. The Legal an ethical has
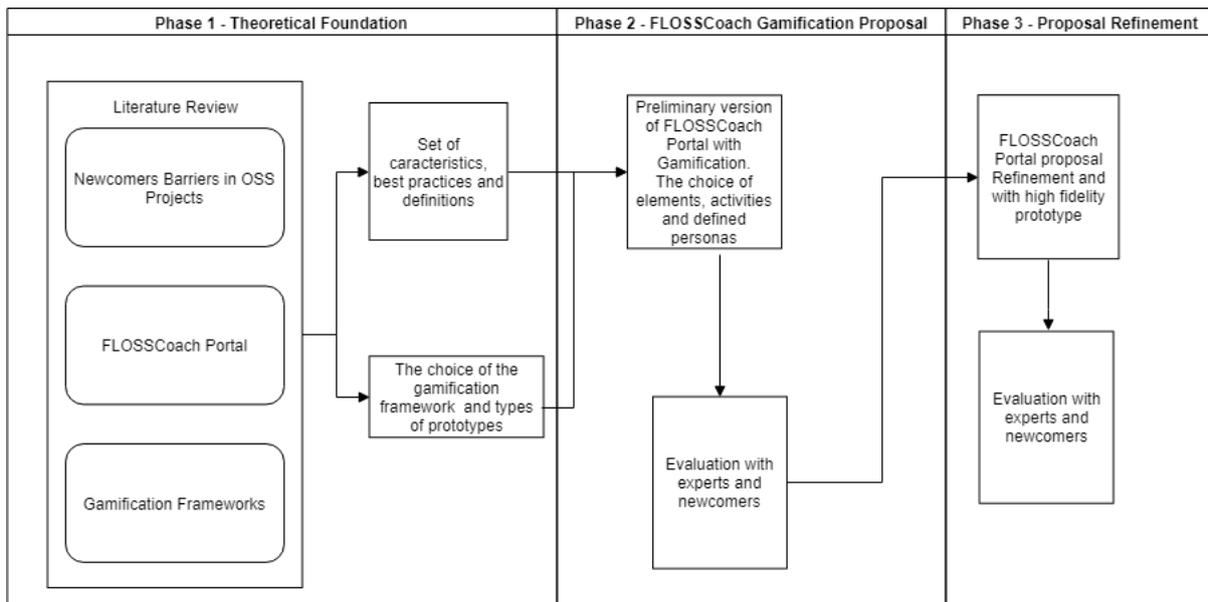
Figure 3.1: Flow of Research Design

to deal with non-disclosure of data. However, the personalized experience is not considered in this initial proposal but maybe a future work.

Following the Toolbox B, the intent of applying gamification to a tool was identified that performs tasks in the portal to reach the main objective: to investigate how gamification can support the Onboarding of newcomers in OSS projects. FLOSSCoach context is leisure. To characterize the users of the FLOSSCoach portal, we searched in the literature who are the potential contributors. These potential contributors are students or programmers, male, between 20-40 years old that among other things, to gain professional recognition by contributing to an OSS project [29, 24, 6, 14]. The activities that can be applied game elements were grouped in three different contexts: profile registration, forum, and tasks. We described these activities in Chapter 4. We created one persona[1] based on this literature. The objective of this persona is to describe scenarios from the description of the profiles created. The scenarios serve to describe in which situations the persona will use or interact with the system, as well as which needs will lead the user to use the system. Their scenarios associated with this activities and describe it too in details in section 4.1.

During the Iterative Conception phase, we selected eight game elements using the gamification elements cards and the decisions tree. We describe how these selected game

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[1]Alan Cooper [17] defined Personas as a technique that can be used for modeling and analyze user profiles. Among the benefits that he pointed out are the following: to help the development team understand the characteristics of a group of users, propose solutions related to the main needs of the user, and provide a human face as a way to generate a team approach with potential end users, as well as represent them in a demographic context. Pruitt and Grüdin [46] defined Personas as user archetypes that serve as an example to represent the designated users of the system. That is the process creation of one or more characters with a name and a photo associated with the description of their abilities, attitudes, constraints, experiences, behaviors, and goals in a particular product. It can be done manually or with the help of graphical tools like Xtensio [3].

elements are used in the portal in section 4.2. The choice of these game elements during this phase reflected in which the authors believe to meet the needs of the contribution flow.

Following the Intent Decision Tree (see Figure 2.7, b), we want a specific behavior due to knowledge or competences issue. Therefore, the elements cards suggested are Task Support and Attractiveness. We selected two game elements of the Task Support category: unlocking and means rhetoric. and selected one element of Attractiveness category: sensory-motor. We use the Task Decision Tree (see Figure 2.9) to help us with each activity of the table that can be applied gamification in the portal. Following Motivators Decision tree (see figure 2.8) and considering personas created in Context Analysis, the achievement are male and competitive profiles. Therefore, the element cards are Motivators Accomplishment Category and we selected one game elements of this category: leaderboard. We use Social Decision Tree and Accomplishment Decision Tree 2.8 to decide whether to use social elements or not and which accomplishment elements are relevant. Thus, how this meaningful and reachable community then uses Social Elements. We selected tree game elements of the Motivation category: social community, voting, and profile. Following Accomplishment Decision Tree, is important the behavior of the user, so the game element suggested is the badge and we used this game element in our proposal.

We used wireframes to represent the FLOSSCoach gamification proposal. These wireframes are represented with aiding of Cacoo platform [2] (more details in Section 4.3) to represented the FLOSSCoach portal gamification proposal and conducted a preliminary evaluation. The preliminary evaluation of proposal was performed using questionnaire-guided interviews with Domain Experts and newcomers in OSS projects.

Researchers use interviews with the aim of understanding general information about processes, personal knowledge, among others. There are three types of interview categories, they are structured, unstructured, and semi-structured. The semi-structured interviews, that we use in this study, comprise a mix of specific closed or open questions, allows eliciting the types of information of interest of the researcher and also those unexpected. The difference is in the type of interviews is the level of control that the researcher has and what you want to know about the topic in research. Open-ended questions allow for in-depth investigation of responses to the respondent's personal experiences, perceptions, opinions, feelings, and knowledge. The data consist of literal quotations with sufficient context to be interpretative [39].

The questionnaire provided by Google [3] was written in Portuguese composed of opened and closed questions, with questions regarding the participant's perceptions of the game elements used in the proposal. The 5-point Likert scale used as an alternative to closed questions, ranked as 1 for Strongly disagree, 2 for Disagree, 3 for Neither agree/nor

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[2]Cacoo: Online Diagram and Flowchart Software, Accessed in February 2018, https://cacoo.com/

[3]Google Forms: create a new survey on you on with others at the same time, Accessed in March 2018, https://docs.google.com/forms

disagree. 4 for Agree, and 5 for Strongly Agree. In each question, there was a field for the participant to suggest improvements and also an image that showed the wireframe with the game element associated with the question.

Before the evaluation, two pilot tests were conducted with two Brazilians Specialists in the area of Computer-Supported Cooperative Work and Social Computing following recommendations of Kitchenham et al. [31]. The Specialists were selected for this activity, based on their experience and proximity to the author. Specialists of Pilot 1 (SP1) is an Agile Coach for a mid-size company and Specialist Computer-Supported Cooperative Work and Social Computing (CSCW). He has 6 years of experience in research and 3 years in team management. Specialists of Pilot 2 (SP2) currently working on the auxiliary professor in Software Developer and she has 8 years of experience in research in CSCW. After some adjustments, the questionnaires were applied, according to the participants' availability. After the participant accepts to participate the interview was scheduled directly. The six online by tool skype [4] and three face-to-face interview were applied.

The interview procedure happened as follows: first, the researcher responsible presented the concepts related to the research, the reason for the tests and clarified the context; after, the questionnaire online was presented to all the participants of the evaluation, that in the first section there was a free and informed consent form, and only after the acceptance of the participant, the evaluation of proposal would be performed. This prelliminary evaluation is more detailed in Chapter 4.4.

3.3   Phase 3 – Proposal Refinement

In Phase 3, we worked in the proposal refinement. The interviews with the experts and newcomer during the preliminary evaluation of the wireframes helped us to refine the proposal and the suggested changes that could be developed were accepted. Furthermore, while designing the new proposal, we also make some changes to it. All changes are detailed in Chapter 4.5.

The final proposal is represented through a high-fidelity prototype was designed with the intention to understand how our target users, newcomers feel about FLOSSCoach with gamification and we wanted to get their opinions. We used the Axure RP Pro software tool [5]

Finally, we made a final evaluation of the FLOSSCoach gamification proposal. The evaluation occurred likewise evaluation of phase 2, questionnaire guided by interview. The

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[4]Skype:the communication tool for free calls and chat, Accessed in March 2018, Available at http://www.skype.com

[5]Axure Software: Prototypes, Specifications, and Diagrams in one Tool, Accessed in March 2018, Available at https://www.axure.com/

questionnaire, provided by Google, is similar to the first evaluation, but now, we would like to know how the choice of elements is seen in a closer representation of the final interface. The questionnaire was written in Portuguese, composed of opened and closed questions, with questions regarding the participant's perceptions of the game elements used in prototype and requested to explore portal. The 5-point Likert scale was used as an alternative for closed questions, ranked as 1 for Strongly disagree, 2 for Disagree, 3 for Neither agree/nor disagree, 4 for Agree, and 5 for Strongly Agree. In each question, there was a field for the participant to suggest improvements.

In the same way of preliminary evaluation, three pilot tests were conducted with Brazilians researchers in the area of Collaborative Systems and HCI following recommendations of Kitchenham et al. [31]. The researchers were selected for this activity, based on their experience and proximity to the author. Specialist of pilot 1 (SP1) and Specialist of pilot 2 (SP2) are the same of pilot tests of preliminary evaluation. Specialist of pilot 3 (SP3) has 3 years of experience in research of HCI. After some adjustments, the questionnaires were applied, according to the participants' availability. After the participant accepts to participate the interview was scheduled directly. The fourteen online by tool Skype, and one face-to-face interview applied.

The interview procedure happened that same that preliminary evaluation, as follows: first, the researcher presented the concepts related to the research, the reason for the tests and clarified the context; after, the questionnaire online was presented to all the participants of the evaluation, that in the first section there was a free and informed consent form, and only after the acceptance of the participant, the evaluation of proposal would be performed. This evaluation is more detailed in Chapter 4.7.

4.   FLOSSCOACH GAMIFICATION PROPOSAL

Following the Gamification Design Process [38] described in Section 2.3.1.1, Context Analysis was first performed, followed by Iterative Design. Next, The activities that can be applied game elements and that need to be performed according to the Table 4.1.

Table 4.1: Newcomers activities in FLOSSSCoach portal

	Activities
Profile Registration	Early Bird Registration
	Profile Registration
Forum	Asking
	Reading
Tasks	Commenting
	Configure Workspace
	Find a Task
	Send Contribution

4.1   Personas and Scenarios for FLOSSCoach

As previously described in section 3.2, we created one persona based on the literature of OSS projects [29, 24, 6, 14] to represent the possible users of the FLOSSCoach portal. The persona is shown in Figure 4.1. The name of persona is Augusto Camargo, he has 25 years old and has a web developer. He works from 10 am. to 7 pm. In its service, it acts by assisting the back-end development of web applications in Java Language. He is altruist person and devoted to your job. In your free time, August usually plays some online game or tries to improve his programming skills. These skills are the computer technician, Java 8 course, and C# course. He would like a tool that can assist he to participate in OSS projects, so that can engage in challenging projects and improve his programming skills. The main goal of he is to become a recognized professional in the area of software development. He believes that FLOSSCoach will work as an aid tool for joining your first OSS project through simple and engaging dynamics.After creating the personas, we created the following scenarios based on the activities of the table 4.1 and we can use game elements:

Early Bird Registration Scenario

Augusto decided to participate in a new OSS project called Exodus. By knowing the FLOSSCoach portal for newcomers in OSS projects. He registered in FLOSSCoach three days before Exodus be available and so understand others projects in the portal.

Complete Registration Scenario

Figure 4.1: Persona to Represent Newcomers in the FLOSSCoach portal.

Augusto knew the FLOSSCoach portal for newcomers in OSS projects, and he registered. Augusto think that internet registration forms should be rapid and login can be linked to another social network to seek information as GitHub [1] or Facebook[2], but saw on the page a tip that he can complete the registration after, with all your personal information.

Asking Scenario

Augusto was in doubt as to how to choose a task in Exodus project. So he sought out this information in the FLOSSCoach portal forum. After accessing the forum from the "find a task" step or any other step and reading the comments from other newcomers, he was not able to solve his doubts. So he decided to ask in the forum and waiting for the help of his fellow newcomers.

Reading Scenario

Augusto was in doubt as to how to set up a workspace library for the Exodus project. So he looked for this information in the FLOSSCoach portal forum. After accessing the forum of the "configure workspace" step and reading the comments from other newcomers, he resolved his doubts.

Commenting Scenario

Augusto is enjoying participating in the Exodus project, but he believes that newcomers need to know an important detail about the project: the documentation is not updated in the shared repository. So he posted this comment on the project homepage on FLOSS-

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[1]Github platform forum, Accessed in July 2017 Available at: https://platform.github.community/
[2]facebook, Accessed in April 2018, Available at: https://www.facebook.com/

Coach and waits for the approval of portal administrators to share his comment with other newcomers.

Configure Workspace Scenario

After Augusto learning the basic information of the Exodus project, he went to step two of the contribution flow: configure workspace. In this step, there is a link that redirects to a page that explains and makes available the code in the shared repository. After setting up the workspace locally. He will have access to the development environment.

Find a Task Scenario

After Augusto set up the workspace of the Exodus project, he went to step three of the contribution flow: find a task. In this step, there is a link that redirects to the page in the shared repository where the available project tasks are. After choosing the task "not show avatars", it will have its login linked to this task in the shared repository.

Send Contribution Scenario

Augusto solved the task that he chose to submit to the Exodus project. Now it sends this task to the shared repository. You can then wait for the code to be accepted by the admins of this shared repository.

4.2   Selected Game Elements and Rules

As previously described in section 3.2, we selected eight game elements using the gamification elements cards and the decisions tree of Gamification Design Process [38]. The game elements separated by category are as follows:

Task Support: The Portal has steps that are locking aimed to adapt the newcomers so that the information is made available on demand, that is the unlocking game element, represented by a *Padlock*, and the Means Rhetoric can be a *Tip* on how to accomplish activities and achieve objectives on the portal.

Attractiveness: We use the Sensory-motor game element, represented by a *Gameboard*, that shows the position of which section the newcomer is currently seeing in the contribution flow. It helps to create a step-by-step process to guide newcomers, keeping then motivated and oriented.

Accomplishment: The *Badges* game element are technical and social achievements that the newcomers receive when performing the activities of the portal. The Badge for the newcomer visualizes their achievements while performing tasks and also interact with the community thereby contributing to the motivation of him to continue in the process of contri-

bution. And the *Leaderboard* game element showing the position of the newcomer to other newcomers registered in the portal in this project based on his badges and reputation.

Motivation: The *Social Community and Voting* game elements for newcomers have a forum to exchange their knowledge. This forum shows the number of online users and these users can use the portal to vote on questions and answers. Posts are sorted by the highest number of positive votes and a *Profile* game element for newcomers showing their activities and can customize this with their photo.

The Table 4.2 presents the game elements that require some newcomer action in FLOSSCoach, triggers actions and rules of the gamification proposal. It shows twenty Badges, two Unblocking from the contribution flow, one Tip, and one Gameboard.

Table 4.2: Game elements for FLOSSCoach Gamification proposal and rules that require some newcomer action.

Game Element	Trigger	If the newcomer...
Autobiographic Badge	Complete Registration	complete the profile in FLOSSCoach.
Explorer Badge	Early Bird Registration	register in FLOSSCoach in "dd" days after "mm /dd/yyyy".
Questioner Badge	Ask	ask 1 question in FLOSSCoach forum.
Bronze Questioner Badge	Ask	ask "xx" questions in FLOSSCoach forum.
Silver Questioner Badge	Ask	ask 1 question on the external forum of the Project.
Plus Questioner Badge	Ask	ask "xx" questions in the external forum of the Project.
Helper Badge	Answer	answer 1 question in the FLOSSCoach forum.
Bronze Helper Badge	Answer	answer xx questions in the FLOSSCoach forum.
Silver Helper Badge	Answer	answer 1 question in the external forum of the Project.
Plus Helper Badge	Answer	answer "xx" questions in the external forum of the Project.
Bronze Enthusiast Badge	Vote	vote for 1 post in the FLOSSCoach forum.
Plus Enthusiast Badge	Vote	vote for "xx" posts in the FLOSSCoach forum.
Bronze Reputation Badge	Receive Votes	receive 1 positive vote in the FLOSSCoach Forum.
Silver Reputation Badge	Receive Votes	receive "xx" positive votes in the FLOSSCoach Forum.
Plus Reputation Badge	Receive Votes	receive "yy" positive votes in the FLOSSCoach Forum.
Commenter Badge	Comment	comment on the project on FLOSSCoach and comment is accepted by the moderator.
Unlock I Badge and Bronze Badge	Configure Workspace	answer the question correctly.
Unlock 2 Badge and Silver Badge	Choose a task	choose the first task.
Diamond Badge	Submit Contribution	submit the contribution.
Plus Badge	Contribution accepted	has the first contribution accepted by the project moderator.
Tip	Click icon	clicked on the icon, tips on how to achieve goals will be shown.
Gameboard	Forward in sections	clicked on the sections, the icon changes position on the Gameboard.

4.3 Proposal Wireframes

As previously described in section 3.2 We used eight wireframes to represent the FLOSSCoach portal gamification proposal. These wireframes represent the contribution
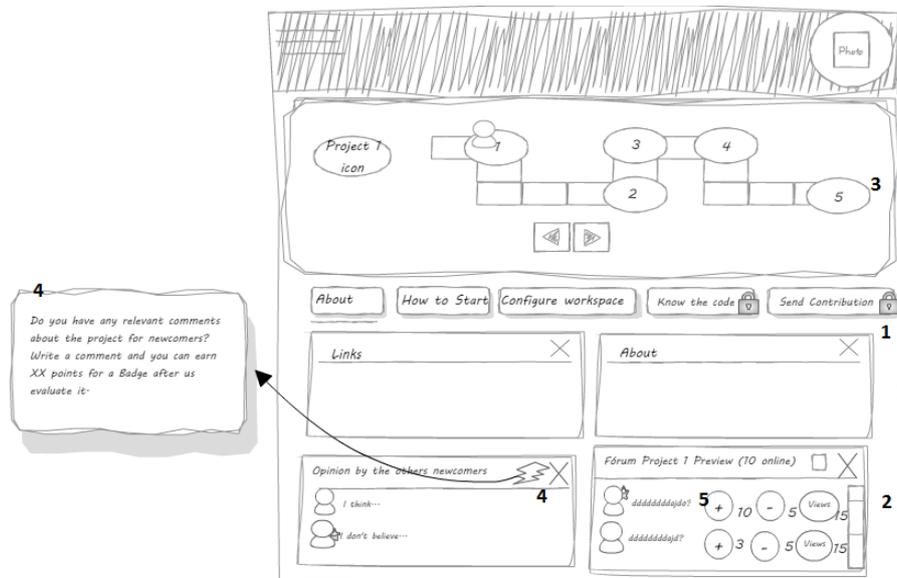
Figure 4.2: "About" wireframe

flow: *"About"*, *"How to Start"*, *"Configure Workspace"*, *"Know the code"*, *"Send Contribution"*, *"Profile"*, *"Leaderboard"*, and *"Forum"*.

The Figure 4.2 represents the *"About"* section, where different game elements were suggested: Unlock, Means Rhetoric, Sensory-Motor and Social Community. Unlocking, was represented in the form of a padlock and mapped with the number '1', and it is blocking the *"Know the code"* and the *"Send Contribution"* sections. The Social Community is represented by a link to the online forum and mapped with the number '2'. The Sensory-Motor is represented by a Gameboard and mapped with the number '3'. The Means Rhetoric game element is represented in the form of tips and mapped with the number '4'. The buttons for the next sections which are also the next steps of the contribution flow are also shown. Voting is represented in the forum by the characters "+" and "-" and mapped by the "5" number. These game elements are also suggested in the following sections: *"How to Start"*, *"Configure Workspace"*, *"Know the code"* and *"Send Contribution"*.

In Figure 4.3 wireframes are shown for the *"Know the code"* and *"Send Contribution"* sections with the game elements suggested. Wireframes for the *"How to Start"* and *"Configure Workspace"* sections have already been mentioned above because they represent the same game elements. Badges are represented in the form of circles, mapped with the number '6', and are assigned to newcomers when they reach a goal in the portal according to the rules of Table 4.2. Below the Gameboard, there is a slider that alternates between the Gameboard and a frame with user information the project, such as the position in the Ranking (number '7'), the progress bar in the contribution flow and the Badges earned.

Figure 4.4 represents the *"Profile"* section. The suggested game elements are Profile and Badges. In the editable profile mapped to the number '8', you can change the
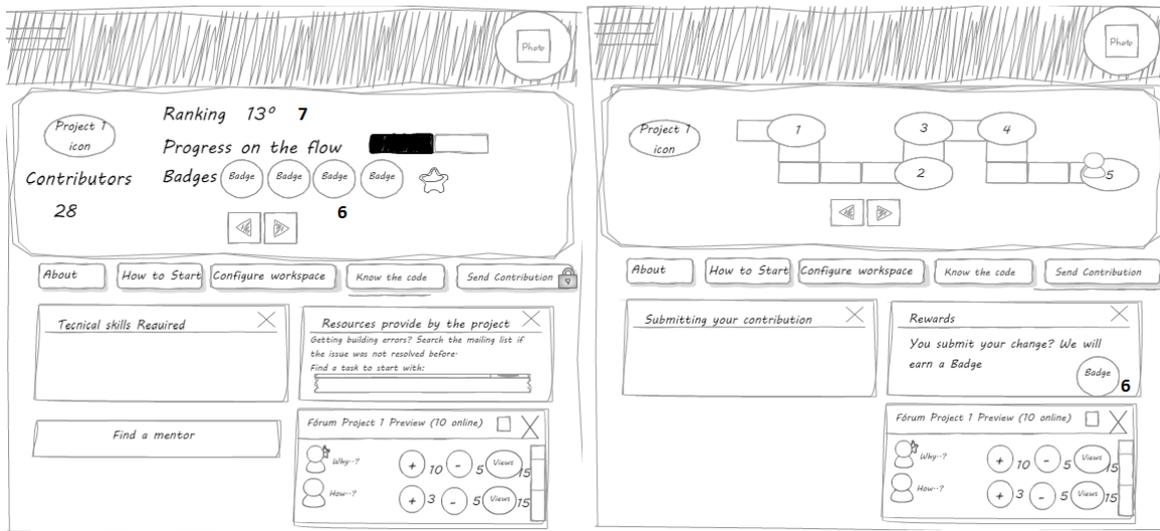
Figure 4.3: *"Know the code"* and *"Send Contribution"* wireframes
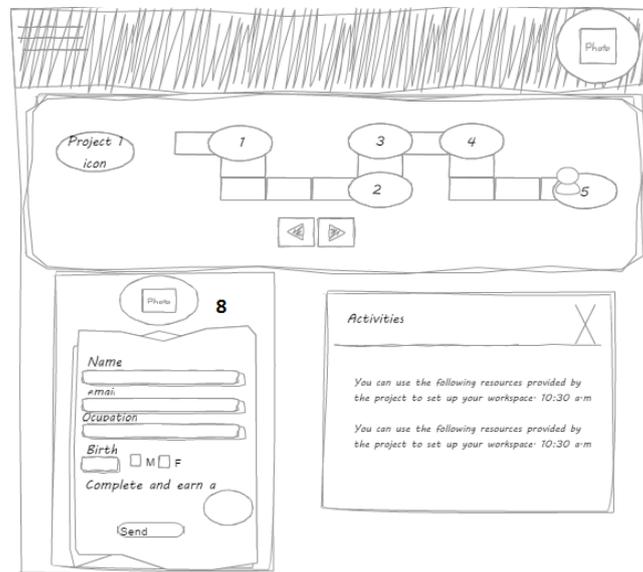
Figure 4.4: "Profile" wireframe

photo and fill in with your personal information. Filling in the personal information generates the achievement of a Badge, the Auto Biographical (see Table 4.2).

After conception of these wireframes of the FLOSSCoach gamification proposal, we performed a questionnaire-guided interview with specialists and newcomers in OSS projects in order to preliminary evaluate the proposal, which is presented in the next section.

4.4 Preliminary Evaluation

The preliminary evaluation of FLOSSCoach gamification proposal with wireframes was performed with the usage of questionnaire-guided interviews. The questionnaires performed to specialists and newcomers are in Appendix B. This preliminary evaluation of proposal was the source of accepted paper in SBSC 2017 Conference, São Paulo, Brazil.

This evaluation was performed as the convenience sample, composed of specialists and newcomers to OSS projects. In total, nine people participated in the research, being five specialists in the area of CSCW, Gamification or IHC, and four newcomers in OSS projects.

In the table 4.3 are the data of the specialists participants and Table 4.4 are the data of newcomers participants of preliminary evaluation. From now, the specialists will be represented by the initial 'SP' and the newcomers by the initial 'NP', both followed by a numbering, for example, SP1 for specialist 1 and NP1 for newcomer 1. In the course of the questionnaire, the researcher noted the feedback given by the participants on the proposal of elements such as suggestions for change, the proposal that cannot work as expected and new ideas. In the table 4.5 the main questions of the questionnaire are presented.

Table 4.3: Specialists participants in the preliminary evaluation

Spec.	Gender	Expertise	Working Experience	Occupation	Interview format
SP1	M	Gamification	3 years	Assistant Professor	Online
SP2	F	HCI, Gamification	4 years	PhD student	Online
SP3	F	HCI, Gamification,CSCW	6 years	Assistant Professor	Face-to-face
SP4	F	HCI	19 years	Assistant Professor	Face-to-face
SP5	M	Gamification	3 years	Mastering Student	Face-to-face

Table 4.4: Newcomers participants in the preliminary evaluation

Newc.	Age	Gender	How long it happened to his first contribution?	Interview Format
NP1	21-30	M	More than 12 months	Online
NP2	21-30	M	6-12 months	Online
NP3	21-30	M	1-3 months	Online
NP4	21-30	F	6-12 months	Online

4.4.1 Results

In general, the participants enjoyed the gamification proposal for the portal. Newcomers believe that the gamification proposal can contribute to the process of the first contribution, NP2 says *"I consider the elements very relevant as they are different from what I*

Table 4.5: Main questions of the questionnaire of preliminary evaluation.

	Questions
1	The "Means Rhetoric" game element, represented by tips, showed how newcomers can achieve their goals, can help in performing tasks and thus the contribution process. (Likert Scale)
2	The "Unlock" game element, represented by a padlock, which is locking the sections as the newcomers perform the tasks, can guide the newcomer in the contribution process. (Likert Scale)
3	The "Sensory-Motor" game element is represented by a Game Board, with information of which session the newcomer is currently viewing, can help theirs understand the flow of contribution. (Likert Scale)
4	The "Leaderboard" game element is represented by the list sorted by the last time achieved badges and a newcomer's reputation can contribute to yours motivation to continue in contribution process.(Likert Scale)
5	The "Social Community" game element, represented by a Forum, where newcomers can exchange knowledge and facilitate communication between them, can contribute to a newcomer's motivation to continue without a contribution process. (Likert Scale)
6	The game element "Voting", represented in the portal forum as "+" and "-", so that the newcomer assigns votes to questions and answers and thus reaches reputation, can contribute to the newcomer's motivation to continue in the process contribution. (Likert Scale)
7	The game element "Profile", represented by an editable profile, can contribute to the newcomer motivation to continue the contribution process. (Likert Scale)
8	The "Badge" game element, represented in the form of circles, so that the newcomer can visualize their achievements while performing tasks and interacting with the community, can contribute to motivation of the newcomers to continue in the process of contribution. (Likert Scale)
9	Overall, how do you evaluate the proposed game elements as a way to help the newcomer make the first contribution to Free Software projects? (Open Question)

had seen in another contact with this system of Gamification and I believe that they did help in the newcomer contribution process"

The newcomer NP4 commented that proposal game elements are more interesting that quests or tutorial. In her opinion, *"The game elements are more interesting than having to answer questions about the contribution process or something like tutorial"*.

The specialists also believe that the proposed elements can help and motivate the newcomers in the process of the first contribution. SP2 says *"I believe that the proposal has the potential to motivate newcomers to contribute to OSS projects"*.

SP3 commented that is important this type of community: *"I believe they can help newcomers participate by bringing more motivation, besides the basic motivation to partici-pate in this type of community"*.

The padlocks in the *"Know Code"* and *"Send Contribution"* sections, was consid-ered important by the nine participants to support newcomers in the contribution process, trying to direct the newcomers to the available sections. However, some considerations have been made regarding the usage proposal referred to the other elements used. The next sec-tions present the suggested changes, the answers for if the proposals for the elements could

go wrong, and the new ideas suggested by the participants.

Suggested Changes

One of the most suggested changes was on the Gameboard. Four specialists and one newcomer suggested a change in the proposal of this representation. The Gameboard was previously proposed as a viewer's selected section. The participants are suggesting is to modify it to present the newcomer's progress in the contribution flow. NP2 and SP5 also suggested removing the section buttons. NP1 says *"These numbers on the Gameboard could be turned into buttons so that the screen becomes less polluted"*. SP2 suggested leaving the Gameboard fixed without the slider option, and to transfer the information that was on the Gameboard as a position to the Profile section.

NP2 suggested swapping the term Ranking with the term Leaderboard, as it is most commonly used in gamification and also, changing the view from the newcomer's name to a nickname as a way of ensuring anonymity for the users, NP2 says *"it is very common for people not to want to expose themselves on portals"*.

What can go wrong

Specialists and newcomers have warned that some elements may not work as planned. SP2 has warned that the forum showing how many newcomers are online could be a risk, saying that it is important to check the system's demand, SP2 says *the newcomer can feel alone if there are no other newcomers Online"*. He advised that newcomers might not want to question a person with the same level of knowledge.

NP1 commented that if they post a question on the portal's forum, and he did not get an answer, even with the retribution of the Questioner's Badge, he would feel intimidated to ask another question. NP1 and NP4 also commented that if he was the last one in the Rank, they might feel unmotivated and SP5 also said that having a profile editable model does not contribute to the newcomer's motivation to continue with the contribution process, since it is only a standard profile tool and should not be considered a motivating game element for the newcomer to continue with the flow of Contribution.

New ideas

All the specialists and one newcomer contributed with new ideas to the proposal. SP1 suggested that Badges should be made shown to the newcomers before they were won, SP1 says *"The newcomer has to know what Badge he will win before receiving it"*.

SP5 pointed out that the tips are passive, in other words, they are only visible if the user wishes for it, he said: *"It is important that the tips are visualized smoothly without disturbing the entire screen"*.

For the voting element, NP1 said that the possibility of receiving negative votes causes the newcomers to think about the question before posting them on the forum, but suggested that the vote could be represented by stars and also that a moderator should be assigned to take care of the forum. SP2 suggested that posts in the forum be sorted by date, from the most recent to the oldest, SP2 says that *"With the latest posts first, it would be easier for the newcomers to see what's new in the forum"*. With respect to the Ranking, SP3 and SP4 have suggested that the newcomer's position is only available to him or only the five newcomers above and the five newcomers below appear in the ranking, because, users would feel less unmotivated if they were in the last positions.

These preliminary results will be used to make changes in proposal that are presented with high-fidelity prototypes of the FLOSSCoach portal, the next step of this study, which is presented in the next section.

4.5   Proposal Refinement

After the preliminary evaluation of the FLOSSCoach portal gamification proposal, we worked on a new version through a high-fidelity prototype. The interviews with the specialists and newcomer during the preliminary evaluation of the nine wireframes helped us to refine the proposal. The suggested changes that could be developed were accepted, they are:

- The sections of the portal were transferred to the Gameboard, and each step of the contribution stream will be a section;

- The padlock is blocking the steps on the Gameboard. It is also possible to unlock the entire board but the technical badges will not be valid;

- In the forum preview, the preview of how many newcomers are online will not be shown;

- The Ranking name changed to Leaderboard;

- In the Leaderboard, will show the names and current scores of the three and the newcomer's position;

- The newcomer name display changed to the newcomer nickname display.

While designing the proposal refinement, we also to make some changes, they are: as step 1 was renamed to "kick-off" and "Rewards" was renamed to "Achievements". We considered that the nomenclature is important in that design of gamification and below the Gameboard, there was a slider that alternates between the Gameboard and a frame with user information the project, such as the position in the Leaderboard, the progress in the contribution flow and the Badges earned. We remove this frame and distribute the information in another way. Project information will be shown in the "kick-off" section. In Leaderboard, they can see the Badges won. The progress of the user will also be visualized by the unlocked padlocks.

4.6   High-fidelity prototyping for FLOSSCoach

As previously described in section 3.2, we developed the final proposal is represented through a high-fidelity prototype (available at https://goo.gl/eE9tj8) was designed with the intention to understand how our target users, newcomers feel about FLOSSCoach with gamification and we wanted to get their opinions. In the following, we describe the main
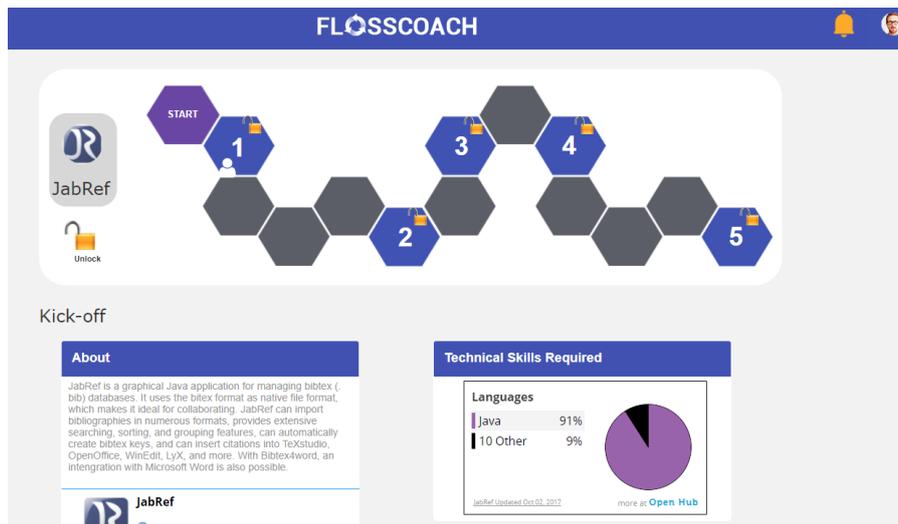
Figure 4.5: "Kick-off Section" prototype
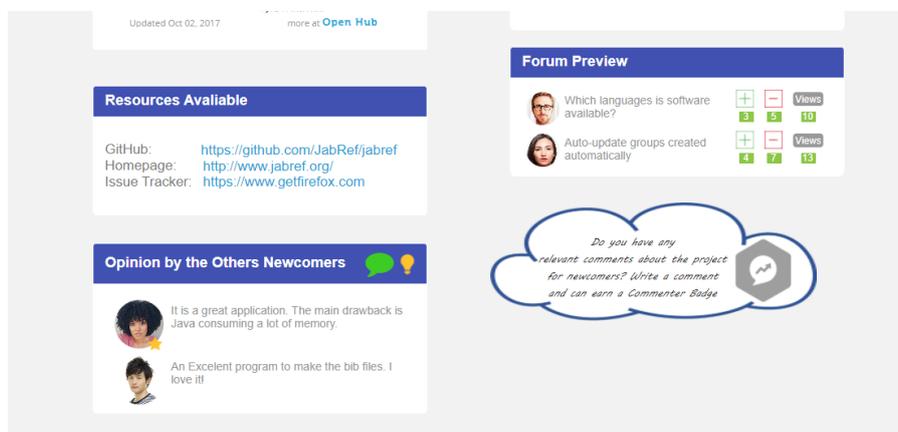
Figure 4.6: "Kick-off Section part II" prototype

FLOSSCoach portal interfaces: *"About"*, *"How to Start"*, *"Configure Workspace"*, *"Know the code"*, *"Send Contribution"*, *"Profile"*, *"Leaderboard"*, and *"Forum"*.

The Figure 4.5 represents the *"Kick-off"* section, where different representations of game elements were suggested: Gameboard, Padlock, Tips, Badges and a link to Forum. The sections, which are also the next steps of the contribution flow of the portal, were transferred to the Gameboard and a padlock can unlock all sections of this Gameboard. It is also possible to unlock the entire Gameboard but the technical badges will not be valid. Badges and Tips were represented in Figure 4.6. Tips are represented by a lamp and when the user mouse over the lamp, shows a tip that shows how to earn a Commenter Badge.

In Figure 4.7 is shown for the *"Configure Workspace"* sections with the game elements suggested in Figure 4.5 but without tips. In this step, if the newcomer can answer the question about to setup the environment on the machine, he will get a silver badge and step 3, find a task will be released. Therefore, if newcomer unlocking all padlocks, he will be accessed these sections and others sections two, but they not earn the technical badges.
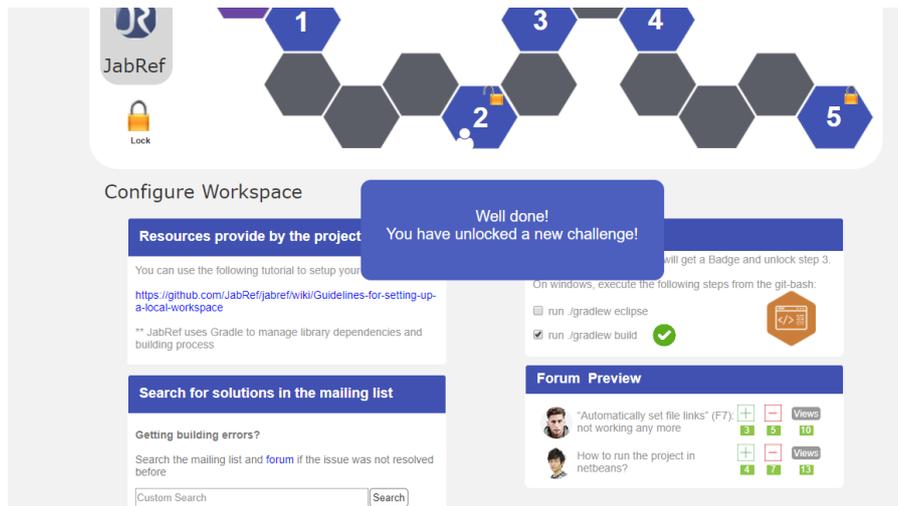
Figure 4.7: Configure Workspace prototype

Figure 4.8: Find Task prototype

The *"Find Task"*, *"Know the code"*, and *"Send Contribution"* sections have the same structure with the respective Badge for each step (see Figure 4.8). The *"Find Task"*, a link is provided to the shared repository in the Github[25] and as soon as the newcomer links his profile to some task. The newcomer will get a badge for having chosen a task, following the table 4.2. In *"Know the code"* section (see Figure 4.9) a link to the documentation and some documents available from the project will be made available. At this stage, the newcomer can earn a badge by having a mentor to guide them in their onboarding process if the project has mentored. In *"Send Contribution"* section, a link is provided to the shared repository in the Github[25] and a "readme" document (see Figure 4.10). The newcomer will get a badge as soon as she submits your code.
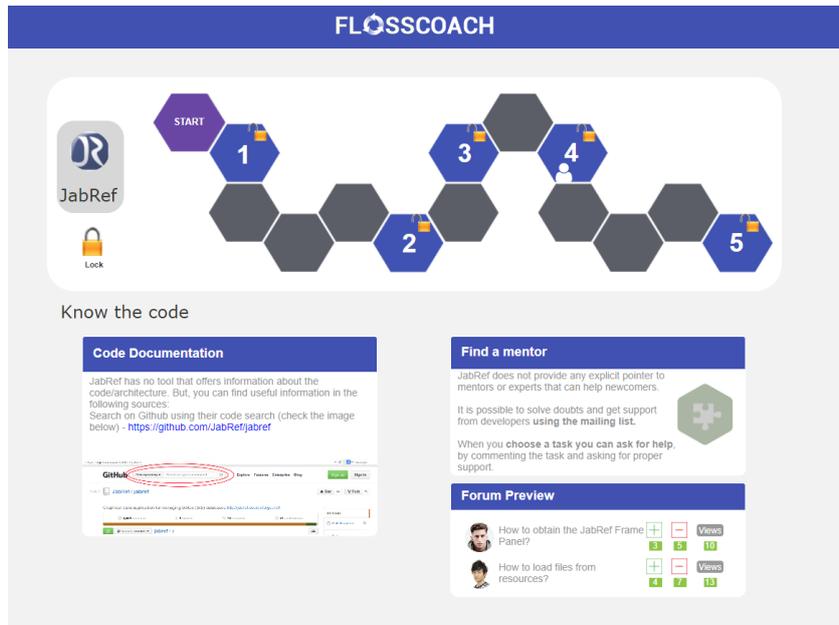
Figure 4.9: Know Code prototype
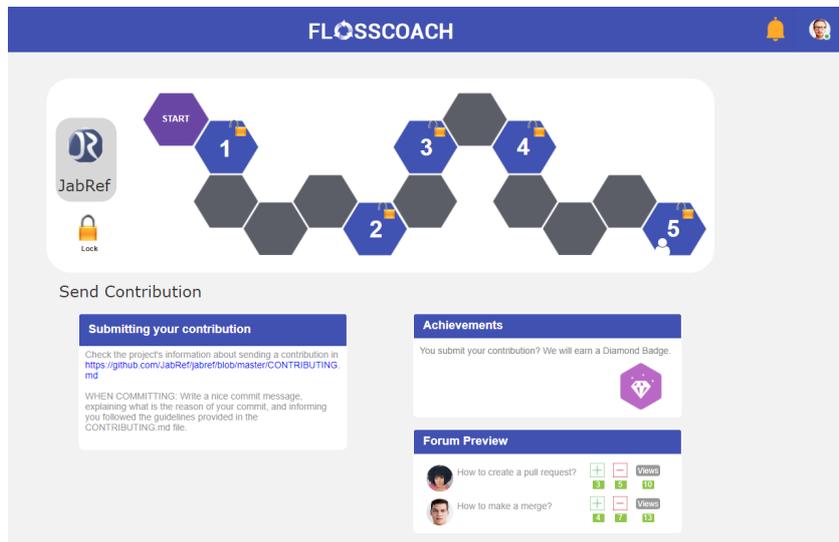
Figure 4.10: Submit Contribution prototype
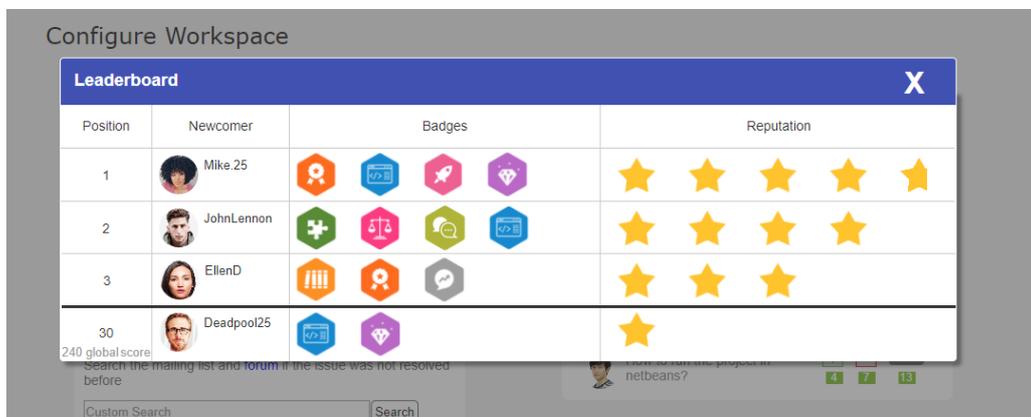
Figure 4.11: Leaderboard prototype

The Leaderboard (see Figure 4.11) has been redesigned and now the Leaderboard shows the classification chart showing the current nicknames, the fictional badges, and scores of the three first placed and the newcomer's position. After conception of the final FLOSSCoach portal gamification proposal, we performed a questionnaire-guided interview with specialists and newcomers in OSS projects, which is presented in the next section.

4.7   Final Evaluation

We conducted a evaluation of the final proposal with questionnaire-guided interview composed of specialists and newcomers to OSS projects. The questionnaires performed to specialists and newcomers are in Appendix **??**.

This evaluation was performed as the convenience sample, composed of specialists and newcomers to OSS projects. In total, fifteen people participated in the research, being five specialists in the area of CSCW, Gamification or IHC, and four newcomers in OSS projects. The first contact with the participants was through e-mail, in which they were invited to participate in the research.

In the table 4.6 are the data of the specialists participants and Table 4.7 are the data of newcomers participants of preliminary evaluation. From now, the specialists will be represented by the initial 'SF' and the newcomers by the initial 'NF', both followed by a numbering, for example, SF1 for specialist 1 and NF1 for newcomer 1. In the course of the questionnaire, the researcher noted the feedback given by the participants on the proposal of elements such as suggestions for change, the proposal that cannot work as expected and new ideas. In the table 4.8 the main questions of the questionnaire are presented.

Table 4.6: Specialists participants in the final evaluation

Spec.	Gender	Expertise	Working Experience	Occupation	Interview Format
SF1	M	HCI, CSCW	3 years	Assistant Professor	Online
SF2	M	CSCW, Gamification	3 years	Assistant Professor	Online
SF3	F	HCI	7 years	Assistant Professor	Online
SF4	M	Gamification	3 years	Mastering Professor	Online
SF5	F	HCI, Gamification	6 years	Assistant Professor	Online
SF6	F	HCI, Gamification	6 years	PhD Student	Online
SF7	M	HCI	3 years	Programmer	Online
SF8	F	HCI, Gamification	13 years	Assistant Professor	Online

Table 4.7: Newcomers participants in the final evaluation

Newc.	Age	Gender	How long it happened to his first contribution?	Interview Format
NF1	21-30	M	3-6 months	Online
NF2	21-30	M	More than 12 months	Face-to-face
NF3	31-40	M	More than 12 months	Online
NF4	21-30	M	More than 12 months	Online
NF5	21-30	M	3-6 months	Online
NF6	21-30	F	3-6 months	Face-to-face

Table 4.8: Main questions of the questionnaire of final evaluation.

	Questions
1	The "Sensory-Motor" game element is represented by a Gameboard with information of which session the newcomer is currently viewing can help theirs understand the Contribution Flow. (Likert Scale)
2	The "Means Rhetoric" game element, represented by tips showed how newcomers can achieve their goals, can help in performing tasks and thus the contribution process. (Likert Scale)
3	The "Unlock" game element, represented by a padlock, which is locking the sections as the newcomers perform the tasks can guide the newcomer in the contribution process. (Likert Scale)
4	The "Social Community" game element, represented by a Forum, where newcomers can exchange knowledge and facilitate communication between them, can contribute to a newcomers' motivation to continue without a contribution process. (Likert Scale)
5	The game element "Voting", represented in the portal forum as "+" and "-", so that the newcomer assigns votes to questions and answers and thus reaches reputation, can contribute to the newcomer's motivation to continue in the process contribution. (Likert Scale)
6	The game element "Profile", represented by an editable profile, can contribute to the newcomer motivation to continue the contribution process. (Likert Scale)
7	The "Badge" game element, so that the newcomer can visualize their achievements while performing tasks and interacting with the community, can contribute to the motivation of the newcomers to continue in the process of contribution. (Likert Scale)
8	The "Leaderboard" game element is represented by the list sorted by the last time achieved badges and a newcomers' reputation can contribute to your motivation to continue in contribution process.(Likert Scale)
9	Overall, how do you evaluate the proposed game elements as a way to help the newcomer make the first contribution to OSS? (Opened Question)
10	Some new game element that could be included in the interface?(Opened Question)

4.7.1 Results

In this section, we bring the results of our study, on the answers we obtained from the questionnaire administered the final evaluation. The proposal of gamification was positive as a first proposal of gamification for a portal for a newcomer in OSS projects. The specialists considered that the chosen elements have great potential, since they instigate the user to participate in the platform, but does not generate competitiveness or presents things that could be demotivating. It is well balanced, not too exhaustive. SF4 says *"The proposed game elements are being used properly, however, some things really can be expanded, such as Badges, Achievements, and integration with other environments and projects, such as GitHub"*. SF5 considered that the elements are interconnected and generate meaning for the user, both of relationship, and of purpose, contribution, and performance that are pillars of intrinsic motivation. The chosen elements have great potential, since they instigate the user to participate in the platform, but does not generate competitiveness or presents things that could be demotivating. It is well balanced, not exhaustive. The graphics aspect of game elements influences a lot in the understanding about orientation. Therefore, it would require an aesthetic refinement in the final version. The next sections present the of game elements

of this proposal and the new ideas suggested by the participants.

Gameboard needs a Graphical Design

Although the idea of putting a Gameboard in portal has pleased the participants. Four specialists and six newcomers evaluated with "Complete Agree" and one specialist complete with "Agree" that this game element can help newcomers understand the Contribution Flow. Although, the graphical design of the game element needs a review.

About three specialists and one newcomer not recognized the element and the steps in gray can be confused the newcomer. Such information is described by the specialist SF2 says *"I had not realized it was a Gameboard yet. And, I do not understand about the Gameboard is that it has empty spaces. The Gameboard could be replaced by a flow"*.

Also, the step of the newcomer is viewing need to highlighted, SF3 commented that *"The step where the newcomer was watching need to highlighted, It took me to notice the avatar on the Gameboard"*.

The newcomer NF3 also thinks that the Gameboard can be replaced by another game element. NF3 says *"The Gameboard could be replaced by a simple progress bar, perhaps with milestones, to make it clear to the user what he needs to do to move forward"*.

The SF6 suggest a new use for empty spaces. She suggested creating small challenges for newcomers. She says *"The gray spaces on the Gameboard could bring small challenges to support the newcomer user in the activities that should be performed by him, guiding what should be done in the system"*. These perceptions give evidences that Gameboard needs a graphical design review but newcomers could be motivated by game element proposal to continue in contribution flow.

Tips needs to be better used

The evaluation of Means Rhetoric game element, represented by tips, by the participants was quite positive. About 5 specialists evaluated with "Complete Agree" and 3 specialists complete with "Agree". SF1 says *"It is important for the user to know what to do next, so these tips will help a lot! I think the image a star would symbolize or a trophy could better represent the goal"*. However, some participants say that it will be necessary to put more tips, SF4 says *"I think it's necessary to put more tips on strategic points in the environment"*. SF3 and SF7 suggest putting tips at the top of each stage so that the newcomer understands the which is necessary to do at each step and which Badges will be won. SF3 says *"Another thing is that you could have in the sections, what to do in each of them The first tip, from step 1 was not visible that could be more prominent"*. On the other hand, SF8 said that we could adopt the discovery process too, spreading tips in some points of the

portal. The newcomer NF7 suggested the use of intelligent agents to guide the newcomer to perform the tasks according to the activities that he is performing in the portal.

Unlocking can be inadequate

The padlock was well rated by newcomers, 5 newcomers rated with "Complete Agree". The newcomers NF1 and NF2 liked the representation of the padlock and said that it will be essential to unlocking the sessions for those who do not like to accomplish missions, NF1 says *"It has to be possible to unblock the other steps, I do not like to accomplish missions"*. But 2 newcomers 2 evaluated with "Neither/Nor Agree" because although they liked the padlock blocking the steps, the Gameboard's full unlock option was very accessible and NF4 warned of the lack of a message to the newcomer about the loss of technical Badges, she says *"the option to unlock the lock could be in the portal settings menu and the newcomer should be warned that he will not win the technical badges"*.

The specialists did not like the representation of the element because although it is blocking the sessions it does not fit into a Game Board. Only 3 specialists evaluated with "Complete Agree" SF2 says *"The padlocks I think are cool because it gives this feeling that I need to fulfill something to release, but I do not think it fits very well on the board as a whole"*. SF4 says *"The element itself alone I believe not to guide, but an element that instigates to accomplish a task. What is guiding me, in this case, is the Gameboard, because it represents a stream and the numbers because it gives the idea of sequencing. The padlock gives the idea of where I should still explore"*. SF2 says *"If the guy comes in two, theoretically you'll have migrated for two, understand? I think it's pretty redundant"*. SF5 says *"Padlock action that unlocks everything, as it can give the user the idea that he can "cheat" the game. And with that, you may have less motivation"*.

Change Profile to a public and private profile

The Profile game element has the function of helping the newcomers' motivation to continue in the portal contribution process. It was considered by the participants as essential for the portal. Initially idealized only with basic information such as nickname, email, date of birth, gender. In this way, as it was conceived, it does not motivate the newcomers to continue in the contribution process and the participants suggested a social profile with private information. SF1 says *"It would be interesting to use Linkedin strategy"*. The specialists SF1 and SF4 suggested to elaborate the profile and make a social profile, putting the projects that the newcomer participates, the badges won in each project and the skills. SF3 and SF7 suggested keeping some private data. SF6 also comments that it is important to be optional to show which projects the newcomer has collaborated with. Newcomers liked the simpler form of profile representation. However, the more elaborate profile would also please. The

newcomer NF7 said: *"I would like to see the badges won, the days I send the contributions and my Skills"*.

Badges needs to be announced before

About 20 Badges were created for the portal. Participants really liked the idea of adding Badges to the portal, but it is possible to reshape them so that they encourage more newcomers to continue contributing flow. All six newcomer participants find Badges an important item to continue in the first contribution process. Many suggestions came from the evaluation. The eight specialists suggested announced that Badges exist before. This Badges list can be viewed in different places, for example: in the user profile. SF1 says *"I do not see what I got, could be more explicit"* and SF2 also said: *"I could see the badges of the project below the Gameboard, already on the main page"*.

In Step 2, Configure Workspace, if the newcomer correctly marks the question in the steps in the project setup, he gains a silver Badge. specialists SF3, SF4, and SF5 found this easy way to circumvent the system. SF5 says *"It would be interesting to answer the whole command and not a checkbox, that would make it more difficult"*. Specialists SF2 and SF8 comment that badges would be one more item in the contribution flow. The newcomer could do the chores and the reward would be the release of the next stages or he could make the platinum way, earning the badges. Specialists SF4 and SF5 consider that the Mentor Badge, given to the newcomer when he gets a mentor to guide him should not be shown if the project has no mentors. SF5 says *"Why show a badge that I will not win? That may discourage"*.

The newcomer NF7 suggested the creation of two new Technical Badges: Back-end Badge and Front-end Badge. He says *"It would be cool if I could have a Badge that says I'm a good Back-end developer or a Front-end developer"*. However, for this, it is important that in the repository where there are the tasks that exist this type of tag. The newcomer NF1 says that it is important that badges have different importance according to the difficulty of the task. Newcomer NF5 says *"...that it is important to have a greater orientation in the choice of task, as this requires a lot of time"*.

Leaderboard General and Leaderboard for Project

The Leaderboard game element shows the newcomers' placement in the project and its overall position. Leaderboard also shows the top three in the project. The Leaderboard was well graded by specialists and newcomers, they believe that it can contribute to the newcomers' motivation to continue in the first contribution process. However, it is necessary to place a General Leaderboard with all the projects. SF1 says *"It would be interesting to compare the projects"*. The newcomer NF7 says *"His contribution may be beneficial to*

the project, and so he deserves this recognition".

Forum and Voting need Feedback

The Forum contextualized according to the step that the newcomer is visualizing pleased specialists and newcomer. Badges that respond to actions such as responding and posting questions in the forum is also an item that motivates the use of the forum. However, it is necessary to verify the demand of the portal, because as the specialist SF1 says *"An underutilized forum ends up demotivating the newcomer"* and specialist SF4 says *"I believe a link to the StackOverflow is sufficient"*. The voting element was also well evaluated by the participants, considered essential to moderate the questions and mark what is most important. The specialist SF5 suggested making the sum of negative and positive votes to use in reputation score. Another thing missing in the forum is to show that it is possible to win Badges, this is only done after the action and not before.

New Ideas

Specialists suggests some game elements that can be included in the gaming interface. Specialist S4 spoke of the importance of adding audios or animated features to the hints. He says *Audio, or audio features for hints helps a lot to catch the newcomers' attention*. SF5 suggested elements such as progression, incentives for collaboration as virtual goods and exchange or donation. Newcomers have suggested some new ideas such as notifications of what is happening in the environment or an Avatar to help them along the way. The SF5 suggest put the badges on gray spaces on the Gameboard once they are won and SF2 suggest put on the Gameboard for newcomer know what they need to conquer.

5.   CONCLUSION

OSS projects are maintained by voluntary contributions and need an influx of newcomers for their sustainability [44]. The viability and success of these projects depend mainly on the contributions of the active members as well as the entry and retention of newcomers [34]. In a previous work, Steinmacher et al. [51] identified, organized, discussed newcomers' barriers first contribution to OSS projects, proposed and evaluated FLOSSCoach, a portal to support newcomers. In this thesis, we proposed and evaluated a FLOSSCoach portal gamification proposal for support newcomers in OSS project. The design of this research was based on 3 Phases: a Theoretical Foundation, a FLOSSCoach Gamification Proposal, and Proposal Refinement.

In phase I of this thesis, our goal was to identify a Gamification framework to support our implementation of the FLOSSCoach portal proposal. We relied on data extracted from a literature review on Gamification Frameworks. The main result of this phase was the game elements utilized based on a framework of the literature called "Gamification Design Process" [37].

In phase II, our goal was to propose the game elements that were part of gamification proposal. We selected eight game elements, that are Gameboard, Unlocking, Tips, Badges, Forum, Voting, Profile, and Leaderboard. These game elements are distributed throughout the contribution flow. This proposal was later preliminary evaluated although wireframes by five specialists and four newcomers with questionnaire-guided interviews. In general, the participants enjoyed the gamification proposal for the portal. Newcomers believe that the gamification proposal can contribute to the process of the first contribution.

In phase III, we generated a proposal refinement based mainly in the preliminary evaluation and conducted a final evaluation although high-fidelity prototypes with questionnaire-guided interviews. The evaluation with eight specialists and six newcomers was designed with the intention to understand how our target users, newcomers feel about FLOSSCoach with gamification and we wanted to get their opinions. The proposal of gamification was positive as a first proposal of gamification for a portal for a newcomer in OSS projects. The specialists considered that the chosen elements have great potential, since they instigate the user to participate in the platform, but does not generate competitiveness or presents things that could be demotivating. It is well balanced, not too exhaustive. The graphics aspect of game elements influences a lot in the understanding about orientation. Therefore, it would require an aesthetic refinement in the final version.

5.1   Future Work

As future work, we suggest a graphic refinement of the game elements, a usability evaluation with users, adding collaborative features to FLOSSCoach to making the portal a collaborative environment, like a social community. Create a personalized experience, for which user have a personalized gamification, and finally the development of the portal and its evaluation with users.

5.2   Limitations

To achieve the task of make a prototype of FLOSSCoach, we decided for uses the technique of High-Fidelity. Although we choose a recommended by the literature of Human-Computer Interaction (HCI) area, we could not find an HCI professional to help us in the production of our prototype. Therefore, with the lack of this professional, we study the literature of HCI and we assigned this task to an undergraduate student, who contributes with our research group to accomplish this prototype of FLOSSCoach according to with the technique of High-Fidelity present on HCI literature.

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APPENDIX A – SCRIPT INTERVIEWS - PHASE 1

FLOSScoach - Avaliação dos Protótipos de Baixa Fidelidade

Somos pesquisadores brasileiros investigando questões relacionadas à utilização de gamificação, a fim de auxiliar a entrada de novatos em projetos de Software Livre.

Para isto, os participantes são convidados a avaliar os protótipos de baixa fidelidade de um portal para novatos em Software Livre e responder um questionário. Lembramos que o objetivo deste estudo não é avaliar o participante, mas sim avaliar os protótipos de baixa fidelidade criados para a interface do portal.

O uso que se faz dos registros efetuados durante o questionário é estritamente limitado a atividades de pesquisa e desenvolvimento, garantindo-se para tanto que:

1. O anonimato dos participantes será preservado em todo e qualquer documento divulgado em foros científicos (tais como conferências, periódicos, livros e assemelhados) ou pedagógicos (tais como apostilas de cursos, slides de apresentações, e assemelhados).
2. Todo participante terá acesso a cópias destes documentos após a publicação dos mesmos, caso tenha interesse.
3. Todo participante que se sentir constrangido ou incomodado durante uma situação de teste pode interromper o teste e estará fazendo um favor à equipe se registrar por escrito as razões ou sensações que o levaram a esta atitude. A equipe fica obrigada a descartar o teste para fins da avaliação a que se destinaria.
4. A equipe tem direito de utilizar os dados dos testes, mantidas as condições acima mencionadas, para quaisquer fins acadêmicos, pedagógicos e/ou de desenvolvimento contemplados por seus membros.

Agradecemos a sua participação,

Carolina Toscani (PUCRS, Brasil)
Sabrina Marczak (PUCRS, Brasil)
Igor Steinmacher (UTFPR, Brasil)

*Obrigatório

1.
*
Marque todas que se aplicam.

☐ Sim, concordo com o termo de compromisso

Ir para a pergunta 2.

Perfil do Participante

2.
1) Nome *

_____

3.
2) Gênero *
Marcar apenas uma oval.

◯ Masculino

◯ Feminino

◯ Outro

4. **3) Idade** *

_____

5.
4) Especialidade *

Marque todas que se aplicam.

☐ IHC (Interação Humano-Computador)

☐ Gamificação

☐ Sistemas Colaborativos

☐ Projetos de Software Livre

☐ Outro: _____

6.
5) Escolaridade *

Marcar apenas uma oval.

◯ Pós-Graduação

◯ Pós-graduação incompleto

◯ Ensino Superior

◯ Superior Incompleto

◯ Ensino Médio

◯ Ensino Médio Incompleto

Ir para a pergunta 7.

Questionário

Por favor, indique a sua opinião sobre os wireframes criados para a interface do portal FLOSScoach

7.
1) O elemento de jogo "Significado Retórico", representado na forma de dicas*, está mostrando para os novatos como eles podem atingir seus objetivos, pode auxiliar na realização de tarefas e, assim, no processo de contribuição. *

*Olhe Wireframe 01.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

8.
Sugestão de melhoria ?

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Wireframe 01

9.

2) O elemento de jogo "Desbloqueio", representado na forma de um cadeado, que está desbloqueando as sessões* assim que os novatos realizam as tarefas, pode guiar os novatos no processo de contribuição. *

*Sessão "Know the code" na etapa 1 e "Send Contribution" na etapa 2. Olhe os Wireframes 03,04 e 05.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

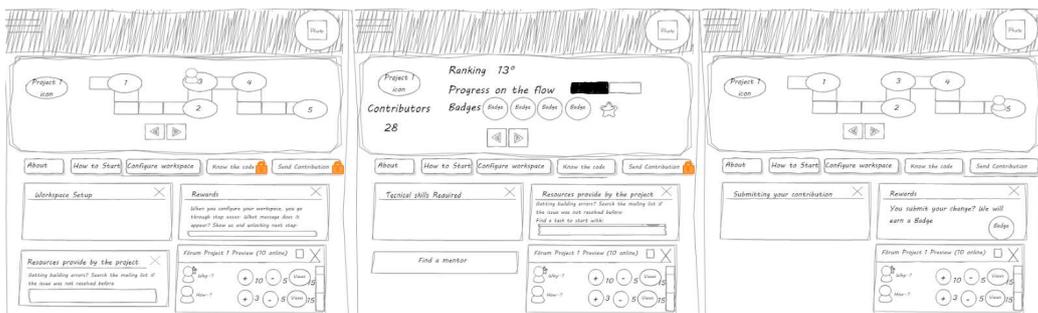10.

Sugestão de melhoria ?

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Wireframes 03, 04 e 05

11. **3) O elemento de jogo "Sensor-Motor", está representado na forma de um tabuleiro animado*, com as informações de qual sessão o novato está visualizando no momento, pode contribuir para que os novatos entendam o fluxo de contribuição.**
*Olhe Wireframes 03, 05.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

12.
Sugestão de melhoria ?

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Wireframes 03 e 05

13.
4) O elemento de jogo "Ranking", está representado na forma de uma lista* ordenada pelas últimas Badges alcançadas e a reputação do novato, pode contribuir para a motivação do novato em continuar no processo de contribuição. *
*Olhe o Wireframe 07.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

14.
Sugestão de melhoria ?

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Wireframe 7

15.

5) O elemento de jogo "Comunidade Social", representado por um fórum* do portal, onde os novatos podem trocar conhecimento e facilitar a comunicação entre os mesmos, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

*Olhe Wireframe 08.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

16.

Sugestão de melhoria ?

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17.

6) O elemento de jogo "Votação", representado no fórum* do portal como "+" e "-" , para que o novato atribua votos para perguntas e respostas e, dessa forma alcance reputação, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

*Olhe Wireframe 08.
Marcar apenas uma oval.

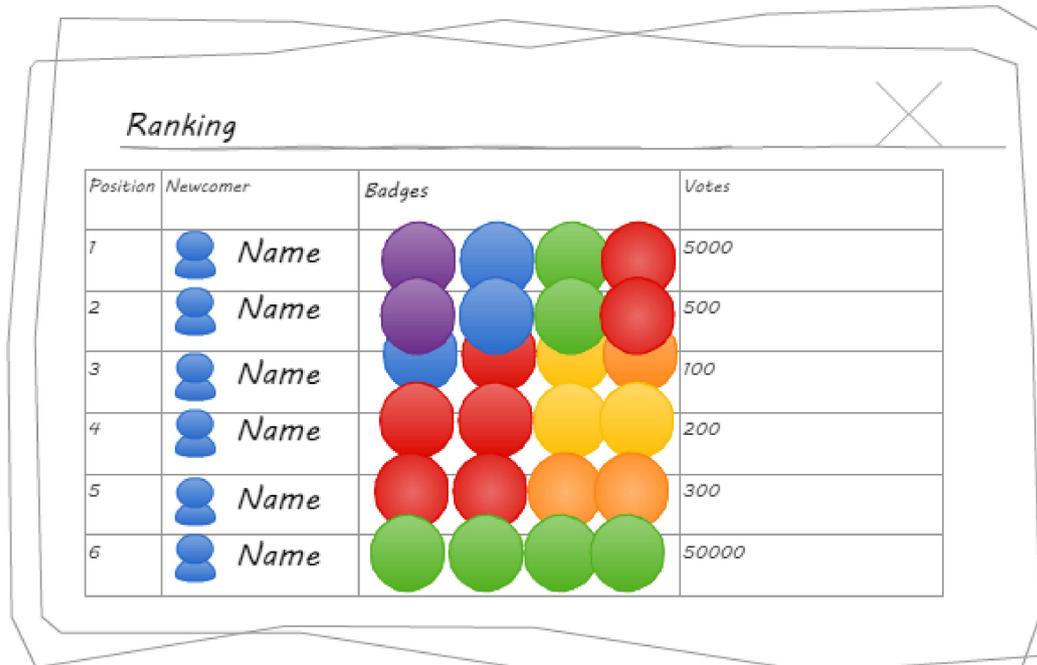|	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

18. **Sugestão de melhoria ?**

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Wireframe 08

19.

7) O elemento de jogo Criação-Personalização, representado na forma de um perfil editável*, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

*Olhe Wireframe 06.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

20.
Sugestão de melhoria ?

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Wireframe 06

21.

8) O elemento de jogo "Badge", representado na forma de círculos*, para que o novato visualize suas conquistas ao realizar tarefas e interagir com a comunidade, pode contribuir para a motivação dos novatos em continuar no processo de contribuição. *

*Olhe Wireframe 04 e 05.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

22.

Sugestão de melhoria ?

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Wireframes 04 e 05.

Ir para a pergunta 23.

Pergunta Aberta

23.

9) De forma geral, como você avalia os elementos de jogos propostos, como forma de auxiliar o novato a realizar a primeira contribuição para projetos de Software Livre? *

24.

Email
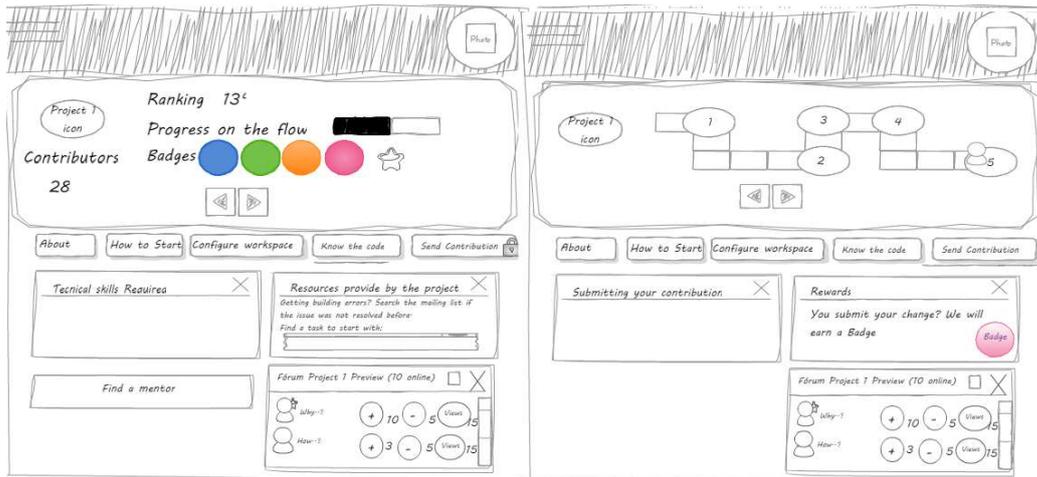
Para envio das respostas

FLOSScoach - Avaliação dos Protótipos de Baixa Fidelidade

Somos pesquisadores brasileiros investigando questões relacionadas à utilização de gamificação, a fim de auxiliar a entrada de novatos em projetos de Software Livre.

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4. A equipe tem direito de utilizar os dados dos testes, mantidas as condições acima mencionadas, para quaisquer fins acadêmicos, pedagógicos e/ou de desenvolvimento contemplados por seus membros.

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Sabrina Marczak (PUCRS, Brasil)
Igor Steinmacher (UTFPR, Brasil)

*Obrigatório

1.
   *
   Marque todas que se aplicam.

   ☐ Sim, concordo com o termo de compromisso

Ir para a pergunta 2.

Perfil do Participante

2.
   1) Nome *

   _____

3.
   2) Gênero *
   Marcar apenas uma oval.

   ◯ Masculino
   ◯ Feminino
   ◯ Outro

4. **3) Idade** *

_____

5.
4) Quanto tempo faz que você fez a sua primeira contribuição em projetos de Software Livre? *

Marcar apenas uma oval.

◯ Menos de 1 mês.

◯ 1 à 3 meses.

◯ 3 meses a 6 meses.

◯ 6 a 12 meses.

◯ Mais de 12 meses.

6.
5) Escolaridade *

Marcar apenas uma oval.

◯ Pós-Graduação

◯ Pós-graduação incompleto

◯ Ensino Superior

◯ Superior Incompleto

◯ Ensino Médio

◯ Ensino Médio Incompleto

Ir para a pergunta 7.

Questionário

Por favor, indique a sua opinião sobre os wireframes criados para a interface do portal FLOSScoach

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1) O elemento de jogo "Significado Retórico", representado na forma de dicas*, está mostrando para os novatos como eles podem atingir seus objetivos, pode auxiliar na realização de tarefas e, assim, no processo de contribuição. *

*Olhe Wireframe 01.
Marcar apenas uma oval.

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Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

8.
Sugestão de melhoria ?

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Wireframe 01

9.
2) O elemento de jogo "Desbloqueio", representado na forma de um cadeado, que está desbloqueando as sessões* assim que os novatos realizam as tarefas, pode guiar os novatos no processo de contribuição. *

*Sessão "Know the code" na etapa 1 e "Send Contribution" na etapa 2. Olhe os Wireframes 03,04 e 05.
Marcar apenas uma oval.

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Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

10.
Sugestão de melhoria ?

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Wireframes 03, 04 e 05

11. **3) O elemento de jogo "Sensor-Motor", está representado na forma de um tabuleiro animado*, com as informações de qual sessão o novato está visualizando no momento, pode contribuir para que os novatos entendam o fluxo de contribuição.**
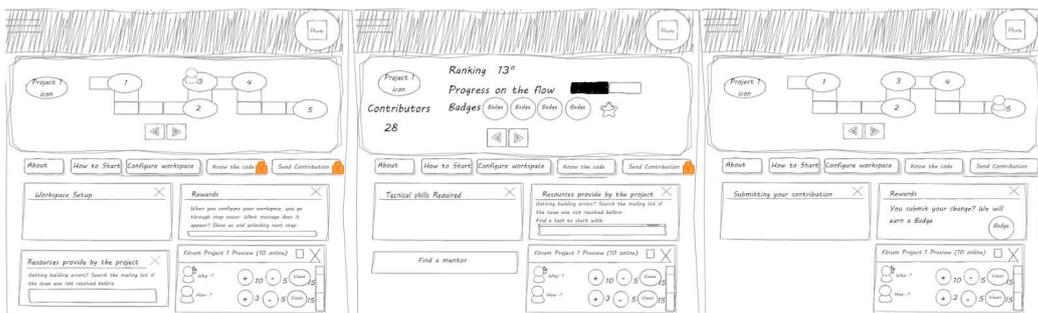
Olhe Wireframes 03, 05.
Marcar apenas uma oval.

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Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

12.
Sugestão de melhoria ?

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Wireframes 03 e 05

13.
4) O elemento de jogo "Ranking", está representado na forma de uma lista* ordenada pelas últimas Badges alcançadas e a reputação do novato, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

Olhe o Wireframe 07.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

14.
Sugestão de melhoria ?

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Wireframe 7

15.

5) O elemento de jogo "Comunidade Social", representado por um fórum* do portal, onde os novatos podem trocar conhecimento e facilitar a comunicação entre os mesmos, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

*Olhe Wireframe 08.
Marcar apenas uma oval.*

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

16.

Sugestão de melhoria ?

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17.

6) O elemento de jogo "Votação", representado no fórum* do portal como "+" e "-" , para que o novato atribua votos para perguntas e respostas e, dessa forma alcance reputação, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

*Olhe Wireframe 08.
Marcar apenas uma oval.*

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

18. **Sugestão de melhoria ?**

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Wireframe 08

19.

7) O elemento de jogo Criação-Personalização, representado na forma de um perfil editável*, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

*Olhe Wireframe 06.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

20.
Sugestão de melhoria ?

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Wireframe 06

21.

8) O elemento de jogo "Badge", representado na forma de círculos*, para que o novato visualize suas conquistas ao realizar tarefas e interagir com a comunidade, pode contribuir para a motivação dos novatos em continuar no processo de contribuição. *

Olhe Wireframe 04 e 05.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

22.

Sugestão de melhoria ?

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_____

_____

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_____

Wireframes 04 e 05.

Ir para a pergunta 23.

Pergunta Aberta

23.

9) De forma geral, como você avalia os elementos de jogos propostos, como forma de auxiliar o novato a realizar a primeira contribuição para projetos de Software Livre? *

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_____

24.

Email

Para envio das respostas

_____

APPENDIX B – SCRIPT INTERVIEWS - PHASE 2

FLOSScoach - Avaliação dos Protótipos de Baixa Fidelidade

Somos pesquisadores brasileiros investigando questões relacionadas à utilização de gamificação, a fim de auxiliar a entrada de novatos em projetos de Software Livre.
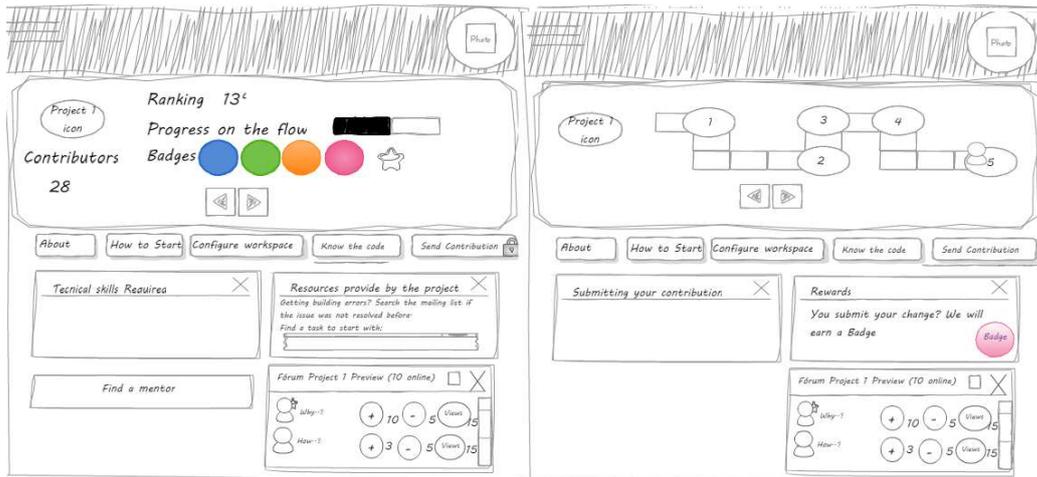
Para isto, os participantes são convidados a avaliar os protótipos de baixa fidelidade de um portal para novatos em Software Livre e responder um questionário. Lembramos que o objetivo deste estudo não é avaliar o participante, mas sim avaliar os protótipos de baixa fidelidade criados para a interface do portal.

O uso que se faz dos registros efetuados durante o questionário é estritamente limitado a atividades de pesquisa e desenvolvimento, garantindo-se para tanto que:

1. O anonimato dos participantes será preservado em todo e qualquer documento divulgado em foros científicos (tais como conferências, periódicos, livros e assemelhados) ou pedagógicos (tais como apostilas de cursos, slides de apresentações, e assemelhados).
2. Todo participante terá acesso a cópias destes documentos após a publicação dos mesmos, caso tenha interesse.
3. Todo participante que se sentir constrangido ou incomodado durante uma situação de teste pode interromper o teste e estará fazendo um favor à equipe se registrar por escrito as razões ou sensações que o levaram a esta atitude. A equipe fica obrigada a descartar o teste para fins da avaliação a que se destinaria.
4. A equipe tem direito de utilizar os dados dos testes, mantidas as condições acima mencionadas, para quaisquer fins acadêmicos, pedagógicos e/ou de desenvolvimento contemplados por seus membros.

Agradecemos a sua participação,

Carolina Toscani (PUCRS, Brasil)
Sabrina Marczak (PUCRS, Brasil)
Igor Steinmacher (UTFPR, Brasil)

*Obrigatório

1.
    *
    Marque todas que se aplicam.

    ☐ Sim, concordo com o termo de compromisso

Ir para a pergunta 2.

Perfil do Participante

2.
    1) Nome *

    _____

3.
    2) Gênero *
    Marcar apenas uma oval.

    ◯ Masculino

    ◯ Feminino

    ◯ Outro

4. **3) Idade** *

_____

5.
4) Especialidade *
Marque todas que se aplicam.

☐ IHC (Interação Humano-Computador)

☐ Gamificação

☐ Sistemas Colaborativos

☐ Projetos de Software Livre

☐ Outro: _____

6.
5) Escolaridade *
Marcar apenas uma oval.

◯ Pós-Graduação

◯ Pós-graduação incompleto

◯ Ensino Superior

◯ Superior Incompleto

◯ Ensino Médio

◯ Ensino Médio Incompleto

Ir para a pergunta 7.

Questionário
Indicar a opinião do especialista sobre os protótipos criados para a interface do portal FLOSScoach. Explorar cada sessão do tabuleiro do projeto focando sempre nos elementos de jogos apresentados.

kick off

7.
1) O elemento de jogo "Sensório-Motor", está representado na forma de um tabuleiro clicável, com as informações de qual sessão o novato está visualizando no momento, pode contribuir para que os novatos entendam o fluxo de contribuição.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

8.
2) O elemento de jogo "Significado Retórico", representado na forma de dicas, está mostrando para os novatos como eles podem atingir seus objetivos, pode auxiliar na realização de tarefas e, assim, no processo de contribuição. *
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

9. **Anotações**

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10.
3) O elemento de jogo "Desbloqueio", representado na forma de um cadeado, que está bloqueando as sessões, pode guiar os novatos no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

11.
Sugestões para Kick-off?

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Configure Workspace

12.
4) O elemento de jogo "Comunidade Social", representado por um fórum do portal, onde os novatos podem trocar conhecimento e facilitar a comunicação entre os mesmos, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

13.
Sugestões para Configure Workspace?

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Find a Task

14. **5) O elemento de jogo "Votação", representado no fórum do portal como "+" e "-" , para que o novato atribua votos para perguntas e respostas e, dessa forma alcance reputação, pode contribuir para a motivação do novato em continuar no processo de contribuição.** *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

15.

Sugestões para Find a Task?

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16.

6) O elemento de jogo Criação-Personalização, representado na forma de um perfil editável, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

17.

Anotações

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Know the Code

18.

7) O elemento de jogo "Badge", serve para que o novato visualize suas conquistas ao realizar tarefas e interagir com a comunidade, pode contribuir para a motivação dos novatos em continuar no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

19. **Sugestões para Know the code?**

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Submitting Your Contributtion?

20.
8) O elemento de jogo "Ranking", está representado na forma de uma lista ordenada pelas conquistas alcançadas e a reputação do novato, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

21.
Sugestões para Submitting Your Contributtion?

_____

Ir para a pergunta 22.

Perguntas Abertas

22.
9) De forma geral, como você avalia os elementos de jogos propostos, como forma de auxiliar o novato a realizar a primeira contribuição para projetos de Software Livre? *

_____

_____

_____

_____

_____

23.
10) Algum novo elemento de jogo que poderia ser incluído na interface?

_____

_____

_____

_____

_____

24.
Email
Para envio das respostas

_____

FLOSScoach - Avaliação dos Protótipos de Alta Fidelidade

Somos pesquisadores brasileiros investigando questões relacionadas à utilização de gamificação, a fim de auxiliar a entrada de novatos em projetos de Software Livre.

Para isto, os participantes são convidados a avaliar os protótipos de baixa fidelidade de um portal para novatos em Software Livre e responder um questionário. Lembramos que o objetivo deste estudo não é avaliar o participante, mas sim avaliar os protótipos de alta fidelidade criados para a interface do portal.

O uso que se faz dos registros efetuados durante o questionário é estritamente limitado a atividades de pesquisa e desenvolvimento, garantindo-se para tanto que:

1. O anonimato dos participantes será preservado em todo e qualquer documento divulgado em foros científicos (tais como conferências, periódicos, livros e assemelhados) ou pedagógicos (tais como apostilas de cursos, slides de apresentações, e assemelhados).
2. Todo participante terá acesso a cópias destes documentos após a publicação dos mesmos, caso tenha interesse.
3. Todo participante que se sentir constrangido ou incomodado durante uma situação de teste pode interromper o teste e estará fazendo um favor à equipe se registrar por escrito as razões ou sensações que o levaram a esta atitude. A equipe fica obrigada a descartar o teste para fins da avaliação a que se destinaria.
4. A equipe tem direito de utilizar os dados dos testes, mantidas as condições acima mencionadas, para quaisquer fins acadêmicos, pedagógicos e/ou de desenvolvimento contemplados por seus membros.

Agradecemos a sua participação,

Carolina Lemos Toscani (PUCRS, Brasil)
Sabrina Marczak (PUCRS, Brasil)
Igor Steinmacher (UTFPR, Brasil)

*Obrigatório

1.
*

Marque todas que se aplicam.

☐ Sim, concordo com o termo de compromisso

Ir para a pergunta 2.

Perfil do Participante

2.
1) Nome *

_____

3.
2) Gênero *
Marcar apenas uma oval.

◯ Masculino

◯ Feminino

◯ Outro

4. **3) Idade** *

_____

5.
4) Quanto tempo faz que você fez a sua primeira contribuição em projetos de Software Livre? *

Marcar apenas uma oval.

◯ Menos de 1 mês.

◯ 1 à 3 meses.

◯ 3 meses a 6 meses.

◯ 6 a 12 meses.

◯ Mais de 12 meses.

6.
5) Escolaridade *

Marcar apenas uma oval.

◯ Pós-Graduação

◯ Pós-graduação incompleto

◯ Ensino Superior

◯ Superior Incompleto

◯ Ensino Médio

◯ Ensino Médio Incompleto

Ir para a pergunta 7.

Questionário

Por favor, indique a sua opinião sobre o protótipo criado para a interface do portal FLOSScoach.
Explorar cada sessão do tabuleiro do projeto focando sempre nos elementos de jogos apresentados.

Kick-off

7.
1) O elemento de jogo "Sensório-Motor", está representado na forma de um tabuleiro animado, com as informações de qual sessão o novato está visualizando no momento, pode contribuir para que os novatos entendam o fluxo de contribuição.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

8.
2) O elemento de jogo "Significado Retórico", representado na forma de dicas, está mostrando para os novatos como eles podem atingir seus objetivos, pode auxiliar na realização de tarefas e, assim, no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Completamente	◯	◯	◯	◯	◯	Concordo Completamente

9. **3) O elemento de jogo "Desbloqueio", representado na forma de um cadeado, que está bloqueando as sessões, pode guiar os novatos no processo de contribuição. ***

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

10.

Sugestão para kick-off ?

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Configure Workspace

11.

4) O elemento de jogo "Comunidade Social", representado por um fórum* do portal, onde os novatos podem trocar conhecimento e facilitar a comunicação entre os mesmos, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

12.

5) O elemento de jogo "Votação", representado no fórum* do portal como "+" e "-" , para que o novato atribua votos para perguntas e respostas e, dessa forma alcance reputação, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

*Olhe Wireframe 08.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

13.

Sugestões para Configure Workspace?

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Find a Task

14. **6) O elemento de jogo Criação-Personalização, representado na forma de um perfil editável*, pode contribuir para a motivação do novato em continuar no processo de contribuição. ***

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

15.

Sugestões para Find a Task?

_____

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Know the Code

16.

7) O elemento de jogo "Badge", representado na forma de círculos*, para que o novato visualize suas conquistas ao realizar tarefas e interagir com a comunidade, pode contribuir para a motivação dos novatos em continuar no processo de contribuição. *

*Olhe Wireframe 04 e 05.
Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

17.

Sugestão para Know the Code ?

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Submitting Your Contributtion?

18.

8) O elemento de jogo "Ranking", está representado na forma de uma lista* ordenada pelas últimas Badges alcançadas e a reputação do novato, pode contribuir para a motivação do novato em continuar no processo de contribuição. *

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

19. **Sugestões para Submitting Your Contributtion?**

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Ir para a pergunta 20.

Pergunta Aberta

20.
9) De forma geral, como você avalia os elementos de jogos propostos, como forma de auxiliar o novato a realizar a primeira contribuição para projetos de Software Livre? *

_____

_____

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_____

21.
10) Algum novo elemento de jogo que poderia ser incluído na interface?

_____

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_____

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22.
Email
Para envio das respostas

_____

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