UXNator: A Tool for Recommending UX Evaluation Methods

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Abstract: UX assessment plays a key role in the development of user-quality software systems. Due to the growing interest, much research has been carried out to propose different UX evaluation methods. However, despite many methods, quantity is an aspect that makes it challenging to choose which one to use in UX evaluation. In this paper, we present UXNator, a tool for recommending UX methods based on filters that collect the responses of interested stakeholders in the evaluation. We conducted a feasibility study to evaluate UXNator's initial proposal, collecting the participants' perceptions of use. We qualitatively analyzed the reports and identified improvement categories in UXNator. The result presents the positive perception of participants about UXNator's goal of recommending UX methods. We intend to improve UXNator based on participant feedback, looking forward it will become a standard option for queries and recommendations of UX methods.

1 INTRODUCTION

User Experience (UX) is defined as *"the user's perceptions and responses concerning a product or system"* (Bevan et al., 2015). UX emerged due to the need to cover aspects related to the user's feelings (Law et al., 2009) when interacting with a software system. According to Russo et al. (2015), current software no longer seeks only to provide useful and usable functionalities but rather to provide engaging experiences for the user, providing good UX.

We can apply UX evaluation methods to meet the need for products with good UX. According to Saad et al. (2021), UX methods play an important role in ensuring the development phase of a system is in the right way. Such methods are diverse and serve to evaluate the UX of products, prototypes, conceptual ideas, or design details (Vermeeren et al., 2010).

There is yet to be a widely used repository recognized by the UX community for selecting UX evaluation methods. One of the existing alternatives is the AllAboutUX[1]. AllAboutUX is a repository of UX assessment methods that lists and briefly describes the methods. It was created in 2010, providing 88 UX assessment methods (Vermeeren et al., 2010). Although the tool maintains a repository of methods, it is still necessary to find which methods are most appropriate and meet the assessment requirements of the stakeholders interested in UX assessment and recommend them. Additionally, AllAboutUX offers an extensive range of methods, a factor of difficulty in choosing methods by the evaluator (Chernev et al., 2015).

Our research goes toward support in choosing a UX evaluation method. To do so, we searched the literature on related work. Following the methodology based on the Design Sprint, we developed a recommendation tool called UXNator. UXnator's goal is to recommend methods based on filters answered by stakeholders. We conducted a feasibility study using UXNator as a standard tool to choose UX evaluation methods. Our results show that UXNator allowed recommending evaluation methods and could be helpful to UX stakeholders. In the next section, we will present the background and related work. Then, in Section 3, we present our methodology and feasibility study. In Section 4, we present the results, and in Section 5, we discuss our findings. Finally, in Section 6, we present our conclusions.

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[1]https://www.allaboutux.org

2 BACKGROUND AND RELATED WORK

In this section, we discuss concepts pertinent to UX and related work.

2.1 UX Evaluation

According to ISO 9241-110:2010, UX is defined as: *"a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service"*. UX considers pragmatic aspects, such as traditional usability features focusing on task completion, and hedonic aspects, such as emotional responses to using a product (Hassenzahl, 2018).

UX evaluation methods are similar to usability ones. However, instead of measuring factors such as the number of errors or clicks, UX evaluation methods focus on subjective factors such as satisfaction and motivation (Vermeeren et al., 2010).

UX evaluation methods are important in ensuring that the development of a system is progressing in the right direction (Saad et al., 2021). They intend to help design a system, ensure that development is progressing correctly, or assess whether it provides good UX (Vermeeren et al., 2010).

UX gained more importance as software systems evolved. As a result, several methods for evaluating the UX of interactive applications have been proposed (Nakamura et al., 2017). Due to the abundant amount of existing methods, one problem is the lack of support for choosing a specific UX evaluation methods.

Our work aims to fill this gap, providing a Web tool to support the selection of UX evaluation methods based on the needs of the evaluator. In the following subsection, we present related work on the organization and categorization of UX methods and research that recommends methods in different contexts.

2.2 Related Work

Previous works such as Vermeeren et al. (2010) and Rivero and Conte (2017) provides an overview of how to organize UX evaluation methods. Vermeeren et al. (2010) give an initial overview of the topic using categories that allow observing essential features of the methods. Following a similar approach, Rivero and Conte (2017) use questions for filtering methods, with the answers generating categories for the methods. These categories generated by both surveys were selected for analysis to determine if they would be helpful for a recommendation.

To support the selection of proper UX methods, Darin et al. (2019) use categories: scale/questionnaire, psycho-physiological, software/equipment, two-dimensional diagrams/area graphs, post-test photos/objects, and others. For each method, the catalog shows the name, main idea, general procedure, instrument type, approach, target users, applications, references, and year of publication. This is an interesting approach, but it does not involve narrowing down the user's choices based on filters.

Kieffer et al. (2019) classified the methods into knowledge elicitation, which describes/document knowledge, and observed-mediated communication, which aims to facilitate communication and collaboration between stakeholders. Knowledge elicitation methods are divided between methods with user participation and methods without user participation, which aim to predict the use of a system and use expert opinions to collect data. User methods gather data on opinions, feedback, and user behavioral.

A platform developed by Liu et al. (2019) suggests methods based on artificial intelligence (AI) results. In this sense, chatbots ask the users to answer three questions: (i) the project phase; (ii) how much time is available for the evaluation; and (iii) if real users participate in the process. Through the information provided in the users' answers, the platform returns a list of varied techniques for different purposes, such as prototyping, information organization, feedback collection, and UX evaluation methods.

Our work differs from previous research as we clearly defined our scope of UX software evaluation. Defining a scope allows for providing a curated collection of methods. The focus on UX facilitates the filtering and selection process, making the experience easier for the user overall. Besides, we added to UXnator only methods with source material and instructions on how to use them.

3 METHODOLOGY

In this section, we explain the methodological procedures for designing and developing UXNator. The following subsections present: (i) the Design Sprint - used as a base procedure for the initial prototype design of the tool, (ii) the UXNator - the tool to support the choice of UX methods based on questions and (iii) the study carried out to verify the viability of the tool and obtain evidence of improvement for it.

3.1 Design Sprint

The Design Sprint is a compendium of tools used in Design Thinking and stands out for being a process

that produces good effects with the same characteristics as Design Thinking but using a time that revolves around a week (Ferreira and Canedo, 2020). A team makes it with the help of stakeholders to come up with good quality products. The sprints can be made successively if the goal is not achieved. However, we made the idealization of UXnator in only one sprint.

We made the sprint as follows: on the first day of the design sprint, we made an idealization of the method recommendation. First, we set targets for our tool, such as "becoming the standard tool for recommending UX evaluation methods". After setting our targets, we made a map of our tool's usage, depicting how our tool would be used and what features it would have. Finally, our team and some stakeholders voted on the essential features and how they would fit into the map we made.

On the second day, we analyzed competing or similar tools, such as: Allaboutux (Vermeeren et al., 2010), DTA4RE (Souza et al., 2020), Design Kit (Kit, 2019), and Selection Universe (Meireles et al., 2021). With the observations we made, we performed a Crazy 8's, a method recommended for design sprints that generates one idea per minute for eight minutes (Ferreira and Canedo, 2020). Each team member then combined the ideas to produce a tool storyboard.

On the third day, we reconvened to decide which ideas from the storyboards produced during the preceding day would be included in our prototype. We then combined the ideas to create a storyboard to guide the tool prototyping. We also decided to recommend the methods using a questionnaire with questions that would filter the available methods. Finally, we decided to present the results in cards with information on the methods.

On the fourth day, we created the initial prototype (Figure 1). We developed the prototype with the features chosen on the third day, so we could build it quickly for the next day's test. We designed the prototype to look like a real product, as our purpose was to make a realistic-looking prototype to test it.

On the fifth and final day, the team conducted a usability test with seven participants. The test consisted of using the prototype one participant at a time. The participants observed and navigated the prototype with the help of the researchers. After finishing the test, we interviewed the participants, and they gave their opinions about the tool. During this phase, the main feedback from participants referred to the high number of questions in the filtering questionnaire. The results obtained in this phase served as the basis for the development of UXnator.
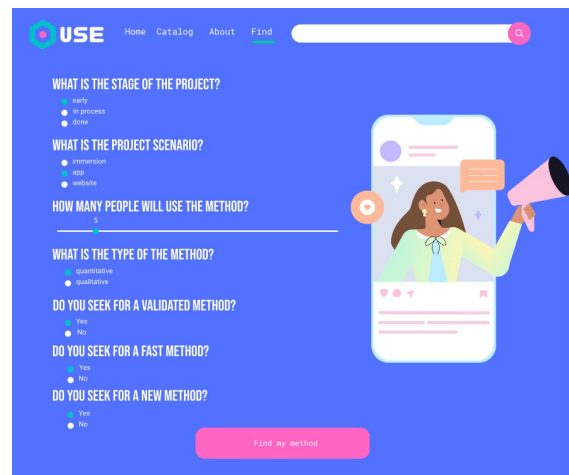

Figure 1: Initial prototype.

3.2 UXnator

The design sprint process culminated in developing a tool whose objective is to recommend UX evaluation methods in the context of software evaluation. We called this tool UXnator[2], in reference to the pop culture application Akinator[3], due to the similarity of the questions that the game asks with the UXnator questionnaire.

During the design sprint, we used a questionnaire to help filter methods that fit the users' needs. We based the questionnaire development on an analysis of categories based on previous systematic mapping work that categorized the UX methods (Vermeeren et al., 2010; Rivero and Conte, 2017). We used these categories to generate filters.

The tests we carried out during the design sprint revealed problems related to the high number of questions in the questionnaire (five questions). For instance, one of the questions filtered which techniques provided quantitative results and which provided qualitative results. In a discussion meeting to narrow down the filtering issues, we identified that primarily two factors are essential when evaluating UX: (i) knowing the stage of the evaluated system and (ii) who are the participants of the evaluation. Therefore, we decided to keep only two questions in the questionnaire of the first version of UXnator. These questions are: "In what phase is your project?" and "Who is the evaluator of your project?" These questions seek, respectively, to understand what stage the project is at and the profile of the evaluators who will use the recommended methods. Figure 2 shows the UXnator interface in the filtering process.

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[2]https://uxnator.vercel.app
[3]https://en.akinator.com

Figure 2: UXnator filtering process. Left indicates the first question and right the second question.

Once the questions are answered, the tool returns a list of UX assessment methods in the form of small cards with a description and a link to the method's page on the AllAboutUX website. As the tool is still in an initial state, we decided to use the AllAboutUx website as the tool's database.

In a previous analysis of the methods available on AllAboutUX, we observed that not all methods cataloged on the AllAboutUX website had sufficient documentation to guide their use or were related to the software evaluation context. Because of this, we analyzed the available methods to filter those that UXnator would recommend. For the selection of methods that would be part of the UXNator recommendation, filtering was performed based on three criteria:

1. The method is related to software evaluation;

2. The description of the method on the website allows its use;

3. The site's references describe how to use the method.

We used the first criterion to remove methods unrelated to the scope of the recommendation tool. Then, we used criteria 2 and 3 to identify whether the methods have documentation on how to use them. We verify whether it is possible to use the methods with the description available on the website or with the reference paper that the website cites. With these criteria, we placed the methods cataloged on the site in a spreadsheet, where we analyzed which criteria each method met. Finally, we eliminated two methods for not meeting the first criterion and 35 for not meeting Criteria 2 or 3, resulting in 44 methods.

The Table 1 illustrates how method filtering works, using a sample of ten methods as an example. In the second column, we have the first filter through the question: "In what phase is your project?". To illustrate the filtering process, we consider the option "Product on the market" as an answer. In this first filter, three methods were removed, as they did not apply to evaluating products available to the end user. Then, the second filter asks: "Who is the project evaluator?". Considering the "Pair of Users" response, five more methods are removed from the recommendation, leaving two methods to be recommended for UX evaluation based on the information provided by the stakeholder. Once the methods are filtered, UXnator returns the list of recommended methods.

3.3 Study

We carried out a study with a computer science class of Human-Computer Interaction (HCI) at Federal University of Amazonas.

The class consisted of 28 students divided into teams of 3 to 6 members to carry out an evaluation activity. The activity aimed to reinforce the topics of usability and UX assessments. In order to do that, we instructed the teams to conduct usability and UX assessments on two online teaching tools and then document their results and experiences in a report. Since the students had to conduct UX assessments as part of the activity, they used UXNator to support the choice of which UX evaluation methods they would use.

Before making the tool available, we conducted a pilot test to guarantee that the UXnator returned the methods properly. Afterward, we presented the tool to the participants and explained its use.

In total, six teams completed the activity. After agreeing to the Consent Form, we collected the reports to perform a qualitative analysis of the data. We present the results of our analysis in Section 4.

4 RESULTS

In this section, we present the results obtained concerning the use of UXNator. We performed a qualita-

Table 1: The method filtering process.

Methods	In what phase is your project? Answer: Product on the market	Who is the evaluator of your project? Answer: Pair of Users	Recommended Methods
2DES, Affect Grid, Co-Discovery, Emocards, Expereience Clip, Group-based Walkthrough, Property Checklists, This-or-that, UX Curve, UX Expert Evaluation	Affect Grid, Co-Discovery, Emocards, Experience Clip, This-or-that, UX Curve, UX Expert Evaluation	Co-Discovery, Experience Clip	Co-Discovery, Experience Clip

tive analysis with data collected from participants' reports. After qualitative analysis, we identified suggestions for improvement UXNator and positive aspects regarding its usefulness. Table 2 summarizes the categorization of reports. In the following subsections, we will describe the main results.

4.1 Improvement Suggestions

4.1.1 Suggested Improvements for the Tool's Filter

In our study, a few participants reported difficulties understanding the questions in the questionnaire. These participants suggested changes or the inclusion of hints about the options. The difficulty concerning the questionnaire suggests the absence of questions aimed at people who do not have in-depth knowledge of UX evaluation and may want to use the tool.

Participants P4, P12, P18, and P20 had doubts about classifying the project phase they were evaluating. Since the filter is a fundamental part of the tool, it must be adequate for users' needs. We highlighted quotes from P18 and P20.

"It is unclear what each stage of the project means (as conceptual and different from initial, for example)." - P18

"The lack of information about the project characterization phase leaves the user confused about the classification of his project." - P20

Another important suggestion pointed out by P18, and P20 is the creation of a ranking of the methods returned through the tool's filter. Even with fewer methods, it is important to refine the results further and make it easier for the user to choose.

"How the methods are presented does not indicate which I should look at first or why I should choose one over another." - P18

"There is no information on which method would be best for my project, and there does not seem to be any preference on which method is shown with priority." - P20

4.1.2 Suggestions for Improving the Efficiency of Using the Tool

Regarding the efficiency of using the tool, participant P20 pointed out that the methods took time to load and that the lack of information about the use of the questionnaire caused confusion regarding navigation on the platform. P18 suggested that specific effects and animations used to show the questionnaire options decrease the efficiency of use, generating delay.

"The questionnaire tab does not have much information about its functionality and leaves the user in doubt whether there is the actual use of the tool or just another feedback questionnaire." - P20

"A minor issue is that the animation to show the options takes time." - P18

Even though the above reports indicate that loading the methods was not a significant issue, ensuring they do not feel like wasting their time during use is important. Besides, improving efficiency means improving the user's perception of the tool.

4.1.3 Suggestions for Including Features

Although we performed a filtering step of the methods available in UXNator, considering only those with minimal documentation on their use, some participants still reported improvements. For example, participant P22 reported that UXNator helped select methods with details about their use. However, participant P23 indicated that, even with the documentation, it is still necessary to present more information.

"Regarding the choices of UX methods in UXNator, it helped by showing the methods in general, but the choice was made mainly after checking the papers that reference the technique, as they show in more detail how it is applied." - P22

"It would be nice if UXNator had more information about the technique." - P23

Therefore, we intend to create our repository of methods for UXNator. The repository will include more practical information regarding the use of each method and the insertion of examples of use.

Table 2: Main suggestions for improvement and Positive Aspects.

Category	Suggestions	Participants
Suggested improvements for the tool's filter	F1. Filtering could be better	P2, P14, P23
	F2. Quiz choices are confusing	P4, P12, P16, P17, P18, P20
	F3. It would be nice if the techniques filtered by the tool were ranked to help with the choice	P18, P20, P26
	F4. The platform should include more important questions	P2
Suggestions for improving the efficiency of using the tool	U1. Slow loading techniques	P20
	U2. Effects and animations that hinder usability	P18
	U3. Tool page navigation is confusing	P20
Suggestions for including features	E1. The platform could have a search bar	P5
	E2. The level of difficulty of the technique could be shown	P11
	E3. The platform does not show the number of techniques in each category	P3
	E4. There is no documentation of the techniques available on the platform	P18, P20, P22, P23, P24
Suggestions for improving the interface	I1. The interface could be more presentable or user-friendly	P3, P5, P16, P18, P20
	I2. Difficulty reading text on the platform due to the color palette	P3, P5, P18
	I3. The use of platform fonts is unstandardized	P3, P16
	I4. Platform pages do no follow a pattern	P5
	I5. The interface should bring more seriousness, be more formal	P11, P13, P15, P16
	I6. The uncomfortable layout of illustrations	P16
	I7. The display of filtered techniques cards should be more presentable	P16, P17, P18

4.1.4 Suggestions for Improving the Interface

Five participants suggested that the system's screens could be more friendly and presentable for the user (element I1 of Table 2). Participants P3 and P5 suggested improvements in the interface. However, the aesthetics of the interface did not influence the perception of the tool's usefulness.

"We use the UXNator system to filter the UX methods, thus facilitating our choices. I particularly liked this tool a lot." - P03

"UXNator was extremely useful, as the system saves time spent looking for methods that do not have documentation. In addition, it is very advantageous for searching methods and filtering methods that do not fit the activity." - P05

One aspect of improvement in the interface is its aesthetic appearance. Participants indicated that leaving the tool with a more standard appearance interface could improve the perception of UXNator.

"UXNator needs to look more serious." - P13

"I found the interface aesthetics very childish, considering the system's target audience." - P15

Finally, three participants reported how the result of filtering the methods is presented. Currently, in UXNator, the arrangement of cards referring to methods resulting from the filter is vertical, showing one card at a time. Participant P16 reported that with this provision, when there are still many methods after applying the filters, navigability is compromised (scrolling). This problem may require the user to scroll the screen a few times to view all the recommended methods cards. Participant P16 indicated that a better arrangement of the cards would be to place them side by side so that the user can view more cards simultaneously without having to scroll a lot.

"Regarding the results returned, the data was well presented, but the choice of a single sample com-

promised the navigability. Perhaps the presentation would be better if the cards were placed side by side." - P16

Additionally, participant P18 indicated that only two or three methods are presented in the interface, so the methods that need to scroll the screen to be viewed can be forgotten and not considered.

"Considering that only 2 or 3 methods are visible at any given time, the methods below are forgotten. I would not have looked at the rest if it were not for the activity." - P18

Participant P17 indicated another improvement concerning the font size on the cards. According to them, the small font size makes methods' presentation a little tiring and that this could be improved.

"I also think the presentation of the methods could be improved. I found it a little tiring because the letters are so small and close together." - P17

4.2 Positive Aspects of UXNator

We aimed in our study to conduct an evaluation of UXNator as a tool to support the selection of UX evaluation methods. Therefore, the suggestions for improvement collected and described above are essential for developing the new version. However, one of the main aspects that we sought with our study was to verify whether this initial version already contemplated the main objective of the tool.

Among the various benefits mentioned, we highlight precisely the reports related to the tool's objective to support the process of choosing UX methods for evaluation. We noticed that participants understood the purpose and usefulness of UXnator.

"UXNator is a very helpful tool for searching methods." - P1

"We use the UXNator system to filter the UX methods, thus facilitating our choices." - P3

Regarding the tool's purpose, participants P5 and P7 also reported another benefit from filtering methods. They pointed out that the time spent choosing a technique is reduced, especially since UXNator only recommends methods with some documentation on how to use the recommended technique.

"UXNator was extremely useful, as the system saves time spent looking for methods that do not have documentation." - P5

"UXNator was excellent, both because it halved our possible choices and, after the choice, we could see how to apply the methods." - P7

We can make a relationship between the suggestions for improvements collected with the reports about the usefulness of UXNator. We highlight that some participants, even with some difficulties presented in the interface, still pointed to UXNator as a tool that has a very relevant purpose.

"UXNator does a lot of what it promises. It greatly facilitates the search for the ideal UX method to use..." - P11

"UXNator helped in filtering/selecting methods because it is a simple and intuitive tool." - P14

"UXNator has a great concept and is well-implemented. Maybe it could improve the design for something more formal." - P15

Participant P16's report shows that UXNator already achieves its main objective. P16's report shows that UXnator guided him/her in the decision-making process and choice of UX evaluation methods.

"The information returned by the page was very useful in guiding me in choosing the three methods." - P16

5 DISCUSSION

UX assessment has played an essential role in the quality of software systems today. In this sense, much research over the last few years has been developed focusing on proposing methods that support UX evaluation in different contexts (Pettersson et al., 2018).

Despite many UX evaluation methods in the literature being considered positive, access to them needs to be facilitated. There is a big gap between the methods available in the literature and the target audience that perform UX evaluation.

Among some repositories available, the main one is AllAboutUX. The repository attempts to organize and classify the UX evaluation methods available in the literature. However, people without much experience or with some need for specific evaluation

may have difficulties finding a method. The repository does not provide as many details on the use of methods. Also, it does not support the evaluator in the technique selection process through a personalized recommendation based on the evaluator's needs.

In this paper, we introduce UXNator. UXNator is a web platform whose main goal is to recommend UX evaluation methods that meet the evaluation interests of the stakeholder. Despite being the first version, the study we conducted to evaluate its feasibility showed positive results concerning the tool's objective. Although we considered only methods with some usage documentation to be recommended, in our study, we identified that to provide complete suggestions, more practical details of the methods are necessary. The participants' reports indicated a more detailed recommendation and showed a research opportunity for creating a repository with standardized information. Indeed, creating a repository would be an excellent benefit for the UX community and, especially, for the development of future research.

Pettersson et al. (2018) recommend that for more robust results in UX studies, it is necessary to better integrate and structure the data. For example, improved cross-analysis of qualitative and quantitative data will allow for better results. In this sense, a tool that supports selecting different UX methods is essential. UXNator can support selecting methods for different needs and development stages.

According to Saad et al. (2021), the main roadblocks for startups not to adopt UX evaluation methods during development are difficulties with the meaning of UX and finding practices and methods that can bring valuable information to them. UXNator can be an alternative to help the adoption of UX evaluations by startups, since it reduces the time needed to research and select a technique.

6 CONCLUSION AND FUTURE WORK

In this paper, we present UXNator to support the selection of UX methods. Considering that there is a vast choice of UX assessment methods, the importance of a tool that helps narrow down the options based on the needs of each assessment is necessary.

To verify the feasibility of using UXNator, we conducted a study in the context of a HCI course. Twenty-eight participants who used UXNator as a standard tool for the course's UX evaluation activity participated in the study. We collected the participants' perceptions of use and performed a qualitative analysis concerning the data obtained.

Our main objective with this study was to investigate whether UXNator met its primary objective of recommending UX evaluation methods. In addition, we get valuable feedback regarding improvements that can be implemented in the next version of UX-Nator. As a main result, we noticed that most participants had a positive perception of UXNator usefulness, especially in the process of selecting which UX method to use in a specific evaluation.

In future work, we intend to improve UXNator and create our repository of UX evaluation methods. We also intend to carry out a study with different profiles of participants.

ACKNOWLEDGEMENTS

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