Socially Aware Design Workshop to Discover Socio-Technical Requirements: Planning, Execution, and Results

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***Abstract*—This innovative practice article describes how society is transforming its daily life due to advances in Information and Communication Technologies (ICT), which primarily affect how people interact and perform their functions at work, home, and even leisure time. The social impacts must be perceived before they become a problem, meaning that during the conception (design) of an Information System (IS), social, cultural, environmental, and legal aspects must be considered to define sociotechnical requirements. Traditional requirements gathering does not address the above, resulting in less inclusive and less sustainable systems that may negatively impact society. This research presents the execution of a Socially Aware Design (SAwD) workshop to uncover sociotechnical requirements for designing an interactive game aimed at teaching Software Engineering, applying techniques, and generating artifacts proposed by SAwD. Design theory addresses techniques and artifacts that contribute to IS construction, and organizational culture theory studies the behavior and values of a group of people. Planning and execution of a semi-participatory design workshop divided into three phases. The first phase uses brainstorming to build artifacts: stakeholder diagram, evaluation framework, value cake, and semiotic ladder. The second phase employs brainwriting to collaboratively build the game, and the third phase uses braindrawing to prototype the game. With active participation from workshop participants, it was possible to generate all planned artifacts with content that effectively contributed to the game prototype, considering the semiotic ladder's social aspects and defined requirements. A quantitative and qualitative analysis of workshop results is presented. The number of participants, completion time, and generated requirements contributed to quantitative analysis, while observation and participant experience reporting contributed to qualitative analysis. This research contributes to the dissemination of techniques and artifacts proposed by SAwD and provides a step-by-step guide to their application in the pursuit of sociotechnical requirements, essential for the construction of inclusive, sustainable, and effective IS.**

***Index Terms*—Socio-technical requirements; Educational games; Socially aware design; Software engineering.**

I. Introduction

The growing integration of information systems into people's daily lives has significantly shaped the way individuals live, work, and relate [1].

The mismatch between technological advancement and the understanding of the social impacts of new technologies can result in systems that do not adequately meet users' needs and expectations, potentially leading to significant negative impacts on people's lives. This reflects a demand for design approaches that go beyond mere technical functionality but also consider the social aspects inherent in the use of these systems.

In this context, it is worth highlighting Paulo Freire, who is still relevant, [...]. As a human practice, technology is political and permeated by ideology. It has a well-defined purpose, serving a group of people and various interests: technology is not neutral, it is intentional and is neither produced nor used without a worldview, a view of humanity, and a society that underpins it [2], which corroborates the importance of understanding the social context in which technologies will be inserted even at present.

From a worldview, and societal perspective combined/associated with the technical vision arising from technologies, the sociotechnical vision is conceptualized which allows technological artifacts to be in harmony with human, organizational, and social factors in the development, adoption, and use of Information Systems (IS) [3], meaning it associates, explores, and combines technical requirements with social requirements.

Identifying and associating social elements with technical requirements is not an easy task. Theories, approaches, methods, techniques, and recommendations are necessary to work

with human and cultural values, especially for Information Technology professionals who often have training and experience only with technical focus [4].

Socially Aware Design (SAwD) can assist in this context by using Organizational Semiotics to discover and model human values, habits, cultures, procedures, and rules involving different types of users of a computer system to link these elements to the technical level of the system [5].

SAwD aims to elucidate problems and propose solutions by observing characteristics at three levels of abstraction and formalism with the objective of including sociotechnical requirements in the interactive systems design process, integrating human values, cultural aspects, and the social reality of users [6]. It proposes the conduct of semi-participatory design workshops, combining concepts from Organizational Semiotics [7] and participatory design.

Within this discussion, this research proposes the conduct of a SAwD workshop aimed at collaboratively discovering sociotechnical requirements for the creation of a Role-Playing Game (RPG) with Internet of Things (IoT) elements for teaching Software Project Management, including elements to be taught to SAwD students themselves. At the end of the workshop, a list of sociotechnical requirements and game prototypes was generated.

This article presents how to apply SAwD, which can be replicated in the development of other educational games and IS in other contexts, detailing the planning and execution of a semi-participatory design workshop according to SAwD guidelines. The artifacts generated during the workshop are presented, discussed, and analyzed, providing an understanding of the sociotechnical requirements identified in the process. By addressing these issues systematically, this work seeks to fill a gap in the understanding and application of SAwD practices, promoting the construction of IS more aligned with the needs and values of the society in which they are embedded, as well as the creation of an educational RPG for Software Engineering (SE).

A. Objective

The overall aim of this research is:

- **To discover** sociotechnical requirements **regarding** the characteristics of informal (culture), formal (rules), and technical (technological requirements) levels, **from the perspective of** researchers representing stakeholders of the project **in the context of** creating an RPG with IoT elements for use in teaching Software Project Management.

The specific objectives that lead to the achievement of the overall aim are:

1) To plan a semi-participatory design workshop;
2) To execute the semi-participatory design workshop generating the artifacts proposed by SAwD;
3) To create a prototype of the RPG;
4) To analyze and present the results.

B. Contribution

The main contribution of this work is to **present** to the scientific, academic, and industrial society how to conduct a SAwD workshop for discovering sociotechnical requirements in the construction of interactive information systems, making these systems more humanized, inclusive, and sustainable, while also minimizing negative impacts when introduced into society.

The study aims to provide valuable insights into how to conduct SAwD workshops for discovering sociotechnical requirements. While there are existing researches exploring SAwD, this study differs from others because it thoroughly addresses the steps for conducting workshops with the characteristics, techniques, and artifacts proposed by SAwD.

Thus, **it reports** the planning and execution of a SAwD workshop in the construction of an RPG with IoT elements for use in teaching technical content and exercises of social skills in the Software Project Management discipline. However, **it is emphasized** that this method can be replicated in the creation of other educational games or in any type of IS such as systems focused on health, safety, industry, entertainment, and other services that permeate society. The main contribution of this research is the presentation of a process for conducting SAwD workshops and the prototyping of the RPG.

II. Background

In this section, important concepts used in this research are presented, as well as the main related works.

A. Sociotechnical Perspective

Information Systems (IS) are developed by people and for people, so understanding human characteristics and behaviors, as well as improving their skills, is essential for IS development [8]. However, IS are still built with a narrow view focused on technical aspects, without considering aspects related to culture, politics, market conditions, organizational conditions, and the impacts caused by technology on society [9].

Increasingly, the importance of software development establishing closer ties with social sciences and cognitive psychology is recognized [9]. This relationship occurs through a sociotechnical approach, which observes the complexity of the application in relation to both technical and social aspects [10]. It is important to highlight that the goal of a sociotechnical perspective in IS development is to unite the technical and the social, perceiving them in a new framework. A perspective that seeks not to fragment SE into technical aspects on one side and non-technical aspects on the other, making them indivisible [9].

The need for a sociotechnical perspective stems from the concept of sociotechnical systems, which seeks to maintain a reciprocal interrelation between humans and machines, maintaining harmony between technological efficiency and humanization, which significantly contributes to the success and effectiveness in the construction and use of IS [10].

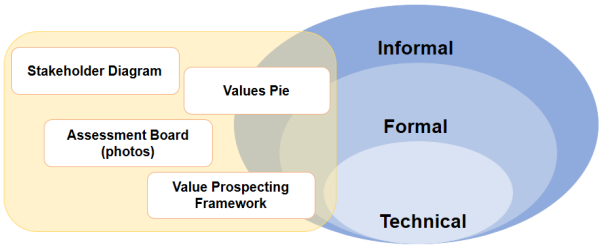

Fig. 1. Semiotic onion with artifacts. Source: Based on [14]

B. SAwD

SAwD proposes the collaborative participation of stakeholders from various layers of society who have an interest in the project, directly or indirectly, and/or may be future users and/or who may contribute in some way to the conception of a design for all [11]. It is based on Organizational Semiotics [7], on the Building Blocks of Culture by [12], on the Theory of Values by [13], and on participatory design.

In Figure 1, the Semiotic Onion is represented, containing the three levels at which SAwD operates (informal, formal, and technical) associated with artifacts that collaborate in the discovery of sociotechnical requirements. At the informal level, everyday life, culture, and human values of the involved people are observed; the formal level represents how society is organized, based on its laws, rules, and models; and at the technical level, technological artifacts are represented, considering the data from the previous levels, society, and design. Each level interferes with the others in a cyclical movement [11].

Each artifact in Fig. 1 represents a specific characteristic. When specifying the Stakeholder Diagram (SD), those involved at different levels regarding the problem/solution are considered. This artifact assists in identifying and/or recognizing non-obvious stakeholders that compromise understanding of the problem [14].

The Evaluation Board artifact is built by stakeholders who discuss problems and solutions of the analyzed context. The Value Prospecting Board is suggested to obtain a more detailed view from the main stakeholders [14]. While the Value Pie is filled for an understanding of values according to their formality, culture, and interaction [15].

C. Related works

SAwD is particularly important in critical domains such as education, health, and safety. [16] reports a collaborative workshop developed to understand problems and gather requirements for a game aimed at assisting children in speech therapy exercises outside the hospital environment. Its goal was to create a systemic understanding of the problem, covering human and technical aspects, potential solutions, and their implications. This study is sequenced and concluded in [17], with the conduct of semi-participatory design workshops.

SAwD has been applied in the educational context in [18], where they designed a socioconstructivist environment, CPES (Collaborative Programmable Environment for Storytelling), in early childhood education. Another study applies SAwD in education for Adult and Youth Education (AYE), aiming to teach computational thinking to this audience by creating real-world scenarios [19]. And a study focused on Software Engineering (SE) addresses the Human-Computer Interaction (HCI) discipline through projects for the creation of interactive artworks.

SAwD was also applied in the construction of a digital educational game focused on SE. This study highlights the importance of understanding the social context in educational approaches in SE when developing interactive games. The method used involved semi-participatory design workshops, resulting in artifacts such as the Stakeholder Diagram, Value Prospecting Board, Evaluation Board, Semiotic Ladder, and a game prototype. This study does not explore the Value Pie [20].

The analysis of results revealed significant contributions, including increased stakeholder participation and the discovery of sociotechnical requirements, promoting a deeper understanding of the problem and enhancing the solution. It also emphasizes the relevance of applying and disseminating SAwD, aiming to build more humanized, sustainable, and inclusive interactive systems in the IS field [20].

Regarding studies seeking methods, processes, and tools for obtaining sociotechnical requirements, one can mention a study that uses the Functional Resonance Analysis Method (FRAM) to model complex sociotechnical systems based on the concepts and principles of Resilience Engineering [21], thus it is applied to model sociotechnical systems, excluding other types of IS.

III. Method

This research aims to conduct a semi-participatory design workshop according to SAwD guidelines, with the objective of identifying and prototyping sociotechnical requirements in the creation of an RPG for teaching SE. It is characterized as descriptive research, associated with the interpretivism paradigm through action research. Data collection occurs from the data generated during the workshop execution, and a quantitative and qualitative analysis of the results is performed.

During the workshop, techniques such as brainstorming, braindrawing, and brainwriting are applied to develop artifacts that contribute to the identification of sociotechnical requirements of the system.

In Figure 2, the process for applying SAwD, developed by the authors, is represented through the planning and execution of a semi-participatory design workshop, with activities and their respective execution flow. The process for conducting SAwD workshops consists of two stages (Fig. 2): Planning and Execution. The Execution stage is divided into Opening, Conception, Modeling, and Conclusion. These stages are detailed in the following subsections.

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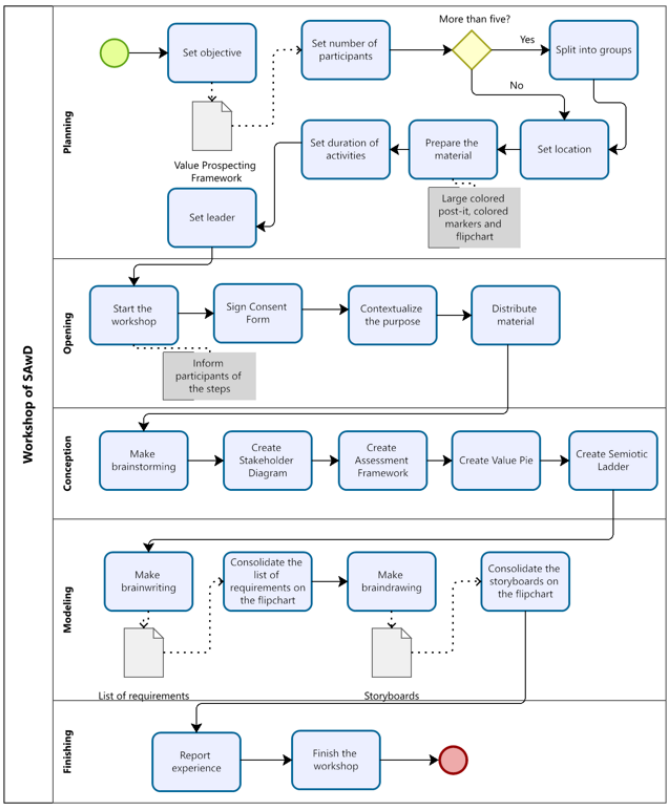

Fig. 2. Process for conducting SAwD workshops.

Conclusion. These stages are detailed in the following subsections.

A. Workshop Planning

The planning stage begins with defining the objective, aiming to understand the problem in a shared manner before solving it. Thus, it is suggested to develop the Value Prospecting Board, which will guide participants in seeking the most suitable solution to the proposed problem, as depicted in Figure 3.

Next, the number of participants is defined. If the number exceeds five, which is often the case due to SAwD's characteristic of involving as many stakeholders as possible for collaborative design, groups should be created to optimize the dynamics' execution.

Based on the number of participants, the location and time are chosen, and the material is prepared, consisting of colored post-it notes, colored markers, A4 paper, and flipchart sheets. The facilitator who will lead the workshop is determined. Typically, the facilitator does not count as a participant unless they also participate in creating the artifacts. It is also important to define the duration of each proposed activity during the workshop execution. The duration may vary according to the complexity of the IS to be modeled.

B. Workshop execution

The execution of the semi-participatory design workshop is divided into Opening, Conception, Modeling, and Conclusion.

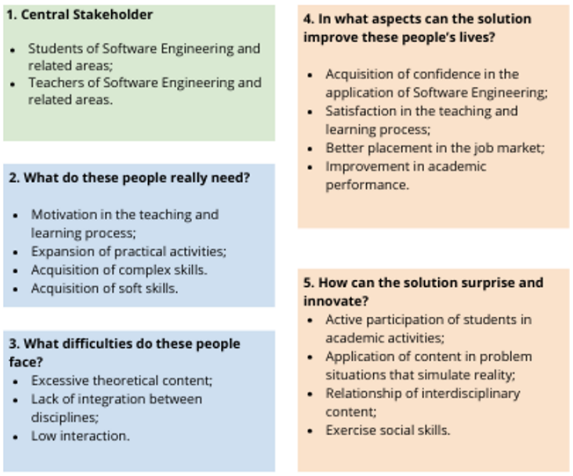

Fig. 3. Value Prospecting Framework.

For these activities, the brainstorming technique is used to encourage participants to fill in the artifacts they are creating.

1) Opening: The facilitator starts the workshop by explaining to the participants the activities to be carried out, their duration, the techniques used, and the artifacts to be generated (10 minutes). They contextualize the purpose, clarifying the workshop's objective, and may at this point request a key stakeholder to contribute additional information and even use additional documents (15 minutes). Then, the facilitator distributes the materials and proceeds to the Conception phase (5 minutes). The total time for the opening session is 30 minutes.

Participants are also requested to read and sign the Consent Form, allowing the use of the produced materials and images for research purposes. It's important to inform the participants about the content of the document and the collection of signatures at the beginning of the workshop.

2) Conception: The majority of the workshop activities are focused during the Conception phase. Thirty minutes should be allocated for identifying stakeholders who will compose the Stakeholder Diagram (SD).

For the creation of the Evaluation Board, at least 20 minutes are needed for the identification and description of problems. Additionally, 20 minutes are required for proposing ideas and solution suggestions related to the identified problems, totaling 40 minutes for this activity.

After creating the Evaluation Board, the activity of identifying values in 10 cultural areas, which will compose the Value Pie, begins. This activity is allotted 40 minutes.

The creation of the Semiotic Ladder requires a little more time than the previous activities because it is based on the results of the artifacts created to identify the sociotechnical requirements that will be part of the six steps of the semiotic ladder. This activity is allocated one hour.

In summary, the Conception phase includes the creation of the Stakeholder Diagram, the Evaluation Board, the Value Pie, and the Semiotic Ladder, totaling 3 hours and 30 minutes.

3) Modeling: In this stage, a list of requirements derived from the sociotechnical requirements of the Semiotic Ladder and storyboards derived from the list of requirements are produced.

For creating the list of requirements, the brainwriting technique is used, which involves distributing an A4 sheet to each participant (divided into groups of up to 5 people). Each participant should start the text on their sheet with "The system must have," "The game must have," or "The application must have," depending on the context, and continue the text until the facilitator gives a warning to switch the sheet of paper with the participant next to them. The participant stops writing, and the other continues from where the previous one left off. The sheets rotate until each one receives theirs back. The first round starts with 1 minute and 20 seconds, and with each round, there is a gradual increase in time so that the participant can read what is already on the sheet and continue writing. This part of the activity lasts for 10 minutes.

Next, each group gathers the sheets from their participants to extract and consolidate the requirements on a flipchart sheet. This activity lasts for 30 minutes. Thus, the total duration of the brainwriting activity is 40 minutes.

From the consolidated list of requirements, participants are invited to create the first prototype using the braindrawing technique, which is similar to brainwriting, but instead of text, participants draw (there may be indicative texts in the drawings). The first round starts with 1 minute and 20 seconds, and with each round, there is a gradual increase in time so that the participant can read what is already on the sheet and continue the drawing, using a total of 10 minutes.

Once the rounds of braindrawing are completed, groups consolidate the drawings on a flipchart sheet, resulting in the first prototype of the IS. For this consolidation activity, 50 minutes are available. In total, 1 hour is needed to complete this activity.

For creating the artifacts proposed in the Modeling stage, 1 hour and 40 minutes are required.

4) Finishing: In this final stage, 30 minutes are allocated for participants to report their experience and provide feedback on the results of the activities, using the focus group method for collecting qualitative data.

Following this, the facilitator expresses gratitude and formally concludes the workshop.

IV. Results and discussion

This section presents the results obtained from the execution of the semi-participatory design workshop, including the respective artifacts generated and discussions regarding the stakeholders' understanding of the problem and their comprehension of the human and social values that constitute the context of the system to be developed.

A. Opening of the workshop

The workshop took place on August 23, 2023, at the Fundamentals and Applications in Software Engineering Laboratory (Lab FAES) of the Graduate Program in Informatics at the University of *[omitted for blind review]*. With ten attendees in total, including researchers, software engineering professors, undergraduate students, and graduate students, the facilitator began by presenting the artifacts that would be worked on, previously drawn on the whiteboard, the duration of the activities, and provided a brief contextualization of the topic to be addressed.

As the theme is the creation of an RPG for teaching Software Project Management with IoT elements, considering the exercise of interpersonal and social skills, one of the key stakeholders presented 16 skills extracted from the ACM/IEEE Global Computing Education paradigms [22] for collaborative selection of which skills should be addressed in the game.

Seven skills were selected: problem-solving ability, critical and sharp awareness, ethics and responsibility, systemic vision, conflict resolution, social and cultural issues through non-technical context analysis, and analysis of the impact of social changes caused by technology. In addition to three other skills that are intrinsic to RPG: collaboration, teamwork, and communication.

B. Stakeholders Diagram

The first artifact collaboratively worked on was the Stakeholder Diagram (SD), which identifies stakeholders, mapping who may be directly or indirectly impacted by the system. The objective of stakeholder identification is to enable the participation of stakeholders in the design process for a better understanding of the problem and joint construction of the solution.

The artifact categorizes stakeholders into five layers, with the closer to the core, the more important the stakeholder is to the system. The categories of the SD, from the innermost to the outermost layer, are as follows:

1) Operation: At the core of the diagram lies the objective, designers, and developers can also be considered.
2) Contribution: Those who directly contribute to the problem.
3) Source: Those who provide data and/or are a source of information for the problem or its solution, or make use of them.
4) Market: Related to market aspects related to the problem.
5) Community: Representatives of the community who influence and are influenced by the problem in the social context.

The result of the Stakeholder Diagram (SD) is presented in Figure 4. It can be highlighted that in the **Operation** category, the core of the diagram, the system to be developed is identified as an RPG for teaching SE; in **Contribution** are the main stakeholders who directly contribute to the solution, including teachers, students, and game designers; in **Source**, professionals in HCI, educators, and game masters are highlighted; in **Market**, ludic extension projects and developers of educational games; and in **Community**, universities and citizens.

Fig. 4. Stakeholders Diagram.

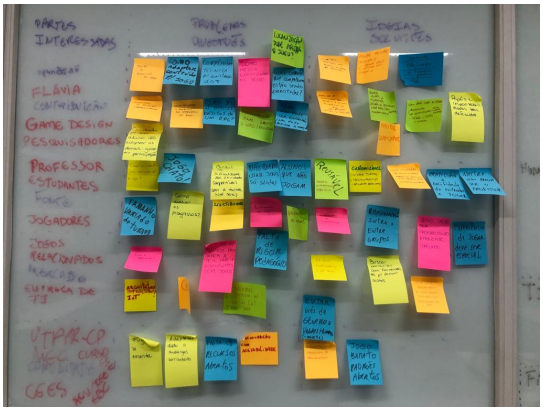

Fig. 5. Construction of the Evaluation Board.

A total of 28 stakeholders were identified, with five of them considered as main stakeholders. Some stakeholders were identified in more than one category, depending on the contribution they can offer or be impacted in relation to the system. When conducting semi-participatory design workshops, it is important to involve representatives from each of the identified stakeholders. This activity was considered satisfactory due to the active participation of all attendees, as well as the presented result.

C. Evaluation Board

The Evaluation Board is filled in two stages: problem identification and suggestion of ideas for solving the identified problems. The construction of this board with respective problems and solutions suggested by the participants can be visualized in Figure 5.

It can be observed in Figure 5 that in the left column, the identified stakeholders from the SD are listed. In the middle column, sticky notes related to the problems perceived by each stakeholder are attached, and in the right column, proposed solutions to the identified problems are listed.

For the identification of problems and proposed solutions, as well as for the creation of the SD, the brainstorming technique was used. As problems and solutions emerged, more issues were brought to light. In total, 29 problems and 25 associated solutions were identified. The dynamic involving participants in understanding the problem suggests that the more people involved in the design process, the more problems and solutions are raised.

One problem can result in multiple solutions, or one or more problems can lead to a single solution. An example of two problems resulting in one solution is: problem 1 - ”How to ensure which competencies are being exercised?” and problem 2 - ”Where to fit the exercise of skills in the game?” The proposed solution for problem 1 and problem 2 was ”Associate skills and/or competencies with challenges, characters, and game objectives.”

It was observed that the greater the involvement of stakeholders in the problem, i.e., the closer they are to the core of the SD, the higher the incidence of problems and solutions reported in the Evaluation Board.

D. Value Pie

The Value Pie is an artifact proposed by [23], also known as eValue, to assist in the analysis and design of interactive computer systems from the perspective of social and cultural values. The authors emphasize the importance of understanding cultural values in system design, facilitating the identification of cultural values and relevant social aspects in the design of the new system.

This artifact is based on Hall’s Primary Message System, which characterizes culture through Building Blocks of Culture [12], divided into: interaction, association, subsistence, classification, space, time, learning, fun, protection, and exploration.

To assist in gathering requirements for the creation of the RPG proposed in this research with a more specific understanding of the cultural characteristics in which the game will be inserted, the Value Pie Chart was conceived. The conception was carried out considering the narrative, scenario, game mechanics, and the social and cultural contexts of the players.

During the workshop, participants filled the Value Pie by contextualizing the players’ profile and characteristics that the game should have to meet the identified context. In Fig. 6, the Value Pie is represented with the identified characteristics.

In the ”Interaction” area, it is mentioned that the ”Interaction” refers to the relationship between the teacher, who masters the game for the student, or the teacher can also be just the mediator and allow the students to take on the role of master while others only play. It is also suggested that the classroom be divided into groups and that the narrative allows collaboration between groups to achieve the game’s objective.

In the ”Space” section, the context of the narrative is defined, which will have family farming as the main theme, and more physically, the dimensions and characteristics of the game board as supporting material for the game.

Under ”Time,” it is highlighted that each game session can last the equivalent of 1 hour and 10 minutes, considering the use of two classes per session, each of 50 minutes (10

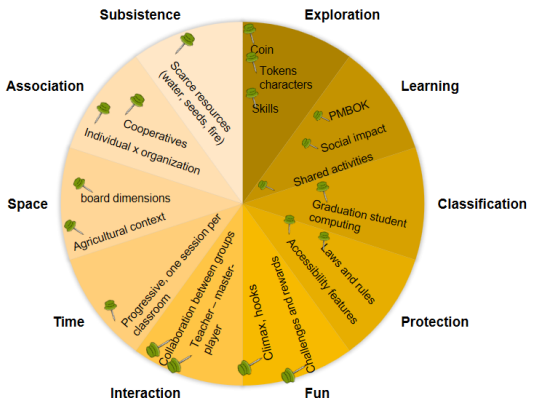

Fig. 6. Value Pie

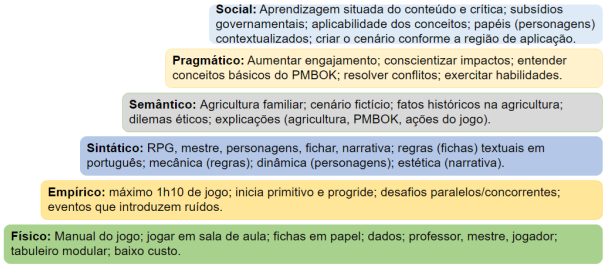

Fig. 7. Semiotic Ladder.

minutes at the beginning of the class to contextualize and prepare, 70 minutes playing, and the remaining 20 minutes for discussion and feedback). It is also noted that the challenges should be progressive (from easy to difficult) and that the use of technologies in the field should also follow a temporal evolution.

In the ”Fun” category, the importance of creating a climax (some tension) to capture the players’ attention is raised, proposing challenges, creating hooks for the continuation of the story, if it extends beyond one class (session), and the need to ensure rewards for achievements in the game.

Under ”Learning,” the technical content to be worked on in the game (PMBOK - Project Management Knowledge Guide) is emphasized, the importance of creating problem situations that players must analyze the social impacts, possibly proposing the use of SAwD artifacts in solving these problems, and also sharing knowledge through collaboration in carrying out activities.

It is also worth noting the ”Subsistence” area, which addresses proposing the scarcity of natural resources such as water, the dangers of global warming that can result in wildfires, and the acquisition of seeds for planting.

The discussion and completion of these areas of the Building Blocks of Culture involved all participants who did not hesitate to place the post-its on the board in the part representing the Value Pie Chart. This activity was considered relevant to the process of eliciting sociotechnical requirements.

E. Semiotic Ladder

Once the problems were identified, solutions proposed, and the characteristics mapped in the ten areas identified in the Value Pie, the collaborative construction of the Semiotic Ladder was carried out, in which sociotechnical requirements are arranged.

The Semiotic Ladder consists of six steps, with the top three steps related to the human information system, in the use of signs, how they function in communicating meanings and intentions, and what the social consequences of their use are. Meanwhile, the bottom three steps refer to aspects of the technological infrastructure, enabling the physical and technological implementation of the system [Reference].

Based on the result of this activity, the sociotechnical requirements were arranged in the Semiotic Ladder in the format shown in Fig. [Reference], based on the previous artifacts and mainly on the perception of the characteristics derived from the Value Pie. These requirements will support the creation of a comprehensive list of requirements and the development of the game prototype.

F. Prototype

Two prototypes were built, one per group, with 10 participants divided into two groups of five each. For this activity, two techniques were used, brainwriting and braindrawing.

In the first execution, participants jointly wrote the characteristics of the RPG starting from the phrase ”The game must contain...”, resulting in 36 valid requirements, discarding duplicates. This activity lasted for 40 minutes, suggesting that participants had a clear understanding of the problem and were able to abstract social and human values, contextualizing the target audience more accurately, thus facilitating the writing of requirements.

In Fig. [Reference], the moment when one of the groups consolidates and presents the list of requirements generated from the brainwriting sessions is recorded.

Following that, braindrawing sessions were conducted to prototype the game, based on the previous results, through the creation of storyboards. Storyboards are drawings containing sequential frames outlining the narrative and its elements, including characters. Through them, ideas can be simulated and communication can be enhanced with other stakeholders involved in the design process.

Figure 9 presents four storyboards as examples of the documents collaboratively created in the braindrawing sessions, meaning each participant initiates their drawing, which then circulates among all participants in the respective group for further development.

After the braindrawing sessions concluded, the groups consolidated the storyboards on a flipchart sheet and presented the result to the participants for final consolidation. One of the consolidated outcomes can be seen in Figure 10.

The prototypes created in this stage of SAwD application reflect the characteristics identified in the previous artifacts, as well as the perception of each participant, collaboratively

Fig. 8. Consolidation of requirements after the brainwriting sessions.

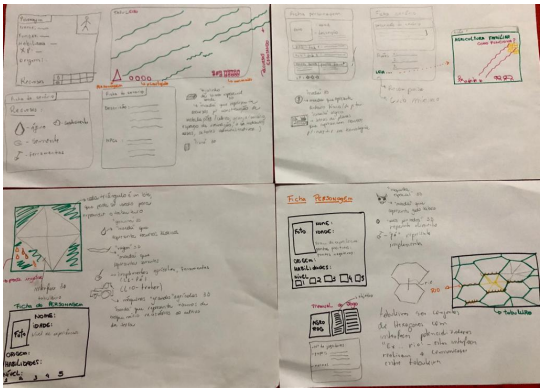

Fig. 9. Storyboards created during the braindrawing sessions.

modeled, making the process more participatory and yielding comprehensive results.

G. Finishing

Upon completion of the proposed activities in the semi-participatory design workshop, the facilitator asks the participants to provide brief feedback on their experience. Overall, the participants expressed satisfaction in learning and applying the concepts of SAwD, reported enjoyment in participating in the activities, and agreed that the generated artifacts contributed to a better understanding of the problem and the search for a solution suitable to the social context. The workshop concluded with the facilitator expressing gratitude to the participants.

V. Final considerations

This work presented the planning, execution, and results of conducting a SAwD workshop, aiming to understand the problem from a socio-technical perspective and generate ideas

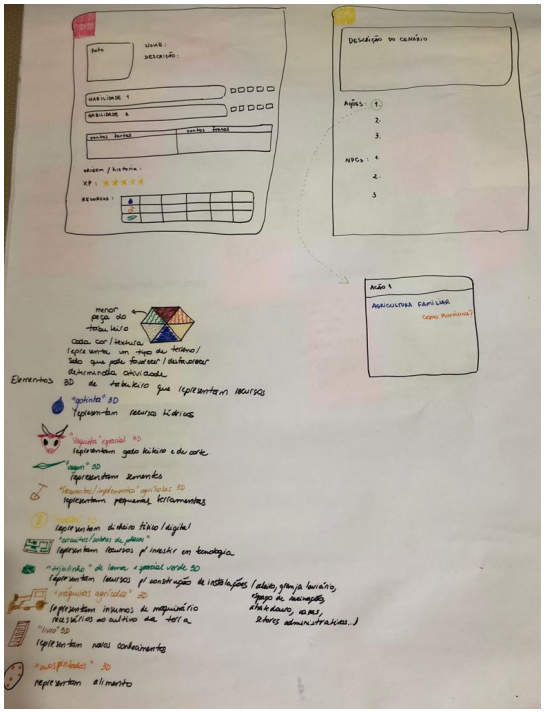

Fig. 10. Consolidation of the Storyboards created during the braindrawing sessions.

for creating an RPG applied to teaching Software Project Management.

The workshop was successfully completed within the expected timeframe, resulting in the generation of artifacts that produced a list of socio-technical requirements and an initial prototype of the game to be developed.

The effective participation of diverse stakeholders, collaborative practices, the number of participants, and the generated artifacts suggest that SAwD can and should be applied when aiming to create more inclusive and sustainable IS based on a deeper understanding of the social context in which the system will be inserted.

It is important to note that generating all proposed artifacts in a single day was a tiring activity, albeit productive. Therefore, it is possible to carry out the proposed activities over multiple days, especially when the complexity of the IS to be developed is high.

A. Contributions

The successful application of SAwD in different contexts, including child therapy, early childhood education, adult education, and software engineering, highlights the method's versatility. The ability to adapt SAwD to various areas demonstrates its relevance and effectiveness in promoting social awareness in diverse scenarios.

The strategy of involving a significant number of stakeholders, as suggested by SAwD, proves to be an effective practice for achieving comprehensive perspectives during collaborative creation. This approach contributes to the validity and repre-

sentativeness of the results obtained, considering the diversity of opinions and experiences.

The choice of techniques such as brainstorming, brainwriting, and braindrawing during different phases of the workshop stands out as a significant contribution. These approaches favor the collaborative generation of ideas, the identification of socio-technical requirements, and prototyping, fostering active participation of those involved.

This research highlights as its main contributions the process developed by the authors to guide the workshop's execution and the prototype of an RPG that will exercise both technical content and important soft skills for software engineers.

B. Limitations

Although the research method based on SAwD presents several contributions, some limitations deserve consideration. The semi-participatory approach adopted in the workshops may result in challenges related to representativeness, as the choice of participants and the formation of groups can influence the diversity of perspectives. Additionally, the emphasis on identifying sociotechnical requirements through the brainstorming technique may introduce bias, as certain voices may be more prominent, compromising equity in the collaborative creation process.

The extension of the method's applicability to other areas or audiences may require additional adjustments and validations, particularly regarding the execution time, which may depend on the complexity of the problem. Moreover, the complexity of the method, evidenced by the extensive list of activities and proposed techniques, may be a barrier to adoption by researchers and professionals with limited resources, compromising the accessibility and replicability of the method.

C. Future works

As a future work, we aim to complete the development of the RPG and apply it in the Software Project Management course, as well as to evaluate and present the results of this game created through SAwD.

Furthermore, we envision conducting research to explore studies that have applied SAwD in different interactive information system development contexts, as well as works that present the traditional design process in order to identify and highlight advantages (benefits) and potential disadvantages of using SAwD compared to other processes.

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