FEDERAL UNIVERSITY OF PAMPA

Igor Dalepiane da Costa

Extensionly - A tool for supporting the management of outreach projects and programs in the university: Backend

Alegrete
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Term Paper presented in Software Engineering Graduation Course in the Federal University of Pampa as a partial requirement for obtaining the title of Software Engineering Bachelor

Supervisor: Prof. PhD. Maicon Bernardino da Silveira

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Term Paper presented and approved on .... of .....
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I dedicate this work to my family and to God,
who have always been my greatest strengths.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my family Eliane, Jair and Mateus, who always helped me in all my obstacles and above all taught me the values, love and religiosity that I carry with me to this day. I also thank all the family members who gave me strength and support to keep me on the road.

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Thank you for everything and God bless you all!

“Everybody should learn to program a computer,
because it teaches you how to think.“
Steve Jobs

RESUMO

Contexto: Devido às diretrizes impostas pela Resolução Nº 7 de 2018 do Conselho Nacional de Educação (CNE) (MEC, 2018), a curricularização da extensão se tornará obrigatória no ano de 2023. Com isso, os cursos de graduação de todas as universidades federais deverão alocar uma carga horária equivalente a 10% (dez por cento) da total do curso, incentivando os alunos a procurarem por mais atividades extensionistas e aos docentes a proporem mais atividades. **Objetivo**: Tendo em vista que os processos que dizem a respeito da criação e manutençao de atividades de extensão são burocraticos, demorados e manuais, o objetivo deste trabalho é produzir uma ferramenta baseada na Web, capaz de dar suporte em todos ou na grande maioria destes processos. O seu desenvolvimento está sendo realizado por dois alunos de graduação, dividindo a carga de trabalho que evolvem todo o processo de Engenharia de Software em *frontend* e *backend*, este trabalho se concentra na área do *backend*. **Método**: Para isso ser possível, dois métodos científicos foram utilizados: uma revisão sistematica na literatura cinza, com o objetivo de encontrar ferramentas semelhantes, para a coleta de requisitos e detalhes pertinentes. O segundo foi um levantamento (*survey*) com os possíveis usuários do sistema que fazem parte da comunidade acadêmica da UNIPAMPA. O objetivo foi classificar por ordem de importância as funcionalidades e, além disso, permitindo com que os participantes fornecessem sugestões relacionadas as mesmas, ou até que sugerissem novas. **Resultados**: Com os resultados obtidos, foi possivel construir uma lista de requisitos classificados pela sua prioridade, junto com funcionalidades adicionais sugeridas pelos respondentes do questionário. Sendo assim, o desenvolvimento da ferramenta já está direcionado e pode ser iniciado. **Conclusão**: Olhando para a hipótese levantada por este estudo, não é ainda possível confirma-la ou refuta-la, pois a ferramenta ainda não foi desenvolvida e testada com os usuários finais. Entretanto, com os resultados positivos obtidos através do levantamento (*survey*) e da revisão na literatura cinza, é bem provável que ela seja confirmada, através do desenvolvimento correto e completo da aplicação final.

Palavras-chave: Ferramenta. *Survey*. Literatura Cinza. *Backend*. NestJS. Extensão. Atividade Extensionista. Comunidade. Universidade.

ABSTRACT

Context: Due to the guidelines imposed by Resolution No. 7 of 2018 of the National Council of Education (CNE) (MEC, 2018), the curricularization of outreach will become mandatory in 2023. With this, the undergraduate courses of all federal universities must allocate a workload equivalent to 10% (ten percent) of the total course, encouraging students to look for more outreach activities and professors to propose more. **Objective**: Considering that the processes related to the creation and maintenance of outreach activities are bureaucratic, time-consuming and manual, the objective of this work is to produce a web-based tool, capable of supporting all or in the vast majority of these processes. Its development is being carried out by two undergraduate students, dividing the workload involved in the entire Software Engineering process into frontend and backend, this work focuses on the backend area. **Method**: To make this possible, two scientific methods were used: a systematic review in the gray literature, with the objective of finding similar tools, for the collection of requirements and pertinent details. The second was a survey with the possible users of the system that are part of the academic community of UNIPAMPA. The objective was to classify the requirements in order of importance and, in addition, allowing participants to provide suggestions related to them, or even to suggest new ones. **Results**: With the results obtained, it was possible to build a list of requirements classified by their priority, along with additional functionalities suggested by the respondents of the questionnaire. Therefore, the development of the tool is already directed and can be started. **Conclusion**: Looking at the hypothesis raised by this study, it is not yet possible to confirm or refute it, as the tool has not yet been developed and tested with end users. However, with the positive results obtained through the survey and the review in the gray literature, it is very likely that it will be confirmed, through the correct and complete development of the final application.

Key-words: Tool. Survey. Grey Literature. Backend. Outreach. Community. University.

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

API Application Programming Interface

ATE Administrative Technician in Education

CAEX Outreach Actions Control

CD Continuous Deployment

CDE Continuous Delivery

CI Continuous Integration

CLE Local Outreach Committee

CONSUNI University Council

CSE Superior Outreach Committee

DBMS Database Management System

DevOps Development Operations

FOREXT National Forum for Outreach and Community Action of Universities and Community Higher Education Institutions

FORPROEX Forum of Pro-Rectors for Outreach of Brazilian Public Universities

FR Functional Requirement

HEI Higher Education Institution

HTTP Hypertext Transfer Protocol

ICES Higher Education Community Institution

ID Identification

IDP Institutional Development Plan

JS JavaScript

MEC Ministry of Education

MoSCoW Must have, Should have, Could have and Will not have

MVP Minimum Viable Product

MySQL My Structured Query Language

NGO Non-Governmental Organization

OA Outreach Activity

OCA Outreach Curriculum Activity

ORM Object Relational Mapper

PaaS Platform as a Service

ProExt University Outreach Program

PROEXT Dean of Outreach and Culture

REST Representational State Transfer

SAP Academic Project System

SEI Electronic Information System

SGCE Electronic Certificate Management System

SIGAA Integrated Academic Activities Management System

SIPPEE Information System for Research, Teaching and Outreach Projects

TP Term Paper

TS TypeScript

UNIPAMPA Federal University of Pampa

CONTENTS

1 INTRODUCTION

Federal University of Pampa currently offers three categories of extra activities, teaching, research and outreach. Teaching activities consist of student learning in general, they can be courses, lectures, monitoring activities, among others. Research activities are constituted by everything that is related to research itself, among them are scientific initiations, Term Papers (TPs), publication of papers in events, and so on. Finally, we have the Outreach Projects and Programs, which are the focus of this work, and according to the 2019 Institutional Development Plan (IDP), "Outreach assumes the role of promoting a dialogic relationship with the external community, for the democratization of access to academic knowledge as well as for the feedback of university practices based on this dynamic" (UNIPAMPA, 2019).

To explain what outreach is within an academic environment, Resolution No. 332 of 2021 will be used (PROEXT, 2021b), which clarifies Outreach Activity (OA) as an action that encourages research and development, increasing the bond between the community and Higher Education Institution (HEI). OAs must have the participation of the external community and promote a balance between practical and theoretical activities. To classify these outreach activities, four terms are defined, namely: (1) Projects, "set of actions articulated around a common theme and objectives"; (2) Programs, "set of articulated projects, which may include more than one type of action (project, courses, events)"; (3) Courses, "training activities"; (4) Events, "activities of an artistic or scientific nature". Therefore, it is necessary for some bodies to be responsible for managing these activities, also defined by Resolution 104, they are: (1) Dean of Outreach and Culture (PROEXT); (2) Superior Outreach Committee (CSE); (3) Local Outreach Committee (CLE).

The curricularization of the outreach described in Resolution No. 7 of 2018 (MEC, 2018), explains that OAs must have their proposal, development and conclusion, duly recorded, documented and analyzed, so that it is possible to organize work plans, methodologies, instruments and knowledge generated. Also ordering that educational institutions should include in their IDP, at least 10% (ten percent) of the total course load focused on OAs, in addition to all related terms, with a deadline of up to three years from the date of its approval. In view of this demand, Federal University of Pampa created University Council (CONSUNI) Resolution No. 317 of April 29, 2021, (UNIPAMPA, 2021b), which implements all the guidelines presented by the Ministry of Education (MEC).

To control all this, a complete software is indispensable, and that is easy to use, with which users are comfortable to use and can complete their tasks using it. Currently, Federal University of Pampa only has a system called Academic Project System (SAP), which serves for registration outreach projects, submit proposals to the public notices offered and manage the scholarship holders of the awarded notices, but does not contemplate the reach that we want to give. Because of this, it ends up making the bureaucracy concentrate outside the system, making this process boring and time-consuming, teachers

often even give up doing it, opting for other less bureaucratic activities.

Related to this matter, Normative Instruction No. 18 (UNIPAMPA, 2021a) was released a short time ago, which stipulates the norms of the Institutional Program "UNIPAMPA Cidadã". Which is an outreach program that should be composed of citizenship and solidarity actions, such as clothing campaign, food collection, support for asylums, etc., being mandatory to offer them. When effective, in all undergraduate courses, a minimum workload of 60 and a maximum of 120 must be allocated.

1.1 Motivation

The process of curricularization of outreach proposed by Resolution Nº 317 (UNIPAMPA, 2021b), will become mandatory in 2023, given the effort that will be required to manually complete demands such as registration, control, issuance of certificates and entry of participants, implicit in an Outreach Curriculum Activity (OCA), it was proposed to create a support tool in the management of these projects and outreach programs, thus managing to reduce bureaucracy and speed up the process.

The community periodically contacts the university to request some type of solidarity action, with this demand, OAs are generated, which can be carried out by students managed by a coordinator or even within a subject of their courses. But this communication is not the most intuitive, not having a system to manage them, it leads to the only option of having to do it through calls or even in person, this is very discouraging for the community. In view of this, one of the motivations for the development of the tool is to strengthen this link between academic communication and external communication, allowing new demands to be created in the tool itself.

Regarding the dissemination of OAs, nowadays emails are sent to students informing them about new opportunities, but usually students inboxes receives a lot of emails on a daily basis, leading to the lack of interest in reading all of them. For this reason, with a tool that concentrated all the information, opportunities and news related to the outreach. Hence, the students would no longer need to venture into their sea of emails when they need to look for a new activity, they would just resort to the tool where everything is already organized and ready to use.

Another motivator that encouraged the development of this tool is that from the review in the grey literature that was conducted, no tools were found that completely solved the problems related to these processes. Some tools had features and details that others did not and vice versa, but together they would build a complete tool.

1.2 Objectives

In view of what has been presented, the research aim of the theme of this term paper is the development of the backend of a tool that will serve as support in the

management of outreach programs and projects, reproducing and assisting in all processes related to this demand, from its creation to the generation of certificates when it is finalized. The aim is to reduce the effort and time spent by those involved in these manual steps of the process. In addition to allowing a new communication channel to be built between the academic community and the external community, allowing suggestions for demands for OAs directly in the tool.

The following research objectives were established in order to achieve the research goal:

- Systematically review grey literature works and products to find comparable solutions, collecting the first batch of requirements.
- Elaborate a survey, according to Kasunic (2005), in order to identify new system requirements and to better comprehend the requirements of the intended users.
- Create concrete tasks and an implementation roadmap by analyzing the findings and refining the elicited requirements.
- Study the most relevant tools, programming languages, and frameworks to create a stack that offers excellent code maintainability, architecture, and performance.
- Create an operational Minimum Viable Product (MVP) of the system that initially implements the most important requirements that have been gathered and refined.

Therefore, the Table 1 presents the synthesis of the research aims and objectives, as well as the subject, the study, the research question (problem) and the solution hypothesis.

1.3 Contribution

The main contribution of this study is the MVP development for the backend of a tool to support and automate the whole process of Outreach Curriculum Activities in the university. It is also expected the generation of two artifacts, a systematic review in the gray literature, to raise tools similar to the proposal, and collect their most important features and details. A survey will also be carried out with possible end users of the tool, to classify the requirements raised by relevance and to understand more about the real need of this public.

The proposal for this tool is designed for the participation of two students because its complexity is high, justifying this double development, Igor Dalepiane da Costa, being responsible for the backend and Lucas Alexandre Fell, responsible for the frontend. Regarding the artifacts created to support the research, such as the survey and the systematic review of the grey literature, they were all completed in collaboration by both authors and are not specifically related to any one piece of work.

Table 1 – Synthesis of the Research Aim and Research Objectives.

Topic	Description
Subject	Management of outreach programs and projects.
Study	Tool for Support in management of outreach programs and projects.
Research Question	How can a tool to support the management of outreach programs and projects of UNIPAMPA can optimize the management of proposition, registration, dissemination and accountability processes of outreach actions?
Research Hypothesis	With a tool to support the management of outreach programs and projects, it's possible to have a reduction on the effort needed to create an outreach activity and an increase in the engagement of volunteer outreach participants.
Research Aim	Develop the backend of the tool to support the management of outreach programs and projects of UNIPAMPA
Research Objectives	Report results and execution methods of the following processes: (i) Research: Analyze similar tools, state the processes that will be made available by the tool, conduct surveys with the organizers and participants of OAs, understand the limitations of current processes. (ii) Planning: Elicitate functional and non functional requirements, identify stakeholders, define architecture, technologies and tools. (iii) Development: Develop the features raised, build and run test cases. (iv) Deployment: Perform experiments with possible end users, collect feedback and implement appropriate improvements and corrections.

Source: Author.

1.4 Organization

This document is organized according to the following:

- **Chapter 2: Methodology:** Details of the the methodology adopted during the search, along with it's classification and research schedule.
- **Chapter 3: Background:** Details of main concepts related to this work, such as, resolutions and OAs.
- **Chapter 4: Grey Literature:** This chapter presents in more detail the review performed in the grey literature to find similar tools.
- **Chapter 5: Survey:** Provides details about the survey performed, its protocol and results.
- **Chapter 6: Extensionly:** Provides details of the design and implementation of the proposed tool.
- **Chapter 7: Conclusions:** This chapter presents the partial conclusions about this study.

2 METHODOLOGY

In this chapter, we presente the methodology, techniques and procedures that were used in the course of this study. Starting with Section 2.1, where we presente the context of the research. In Section 2.2, the search will be classified using terms and definitions presented by Prodanov and Freitas (2013). Then in Section 2.3, it is presented how this study was conducted, along with the research design, the research schedule, with deadlines and time spaces is in Section 2.4.

2.1 Introduction

In order for the objectives of a study to be successfully achieved, scientific research is considered very important for its contributions. According to (PINGPING; YULAN, 2013), the purpose of a research is to explore the present situation and development of the world, under the previously set goals and unknown knowledge plans.

There are several ways in which scientific research can be conducted and it is assigned to researchers to define which one to use, aiming at the greatest relevance in their results. It is very important that they are chosen as the basis for the development of research, authors and successful studies, because as Dampier and Wilson (2000) says, the advances made previously and the known truths, serve as a basis for the advances of the scientific method.

2.2 Research Classification

The classification of this research was given according to the definitions made by Prodanov and Freitas (2013), in Figure 1 the classification of the research is separated by four groups, each with its respective categories, are the groups: (i) According to the **Approach**; (ii) According to the **Nature**; (iii) According to the **Objectives**; (iv) According to the **Procedures**. In Figure 1 the rectangles filled with blue color represent those that apply to this research.

Starting with the point of view of nature, this fits into **Applied Research**, as it seeks to apply new knowledge generated in objective problems, involving truths, interests and local demands. Bringing to the reality of this work, the knowledge generated refers to all the data collected related to outreach in the course of the study, and the objective problem is the bureaucracy involved in OAs.

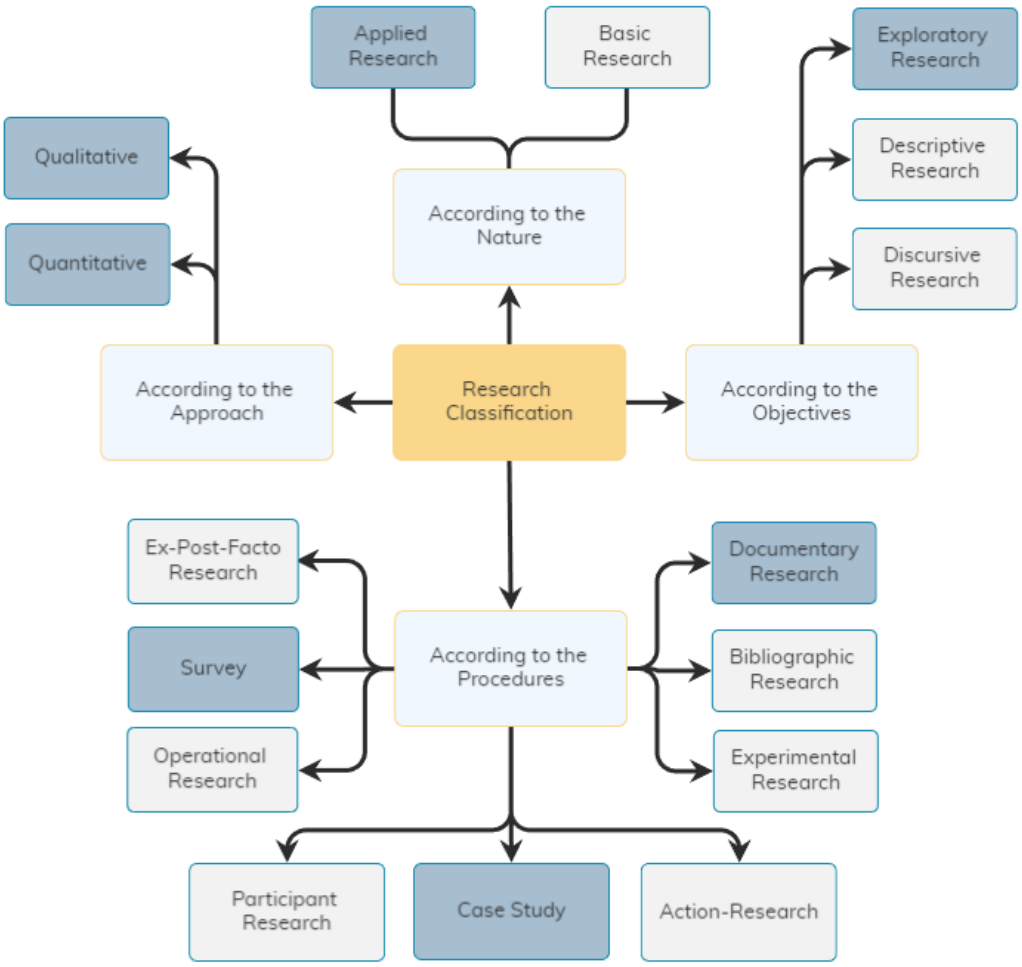
In view of the objectives, this is classified as **Exploratory Research** because to achieve the defined objectives, research in the grey literature and questionnaires with people related to the subject were performed. Thus, using what already exists as a basis, we seek to build a new improved solution.

In relation to technical procedures, **Case Study** is applied, as it seeks to collect information from individuals, tools, processes, related to the main theme using **Qualitative**

methods, to be able to place the results and graphs and analyze them, and **Quantitavive**, allowing a deeper understanding of what was answered. The **Survey** classification also applies, as this is one of the ways of collecting information used by researchers. Before the survey execution with the participants, a pilot test was conducted to validate organization, completeness, coherence and other points of the questionnaire, more of this will be discussed in Chapter 5.

Finally, the study is also classified as **Documentary Research**, for using as a knowledge base, materials that have not yet received an analytical treatment, such as internet search results, the subject of grey literature will be better explained in Chapter 4.

Figure 1 – Research Classification



Source: Adapted from (PRODANOV; FREITAS, 2013).

2.3 Research Design

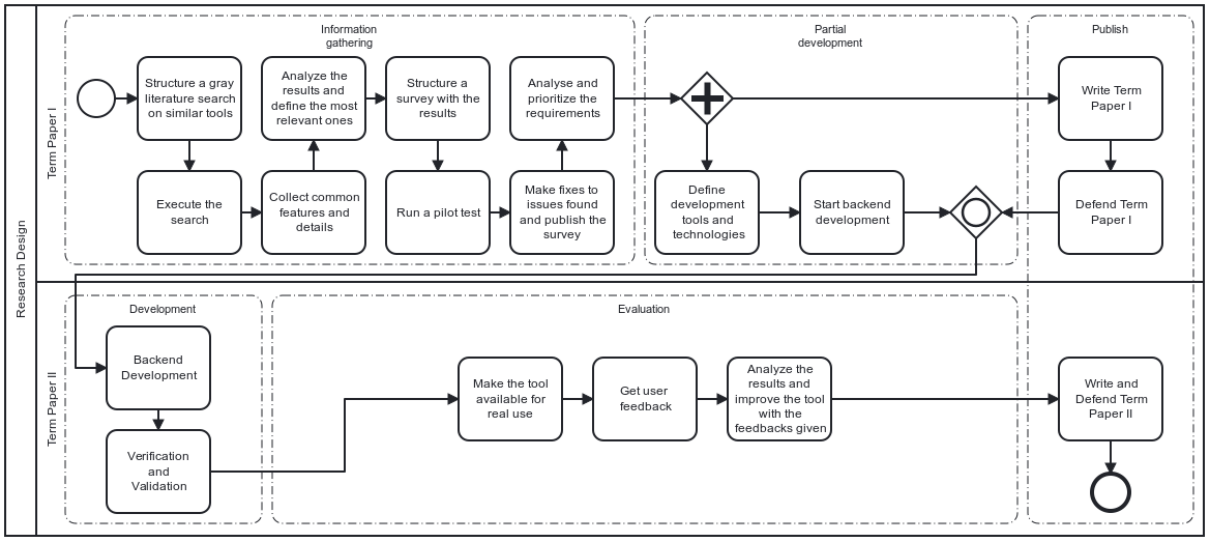
In Figure 2 is represented the flowchart followed in the course of this research, the activities placed in it are divided into five phases: (1) Information gathering; (2) Partial development; (3) Development; (4) Evaluation; (5) Publish.

The first phase, **Information Gathering**, is focused on organizing research structures, questionnaires, prioritization of information, and learning about the research topic. Mainly aimed at producing two important artifacts of the research, the review in the grey literature and the survey with possible end users.

Moving on to the second phase, **Partial Development**, where it was decided among those involved in the project, that it would not be feasible to implement the entire tool at this first moment, so only some more important functionalities and that would already be sufficient for a MVP, which is defined by Ries (2011) as a new product version that enables a team to gather the most verified customer learning possible with the least amount of work, would be developed. Within the **Publish** phase, the two TPs will be written and defended, occurring in parallel to the development of the tool, mostly happening in the **Development** phase.

After there is a stable version of the tool, where users can use it, it will be available for real use, allowing UNIPAMPA's outreach activities to be registered and opening vacancies for participant or volunteer registrations, with this in the phase of **Evaluation**, feedbacks will be collected, analyzed the results and improvements in the tool will be made.

Figure 2 – Research Design



Source: Author.

2.4 Research Schedule

To facilitate the visualization of how the activities took place over time. Table 2 presents the entire schedule of what was planned from the collection of information to the defense of Term Paper II.

Table 2 – Research Schedule

Activities	2021/2	2022/1					2022/2				
	Nov - Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Plan and execute systematic review in the grey literature											
Plan and execute survey with target users											
Analyze results from previous steps and map requirements											
Plan and start tool development											
Write Term Paper I											
Defend Term Paper I											
Continue the development of the tool											
Execute a real use case on the tool											
Write Term Paper II											
Defend Term Paper II											

Source: Author.

2.5 Chapter Summary

In this chapter we have presented the meaning of methodology, and how it can be classified within a scientific scope, along with what terms apply to this TP. In addition, the research design was presented containing the steps taken by the author, as well as those that will be given.

3 BACKGROUND

This chapter discusses subjects that complement the objective of this work, helping to understand the policies and resolutions involved. In Section 3.1 the national outreach activity policy will be presented, which is valid for all of Brazil on the objectives that university outreach has in relation to the academic and external community. Then in Section 3.2 the vision of how Unipampa has adapted to receive these new rules. After that, in Section 3.2.1 the difference between outreach programs and projects will be presented, along with the most pertinent processes related to them in Section 3.2.2, followed by a more detailed explanation about the "Unipampa Cidadã" project in Section 3.2.3. The Section 3.3 highlights some tools related to the subject of the work, their commonalities and a high-level description. Finally in Section 3.4 a general summary of the chapter is presented.

3.1 National Outreach Policy

It is well-known that university outreach is an area of great importance for the academic and external community, also being a tool for connecting professors, students and the community, having a high impact on the soft skills a student formation. To strengthen the objectives that university outreach has within this universe, the Forum of Pro-Rectors for Outreach of Brazilian Public Universities (FORPROEX), updated the old version of the National Outreach Policy document, published in 1999, with current situations and challenges found in recent years. The new version of the document, (FORPROEX, 2012), within its objectives, has as an example the following:

- Achieve the recognition of university outreach activities as an essential tool for the public university;
- Ensure that the outreach activity is the solution to any type of social problem faced by the country;
- Defend the funding of outreach programs and projects so that they can continue to function;
- Promote environmental and sustainable awareness in outreach projects in Brazil;
- Promote solidarity both nationally and internationally, covering the area of impact of outreach actions.

Serving as a basis for universities, the document "Referential for the construction of a National Outreach Policy in Higher Education Community Institutions (ICES)" (FOREXT, 2013), discusses a little about the doubt of classifying an academic activity as outreach or not, but leaving as a fact the following sentence "If the theoretical dimension

of university outreach tends towards greater rigidity - in the sense that it needs to keep principles, resume references, dialogue with other institutional documents – the practical dimension allows for greater flexibility, giving rise to a considerable diversity of actions" (FOREXT, 2013, p.43). This document also highlights the importance of integrating outreach with research and teaching, with discussions of a social nature and the effects of the results on society.

As policy aforementioned, nine possible outreach activity types are discussed in depth, each with its peculiarities, dividing them into direct outreach actions and actions that allow the integration between outreach and teaching or outreach and research.

3.1.1 Outreach Activity Curricularization in Higher Education

Entering the scope of higher education, Resolution No. 7, of December 18, 2018 (SUPERIOR, 2018) was created, where it established guidelines, principles, foundations and procedures for university outreach in Brazilian higher education. In this way, it was regulated that the OAs will be made available in the form of curricular subjects for the courses.

In this document, it is also determined that OAs must make up at least 10% (ten percent) of the entire workload of undergraduate courses, being characterized as an interventionist activity that directly involves the external community and is related to student training.

Another important point raised is related to the self-assessment of outreach activities, in order to constantly improve it. This evaluation should include the identification of the relevance of the use of OAs in curricular accreditation, the contribution to the fulfillment of the objectives of the IDP and the Pedagogical Projects of the Courses and, finally, the presentation of the results achieved in relation to the participating public.

All OAs must also be registered according to the rules mentioned in the same resolution (SUPERIOR, 2018), and must contain the planning of their internal activities, strategies for self-assessment, proposal, development and conclusion, these must be duly registered and analyzed in order to be able to organize your work plans.

Finally, the aforementioned resolution determines that "Higher education institutions will have a period of up to 3 (three) years, counting from the date of their approval, to implement the provisions of these Guidelines."

3.2 Outreach Activity Curricularization in Federal University of Pampa

In UNIPAMPA's view, like all other Higher Education Institution, must have a resolution aimed at standardizing OAs in general, presenting what they are, their target audience, objectives, etc. In view of this, UNIPAMPA, in CONSUNI/UNIPAMPA Resolution No. 332 of 2021, (PROEXT, 2021b), determines the types of outreach activities,

already mentioned in Chapter 1, its managing bodies, executing team, possible related processes, and some rules such as the minimum duration of 8 (eight) hours, taking into account the period of organization, execution and preparation of the final report.

For some time now, UNIPAMPA has been implementing some outreach projects within its curriculum, for example in the Software Engineering course where, within the Problem Solving subject, students meet in groups, similar to development teams and project management, where they are assigned to work on real demand for someone in the external community. This activity provides the student with a very rewarding experience, for the opportunity to talk, interact and contribute directly with a customer who needs help in solving a problem.

The main objectives in the insertion of outreach activities in undergraduate courses, which UNIPAMPA highlights in its Resolution No. 317 of 2021, (UNIPAMPA, 2021b) are the following:

- Help students develop their critical, citizen, interdisciplinary and responsible education;
- Improve teaching in undergraduate courses as a whole and strengthen the inseparability among teaching, research and outreach;
- Strengthen UNIPAMPA's social commitment;
- Stimulate constructive discussions in all sectors of UNIPAMPA;
- Promote actions that strengthen UNIPAMPA's ethical principles and social commitment in all areas;
- Encourage the academic community to be more present in human, academic, social, cultural, and economic development.

3.2.1 Outreach Programs and Projects

To explain what outreach projects and programs are, the definitions of FOREXT (2013) will be used, which says that they are activities regulated internally by the institution that articulates events involving teaching and research, always involving the external community. With them, students can take attitudes and decisions directly about the community in which they live, contributing to its evolution and progress. In addition to helping the external community, National Forum for Outreach and Community Action of Universities and Community Higher Education Institutions (FOREXT) says that the programs and projects do not seek to create a bond of dependence with the university, so it is necessary to solve the problem with the most efficiency and quality possible.

Because the two terms are similar, some confusion can arise, so Viero (2012) highlights the difference between the two, citing the definitions made by University Outreach Program (ProExt):

> It is important to point out that ProExt provides for two sets of university outreach actions: outreach projects, defined as "a set of continuous procedural actions, of an educational, social, cultural or technological nature, with a specific objective and a determined period"; and outreach program, as "an articulated set of projects and other outreach actions, preferably of a multidisciplinary nature and integrated with research and teaching activities (VIERO, 2012).

Within the UNIPAMPA Alegrete campus there are some current projects and programs, examples of which are with their respective coordinators: (1) **Ciência a Cavalo: University and Basic Education Hand in Hand for Strengthening Education**, Profº Marco Antonio Durlo Tier; (2) **IT consultancy for Agribusiness Companies**, Profº Elder de Macedo Rodrigues; (3) **Empresa Júnior: Multi Advisory and Solutions in Junior Engineering - MASE Junior**, Profº José Gabriel Vieira Neto; (4) **Espaço Maker** - Criative Learning, TAE Vitor Almada; (5) **Programa UniHacker.Club**, Profº Diego Luiz Kreutz; (6) **UNIPATAS Alegrete: Protection, Sterilization and Adoption**, TAE Camila da Costa Lacerda Tolio Richardt; (7) **Programa C**, Profª Aline Vieira de Mello; (8) **Programa JEDI**, Profº Maicon Bernardino da Silveira.

3.2.2 Processes for New Proposals for Outreach Programs and Projects

In order to register a new outreach program or project and generate certificates at the end, there are some rules defined by PROEXT (2021b), which must be performed beforehand. With these documents in hand, UNIPAMPA standardized some process flow schemes, so that all proponents are aware of what happens after the proposal is made.

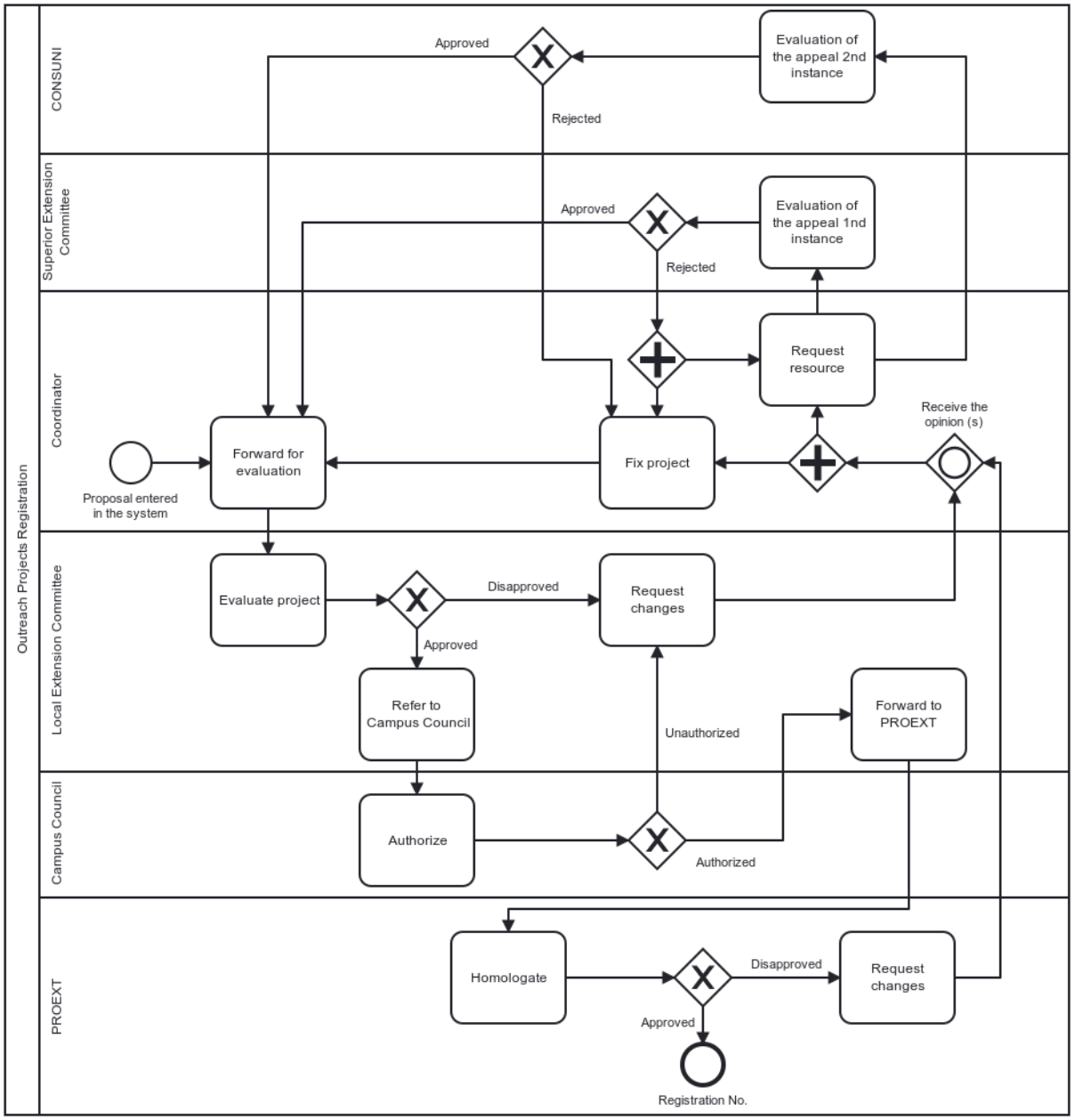
In Figure 3, the registration flow of a new outreach project is presented, in which it is possible to see that the proposal goes through several steps of corrections and evaluations, being sent to several actors throughout the process.

In Figure 4, the steps related to the approval and generation of certificates are represented, starting with the proponent of the activity having the attendance list and the spreadsheet with information for the generation of certificates. Then, a final report is built and inserted in the Information System for Research, Teaching and Outreach Projects (SIPPEE) system, it is evaluated and approved, reaching again at PROEXT which, with the spreadsheet sent, sends its data to the Electronic Certificate Management System (SGCE) system, receiving the certificates and sending them to participants' emails.

3.2.3 "Unipampa Cidadã" Program

UNIPAMPA through Normative Instruction No. 18 (UNIPAMPA, 2021a), using Resolution No.317 (UNIPAMPA, 2021b), established that the outreach project called

Figure 3 – Outreach Projects Registration



Source: Adapted from (PROEXT, 2022).

"Unipampa Cidadã" must be offered by all courses, consisting of citizenship and solidarity activities and with the objective of training graduates aware of their social responsibility, stimulating and increasing integration with the local community.

After the implementation of the project in the institution's courses, it must be carried out by all students, the course offered for the project must have a minimum of 60 and a maximum of 120 hours. Community actions must be carried out in public institutions, Non-Governmental Organizations (NGOs) and organizations or associations

of organized civil society. The course outreach supervisor is responsible for carrying out the project evaluation, planning, monitoring, validation and he will be responsible for approving the beginning of the activities.

The project also makes available in Normative Instruction Nº 18, a form template for filling in data when the activities are completed, allowing the student to reflect on the impact of the project under their view, pointing out what they learned during the execution. Finally, the supervisor can make observations about the student and indicate whether he or she passed or failed.

3.3 Similar Outreach Support Tools

In conjunction with Chapter 4 that will present the review conducted in the grey literature, some tools were researched to acquire information on how the market is in relation to outreach in universities. With the results it was possible to raise functionalities, details and common points among the tools.

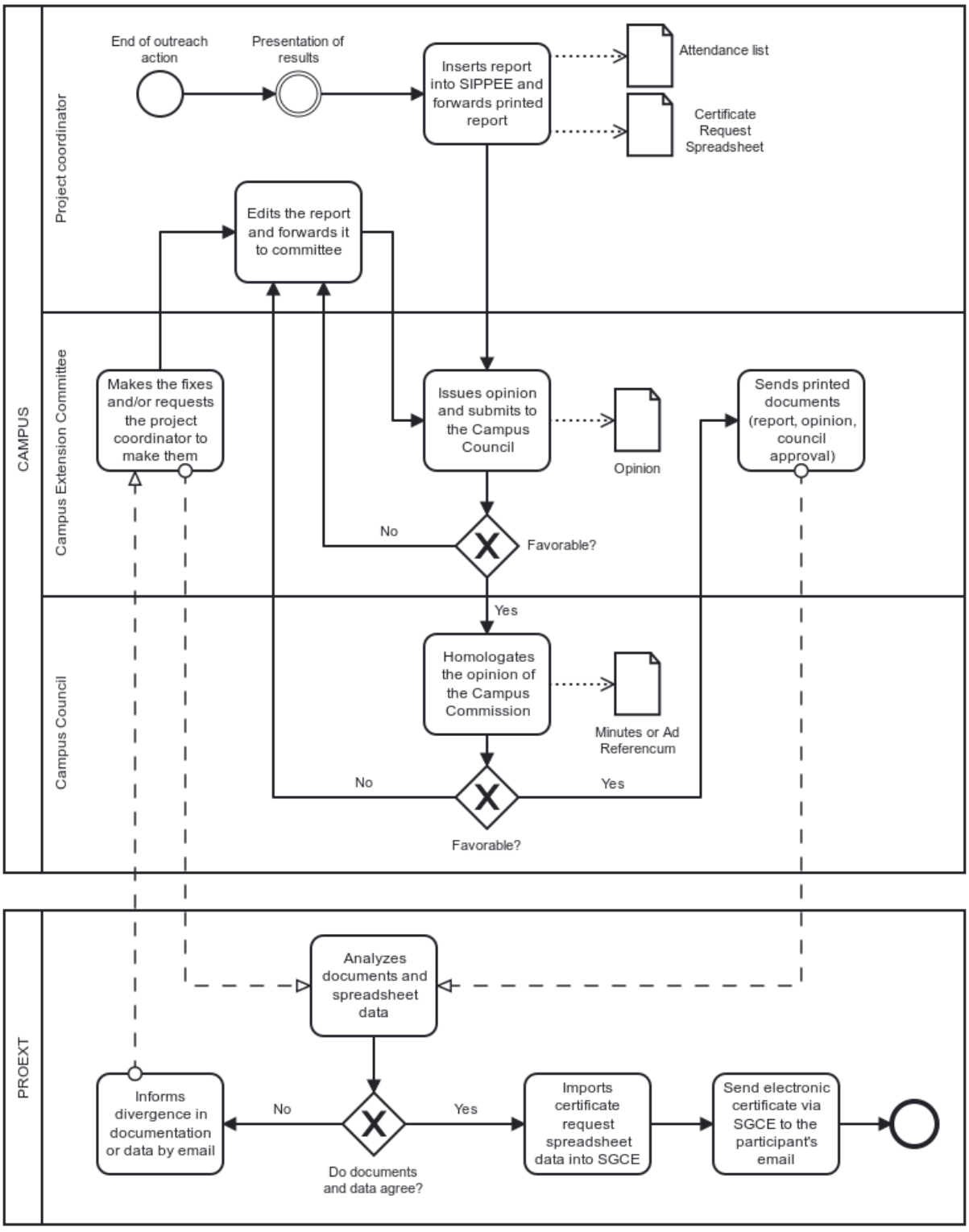
At first, the authors sought to make a systematic review of the white literature, but the results found would not be completely satisfactory, since the manual exploration by various tools related to the topic would bring more content to be classified and discussed among those involved in the research.

During the execution of the review, the tool that returned the most results and was always present in the research was Integrated Academic Activities Management System (SIGAA), which is the most used by several institutions, being very complete, containing parts in its system aimed at most processes involving an institution. Another one that presented interesting results was Outreach Actions Control (CAEX), which presented several unique features, being only it that presented them, with this it was possible to extract ideas of great importance for the construction of a complete tool.

3.4 Chapter Summary

In this chapter, guidelines of various resolutions and regulations related to outreach were presented, both in the country as a whole and in UNIPAMPA. It was also discussed the similarities and differences between the terms outreach program and project, presenting the most relevant processes involved in its life span. As a more recent example of an outreach program, “Unipampa Cidadã” had part of its objectives and guidelines presented, finally, a little discussion about the grey literature review carried out by the participants of this research was discussed, so in the next chapter, criteria will be more in-depth, methodology, results, research questions, among other information relevant to grey literature.

Figure 4 – Issuance of certificates



Source: Adapted from (PROEXT, 2022).

4 GREY LITERATURE

Before beginning to develop the solution itself, it would be extremely beneficial to conduct a systematic review of the grey literature to map and assess existing tools and solutions that already address the issue of managing outreach activities in the context of HEIs. This research will ultimately result in a software product. Two authors did the review. Although the two term papers were prepared independently, as was already indicated, the artifacts produced to support the study were produced collectively.

The systematic review of the grey literature is described in this chapter. Additionally, data gathered during the study that is pertinent to the creation of the target product will be presented. In addition to a thorough examination and comparison of the chosen tools, the protocol established to conduct the evaluation will be covered, citing details such research questions, inclusion and exclusion criteria, extracted data, and search strings.

In this manner, the chapter is structured in the following way: Introduced in the Section 4.1 are words and ideas utilized in the study. The technique outlined by the authors will be presented in Section 4.2. The methods used in the study and the information gathered to address the research questions will be explained in the Section 4.3, while the Section 4.4 highlights risks to the study's validity. The systematic review is concluded by Section 4.5.

4.1 Background

The following definition of grey literature comes from Garousi, Felderer, and Mäntylä (2019, p.2):

> <grey literature> is produced at all levels of government, academia, business, and industry in print and electronic formats, but is not controlled by commercial publishers, or that is, where publication is not the main activity of the producing body.

The quality of software described as a "black box" is one in which the internal workings of the system are unknown; its use solely concentrates on the outputs produced in response to chosen inputs and execution conditions Nidhra and Dondeti (2012).

This phrase was used in relation to the Google search engine, where it is unknown exactly what occurs internally other than the fact that occasionally, despite the identical search word, the results differ just little.

4.2 Planning

Due to the limited amount of formal works published on the issue of outreach activities management, the authors determined that a systematic review of the grey literature would be more interesting and valuable to the study than one in the white literature.

4.2.1 Reasons for Carrying out the Review

The following were the key justifications given by the authors to include a review of grey literature in their study: (i) More tools than formal articles in search results; (ii) Very few results were obtained when the search terms were applied to white literature; (iii) There are a number of tools and solutions without published articles; (iv) The authors are looking for tools in order to gather functionality ideas and inspiration for the creation of the intended product.

The questions and their responses that were used to make the choice to conduct the review of the grey literature can be found in Table 3. Additionally, the following objectives were specified for carrying out the review:

(i) Find free tools that partially support academic management; (ii) Find features in existing tools; (iii) Validate ideas for features and data that will be used in the solution.

Table 3 – Questions for Inclusion of Grey Literature

Question	Answer
Is the subject "complex" and insoluble considering only the formal literature?	No
Is there a lack of volume or quality of evidence, or lack of consensus on outcome measurement in the formal literature?	Yes
Is contextual information important to the subject under study?	Yes
Is the objective to validate or corroborate scientific results with practical experiences?	No
Is the aim to challenge assumptions or falsify results of practice using academic research or vice versa?	No
Would a synthesis of insights and evidence from the industrial and academic-community be useful to one or even both communities?	Yes
Is there a large volume of professional sources that indicate high professional interest in a topic?	Yes

Source: Adapted from Garousi, Felderer, and Mäntylä (2019).

4.2.2 Research Questions

The research questions that the authors have identified for the systematic review are listed in Table 4.

Table 4 – Research Questions

ID	Question
RQ 1.	What tools currently exist that perform academic management?
RQ 1.1.	Which ones have related functionality or support outreach activities?
RQ 1.2.	What are the features offered by these tools?
RQ 1.3.	What are the most common features between this type of tool?
RQ 1.4.	What data do the tools use in relation to activities, participant registration and user registration?

Source: Author.

The search terms were developed by modifying the approach utilized in (GODIN et al., 2015). The first step was to establish search phrases using words like **extensão** (outreach), **programa** (program), **projeto** (project), **gerenciamento** (management) and **atividade** (activity).

Additionally, because the search engine's site filter was initially employed and the scope of the project was restricted to outreach initiatives at Brazilian universities, only websites with the specified ".edu.br" ending would be displayed. Later on, it was discovered that it would have been wiser to remove the filter because some private universities do not use the .edu domain extension.

In the end, the authors generated ten search strings, seven of which combined the terms "**extensão** (**programa** | **projeto**)", which were deemed to be the most pertinent terms. There were 100 (one hundred) entries per string and a limit of only using the first ten pages of the search engine's results meant that there were a total of 1000 (one thousand) records.

The keyword "SIGAA" was removed after the first search because it is a tool used by many public universities as said by Graças Vieira and Machado (2013), it cluttered the results with essentially the same record, potentially hiding other solutions. The defined strings are presented in Table 5.

Table 5 – Search Strings

No.	Search String
1	sistema gestão acadêmicas (atividades | projetos) site:.edu.br
2	(sistema | ferramenta) gestão acadêmicas (atividades | projetos) extensão site:.edu.br -SIGAA
3	(ferramenta | aplicação) extensão (programa | projeto) (gestão | gerenciamento) -SIGAA
4	(app | aplicativo) extensão (programa | projeto) (administração | gerência) -SIGAA
5	ferramenta extensão (programa | projeto) (gestão | gerência) -SIGAA
6	(ferramenta | aplicação | app | aplicativo) extensão (programa | projeto) gestão -SIGAA
7	software extensão (programa | projeto) (gerência | gestão | controle) -SIGAA
8	(software | ferramenta | aplicação) extensão atividade -SIGAA
9	sistema extensão (projeto | programa | atividade) gestão -SIGAA
10	acadêmica extensão (projeto | programa | atividade) -SIGAA

Source: Author.

The Google search engine was used to conduct the actual search for the strings.

4.2.3 Inclusion Criteria

The inclusion criteria were developed over the course of two stages. The authors implemented a filter in the first stage to distinguish tools from catalogs due to the significant number of institutional sites that were simply catalogs of outreach initiatives. The outcome must meet at least three of the following standards in order to be considered: (a) User login; (b) Registration of activities; (c) Activity listing; (d) Possibility of signing up for outreach activities.

Step 2 was implemented once the results had been filtered using the aforementioned criteria. In it, the criteria defined for inclusion were more rigorous. They are listed in Table 6 as follows:

Table 6 – Inclusion Criteria

ID	Inclusion Criteria
IC 1.	The tool or website supports the management of outreach activities.
IC 2.	The tool or website has a stable version.
IC 3.	If it is a tool, it must have documentation.

Source: Author.

4.2.4 Exclusion Criteria

Exclusion criteria were also established, and any result that met even one of these was automatically disqualified from further consideration. Six criteria were initially created by the authors, but following alignments with the adviser, it was determined that two of them were superfluous. The remaining factors, which affected the results, are shown in Table 7.

Table 7 – Exclusion Criteria

ID	Exclusion Criteria
EC 1.	If it is a tool, it does not have a source code download or an online page.
EC 2.	The tool or the website has not received updates for more than 10 years.
EC 3.	The tool or website is for the exclusive use of the organization, that is, closed to the external public.
EC 4.	The tool or website is paid and does not provide a trial version or all outreach activities are paid.

Source: Author.

4.2.5 Quality Criteria

Five quality criteria that are focused on traits deemed relevant within a tool and how it differs from the others were created to evaluate the quality of the tools that passed the inclusion and exclusion criteria. The scale used in the article by Iung et al. (2020) was modified to quantify the scores for each criterion and is as follows: (i) **Y**es: 1.0; (ii) **P**artially: 0.5; (iii) **N**o: 0. The defined criteria are shown in Table 8.

4.2.6 Data Extraction Strategy

After the final list of tools was selected, a manual data extraction was done in order to respond to the research questions that have been established Table 4. In the beginning, we look for all the OA functionalities the program has, creating a data matrix.

Table 8 – Quality Criteria

ID	Quality Criteria	Score		
		Yes (1)	Partial (0.5)	No (0)
QC 1.	Does the tool use a relevant amount of data related to outreach activities?	The tool uses >=20	10 - 19	10 pieces of information
QC 2.	Does the tool have unique features among the selected tools?	The tool has 1	1	No unique features
QC 3.	Does the tool have a relevant amount of features among those collected?	The tool has >=14	9-13	8 features in common with other tools
QC 4.	Does the tool have specialized support?	Yes	Partially	No
QC 5.	Has the tool been maintained frequently?	The last update was in 2022	2021-2019	2018 and before

Source: Author.

There, all the different functionalities found between the results are listed. The matrix is discussed in more detail in Section 4.3.2.1 below.

Afterwards, a new manual extraction was carried out while highlighting the first four most pertinent properties that were shared by all of the studied tools. Now with the intention of discovering every feature these solutions had. It is much simpler to handle similar problems that will eventually arise when constructing the goal product if this data is refined and tabulated.

4.3 Reporting

The search and record mapping was carried out between 17/02/2022 and 20/02/2022, with the objective of starting and ending in close dates, thus reducing one of the threats to validity.

4.3.1 Research

Both authors contributed equally to the overall workload. In this manner, each person examined five of the ten pages using the search term, yielding fifty results per search string and 500 results per author. Initially, 169 (one hundred sixty nine) results were collected, as shown in Table 9.

There were 56 (fifty six) results left after applying the first step of the inclusion criterion. The findings were then further decreased once the verification with the second step of the inclusion and exclusion criteria was completed, with 19 (nineteen) tools failing **IC 1.**, 8 (eight) tools failing **IC 2.**, and 24 (twenty four) tools being rejected for failing **IC 3.** Regarding the exclusion criterion, only one tool was removed by **EC 1.** and also only one by **EC 2.**. However, 14 (fourteen) tools failed **EC 3.**, and the same number

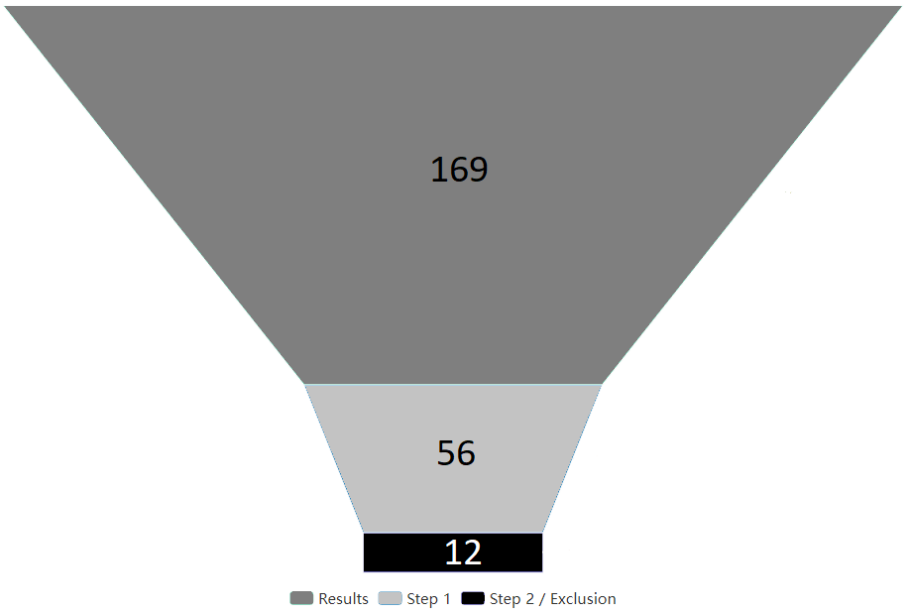
failed **EC 4.** As can be seen in Figure 5, there were only 12 (twelve) tools and websites left to be examined.

Table 9 – Search Results

No.	Search String	Evaluated Results	Potential New Tools	Total
1	sistema gestão acadêmicas (atividades | projetos) site:.edu.br	100 out of ∼1.250.000	4	4
2	(sistema | ferramenta) gestão acadêmicas (atividades | projetos) extensão site:.edu.br -SIGAA	100 out of ∼182.000	11	15
3	(ferramenta | aplicação) extensão (programa | projeto) (gestão | gerenciamento) -SIGAA	100 out of ∼15.600.000	9	24
4	(app | aplicativo) extensão (programa | projeto) (administração | gerência) -SIGAA	100 out of ∼7.140.000	13	37
5	ferramenta extensão (programa | projeto) (gestão | gerência) -SIGAA	100 out of ∼11.000.000	27	64
6	(ferramenta | aplicação | app | aplicativo) extensão (programa | projeto) gestão -SIGAA	100 out of ∼22.500.000	15	79
7	software extensão (programa | projeto) (gerência | gestão | controle) -SIGAA	100 out of ∼8.300.000	24	103
8	(software | ferramenta | aplicação) extensão atividade -SIGAA	100 out of ∼30.900.000	10	113
9	sistema extensão (projeto | programa | atividade) gestão -SIGAA	100 out of ∼26.400.000	30	143
10	acadêmica extensão (projeto | programa | atividade) -SIGAA	100 out of ∼17.000.000	26	169

Source: Author.

Figure 5 – Results x Criteria



Source: Author.

4.3.2 Data Extraction

This section explains how the two data extractions from the discovered tools were carried out: one for the feature matrix and the other to collect more details on the key features shared by the tools.

4.3.2.1 Feature Matrix

It was important to develop a functions matrix among the filtered results after the research was completed in order to apply the quality standards. In this way, the authors were able to understand which features are present most frequently among the evaluated tools. There were determined to be 37 features in total, some of which repeated more frequently than others. The matrix can be seen in Figure 6.

Lighter gray highlights were utilized to draw attention to the characteristics that were shared by all of the examined tools and websites so that they could be used as criteria in the subsequent stage of data extraction.

4.3.2.2 More Information from Important Features

The goal of the second data extraction was to determine which data was utilized to (i) Listing of outreach activities; (ii) Detailed page of an activity; (iii) Enrollment of a participant into an activity; (iv) Registration of users external to the institution.

It was challenging to unify the analysis because each tool has its own format and attribute naming, so the original names were kept. To prevent confusion, tools that lacked the chosen features have been highlighted in grey, rather than having the cells left blank. Because it was nearly impossible to try to follow a pattern for all the tools, the extracted findings are written informally. The extracted data can be seen in Figure 7.

4.3.3 Tool Classification

The extracted and tabulated data allowed for the classification of the tools based on the previously established quality standards. The scoring range for a tool is from 0 (zero) to 5 (five). The final results are shown in the table Table 10.

With this classification, it is clear that the CAEX tool and SIGAA received the highest ratings, which was exactly what was anticipated. First, SIGAA is one of the academic management tools that institutions in the nation utilize the most, and CAEX is the tool that offered the most distinctive features. As a result, they were two instruments that had a lot of promise and were very helpful in gathering data to create the goal product.

Figure 6 – Feature Matrix

		Tools											
		Cachalote	CAEX	Einstein	ENS	Santa Marcelina	SGE	SIEX	SIG	SIGAA	Suap	UNINASSAU	UNINTER
Features	System login	X	X	X	X	X	X		X	X	X	X	X
	Outreach activity listing	X	X	X	X	X	X	X	X	X	X	X	X
	Issuance of certificates	X	X						X	X		X	X
	Certificate validation	X	X				X		X	X	X		
	Application for activity evaluator	X									X		
	Event details page	X	X	X	X	X	X	X	X	X	X	X	X
	Event enrollment	X	X	X	X	X	X		X	X	X	X	X
	Detailed schedule	X					X		X	X	X		X
	Event query with filter		X	X	X		X	X	X	X		X	X
	Calendar view		X								X		
	External user registration	X	X	X	X	X	X		X	X		X	X
	Registration of interest in areas of knowledge		X	X									
	Discussion forums by event		X										
	Attendance recording - MGMT		X										
	Proposals for new events - MGMT		X										
	Task evaluation environment - MGMT	X	X										
	Transform proposals into events - MGMT		X										
	Manage submissions - MGMT		X										
	Enable certificates - MGMT		X										
	Fill in the final report - MGMT		X										
	Responsible teacher details		X	X	X					X			X
	List of events by teacher			X						X			
	Favorite events			X									
	Text event search	X		X		X	X	X	X	X			X
	Application of interest (when applications are not open)				X								
	Registration of event prerequisites				X								
	Enrollment form without login				X						X		
	Related events				X	X		X	X				
	Print enrollment status						X						
	Edit enrollment		X				X		X	X			
	Print event information							X					
	History of past versions of the event							X				X	
	Teacher's notes									X			
	Logged user event listing		X	X			X		X	X		X	X
	Logged user event history		X				X		X	X		X	X
	Help area (frequently asked questions, manuals)	X		X			X		X		X		X
	Testimonials from past participants				X								
	Sum of features	**12**	**22**	**13**	**12**	**7**	**14**	**7**	**15**	**16**	**10**	**10**	**13**

Source: Author.

4.3.4 Answering the Research Questions

The research questions are under Table 4 and were introduced earlier in the study. However, each question is also described below, for the sake of convenience.

- **RQ 1.** What tools currently exist that perform academic management?

  This is a question that also refers to some instruments that were eliminated during the use of inclusion and exclusion criteria. In this instance, 36 tools supporting academic management of various kinds were found, but only 12 of them meet the required requirements and are mentioned in the tool matrix in Figure 6.

- **RQ 1.1.** Which ones have related functionality or support outreach activities?

Figure 7 – Additional Information Extraction

		Features			
		Listing of outreach activities	**Detailed page of an activity**	**Enrollment of a participant into an activity**	**Registration of users external to the institution**
Tools	**Cachalote**	Image and title, duration, location, "Learn More" button.	Activity image, description, duration, location, contact phone, contact email, enrollment period and detailed schedule.	Description of the participant's disability, if any.	Name, username, email and password.
	CAEX	Title, duration, enrollment period and "Learn More" button.	Presentation of the activity, general objective, justification, beneficiary, "I want to register" button .	**Step 1**: Choose the activity; **Step 2**: Education, course, institution, scholarship holder?, funder, occupation, place of work; **Step 3**: Select which sub-activities you want to participate in; **Step 4**: Review completed information, confirm.	CPF, name, category, date of birth, sex, place of birth, nationality, marital status, password.
	Einstein	Image, category, title, "Learn More" button.	About, objectives and qualifications, student profile, program and methodology, faculty, FAQs, target audience, period, investment.	Select class, payment information.	Email
	ENS	Image, title, start date, "Learn More" button.	About, content, modality, validity, duration in hours, contact information, prerequisites, investment, faculty, testimonials from participants, related courses.	**Step 1**: Entry form, CPF, name, email, telephone; **Step 2**: Course, location, modality; **Step 3**: Personal data, CPF, name, email, telephone, gender, education level, address; **Step 4**: Review of information; **Step 5**: Payment if necessary; **Step 6**: Conclusion.	User-related data used in event registration
	Santa Marcelina	Image, title, brief description.	Link to application form, presentation, target audience, faculty, contact, related activities.	Desired activity, full name, email, date of birth, RG, CPF, telephone number, address, do you have a link with the institution?, how did you find out about the activity?	User-related data used in event registration
	SGE	Image, title, enrollment period, short description, "Learn More" button.	About, validity, certification, modality, transmission platform, target audience, faculty, schedule.	Select which event activities you want to participate in.	Name, nationality, CPF, gender, type of participant, telephone, institution, email, password.
	SIEX	Registration number, type (project, program...), title, unit, department, coordinator, status, functionality to print.	**Description**: Activity data, characterization (year it started, unit, linked program, extension line, knowledge area, keywords, thematic area). **Full description**: Presentation and justification, general objectives, specific objectives, methodology, evaluation method, website, internal or external target audience, characterization of the target audience. **Plans**: Activity plans, monitoring and guidance plan, evaluation process. **Specific information**: Physical infrastructure, link with teaching?, link with research?, estimated public. **Additional information**: Faculty (Position of participation, name, telephone, email, unit, department, period of work). **Partner institutions**: CNPJ, name, characterization, type. **Scope**: Name, state, county, zip code, details. **Linked activities**: Type, registration number, title, status. **Results achieved**: Specific results, general results. **Productions**: Type, title, date of publication/delivery of the product, identification/reference. **History**: Name of the activity along with the date it was performed, Print PDF Review Information.		
	SIG	Title, type, details, schedule, enrollment.	**Activity data**: Type, title, description, free?, total workload, total vacancies, scope, thematic area, knowledge area, classification, promoting unit, coordinator. **Period**: Start date/time, End date/time. **Contacts**: Phone, email, website, registration period.	Just subscribe button after being logged in.	**Access data**: Email. **Personal data**: Name, gender, date of birth, marital status, nationality. **Documents**: CPF, passport, RG, address. **Professional data**: Academic degree, training, institution that obtained the highest degree, institution where you work. **Contacts**: Phone, cell phone.
	SIGAA	Year, title, type, department.	Title, year, no. of scholarships awarded, no. number of students involved, estimated audience, period, main area, CNPq area, proposing unit, units involved, type, cities where it will be held, spaces where it will be held, source of funding, workload, number of vacancies, person responsible for the action, email of the person responsible , url, summary, schedule, internal target audience, external target audience, team members (name, role, category (faculty, student)), photo list, enroll button.	**Activity data**: Title, coordinator, remaining vacancies, proposing unit, instructions, general information. **Completed by the participant**: Link (institution), file if necessary (file description).	Personal data: CPF, RG, name, date of birth, address, contact (phone, cell phone), authentication (email, password).
	Suap	Title, description, enrollment period	Title, presentation, workload, location, start of registration, end of registration, start, end.	Name, email, telephone, CPF, profile (student, external audience).	
	UNINASSAU	Title, category (lecture, personal development...).	Start date, end date, category, image, summary, location. **Activities**: Title, number of vacancies, deadline for registration, period, location, menu, schedule, bibliography.	Vacancies, workload, investment, discount, final value, completion period, user clicks "Finish".	CPF, name, email, address, cell phone, password.
	UNINTER	Image, title, price, add to cart button.	Date, description, realization, target audience, curriculum structure, certification criteria, faculty, sub-activities, how it works.	Add to cart and checkout.	Name, CPF, RG, date of birth, gender, email, cell phone, telephone, address.

Source: Author.

The following tools were found, as it was already demonstrated in Figure 6, which describes the relationships between tools and features: (1) Cachalote; (2) CAEX; (3) Einstein; (4) ENS; (5) Santa Marcelina; (6) SGE; (7) SIEX; (8) SIG; (9) SIGAA; (10) SUAP; (11) UNINASSAU and (12) UNINTER.

- **RQ 1.2.** What are the features offered by these tools?

  The features matrix, which is present in Figure 6 and has a total of 37 features, contains a list of every feature that was discovered.

Table 10 – Quality Criteria Evaluation

		Quality Criteria										
		QC 1.		QC 2.		QC 3.		QC 4.		QC 5.		Final
		A	S	A	S	A	S	A	S	A	S	Results
Tools	**Cachalote**	9	0,0	No	0,0	12	0,5	Partially	0,5	2021	0,5	1,5
	CAEX	4	0,0	7	1,0	22	1,0	Yes	1,0	2022	1,0	4,0
	Einstein	12	0,5	1	0,5	13	0,5	Partially	0,5	2022	1,0	3,0
	ENS	11	0,5	3	1,0	12	0,5	Partially	0,5	2022	1,0	3,5
	Santa Marcelina	6	0,0	No	0,0	7	0,0	Partially	0,5	2022	1,0	1,5
	SGE	8	0,0	1	0,5	14	1,0	Yes	1,0	2016	0,0	2,5
	SIEX	53	1,0	1	0,5	7	0,0	Yes	1,0	2022	1,0	3,5
	SIG	18	0,5	No	0,0	15	1,0	Partially	0,5	2022	1,0	3,0
	SIGAA	28	1,0	1	0,5	16	1,0	Yes	1,0	2022	1,0	4,5
	Suap	8	0,0	No	0,0	10	0,5	Yes	1,0	2022	1,0	2,5
	UNINASSAU	14	0,5	No	0,0	10	0,5	Partially	0,5	2022	1,0	2,5
	UNINTER	9	0,0	No	0,0	13	0,5	Partially	0,5	2022	1,0	2,0

Legenda: A = Answer | S = Score.

Source: Author.

- **RQ 1.3.** What are the most common features between this type of tool?

  The most common functionalities in this type of tool are: (i) A login system; (ii) Lististing of Outreach Activities; (iii) OA details page; (iv) OA enrollment and (v) Registration of external users. The ability to search for events by text is another feature that is present regularly but not as frequently as the other features; 8 of the tools were found to support this functionality.

- **RQ 1.4.** What data do the tools use in relation to activities, participant registration and user registration?

  By analyzing the second data extraction presented in Section 4.3.2.2, the most common fields for OAs are: (a) Title; (b) Duration; (c) Enrollment period; (d) Contact information; (e) Description; (f) Target audience; (g) Faculty and (h) Schedule.

  Regarding enrollment, the most common fields found are: (a) Participant's personal data; (b) Institutional affiliation; (c) Participant type and (d) Information about the participant's disability, if any.

  When it comes to user registration, these tools mostly employ personal information, authentication information, and an address; however, some also request information about the institution, participant type, and professional data.

4.4 Validity

Some validity threats were found as the systematic review mapping process progressed. Most of them the authors were able to minimize, but others remain unresolved. They are as follows:

- When comparing the findings they both found throughout the study phase, the authors observed that the search results varied just little, between one or two different records. It was an easy threat to mitigate, but it couldn't be completely ruled out. It was decided to perform the search in anonymous mode and log out of the account that was logged into the browser. As a result, there were fewer divergences overall, though there were still some instances of inconsistent outcomes.

- Functionalities of the tools weren't checked with the creators. Unfortunately, the authors were unable to reach any universities to ask about the management strategy being employed.

- The authors aimed to conduct the search in as little time as possible, beginning and finishing it in just three days, in order to reduce the divergence of findings. As the search engine is regarded as a "black box", making it challenging to predict the precise results that will emerge with each search string, the longer the delay, there would be an increasing opportunity to bring threats to the study.

4.5 Considerations

Through this systematic review of the grey literature, it was possible to find tools similar to what the goal product of the whole study should be. Before conducting the review, there was no idea of the current state of the area and of which solutions are most widely used by Brazilian HEI.

AA lot of valuable data was gathered regarding the instruments used today. The management and processes for Outreach Activities were now much more clearly defined. This information will be useful when putting the objective product into use, which seeks to provide a comprehensive solution for OA management.

Additionally, it was possible to provide answers to every research question that had been previously stated in the review protocol.

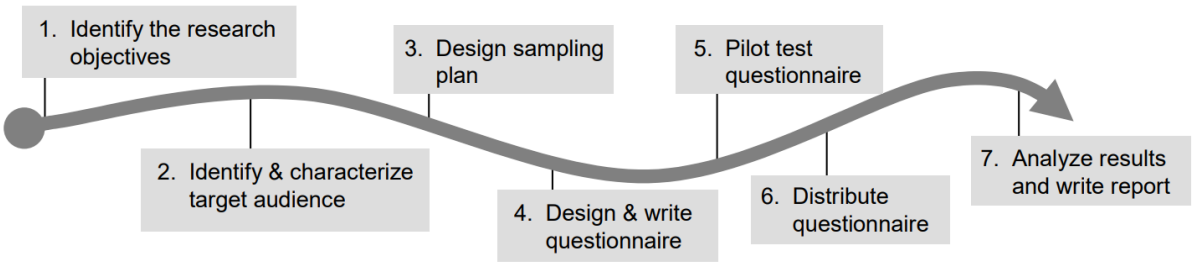
5 SURVEY

In this chapter, more detailed information is presented about the survey that was conducted. The survey was a collaborative effort between two authors, just like the grey literature systematic review discussed in the preceding chapter. Later, we'll go over each person's responsibilities. In Section 5.1, details about the adopted protocol, reference author, and task division among researchers are presented. The Section 5.2, reports threats to the validity of the study, and finally, in Section 5.3, all results achieved during execution are discussed.

5.1 Survey Protocol

According to Kasunic (2005), a survey is a method of gathering and analyzing data in which participants respond to pre-formulated questions or statements. The guidelines suggested by the author served as inspiration for the protocol that was developed for this study and is shown in Figure 8.

Figure 8 – Seven steps of the research process



Source: (KASUNIC, 2005).

The goal is to comprehend teacher and student needs with regard to outreach projects and activities, as will be stated later. The choice of *survey* as a data collection approach is due to the fact that the characteristics of a survey of this type allow us to generalize about the beliefs and opinions of many people by studying only a subset of them (KASUNIC, 2005). In this case, the ideal tool.

Due to the fact that this research was conducted by two students, efficiency and effectiveness were enhanced by dividing the workload. Table 11 shows the division of adopted activities, taking into account those that Kasunic (2005) has already defined.

5.1.1 Identify the Research Objectives

This first step's goal is to explain why conducting a survey is important and what can be accomplished by doing so. Taking into account the results generated by the review

Table 11 – Tasks Separation

Activity	Responsibility
Define and document research objectives	Lucas F.
Define and document research questions	Lucas F.
Define and document how research results will be used	Lucas F.
Define the appropriate target audience for the research	Igor C.
Determine the appropriate media to apply the research in	Igor C.
Recruit members of the target audience to participate in pilot test	Igor C.
Breakdown research questions into questionnaire topics	Lucas F.
Organize and sequence questions	Lucas F.
Review the questionnaire based on the pilot test	Igor C. and Lucas F.
Perform the pilot test	Igor C. and Lucas F.
Evaluate comments	Igor C. and Lucas F.
Perform final corrections before the distribution of the questionnaire	Lucas F.
Questionnaire ready for distribution	
Distribute questionnaires	Lucas F.
Monitor answers	Igor C. and Lucas F.
Send reminders	Igor C.
Questionnaire response deadline	
Perform analysis	Igor C. and Lucas F.
Write draft report	Igor C.
Revise draft	Igor C. and Lucas F.
Perform the final corrections	Igor C. and Lucas F.

in the gray literature, mentioned in Chapter 4, it was possible to elaborate questions in a way that the participant informs, in his view, the importance of a certain requirement raised. As a result, the goal of this survey is to prioritize them based on the views of potential end users.

In addition to being asked their opinions, participants were free to offer suggestions or improvements in relation to the needs of the tool, as one of the study's goals is to identify the needs of potential system users. Consequently, with a more solid foundation and a more clearly defined scope of activities, the solution development process will begin.

5.1.2 Identify and Characterize the Target Audience

At this stage, it is necessary to look at the possible respondent audiences and identify who will be the respondent audience and who the study population is. Therefore, the population is made up of all people within the academic community, so the coordinators of outreach programs or projects, professors and students were chosen to represent the sample of this population, with preference given to participants who have experience with outreach activities. With this audience, it is possible to understand all tool users' perspectives, including those of activity creators and subscribers.

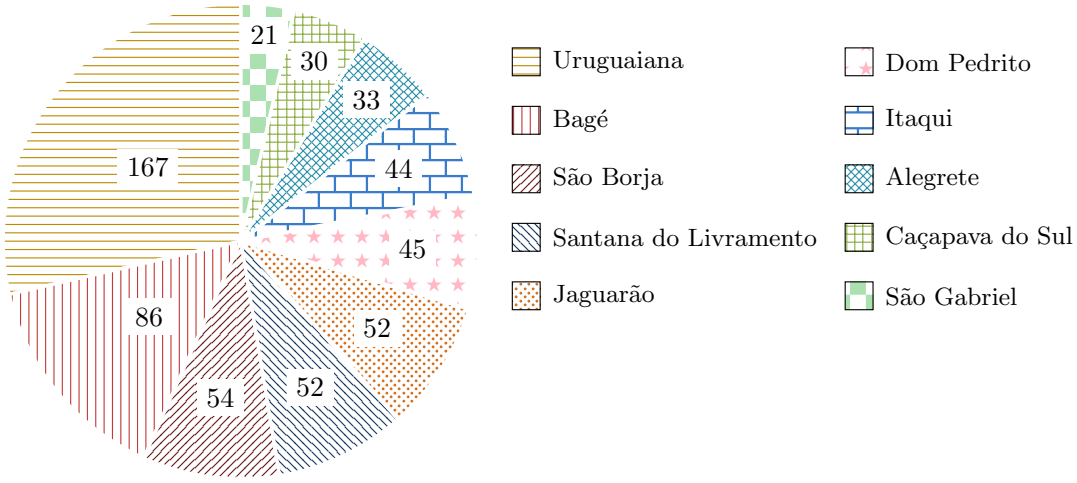
5.1.3 Design the Sampling Plan

According to Kasunic (2005), the objective of this phase is to determine the following topics:

- How individuals will be selected to participate in the survey;
- The required size of the sample.

Therefore, the first topic sought to cover as many UNIPAMPA campuses as possible by sending emails to its Academic Secretariats, directed to students and to lists of coordinators of programs and outreach projects, keeping the balance between teachers and students. As a result, it was anticipated that campuses like Uruguaiana and Bagé, which can be seen in Figure 9 as being the campuses that performed outreach activities the most in 2021 (PROEXT, 2021a), would contribute more respondents to the survey.

Figure 9 – Number of Projects Contemplated in the Internal Public Notices



Source: Adapted from (PROEXT, 2021a)

Along with all of the quantitative responses, each respondent had the chance to discuss the questions in greater detail, allowing for qualitative feedback. This added significantly to the amount of work needed to conduct the analysis. The questionnaire received 123 responses in total.

The separation of the sample is an essential point for the best efficiency of the survey, being in accordance with the recommended practice 22 defined by Molléri, Petersen, and E. (2020), which says that the sample should be divided according to its characteristics and similarities. To contemplate it, the questionnaire respondents who declared themselves as Administrative Technician in Educations (ATEs) or professors were directed to one area of the questionnaire, and students to another, both areas with questions related to the profile claimed by the respondent.

5.1.4 Design and Write the Questionnaire

Kasunic (2005) emphasizes that for the structuring and writing of the questionnaire, the research objectives and the characteristics of the sample must be taken into

account. According to the author, questionnaires that do not have well-defined objectives are more likely to have questions that only consume the respondent's time, he highlights this with a question Kasunic (2005, p.34) "How can you reach insightful conclusions if you do not know what you were looking for or planning to observe?", in this questionnaire the objective is well defined, focused on prioritizing requirements and gathering suggestions from potential end users as well described in Section 5.1.1. In the same way, the characteristics of the sample are important to write the questions in a way that everyone understands and not just thinking about the understanding of the researchers themselves. Linåker et al. (2015) notes that the results that will be obtained with the survey are directly related to the quality of the questionnaire used.

For Linåker et al. (2015) there are two types of questionnaires, self-administered and interviewer-administered questionnaire, according to its definitions, this fits the first type, as it is a web-based questionnaire, the researches don't have to monitor the respondents. This model allows for a wider range of respondents, but on the other hand tends to have a higher dropout rate, emphasizing the importance of good structuring.

The survey was designed using Google Forms because it offers a straightforward user interface and is a component of the Google Suite service, which is used by UNIPAMPA to support a number of different processes. Additionally, it is widely used and is known to the majority of the respondents.

The structure of the questionnaire that is contained in Appendix A is given by the home page, the respondent's profile questions, requirements prioritization questions and finally functionality suggestions, these are described below in their respective sections.

5.1.4.1 The Welcome Screen

Following instructions from Kasunic (2005), the first page of the questionnaire contains important information for the participant such as:

- Research objective;
- Estimated duration of the questionnaire;
- Researchers' contact email addresses;
- Researchers involved;
- Voluntary, anonymous and confidential character of the research;
- Institution and organization involved.

5.1.4.2 Profile Questions

Questions related to acquiring information about the participant are important in the first phases of the questionnaire, as they motivate participants to continue answering it

without confusing them with complex questions right at the beginning, (REA; PARKER, 2005). In addition to having a good classification of participants, it allows the analysis of these to be done in a more controlled and organized way, as mentioned by Martins (2021).

The data that was taken with the profile questions are listed below: (1) Is enrolled in UNIPAMPA; (2) Sex; (3) Age group; (4) Academic education; (5) Already participated in an OA; (6) Which roles the participant had in the OA; (7) His role in the academic community; (8) His campus and city; (9) The course the participant is taking.

5.1.4.3 Requisites Priorization Questions

In the questions related to the research objective, some directions described by Forza (2002) were used, they are:

Suggestion 1. Define the way questions are asked to collect the information on a specific concept;

Suggestion 2. For each question decide the scale on which the answers are placed;

Suggestion 3. Identify the appropriate respondent(s) to each question;

Suggestion 4. Put together the questions in questionnaires that facilitate and motivate the respondent(s) to respond.

In the case of **Suggestion 1**, in which it is suggested that the questions be written in such a way that the entire respondent sample can understand and formulate an answer. Since the questions in this questionnaire refer to software requirements, the user stories model was used, which makes it very clear who the actor is, what is desired with the given requirement and the reason for it, also as reported by Lucassen et al. (2016, p.220), "Stakeholders enjoy working with user stories, as they foster a pleasant workplace". It was also determined that the questions would be classified as closed questions, which determine the possible responses of the respondent as described by Forza (2002). Thus, at the end of each page of the questionnaire there was also an open-ended question allowing the respondent to discuss possible suggestions for improvements or new requirements not yet elicited.

The **Suggestion 2** is the scale used in the questions, at first it was thought to use the Likert scale, but analyzing the situation and the format of the questions later it was decided to use the method Must have, Should have, Could have and Will not have (MoSCoW), it was selected because, according to Waters (2009), it is more closely related to software requirements prioritization.

Then in **Suggestion 3**, it is suggested that the questionnaire directs the participants to the questions that they have the most ability to answer, bringing more constructive and relevant answers. In the questionnaire used, this division was performed using the

profile questions commented on Section 5.1.4.2, with the participant being automatically directed to the corresponding section with their profile.

Finally, in **Suggestion 4** it is advised that all questions that have a common subject are arranged next to each other to facilitate cross-checks between the answers. To implement this suggestion, the requirements are organized into groups by system actors' roles, as follows: (1) OA proponent; (2) OA instructor; (3) OA participant; (4) Outreach programs and projects coordinator.

To improve future visualizations of the collected data, the questions were additionally given Identification (ID) tags for each profile. The naming makes intuitive sense, it begins with a letter that is relevant to the profile that question is asking about and a number that is just a count. They are as follows:

- **A(1-14)**: "A" stands for "Aluno", the student or participant;
- **C(1-2)**: "C" stands for Coordinator;
- **I(1)**: "I" is for Instructor;
- **P(1-8)**: "P" stands for Proponent.

Students were directed to the A(1-14) questions, while professors and ATEs were directed to the remaining 3 categories, since they have a higher chance to perform any of these roles.

5.1.4.4 Feature Suggestions

A field was provided on the questionnaire's final page so that participants could offer researchers any suggestions for functionality, improvement, or other adjustments. With these answers it is possible to make a qualitative analysis and get new ideas for the development and completion of the final tool.

5.1.5 Pilot Questionnaire

After generating a stable version of the questionnaire, it is necessary to validate it, for which a pilot questionnaire was carried out. According to Kasunic (2005) the pilot test is a simulation of the real questionnaire carried out with a small number of members from the target audience. To carry out it, 7 (seven) people were arbitrarily invited, divided into: 4 (four) undergraduate students, 2 (two) professors from the UNIPAMPA Alegrete campus and 1 (one) ATE. The choice of pilot questionnaire respondents was made because it represents all the profiles expected in the target sample, and represents the proportion expected in the actual completion of the questionnaire.

Only one participant who was selected to take part in the pilot survey was unable to respond on time, and that participant was ATE. However, this did not actually present

a problem because, as mentioned in Section 5.1.3 the survey is divided into two parts, in which ATEs and teachers answer the same.

With the execution of this pilot, it was possible to acquire several suggestions, corrections and important points for the final version of the questionnaire. As an illustration, it was suggested to ask for participants' ages in age groups because one participant didn't feel comfortable revealing his exact age.

5.1.6 Distribute the Questionnaire

The questionnaire was distributed to all the people who make up the sample of this research. To carry this out, all emails from coordinators with active outreach projects or programs from all UNIPAMPA campuses were gathered, and they were the first to respond to questionnaire. After 2 (two) days, emails were sent to all campus academic secretariats, requesting that it be passed on to all the students from all courses. In conclusion, the entire survey was open for responses for 18 (eighteen) days.

5.1.7 Analyze the Results and Write a Report

The quantitative results related to requirements prioritization must be collected and organized in graphs for better understanding and visualization of the data. This will allow you to have an ordered list of requirements that were considered most important to end users.

Regarding the qualitative answers, these will be analyzed on a case-by-case basis and, if the suggestion is relevant, they will be added to the final backlog of features or improvements.

5.2 Threats to Validity

In order for a survey to be successful, validity is a crucial factor that must be carefully considered and planned. Without the right precautions, the entire study may fail. Threats to the validity of the research can be avoided or reduced, according to Kasunic (2005), by adhering to a well-defined procedure and tailoring it to the research subject. The author lists two crucial categories of survey research validity: (1) Construct validity and (2) External validity.

The first point focuses on knowing exactly what needs to be measured or collected, as the author says "Are these questions providing enough information to answer my research objective?". The second validity is more concerned with the ability to generalize the obtained results to other people, places, or times.

5.2.1 Construct Validity

It was possible to gain important knowledge and insights from the results as soon as the first participants began sending in their responses. Having said that, the following items were noted as potential threats:

Construct Threat 1. Despite the fact that the questions were straightforward and made to be understood by all, those who are unfamiliar with the scale may find it confusing. The MoSCoW scale was modified and translated into Portuguese, but for those who are not accustomed to it, it may still be challenging to respond.

Construct Threat 2. Because the questions were written as user stories, it was simple for the participants to group the requirements according to their relevance. The threat posed by this way of describing the questions, could prevent the respondent from suggesting new functionalities because the "creative work" has already been done.

Construct Threat 3. Threats could also be viewed in the definitions' ambiguity and lack of clarity. Sometimes the participant was unable to respond because he did not understand what a OA was.

5.2.2 External Validity

There are some inherent risks to external validity by how the study's scope was established. Furthermore, it is not necessary or possible to completely neutralize this, as doing so would reduce the study's usefulness. The threats discovered are listed below:

External Threat 1. The study is limited to participants who are familiar with the academic environment and have preferably participated in an outreach activity at UNIPAMPA due to the defined scope.

External Threat 2. The scope could be expanded to other HEI without introducing significant risks, but the study would become less useful because this term paper describes a goal product aimed at UNIPAMPA.

5.3 Result Analysis

In the 18 (eighteen) days that the questionnaire was available for responses, 123 (one hundred twenty three) responses were collected from students, professors and ATEs. As the quantitative questions were all mandatory, a 100% response rate was obtained for both teachers and ATEs and students. On the other hand, adding up all the qualitative questions, involving those present at the end of each page of the questionnaire and those on the last page to request suggestions in general for the tool, a rate of approximately

23% was obtained by the professors and approximately 12% by students. This low value may have been a reason for the validity threat described in **Construct Threat 3**.

In the following subsections, the results transcribed into graphs will be presented, improving the visualization and understanding of the collected data. In Section 5.3.1, the collected data referring to the respondent sample of the questionnaire will be presented, among them are: (1) Sex; (2) Age; (3) Formation; (4) Community Role; (5) City; (6) Outreach participation and roles. After in Section 5.3.2 the results of the questions with a quantitative aspect are presented again in graphs, informing the percentage of each answer. Finally, in Section 5.3.3, the qualitative results will be discussed, raising the main suggestions and improvements mentioned by the respondents.

5.3.1 Respondent Identification

In this section, the survey's demographics are shown together with information about the respondent profile. Figure 10 and Figure 11 demonstrate that the majority of respondents identify as female (woman) and are between the ages of 19 and 39. This information is relevant to understand the demographic, which is comprised mostly by college students, as can be seen in Figure 12 and Figure 13.

The city and campuses where the majority of responders attend are another significant piece of knowledge discovered through studying the identification data. As it was shown earlier in Figure 9, more students from Uruguaiana - the campus which executed most Outreach Activities in 2021 - were expected to respond, which was not the case, as can be seen in Figure 14.

Finally, the list of how many respondents participated in OAs was raised, and it can be seen in Figure 15 that more than a quarter of the respondents did not participate in any way in these activities, this point was raised as a threat in **External Threat 1** and thus implicating in **Construct Threat 3**. The distribution of roles among respondents who participated in outreach activities is also presented in Figure 16, it can be seen that more than 50% of the sample has already participated as a listener.

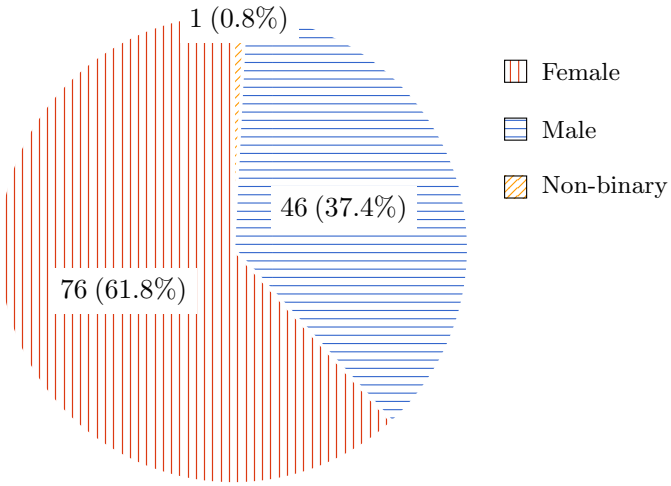
5.3.2 Quantitative Results

The MoSCoW scale, which was previously described, was used to ask respondents to prioritize the user story in the question in order to collect quantitative data.

By examining the responses to each of the questions in the questionnaire, which is available at Appendix A[1],some interesting results were found regarding each user role defined for the MVP, which are going to be discussed later in more detail in Section 6.2.3. The following sections describe the results obtained on each of their quantitative questions.

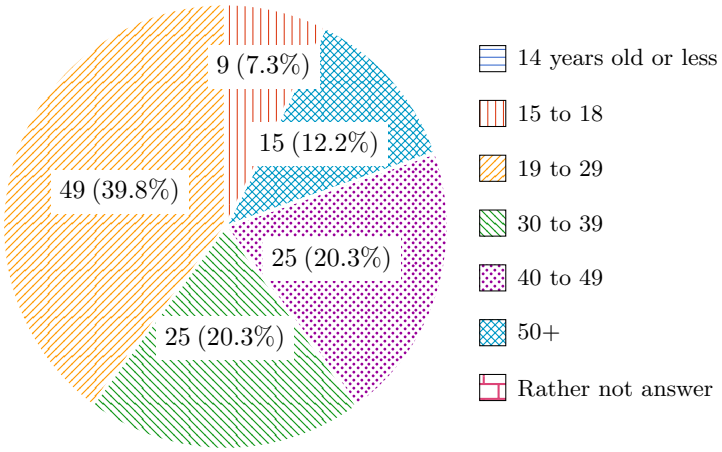
[1] As a note, to better navigate from the charts to the questions themselves, which are all the way down in the appendix, open the PDF in the browser and hit "CTRL + F", searching for the question ID and using the arrows to navigate between occurrences.

Figure 10 – Participants Sex Distribution



Source: Author.

Figure 11 – Participants Age Distribution



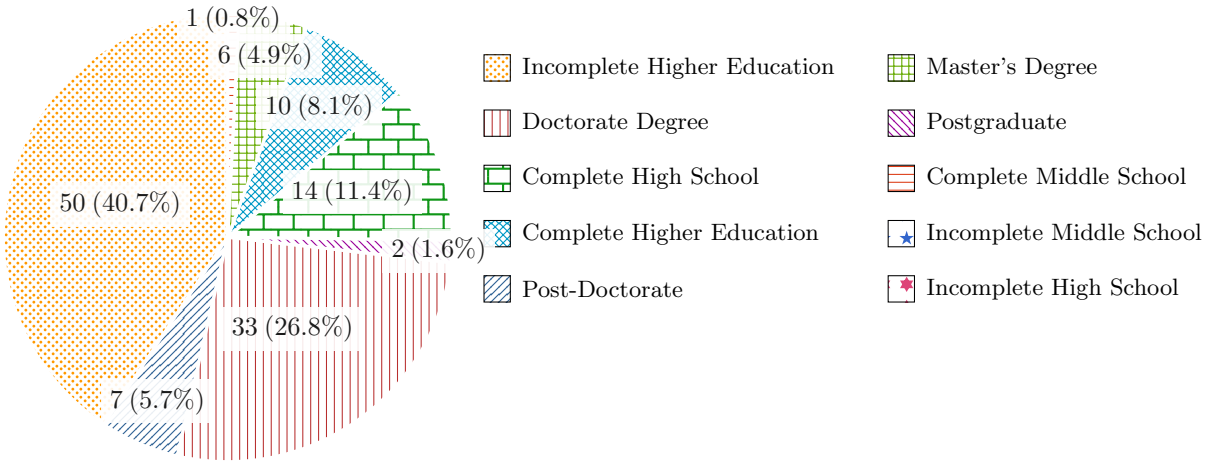
Source: Author.

The roles are as follows: (a) Proponent, (b) Coordinator, (c) Instructor and (d) Participant.

5.3.2.1 Proponent

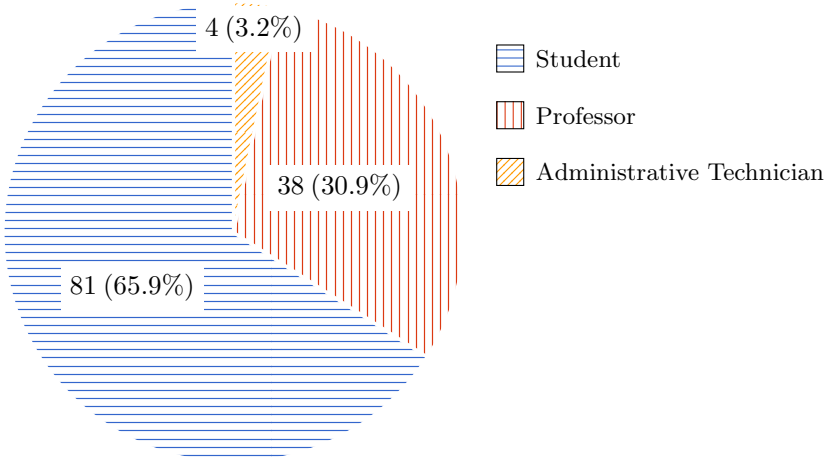
Regarding the role of OA proponent, the P(1-8) given written survey questions were appropriate, with the majority of them scoring Must haves and Should haves as shown in Figure 17, demonstrating the interest of end users, for the mentioned features. The only exceptions were P2 and P5, scoring the most of Could and Will not haves out of all of the questions.

Figure 12 – Participants Formation Distribution



Source: Author.

Figure 13 – Community Roles Distribution



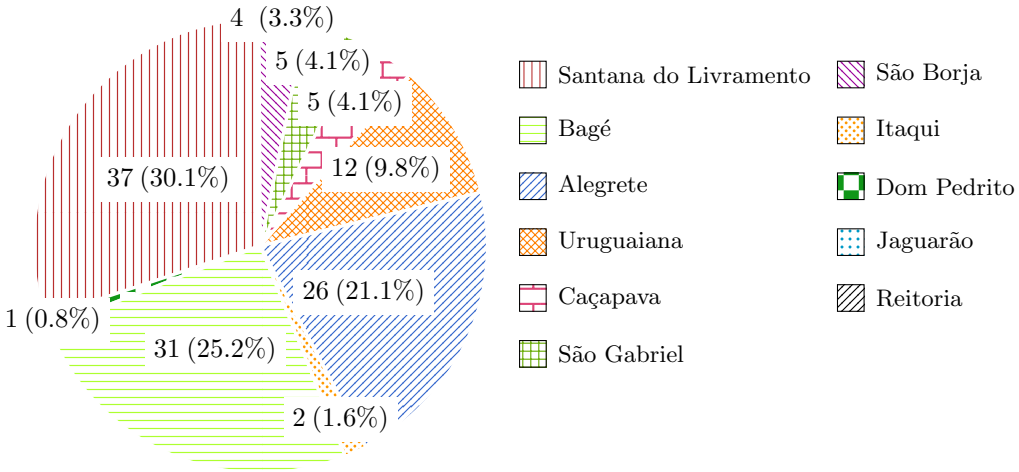
Source: Author.

In question P7, as can be seen in Figure 18, there was a sub question related to which communication channel the user would prefer for communicating with the future OA participants. The respondents could check both alternatives, and it was unexpected that *WhatsApp* got over half of votes, considering the history of using emails most of the time for communication in the university.

5.3.2.2 Coordinator

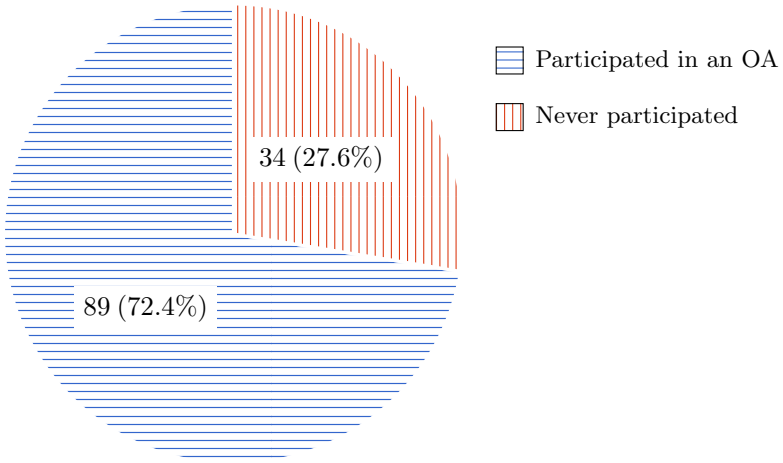
For the role of coordinator, only two questions were asked to the respondents. Since it was assumed that the review and approval process of the OAs was as important

Figure 14 – Participants City Distribution



Source: Author.

Figure 15 – Outreach Participation Distribution



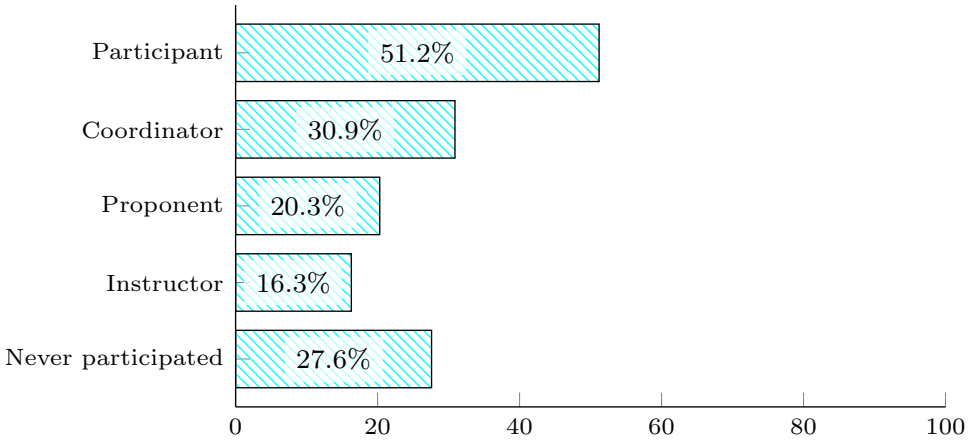
Source: Author.

as, if not more important than issuing participation certificates, it was interesting to see that the first question, C1, did not receive as many Must haves as C2. The results can be seen in Figure 19.

5.3.2.3 Instructor

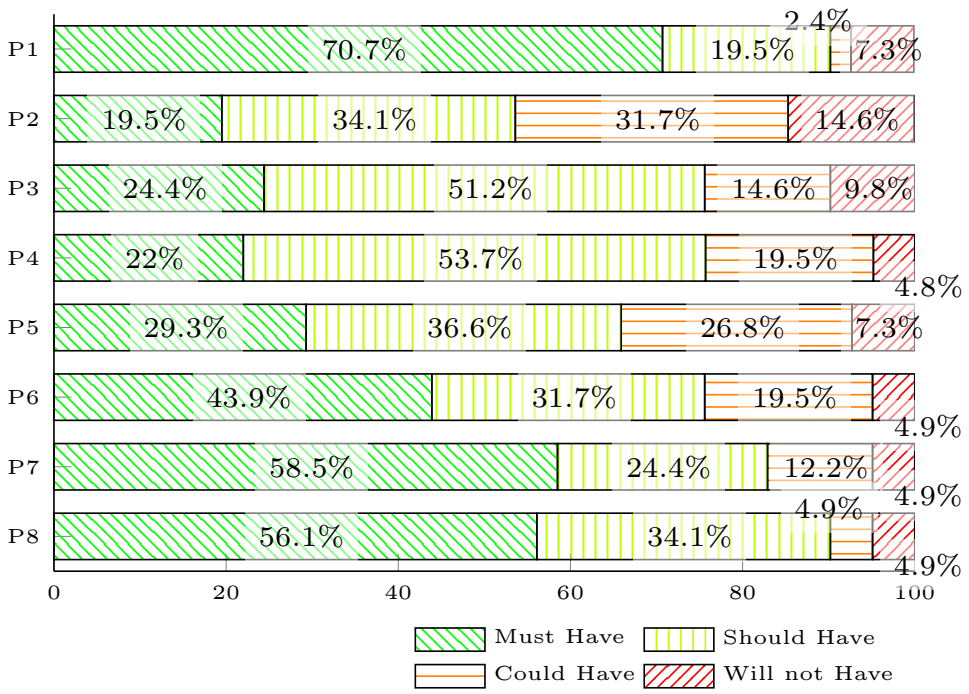
As was previously noted, the survey respondents place a high value on the distribution of participation certificates. The only question relating to the Instructor role, which is illustrated in Figure 20, can be said to be similar because it is one of the user stories in the study with the highest priority, with over 60% Must haves.

Figure 16 – Outreach Roles Distribution



Source: Author.

Figure 17 – Questions Regarding Proponent Role

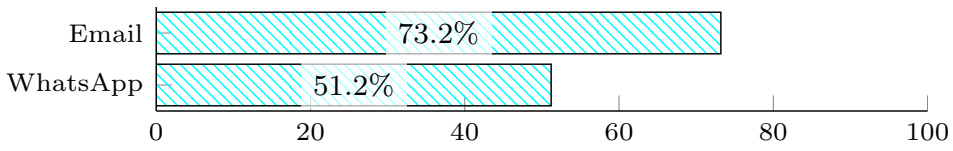


Source: Author.

5.3.2.4 Participant

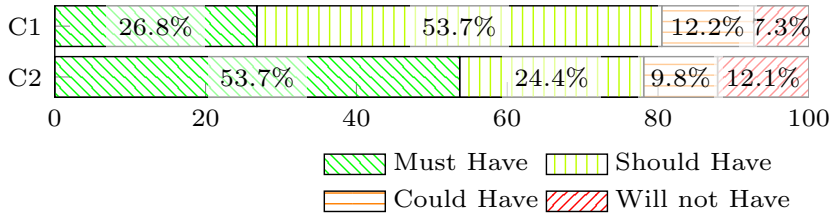
This user role is where most of the demographics for this survey are located. In order to achieve a balanced distribution of questions, all of the students were asked to respond only to the participant system user role, composed by 14 (fourteen) questions, while the teachers and ATE provided responses for three different profiles, which together

Figure 18 – Which communication channel the proponent prefers



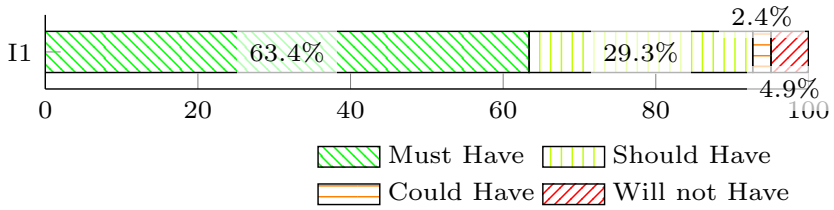
Source: Author.

Figure 19 – Questions Regarding Coordinator Role



Source: Author.

Figure 20 – Questions Regarding Instructor Role



Source: Author.

totaled 11 (eleven) questions composed by.

The questions were split between two graphs, the first half being on Figure 21, and the second half being on Figure 22. Most of the user stories present in these questions received high Must haves scores, demonstrating the importance of the requirements raised. However, not all of them were ranked highly, such as A11 and A13, which showed an above average number for Could and Will not haves.

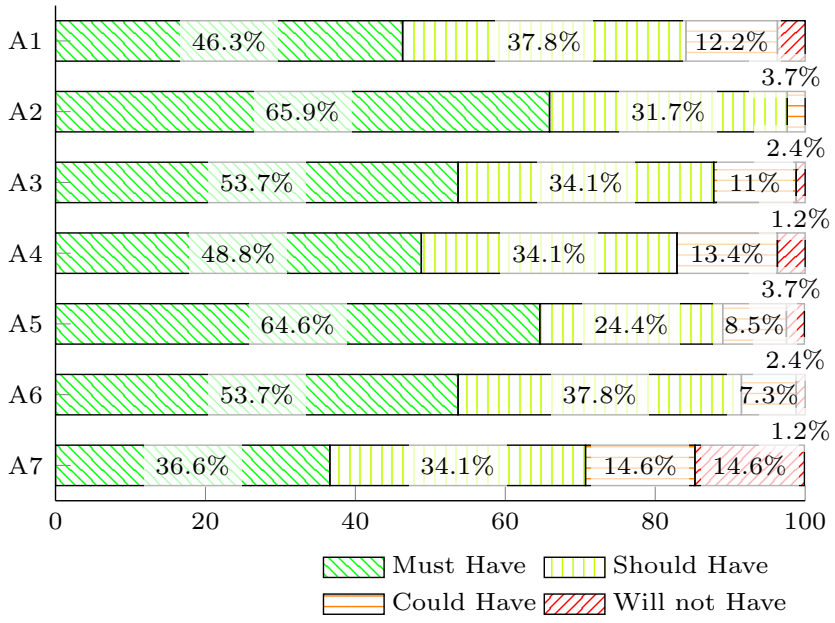
It makes sense that respondents attribute these ratings to A11, as the question relates to the point of view of someone outside the academic community. This user story is also a little bit of out scope for an MVP, so the feedback was important to rank it lower in the requirements.

A13 was thought up during meetings with the advisor, and it seemed to be a very good feature, but in the view of the respondents it was not, exemplifying the importance

of carrying out a survey with end users.

Last but not least, A14 included a sub-question, seen in Figure 23, that was similar to P7 and asked respondents to select the location where they would prefer to view the upcoming OAs they were enrolled in. It was great to know ahead of time that most users would prefer to export the OA to their own calendar apps rather than adding a calendar view to the website itself.

Figure 21 – Questions Regarding Participant Pt.1



Source: Author.

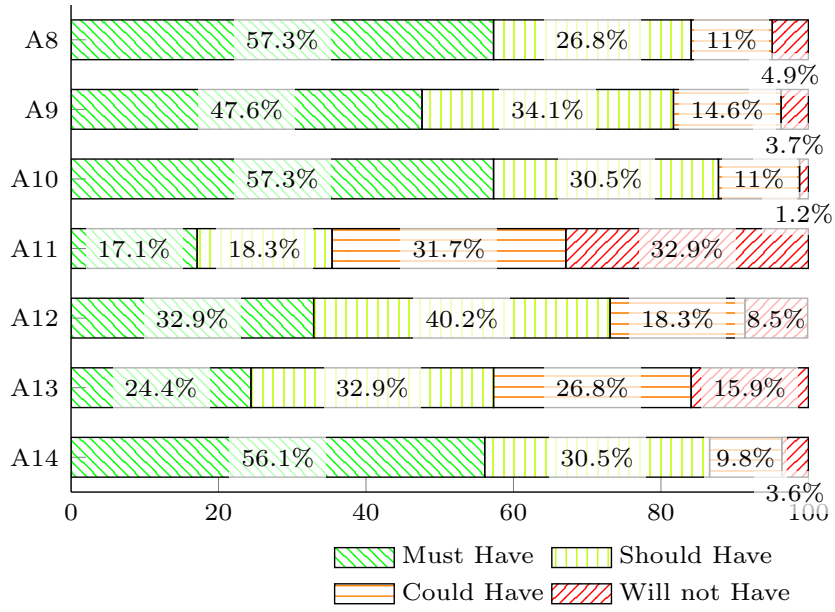
5.3.3 Qualitative Results

For the answers collected in the open-ended questions, in which improvements and suggestions for the researchers were pointed out, some among them stood out for their importance value to achieve the objective of the study. Among the two groups of responses, the first one being composed by students and the second by teachers and ATEs, the second group generated more robust and more appropriate results, precisely because they already experience these bureaucratic activities in their daily lives.

The responses will be translated freely from their original language, Portuguese and some of the most relevant answers given by respondents in the first group are mentioned below, they highlight improvements in the structure of the questionnaire together with suggestions for functionalities, they are:

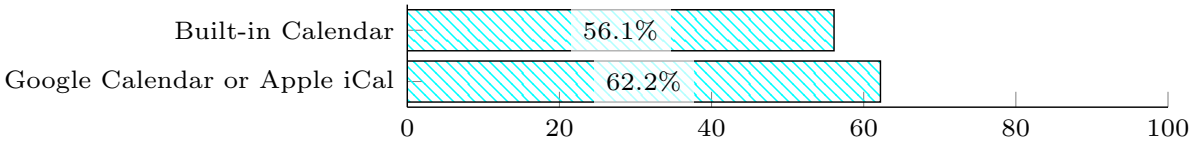
- "*Regarding A9, it would be cool to send out notifications, for instance, when an OA's registration deadline is approaching*". This was a very interesting and valid

Figure 22 – Questions Regarding Participant Pt.2



Source: Author.

Figure 23 – Where the user would rather see their upcoming OA



Source: Author.

suggestion, which, besides the notifications part, opens doors to features such as having an OA watchlist and saving favorites;

- "*The questions are repetitive, leading the individual to declare them irrelevant*". This was unexpected input on the survey's questions because it wasn't raised at any point during the survey's development. Nevertheless, it was excellent feedback;

- "*Change the order of importance and the highest level of satisfaction since the order of presentation of the points was incorrect at the beginning of the question because it starts with number 4*". Maybe setting the MoSCoW scale in reverse, starting as Must Have as a 1, instead of a 4, would add more value. However, this was the only criticism written on this topic.

The ideas raised by the respondents of the second group are presented and discussed below:

- Two respondents from this group raised the question regarding rework and the amount of information to be filled in. They point out that for today the Outreach Activities will have to be registered in the SAP project, it is of great importance that the final tool manages to generate a report in the model accepted by this tool, if this is not fulfilled, it would only generate more work for the professors having to fill in both tools. One of them also notes that it would be much more interesting for him if the forms in the tool were as succinct as possible, making it easier to fill in and not adding so much extra bureaucratic burden;

- Another point that was very well remembered by another respondent in this group refers to participants who have a history of dropouts or low participation in activities in which they are enrolled, making misuse of their vacancy. To solve this, it was suggested that the system be aware of these individuals and at the time they were placed in an activity registration queue, they would have less priority than someone who is assiduous with their commitments;

- A pain raised by an outreach activities coordinator, says about the generations of certificates that PROEXT is responsible for, but most of the time the generation progress and estimated time are not reported to the coordinator in charge. For this reason, the participants, who do not know how this process works, keep asking the coordinator directly and not to PROEXT itself, causing them discomfort. This suggests that there is some way in which notifications can be deferred, or even a visualization feature informing the expected date for the generation of certificates;

- The generation of certificates is an indispensable process in the life cycle of an Outreach Activity, so this process should be as tiring as possible, but this does not happen, according to a respondent from the second group, he says that nowadays the generation of of certificates is done one by one in the Electronic Information System (SEI) system, and this process is quite slow. He suggests that this process be as simple as possible, allowing the generation of all certificates at once;

- Related to the previous topic of certificates, another respondent states that it would be interesting, especially for the external public, to be able to generate a certificate without having to wait for the project completion date, informing that the participant is duly enrolled in the activity.

5.4 Chapter Summary

The survey as a whole was covered in this chapter, including information regarding the protocol that was followed, the methods used to generate the questions, threats to validity, and both a quantitative and qualitative analysis of the outcomes. Chapter 6

will go into further detail on the particulars of the Backend MVP that will be produced, discussing architecture choices, DevOps processes, tools and other topics.

6 EXTENSIONLY BACKEND DESIGN

This chapter describes the particularities of the Extensionly tool, decisions related to the backend and other design decisions.

6.1 Initial Considerations

The Extensionly tool, as it aims to incorporate and reproduce all or most of the processes involving Outreach Activity, its development is divided between two students, one being responsible for the frontend and the other for the backend, which is the objective of this work. The project will be versioned utilizing Git, a version control tool designed to efficiently and quickly manage any project, no matter how big or small (CHACON; STRAUB, 2014). The source code will be split between two repositories, one for the frontend[1] and one for the backend[2].

For development to happen in a fluid and performative way, communication between developers must be constant, as any change in business rules must be very clear by both parties.

The general purpose of the tool, in addition to supporting various processes involving university outreach, is to strengthen relations between the external and academic community, creating a communication channel in which demands can be generated for the university. Therefore, students will be increasingly accustomed to and linked to the community as a whole, attributing much value and experience to their formation.

The first objective of the tool is to be used by UNIPAMPA Campus Alegrete, but not dispensing with possible future expansions, for all the institution's campuses and even for other institutions in Brazil. For this the implementation must be carried out in a way that the cost is reduced when these new design decisions are made.

6.2 Extensionly Requirements

This section is intended to present in more detail the functional requirements raised by the study, which was divided into two main parts, first being conducted a review of the gray literature, as presented in Chapter 4, and then, with the results analyzed and transformed into user stories, they were applied to the survey described in Chapter 5

6.2.1 Requirements Obtained through the Grey Literature Review

In carrying out the review of the gray literature, analyzing other similar tools, as already described in Chapter 4, some functionalities present in the tools were raised, as shown in Section 4.3.2.1, among them 28 (twenty eight) Functional Requirements

[1] Extensionly Frontend code is available at `https://github.com/Dalepfell/extensionly-frontend`

[2] Extensionly Backend code is available at `https://github.com/IgorDalepiane/extensionly-backend-service`

(FRs) were selected to participate in the next phase, the survey. So the developers, together with their supervisor, analyzed it on a case-by-case basis and ranked their priority among: (1) High; (2) Medium; (3) Low. Some of these requirements were removed after classification, as they were too complex for the context of an MVP, or simply not in scope. All the initial requirements among with their priority can be found in Table 12.

Table 12 – Initial Requirements

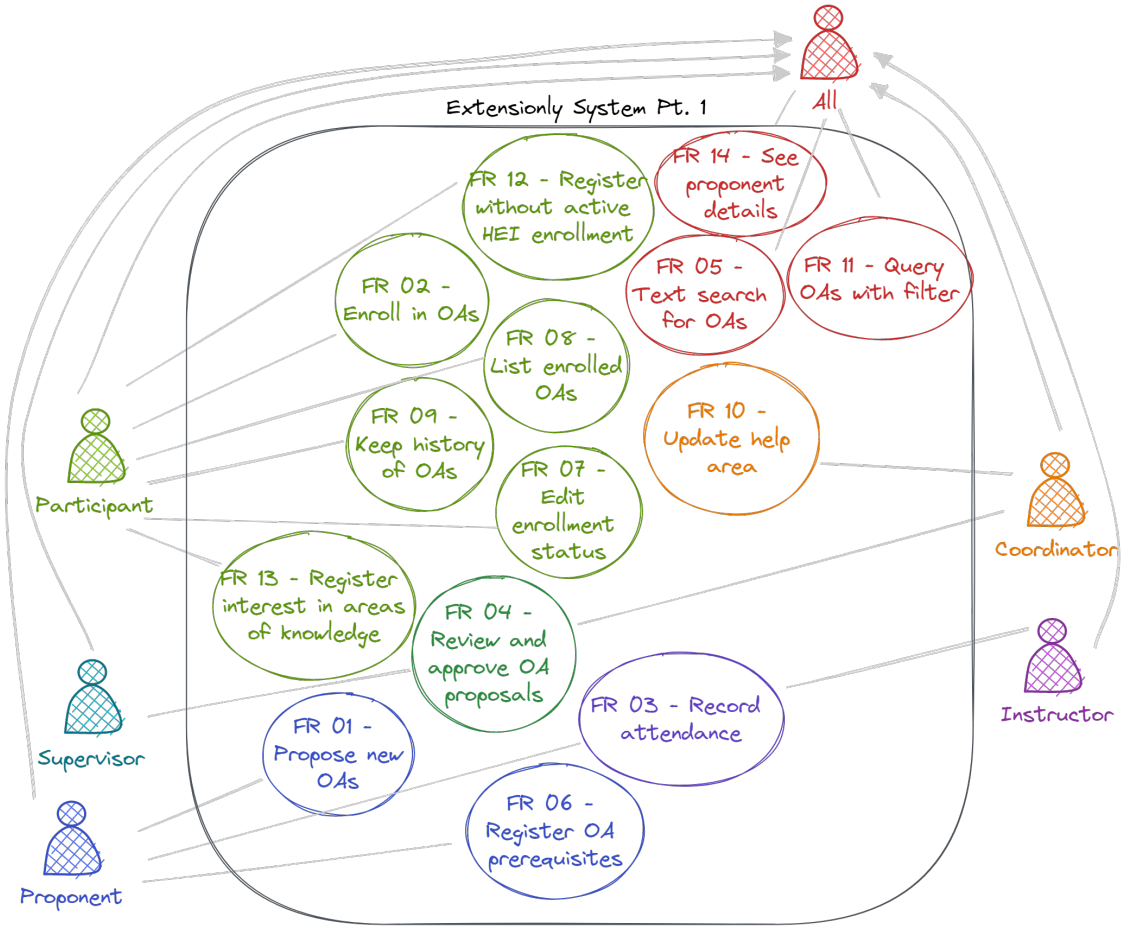
ID	Requirement	Priority
FR. 01	Propose new OAs	High
FR. 02	Allow enrollments in OA	High
FR. 03	Record participant attendance	High
FR. 04	Review and approve OA proposals	High
FR. 05	Text search for OAs	High
FR. 06	Registration of OA prerequisites	High
FR. 07	Edit enrollment status in OAs	High
FR. 08	List OAs the user is enrolled in	High
FR. 09	Maintain history of OAs participated	High
FR. 10	Help area (frequently asked questions, manuals)	High
FR. 11	OAs query with filter	Medium
FR. 12	External user registration	Medium
FR. 13	Registration of interest in areas of knowledge	Medium
FR. 14	Show proponent details	Medium
FR. 15	Favorites list for OAs	Medium
FR. 16	Declare interest in an OA (when enrollments are not open)	Medium
FR. 17	Share OA information	Medium
FR. 18	OA past versions history	Medium
FR. 19	Teacher's note in the OA details	Medium
FR. 20	Final OA assessment by the student	Medium
FR. 21	Detailed schedule for upcoming OAs	Low
FR. 22	Fill in final OA report	Low
FR. 23	Print enrollment status	Removed
FR. 24	Testimonies/reviews from past participants in the OA details	Removed
FR. 25	Instructor/student communication channel	Removed
FR. 26	Environment for evaluation of students submitted works	Removed
FR. 27	List of OAs by teacher	Removed
FR. 28	List of related OAs	Removed

The following are sketches of how the initial requirements relate to the defined user roles. Figure 24 presents the first 14 FR and Figure 25, the remaining 8, excluding the ones that were removed.

6.2.2 User Stories Derived from the Requirements

For the survey to be applied, a question template should be set up so that most respondents understand the message to be conveyed. The user stories were derived from the Functional Requirements presented by Table 12 and were divided between the roles of the system users. Table 13 shows user stories related to the proposer, then table 14 shows those related to the instructor, Table 15 lists those related to the participant, and finally the Table 16 contains the coordinator's user stories.

Figure 24 – User Roles on the First 14 FR

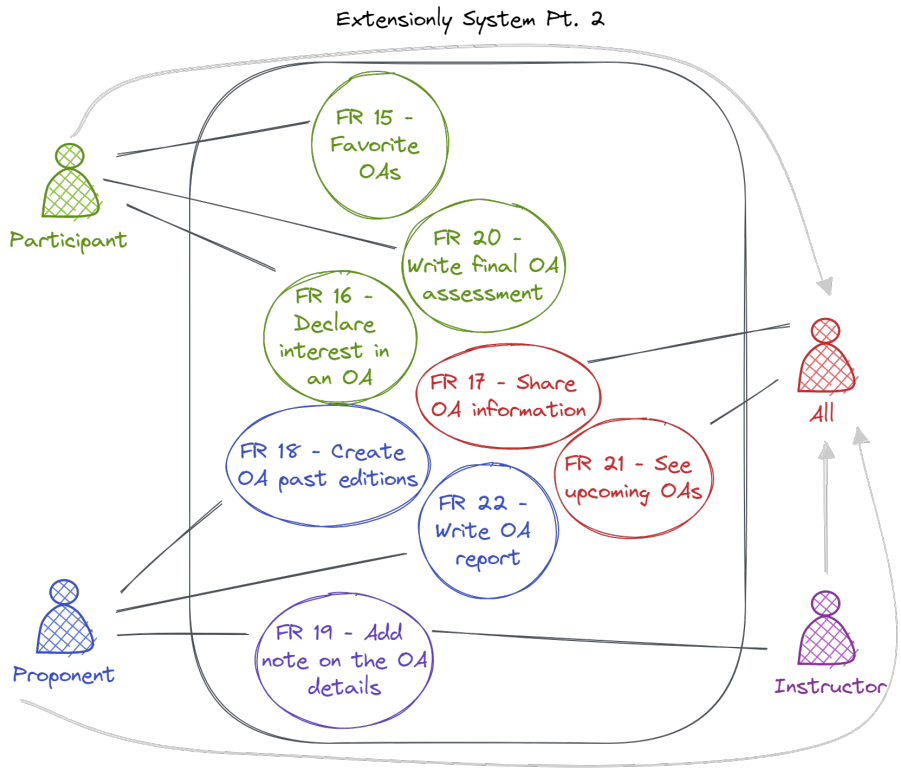


Source: Author.

Table 13 – Proponent User Stories

ID	User Story
P1	As a Proponent, I would like to propose an outreach activity, creating knowledge opportunities for other people.
P2	As a Proponent, I would like to define desired prerequisites for enrollment in my outreach activity proposal, so that my applicants do not come unprepared.
P3	As a Proponent, I would like my data to be shown along the details page of my outreach activity, so that participants have more details of who I am.
P4	As a Proponent, I would like to leave comments on the outreach activity page, to request some special material for carrying out the activity or just leave a note of mine for the participants.
P5	As a Proponent, I would like to fill in a general report on the progress of the outreach activity carried out, for archiving purposes.
P6	As a Proponent, I would like to register multiple editions of the same outreach activity, so that new participants can check past editions.
P7	As a Proponent or Instructor, I would like to get in touch with the participants of the outreach activity, so that it is easy to pass on information relevant to the activity.
P8	As a Proponent, I would like to receive the evaluation of the participants of my outreach activity in a detailed report/form format, so that I am aware of what I should improve for the next edition.

Figure 25 – User Roles on the Last 8 FR



Source: Author.

Table 14 – Instructor User Stories

ID	User Story
I1	As an Instructor, I would like to manage the attendance of registered participants so that certificates can be issued for those present.

They were applyed directly, with no other refinements, in the final survey and can be seen in Appendix A. However, in order to relate FRs with the questions and also update their ranking based on the survey results, Table 17 was created.

6.2.3 Roles

For the service to work correctly and in an organized way, user roles were created, controlling what each one can or cannot perform within the tool. These roles were designed taking into account the current roles that exist related to OAs within an HEIs, the roles are the following: (1) Participant - a listener, someone who enrolls to passively participate in the activity; (2) Instructor - a speaker, someone who presents or teaches something to participants; (3) Proponent - the one who proposes the OA, usually a professor; (4) Coordinator - a role that can review and approve proposed activities for one campus; (5) Supervisor - usually does not interact with the process, but can monitor the

Table 15 – Participant User Stories

ID	User Story
A1	As a Participant, I would like to apply for outreach activities such as events, courses and lectures, to enter the waiting list and be accepted in the activity.
A2	As a Participant, I would like to be able to search for outreach activities, so that I can find what I am looking for more easily.
A3	As a Participant, I would like to cancel or edit the information of an outreach activity enrollment made by me, to have more freedom in case I change my mind.
A4	As a Participant, I would like to see previous editions of outreach activities, so that I can read past proposals.
A5	As a Participant, I would like to view the history of all the outreach activities I have participated in, so that I don't have to keep the record outside of the tool.
A6	As a Participant, I would like to have a help area within the system, to guide me with any questions or problems that I may face with the activity I signed up for.
A7	As a Participant without college enrollment, I would like to register in the system to participate in outreach activities that interest me.
A8	As a Participant, I would like to inform my interest in areas of knowledge, so that I can see outreach activities related to them.
A9	As a Participant, I would like to favor outreach activities that I deem interesting, so that I have easy access to them when I need them.
A10	As a Participant, I would like to show my interest in unavailable outreach activities, so that I will be notified when a new issue opens.
A11	As a Participant, I would like to register for outreach activities without registering in the system, so that my information is not saved.
A12	As a Participant, I would like to share information about the outreach activity, so that I can share it more easily with my friends.
A13	As a Participant, I would like to evaluate the outreach activity in which I participated, so that other participants can see the grade I assigned.
A14	As a Participant, I would like to see the outreach activities in which I am enrolled in the form of a calendar, so that I can organize myself better.

Table 16 – Coordinator User Stories

ID	User Story
C1	As Coordinator, I would like to manage the submissions of new outreach activities carried out, so that each proposal goes through a review process before being accepted.
C2	As Coordinator, I would like to issue certificates of participation with a certain number of hours for all involved, participants, instructors and coordinator, so that the individual's involvement in the outreach activity is proven.

system as a whole, having access to OA in multiple campuses.

In addition to the roles mentioned above, another that is not within the scope of MVP was thought, this is the "External Participant", which has similar permissions to the Participant, but is a person who has no direct relationship with the university, but who manages to enroll in Outreach Activities in the same way.

6.3 Design Decisions

This section describes the design decisions taken to carry out this study and the development of this tool:

Programming Language: TypeScript (TS) was chosen because it enriches JavaScript

Table 17 – Requirements vs User Stories Priorities

Requirement ID	Question/Story ID	Priority
FR. 01	P1	Must have
FR. 02	A1	Must have
FR. 03	I1	Must have
FR. 04	C1	Must have
FR. 05	A2	Must have
FR. 06	P2	Should have
FR. 07	A3	Must have
FR. 08	A5	Must have
FR. 09	A5	Must have
FR. 10	A6	Must have
FR. 11	A2	Must have
FR. 12	A11	Will not have
FR. 13	A8	Must have
FR. 14	P3	Should have
FR. 15	A9	Must have
FR. 16	A10	Must have
FR. 17	A12	Should have
FR. 18	P6	Must have
FR. 19	P4	Should have
FR. 20	A13	Should have
FR. 21	A14	Must have
FR. 22	P5	Should have

(JS) with a module system, classes, interfaces, and a static type system, as said by Bierman, Abadi, and Torgersen (2014). The author also comments that a typed language helps a lot in development, finding and preventing bugs, providing auto-completion, hover tips, navigation through the code, and also helps in code refactoring. Another choice factor is given by the experience of the developers, who are already familiar with this language and its frameworks, the same language was chosen in the frontend, facilitating the understanding between the source codes;

Framework: NestJS developed by Mysliwiec (2022), was the chosen framework due to its potential and ease of application scalability. It has a very simple file organization, called model-service-controller, where the model layer is responsible for managing data, controller is responsible for managing input and output requests in our application and the service layer contains all the logic of implementation, part of this organization can be seen in Figure 26;

Another very strong point of NestJS is its support for modularization, as demonstrated by Mysliwiec (2022), in which even if the code is written in a monolithic way, the controllers and services will be separated by responsibilities, facilitating a possible future transition between architectures. Combined with modularization, this framework provides a powerful dependency injection system allowing code to be reused between modules in a very simple way, just inject it into the target module;

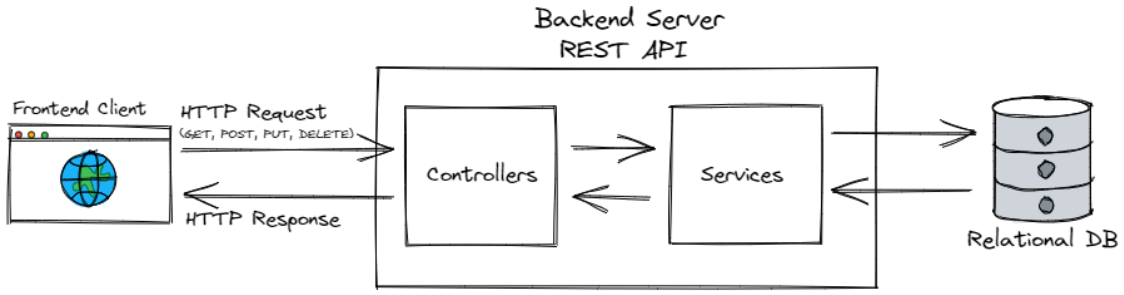
Regarding data persistence, Nest allows the use of Object Relational Mappers

(ORMs), which is, as Wiphusitphunpol and Lertrusdachakul (2017) said, a tool for mapping database query results to strongly typed or weakly typed objects in object-oriented programming languages, increasing the speed of development and maintainability. More on the subject will be explained in Section 6.3;

Architecture: The architecture chosen for the development of Extensionly was the server-client model which, according to Puliafito, Riccobene, and Scarpa (1995), is an architecture that has duplicated services or servers for a network of clients that use them ;

The architecture designed for this MVP is represented in Figure 26, there are still possibilities for improvement, such as adding a server load balancer between client calls to the server, being responsible for spreading out the transmission of information flow and data operations, as well as lowering the risk of information loss and computing time, as Chen, Chen, and Kuo (2015) described. Another improvement is the addition of caching in calls to the database, which serves to more quickly access data that is being requested frequently;

Figure 26 – Backend Achitecture



Source: Author.

The backend server uses the Rest API architecture, where Application Programming Interface (API), according to Souza (2020), uses Hypertext Transfer Protocol (HTTP) requests such as: (1) GET; (2) POST; (3) PUT; (4) DELETE, to perform system data manipulation. Then, Souza (2020) defines Representational State Transfer (REST) as restrictions used so that HTTP requests meet the guidelines defined in the architecture, among them are: (1) Use server-client architecture; (2) Not having state, requests being independent; (3) Have cache; (4) Have a uniform interface;

License: The Extensionly backend is licensed under the GNU General Public License v3.0, which is an open source license and is very permissive, allowing even for commercial use. However, it is very important to keep in mind that all works

and modifications must be released under the same license, with the source code made available, and that the distribution of closed source versions is not permitted. Additionally, it does not provide the software with any guarantees or liabilities (FOUNDATION, 2007).

Data Persistence: To perform the data persistence, a relational database will be used, which is the most suitable for this problem because it has many relationships between the objects present in the system, for which Database Management System (DBMS) My Structured Query Language (MySQL) will be used.

Prisma will also be used as the ORM of the tool, which according to Prisma (2022), is an ORM that helps app developers build faster and make fewer errors, providing a database schema which allows developers to define their application models in an intuitive data modeling language, reducing boilerplate so developers can focus on the important parts of the app;

6.4 Development Operations (DevOps)

Perera, Silva, and Perera (2017) describes DevOps as a set of techniques that allows developers and operators to interact and work together to provide software and services quickly, consistently, and of higher quality. The solution chosen was the GitHub Actions, which are very simple to understand and already are allocated along with the backend repository.

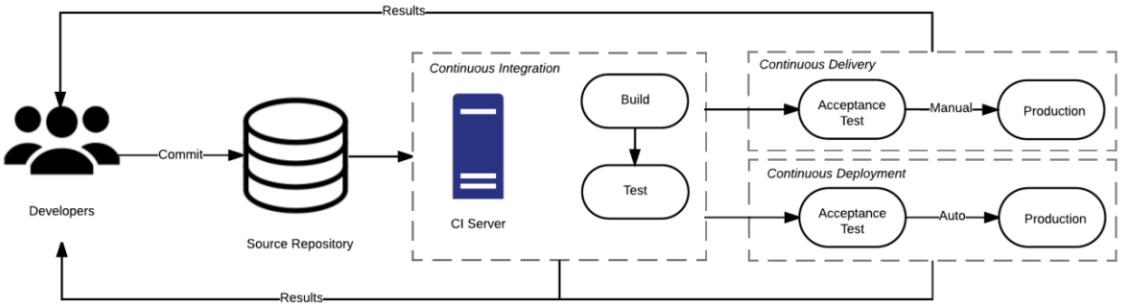
Integrated into the DevOps practice, the author Shahin, Babar, and Zhu (2017) explains three different terms that are very important to understand how this practice works, the structure of the pipeline and how these terms work in practice is represented in Figure 27, the terms are as follows:

Continuous Integration (CI) The definition of the term is about development teams merging development work more frequently, increasing product quality, team performance and reducing delivery times, including steps of build and automated tests.

Continuous Delivery (CDE) This term represents the process that guarantees that the application will always be in a state ready to be sent to production, passing through pipelines with automated tests and quality checks. This practice reduces the effort required and risks involved when sending software to production.

Continuous Deployment (CD) This term can be very similar to the previous one, as it seeks to do the same things but in a more automatic way, while the previous item needs human action to approve a deploy for production, this term uses pipelines that send any merged code changes directly to the real production environment.

Figure 27 – The relationship between continuous integration, delivery and deployment



Source: (SHAHIN; BABAR; ZHU, 2017).

The terms that will be implemented in the backend of the Extensionly tool will be CI and CDE, because this way it is possible to have more control in the versioning of the solution, and always keeping it tested and ready to be sent to production.

For the DevOps application to work correctly, a good configuration of repository, projects, deploys and pipelines must be performed, for this will be used the tutorial[3] developed by the author of this TP.

For the deployment, Heroku will be used, which according to Heroku (2022) is a cloud platform that lets developers build, deliver, monitor and scale apps. Heroku's Platform as a Service (PaaS) service will be used, which according to Zvarevashe, Karekwaivenane, and Bakasa (2014), is a service that allows the contractor to publish their applications in the cloud without having to install any software on their local machine, it also already solves configurations related to infrastructure and machine configurations, allowing the developer to focus only on the development of the tool.

6.5 Chapter Summary

This chapter discussed decisions related to the production of the Extensionly tool, first explaining some points of attention in Section 6.1, then in Section 6.2, the final requirements raised by (Grey Literature) and user stories with their scores received for carrying out the survey. Section 6.3 reports the design decisions for the execution of the project, such as technologies and architecture used. Finally, in Section 6.4, some terms related to DevOps were discussed, along with the choices that will be used in the tool development processes.

[3] CICD Tutorial is available at `https://github.com/IgorDalepiane/CICD-Tutorial/wiki`

7 PRELIMINARY CONCLUSIONS

The present work sought to delve into processes of management of Outreach Activities, to build a tool that supports the bureaucratic processes involved, facilitates communication with the external community, and increases the dissemination and integration of students with the activities. For this, two methodologies were used, a review in the grey literature to find similar solutions that already exist, eliciting their main functionalities, and a survey with the possible end users of the tool, in search of ordering the requirements based on their importance, also acquiring more suggestions related to the subject.

In order to achieve the general objective of the work, which is develop the backend of the tool to support the management of outreach programs and projects of UNIPAMPA, five specific objectives were defined. The first objective was to carry out a review in the grey literature in search of features in similar tools, with the results obtained it can be seen that this was achieved, as it was possible to raise several tools and in the end to come out with a list of significant size together with its functionalities and specific details, contributing a lot in planning. The second objective is related to the elaboration of a survey to understand the opinions of the possible end users, this objective was successfully achieved because it was possible to analyze the pains and concerns of the users, being possible with the results, to extract several improvements and functionalities for the proposed tool.

The construction of a roadmap and concrete tasks for the development, defines the third specific objective, this was partially achieved because the transformation from FR to development tasks will only occur in the development of the second part of this work, during the TP II. The fourth objective says about the study, analysis and choice of a development stack for the backend of the proposed tool, including programming language, architectures and frameworks, this objective was successfully achieved, the choices made can be seen in Chapter 6. As the fifth and last specific objective is the development of an MVP for the tool's backend, this objective has not yet been achieved, as it is planned that the development will happen yet.

With the objectives and results analyzed, the hypothesis of this work is that "With a tool to support the management of outreach programs and projects, it's possible to have a reduction on the effort needed to create an outreach activity and an increase in the engagement of volunteer outreach participants", cannot yet be confirmed or refuted, as the application has not yet been developed and tested with end users. But in view of all the positive reactions that the respondents provided through the survey, it is very likely that with the correct and complete development of the application, this hypothesis will be confirmed.

Therefore, answering the research question of this work, presented in Table 1, it is possible with a tool of this type, to reduce the manual and repetitive work necessary in the registration of new proposals for outreach actions, facilitating processes such as generate

certificates more efficiently, also with a tool that centralizes information related to the outreach, students will know where to look when they need to, increasing the dissemination of new actions. With the tool, the relationship between teacher and participant will also be strengthened, allowing for more meaningful experiences and interactions between them.

The results obtained with the survey allowed the researchers to understand the opinion that possible end users have in relation to the existence of a tool like this to assist them in similar processes, with it it was possible to reassess some implementation issues, taking into account suggestions raised. It is safe to say that without an opinion survey with these users, the tool would be in great danger of not meeting the expectations previously defined.

For the second version of this TP, we intend to focus a lot of time on the development of the application, so that it is possible to run a real test with teachers and students, using the features present in the tool with real outreach programs and projects from UNIPAMPA, thus obtaining feedback from within the tool, possibly carrying out another survey for data collection.

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Appendix

APPENDIX A – SURVEY QUESTIONNAIRE

Extensionly - Survey

Dear collaborator,

We are graduate students in software engineering at the Federal University of Pampa, and our Course Completion Work is a tool to make life easier for the academic community. It will concentrate on automating the management of extensive activities, such as events, minicourses, lectures, and workshops. Process that is currently carried out manually, both in terms of participant registration and teacher proposals for new initiatives.

With this in mind, we are conducting a study to better understand the needs of our target audience. We would appreciate your assistance in responding to this form, which takes about 10 to 15 minutes.

Before moving on, it's crucial to clarify the following information about the study:

- Your participation in the study is entirely voluntary, thus you are not required to provide the information requested by the researchers or to participate in their activities. You are free to stop participating in the study at any time.

- The responses collected are anonymous and private. Only the restriction of responses to one per person requires the need of a login. We don't collect any personal information.

Finally, we put ourselves at your disposal for any questions via the email addresses lucasfell.aluno@unipampa.edu.br or igorcosta.aluno@unipampa.edu.br.

Supervisor: Maicon Bernardino da Silveira.

* Required

LESSE

Laboratory of Empirical Studies in Software Engineering

1. Do you agree to continue the research? *

Mark only one oval.

- ◯ Yes
- ◯ No

Identification

To evaluate the respondents' profile, we ask for a few anonymous data.

2. Are you part of Unipampa? *

Mark only one oval.

- ◯ Yes *Skip to question 8*
- ◯ No *Skip to question 27*

3. Gender *

Mark only one oval.

- ◯ Male
- ◯ Female
- ◯ Other: _____

4. What is your age? *

Mark only one oval.

- ◯ 14 years or less
- ◯ 15 to 18
- ◯ 19 to 29
- ◯ 30 to 39
- ◯ 40 to 49
- ◯ 50+
- ◯ I would rather not respond

5. Education *

Mark only one oval.

- Incomplete middle school
- Finished middle school
- Incomplete high school
- Finished high school
- Incomplete higher education
- Finished higher education
- Postgraduate
- Masters
- Doctorate
- Post Doctoral

6. Have you ever taken part in Outreach Activities? *

Mark only one oval.

- Yes
- No

7. If yes, what was your role? *

Select all that apply

Check all that apply.

- [ ] Participant / Listener
- [ ] Outreach Program or Project Coordinator
- [ ] Outreach Program or Project Proponent
- [ ] Outreach Activity Instructor / Speaker
- [ ] I have never participated in any Outreach Activity

Identification

To evaluate the respondents' profile, we ask for a few anonymous data.

8. What is your role in the academic community? *

Mark only one oval.

- ◯ Student *Skip to question 10*
- ◯ Professor
- ◯ ATE *Skip to question 12*
- ◯ Other: _____

9. Campus / City:

Mark only one oval.

- ◯ Alegrete
- ◯ Bagé
- ◯ Caçapava
- ◯ Dom Pedrito
- ◯ Itaqui
- ◯ Jaguarão
- ◯ São Borja
- ◯ São Gabriel
- ◯ Santana do Livramento
- ◯ Uruguaiana
- ◯ Rectory

Identification - Course

To evaluate the respondents' profile, we ask for a few anonymous data.

10. Course: *

Mark only one oval.

- Management
- Public Management
- Agronomy
- Aquaculture
- Biotecnology
- Computer Science
- Food Science and Technology
- Biological Sciences
- Nature Sciences
- Economic Sciences
- Exact Sciences
- Human Sciences
- Social Sciences
- Advertising and Marketing
- Public Administration
- Law
- Physical Education
- Nursing
- Agricultural Engineering
- Environmental and Sanitary Engineering
- Cartographic and Surveying Engineering
- Civil Engineering
- Food Engineering
- Aquaculture Engineering
- Computer Engineering
- Energy Engineering
- Production Engineering
- Software Engineering
- Telecommunications Engineering

- [ ] Electrical Engineering
- [ ] Forest Engineering
- [ ] Mechanical Engineering
- [ ] Chemical engineering
- [ ] Pharmacy
- [ ] Physiotherapy
- [ ] Orcharding
- [ ] Physics
- [ ] Geophysics
- [ ] Geography
- [ ] Geology
- [ ] Environmental Management
- [ ] Tourism Management
- [ ] History
- [ ] Science and Technologies
- [ ] Journalism
- [ ] Spanish and Hispanic Literature
- [ ] Additional Languages English, Spanish and Their Literature
- [ ] Portuguese and Spanish
- [ ] Portuguese and Portuguese Language Literatures
- [ ] Portuguese
- [ ] Mathematics
- [ ] Medicine
- [ ] Veterinary Medicine
- [ ] Mining
- [ ] Music
- [ ] Nutrition
- [ ] Pedagogy
- [ ] Production and Cultural Politics
- [ ] Chemistry
- [ ] International Relations
- [ ] Public Relations
- [ ] Social Services

Social Services
Other: _____

Identification - Course

To evaluate the respondents' profile, we ask for a few anonymous data.

11. Course: *

Mark only one oval.

- Management
- Public Management
- Agronomy
- Aquaculture
- Biotecnology
- Computer Science
- Food Science and Technology
- Biological Sciences
- Nature Sciences
- Economic Sciences
- Exact Sciences
- Human Sciences
- Social Sciences
- Advertising and Marketing
- Public Administration
- Law
- Physical Education
- Nursing
- Agricultural Engineering
- Environmental and Sanitary Engineering
- Cartographic and Surveying Engineering
- Civil Engineering
- Food Engineering
- Aquaculture Engineering
- Computer Engineering
- Energy Engineering
- Production Engineering
- Software Engineering
- Telecommunications Engineering
- Electrical Engineering

- [ ] Electrical Engineering
- [ ] Forest Engineering
- [ ] Mechanical Engineering
- [ ] Chemical engineering
- [ ] Pharmacy
- [ ] Physiotherapy
- [ ] Orcharding
- [ ] Physics
- [ ] Geophysics
- [ ] Geography
- [ ] Geology
- [ ] Environmental Management
- [ ] Tourism Management
- [ ] History
- [ ] Science and Technologies
- [ ] Journalism
- [ ] Spanish and Hispanic Literature
- [ ] Additional Languages English, Spanish and Their Literature
- [ ] Portuguese and Spanish
- [ ] Portuguese and Portuguese Language Literatures
- [ ] Portuguese
- [ ] Mathematics
- [ ] Medicine
- [ ] Veterinary Medicine
- [ ] Mining
- [ ] Music
- [ ] Nutrition
- [ ] Pedagogy
- [ ] Production and Cultural Politics
- [ ] Chemistry
- [ ] International Relations
- [ ] Public Relations
- [ ] Social Services

Other: _____

Skip to question 27

Extensionly

We ask the respondent to evaluate the question, assuming that they were a system user. The questions are arranged according to the MoSCoW scale, which is frequently used to prioritize requirements. The four levels in English are:

4 - Must have
3 - Should have
2 - Could have
1 - Wouldn't have

Outreach activities proponent

The one who idealizes an outreach activity and assembles a formal proposal with the project of what was thought.

12. P1 - As a Proponent, I would like to propose an outreach activity, creating knowledge opportunities for other people. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

13. P2 - As a Proponent, I would like to define desired prerequisites for enrollment in my outreach activity proposal, so that my applicants do not come unprepared. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

14. P3 - As a Proponent, I would like my data to be shown along the details page of my outreach activity, so that participants have more details of who I am. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

15. P4 - As a Proponent, I would like to leave comments on the outreach activity page, to request some special material for carrying out the activity or just leave a note of mine for the participants. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

16. Please leave your comment (suggestion, improvement or criticism) about the evaluated features:

Please, when commenting, write the question code (P1, P2...). Thanks!

Extensionly

4 - Must have
3 - Should have
2 - Could have
1 - Wouldn't have

17. P5 - As a Proponent, I would like to fill in a general report on the progress of the outreach activity carried out, for archiving purposes. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

18. P6 - As a Proponent, I would like to register multiple editions of the same outreach activity, so that new participants can check past editions. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

19. P7 - As a Proponent or Instructor, I would like to get in touch with the participants of the outreach activity, so that it is easy to pass on information relevant to the activity. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

20. Regarding the previous question (P7), I prefer to get in touch through: *

Check all that apply.

- [ ] Email
- [ ] WhatsApp

21. P8 - As a Proponent, I would like to receive the evaluation of the participants of my outreach activity in a detailed report/form format, so that I am aware of what I should improve for the next edition. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

22. Please leave your comment (suggestion, improvement or criticism) about the evaluated features:

Please, when commenting, write the question code (P5, P6...). Thanks!

Extensionly

4 - Must have
3 - Should have
2 - Could have
1 - Wouldn't have

Outreach Activities Instructor

The person who passes the content in the case of workshops, gives a lecture or teaches a course. The agent who presents something to the participants.

23. I1 - As an Instructor, I would like to manage the attendance of registered participants so that certificates can be issued for those present. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

Coordinator of outreach projects or programs
One who reviews and approves proposed outreach activities.

24. C1 - As Coordinator, I would like to manage the submissions of new outreach activities carried out, so that each proposal goes through a review process before being accepted. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

25. C2 - As Coordinator, I would like to issue certificates of participation with a certain number of hours for all involved, participants, instructors and coordinator, so that the individual's involvement in the outreach activity is proven. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

26. Please leave your comment (suggestion, improvement or criticism) about the evaluated features:

Please, when commenting, write the question code (I1, C1...). Thanks!

_____

_____

_____

_____

_____

Skip to question 47

Extensionly

We ask the respondent to evaluate the question, assuming that they were a system user. The questions are arranged according to the MoSCoW scale, which is frequently used to prioritize requirements. The four levels in English are:

4 - Must have
3 - Should have
2 - Could have
1 - Wouldn't have

Participant

The Participant or Listener user is the one who enroll to some outreach activity and is present on the established dates.

27. A1 - As a Participant, I would like to apply for outreach activities such as events, courses and lectures, to enter the waiting list and be accepted in the activity. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

28. A2 - As a Participant, I would like to be able to search for outreach activities, so that I can find what I am looking for more easily. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

29. A3 - As a Participant, I would like to cancel or edit the information of an outreach activity enrollment made by me, to have more freedom in case I change my mind. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

30. Please leave your comment (suggestion, improvement or criticism) about the evaluated features:

Please, when commenting, write the question code (A1, A2...). Thanks!

Extensionly

4 - Must have
3 - Should have
2 - Could have
1 - Wouldn't have

31. A4 - As a Participant, I would like to see previous editions of outreach activities, so that I can read past proposals. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

32. A5 - As a Participant, I would like to view the history of all the outreach activities I have participated in, so that I don't have to keep the record outside of the tool. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

33. A6 - As a Participant, I would like to have a help area within the system, to guide me with any questions or problems that I may face with the activity I signed up for. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

34. A7 - As a Participant without college enrollment, I would like to register in the system to participate in outreach activities that interest me. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

35. Please leave your comment (suggestion, improvement or criticism) about the evaluated features:

Please, when commenting, write the question code (A5, A6...). Thanks!

Extensionly

4 - Must have
3 - Should have
2 - Could have
1 - Wouldn't have

36. A8 - As a Participant, I would like to inform my interest in areas of knowledge, so that I can see outreach activities related to them. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

37. A9 - As a Participant, I would like to favor outreach activities that I deem interesting, so that I have easy access to them when I need them. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

38. A10 - As a Participant, I would like to show my interest in unavailable outreach activities, so that I will be notified when a new issue opens. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

39. A11 - As a Participant, I would like to register for outreach activities without registering in the system, so that my information is not saved. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

40. Please leave your comment (suggestion, improvement or criticism) about the evaluated features:

Please, when commenting, write the question code (A9, A10...). Thanks!

Extensionly

4 - Must have
3 - Should have
2 - Could have
1 - Wouldn't have

41. A12 - As a Participant, I would like to share information about the outreach activity, so that I can share it more easily with my friends. *

Mark only one oval.

	1	2	3	4	
Wouldn't have					Must have

42. A13 - As a Participant, I would like to evaluate the outreach activity in which I participated, so that other participants can see the grade I assigned. *

Mark only one oval.

	1	2	3	4	
Wouldn't have					Must have

43. A14 - As a Participant, I would like to see the outreach activities in which I am enrolled in the form of a calendar, so that I can organize myself better. *

Mark only one oval.

	1	2	3	4	
Wouldn't have	◯	◯	◯	◯	Must have

44. About the previous question (A14), I: *

Check all that apply.

- [ ] I prefer a calendar on the website of the tool itself
- [ ] I prefer to export events to my calendar app (Google Calendar or iCloud Calendar)

45. Please leave your comment (suggestion, improvement or criticism) about the evaluated features:

Please, when commenting, write the question code (A13, A14...). Thanks!

_____

_____

_____

_____

_____

Skip to question 46

Extensionly - Suggestions

This section is reserved for you to suggest some functionality (requirement) that was not mentioned above, but that you consider important for the completeness of the system.

46. Suggestions (as a Participant):

Skip to question 48

Extensionly - Suggestions

This section is reserved for you to suggest some functionality (requirement) that was not mentioned above, but that you consider important for the completeness of the system.

47. Suggestions (as Coordinator, Instructor or Proposer):

Skip to question 48

Submission of participation certificate

If you want a certificate of participation in this survey, fill in all the fields below.

48. Your email:

49. Your full name: