Unlock the Power of the USARP Method: The USARP Tool Contribution to Usability Requirements Elicitation and Specification

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Abstract. Usability is fundamental to the success of digital products. The USARP method (USability Requirements with Personas and user stories) emerged to assist in eliciting and specifying usability requirements. USARP suggests using personas, user stories, and brainstorming sessions to discuss usability guidelines in card format. Although its effectiveness in eliciting usability requirements, USARP must improve its application. Conducting the brainstorming sessions with USARP artifacts, registering decisions, and refining requirements based on them requires different support tools. This work proposes to fill this gap with the USARP Tool, a tool dedicated to eliciting and specifying usability requirements. The USARP Tool follows a client-server architecture and uses technologies such as JavaScript, React, Node.js, and PostgreSQL to offer functionalities such as project management, user stories, brainstorming sessions, sharing and collaboration, card customization, and recommendation. This work provides a practical solution for applying the USARP method in eliciting and specifying usability requirements.

Keywords: Usability Requirements, USARP Tool, Web Platform

1 Introduction

Usability is widely recognized as an essential component for the success of any digital product or service [11]. Effectively eliciting and specifying usability requirements is crucial to ensuring that systems meet users' needs and expectations [1] and provide a positive user experience.

The USARP method (USAbility Requirements with Personas and user stories) stands out as an approach that utilizes personas, user stories, and cards with usability guidelines for this purpose [12]. Personas are used to describe the user profiles, expectations, and needs. User stories are adopted as a template for requirements specification. Based on a set of user stories and personas related to them, brainstorming sessions are conducted to discuss usability requirements guided by the cards [9].

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Despite the relevance of the USARP method, studies have identified some gaps in its practical application, especially concerning the selection of the questions that compose the method during brainstorming sessions, the registering of the decisions made, and the refinement of requirements [10][8]. These difficulties can limit effectiveness, highlighting the need for tools to support this process.

Recent research has explored different approaches to eliciting and specifying usability requirements, including methods that consider gender diversity [2], Design Thinking techniques [4], and rapid prototyping tools [13]. However, only some studies have focused explicitly on evolving existing methods, such as USARP, by developing specific tools to overcome their limitations and improve their practical applicability.

Developing a tool dedicated to the USARP method can significantly benefit Software Engineering professionals. It can assist them in eliciting and specifying usability requirements more efficiently and effectively. Additionally, it can contribute to the broader dissemination and adoption of USARP in industry and academia. Thus, this paper introduces the USARP Tool, a tool dedicated to eliciting and specifying usability requirements based on the USARP method. The tool aims to support professionals in all steps proposed by USARP.

2 USARP (Usability Requirements with Personas and User Stories)

The USARP Method (Usability Requirements with Personas and User Stories) is a systematic approach for eliciting and describing usability requirements, as presented by Oliveira Júnior et al. [12] and evolved by Marques and Fiori [10]. USARP combines user stories to specify requirements, the persona technique to specify different user profiles, and cards containing questions based on the usability guidelines proposed by Juristo et al. [7].

The cards provide a structure for identifying usability requirements in brainstorming sessions with the team involved in different areas of application development. USARP offers a set of cards that are classified into usability mechanisms, usability requirements, and Prototypes. These cards provide guidance and questions to assist in obtaining and specifying usability requirements and creating prototypes that represent these requirements. These cards support the elicitation and specification process of usability requirements.

Although USARP presents significant advantages, adopting this method by inexperienced teams using cards revealed difficulties in the process [10][8]. These difficulties occur in selecting usability cards during brainstorming sessions and in understanding and applying the guidelines proposed by the method. In light of this, Marques and Fiori [9] presented the evolution of the method, which involved a review of the cards, removing redundant content, and combining cards with similar content, as well as the proposal of a checklist and a framework to guide the selection of cards according to the characteristics of users and the system. Figure 1 illustrates the steps, accompanied by a concise example of the application of the USARP method, now in its updated version.

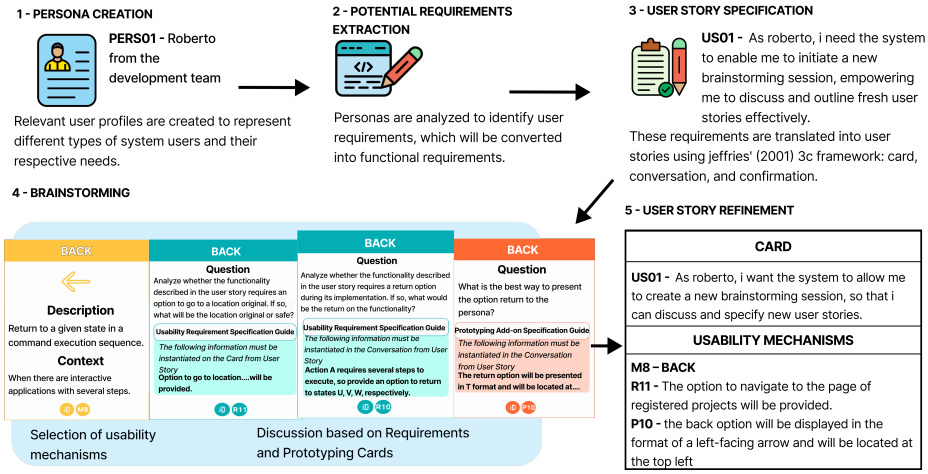

Fig. 1. The process updated to apply the USARP method.

1. **Persona Creation:** To think about usability mechanisms, it is necessary to think about users. Thus, USARP suggests that the requirement team creates personas to represent the user profiles, including their needs, expectations, and demographic data. Diverse methods can be applied to create personas, such as proto-personas [8], PATHY [5], or GenderMAG [6].
2. **Potential Requirements Extraction:** The requirement team discovers the requirements that address their needs by analyzing the persona's content and other data collected on user research.
3. **User Story Specification:** The requirement team specifies a set of user stories that represent the requirements. USARP adopts the 3C template (Card, Conversation, Confirmation) for user stories. In this step, the focus is on specifying the **Card** of the user stories.
4. **Brainstorming:** The requirement team selects a set of user stories and conducts a brainstorming to discuss usability mechanisms related to them. In this brainstorming, the USARP cards are used, which contain questions about how to provide cancel, undo, preferences, and structured data input resources. USARP strongly suggests the participation of professionals from different project areas in these sessions to provide diverse viewpoints.
5. **User Story Refinement:** The decisions made during the brainstorming sessions are registered in the **Conversation** of the user stories, in a section named **Usability Mechanisms**. Steps 4 and 5 are repeated until all the project user stories are refined.

3 Related Works

This section summarizes related work on usability requirements and proposed interventions to address them in the Requirements Engineering process.

A case study reported by Marques et al. [8] investigated the effectiveness of the USARP method in eliciting usability requirements in a remote development context in the industry. The analysis of the results revealed that USARP effectively identified and specified usability requirements, demonstrating its usefulness in remote development. The team defined 120 UI/UX aspects relevant to the system under development, showcasing the method's ability to support comprehensive usability requirements elicitation. However, the tools used to apply USARP presented limitations, emphasizing the importance of having adequate tools to facilitate collaboration during brainstorming and documenting decisions made for subsequent use in refining requirements.

Too et al. [16] present the development of a tool to support the specification of usability requirements, named UReST, based on knowledge. The proposal consists of a solution grounded in ontologies and boilerplate[1] models aimed at assisting requirements engineers in generating usability requirements and automating and facilitating the selection and specification process of these requirements. The experiments conducted to examine the tool's effectiveness are detailed, including a controlled study and a usability analysis. The results of these experiments demonstrate how UReST can improve the generation of usability requirements compared to manual approaches. The authors highlight improvements and plans to extend the research, including validating the tool in industrial settings and comparing it with other elicitation and specification methodologies.

Silva et al. [15] address the development of a library of reusable usability requirements using the RSL (Requirements and Tests Specification Language), a controlled natural language developed to facilitate the systematic, rigorous, and consistent production of requirement and test specifications. During the development of this language, they classified usability patterns as reusable quality objectives and requirements. The library encompasses 41 reusable objectives corresponding to identified usability patterns. Furthermore, evaluation sessions were conducted with industry professionals to validate the effectiveness of the proposed approach, which positively contributed to the elicitation, analysis, and specification of usability requirements. The results suggested further evaluations, additional case studies, and mapping of dependencies between requirements and user interface design decisions.

The study conducted by Marques et al. [8] demonstrates the effectiveness of the USARP method in fulfilling its functionalities in the industry while highlighting the need for the USARP Tool to strengthen the application of this method. Too et al. [16] focus on the role of the requirements engineer and the automation of generating usability requirements, which contrasts with the purpose of the USARP Tool, aimed at fostering multidisciplinary collaboration among members in eliciting usability requirements. Silva et al. [15] focus on reuse based on usability patterns, which can also be applied with USARP and were enhanced in the study conducted by Marques e Fiori [9], eliminating redundancies and assisting in selecting appropriate usability mechanisms.

[1] Code sections included in various places with little or no modification.

4 USARP Tool Overview

This section presents the organization of the tool's architecture, the current prototype visualization, and its fundamental functionalities.

4.1 USARP Tool Architecture

The USARP tool's architecture follows the two-layer client-server pattern [3], standing out for the clear separation between the layer responsible for the user interface and presentation logic (front-end) and the layer for business logic and data persistence (back-end), as depicted in the containers diagram in Figure 2. Front-end development employed technologies such as JavaScript, React, HTML, and Sass (a compiled stylesheet language for CSS). JavaScript with the Node.js framework was used for the back end, Sequelize ORM, and Express to handle HTTP requests. For data persistence, the PostgreSQL database is used.

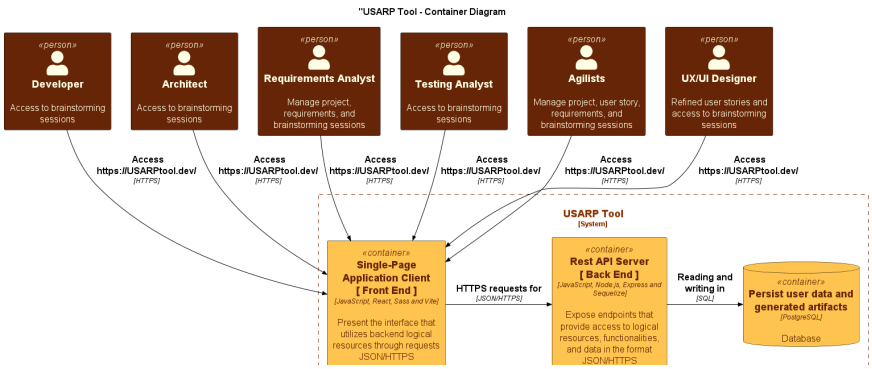

Fig. 2. Container diagram of the USARP Tool architecture using the C4 model.

4.2 Prototype

Figure 3 presents the prototypes developed initially. It is important to note that the tool is still in the development phase. Item (1) in Figure 3 refers to the user login interface. Item (2) represents the form for registering new users. Items (3) and (4) illustrate the project registration form. Finally, Figure 4 corresponds to the main screen, providing access to various functionalities, including project creation and brainstorming sessions, and a section for quick viewing of the most recent brainstorming sessions.

4.3 Functionalities

This subsection describes the essential functionalities of the USARP Tool. The **Project Management** functionality allows for registering and keeping relevant

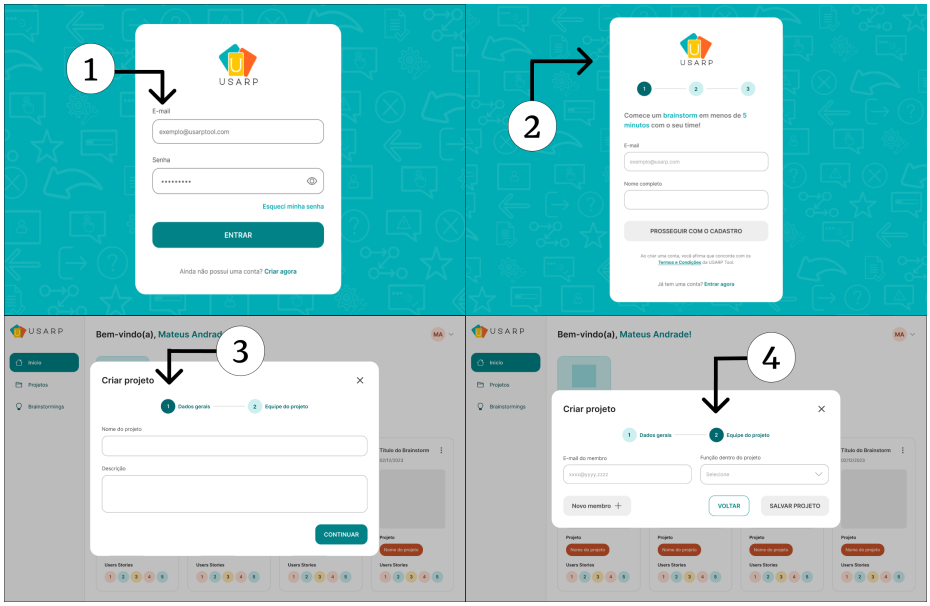

Fig. 3. USARP Tool screens prototypes.

information up-to-date for ongoing projects. It also provides proper organization and monitoring of development initiatives.

The **User Story Management** functionality enables the registration, listing, and deletion of user stories, which is essential for defining and monitoring project requirements. A resource for reopening stories marked as completed will be provided to deal with possible changes or issues in requirements over time.

Brainstorming Management enables users to create and manage brainstorming sessions in the system. It facilitates the discussion and specification of new ideas and user stories. Deleting previous sessions is highlighted to maintain the management of brainstorming activities.

The **Sharing and Collaboration Control** function enables team members to share links and email invites for effective and secure collaboration. Access control to projects ensures data integrity and protects sensitive information.

Lastly, the **Customization and Recommendation of Brainstorming Cards** functionality allows for annotations, saving, and customizing the brainstorming board. Card recommendation based on a checklist created by [9] can support the team to discuss only the cards relevant to a set of user stories.

5 Final Remarks and Future Work

This article highlights the importance of the USARP Tool as a practical solution to address gaps in the application of the USARP method in eliciting and specifying usability requirements. Its relevance lies in its ability to facilitate and

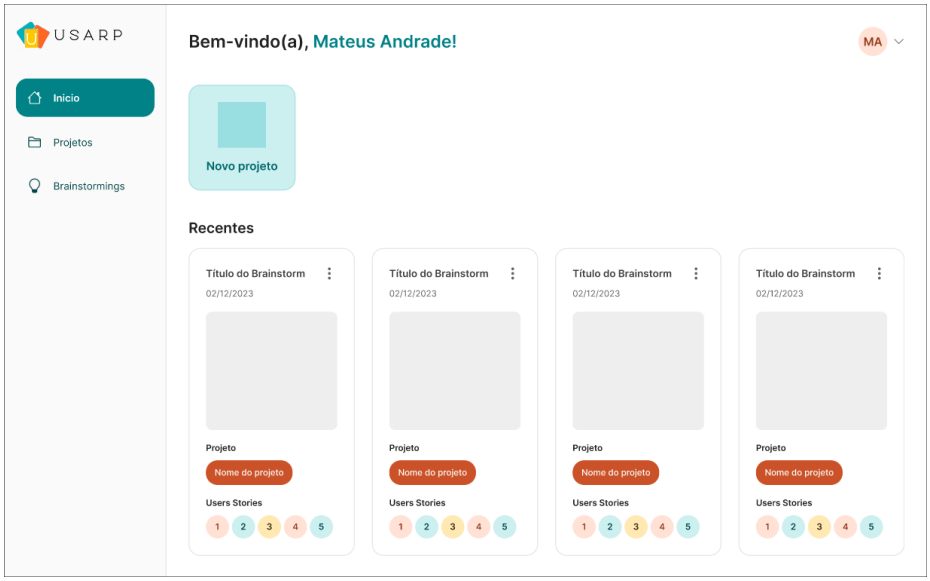

Fig. 4. USARP Tool main screen prototype.

enhance the software development process, ensure a positive user experience, and promote the creation of more usable and satisfactory systems for end users. The development schedule sets four months to complete the tool's essential functionalities, culminating in its readiness for acceptance testing.

As prospects for future work, it is proposed to improve the tool by adding new functionalities, as grounded in the study conducted by Santos et al. [14], and to investigate the reuse of usability requirements [15].

Experimental studies are recommended to validate the USARP Tool and gather feedback, identify areas of improvement that can be explored in various software development contexts and environments, and further enhance its utility and applicability in different web application development scenarios. The experimental studies will enable the safe and effective technological transfer of the USARP Tool to the software industry.

USARP tool demonstration video: https://youtu.be/673l3NO74sU.

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