UX Poker: Estimating the Influence of User Stories on User Experience in Early Stage of Agile Development

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Abstract

Agile methods are used more and more frequently to develop products by reducing development time. Requirements are typically written in user stories or epics. In this paper, a new method called UX Poker is presented. This is a method to estimate the impact of a user story on user experience before development. Thus, there is the opportunity that the product backlog can also be sorted according to the expected UX. To evaluate UX Poker, a case study was conducted with four agile teams. Besides, a workshop followed by a questionnaire was conducted with all four agile teams. The goal of being able to estimate the UX even before development was achieved. Using UX Poker to create another way to sort the product backlog can be considered achieved in this first evaluation. The results show that UX Poker can be implemented in a real- life application. Additionally, during the use of UX Poker, it was found that a shared understanding of UX began. The participants clarified in the team discussion about UX Poker what related to influence the user stories had on UX and what UX meant for their product.

Keywords

Agile, Agile Methods, Usability, User Experience, User Experience Management, UX Management, UX, UX Estimation.

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I. Introduction

Today's users expect to derive a high level of satisfaction while interacting with a product. They also expect to be able to use the product without having to make any major effort to finish their tasks in a quick and efficient manner. Moreover, for a product to succeed, it is important to consider hedonic qualities, that is, the qualities that are not directly target-oriented [1]. It is, therefore no longer sufficient to develop only usable products, they must also inspire the user and address hedonic qualities. In summary, the user wants to have a positive user experience (UX) while interacting with any product or service.

A well-known definition of user experience is given in ISO 9241-210 [2]. Here user experience is defined as 'a person's perceptions and responses that result from the use or anticipated use of a product, system or service'. Therefore, user experience is viewed as a holistic concept that includes all types of emotional, cognitive, or physical reactions to the concrete or even only the assumed usage of a product formed before, during, and after use. In ISO 9241-220 [3] the term human-centred quality has been introduced. Human-centred quality includes user experience, usability, accessibility, and minimizing risks arising from the use.

An additional interpretation defines user experience as a set of distinct quality criteria [1] that includes the classical usability and non-goal directed criteria [4]. Thus, usability is classified as a set of pragmatic factors or qualities, such as efficiency, controllability, or learnability. Non-goal directed criteria are classified as a set of hedonic factors or qualities [4], such as stimulation, novelty, or aesthetics [5]. This definition has the advantage that it splits the general notion of user experience into a number of quality criteria, thereby describing the distinct and relatively well-defined aspects of user experience. This also complies with ISO 9241-220 [3]. One advantage of this definition is that user experience could be measured by using standardized questionnaires such as UEQ+ [6]–[8], SUPR-Q [9], or VisAWI [10]. In addition, a benchmark [11] or KPI [12] can be calculated based on the individual UX factors. The UEQ+ is a modular framework that allows one to combine predefined UX factors to create a concrete UX questionnaire. Currently, the UEQ+ framework contains 20 UX scales, but they can be extended as needed. The construction of the clarity factor can be read as an example [13].

Software development teams use agile methods to develop products or services more and more efficiently. Agile methods (e.g. Scrum [14], Kanban [15], or Extreme Programming (XP) [16]) reduce the time taken to develop a product and make it available on the market [16]. The iterative approach to developing software minimizes the risk of developing software that is not in line with what is needed in the market [17]. The requirements to be developed are collected, evaluated and prioritized in a product backlog [18]. The items with the highest priority were selected for the next development iteration. This also means that the requirements must be prioritized by some method. In agile methodologies, requirements are typically written in user stories or epics.

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This paper, we will present UX Poker, a method to estimate the impact of user stories or an epic on user experience. We will also present the results of a first evaluation study conducted in four different companies.

This paper is structured as follows: Section II briefly summarizes the related work. Section III present the research methodology, including the evaluation study. Section IV outlines the results and key findings of our evaluation study. Section V discusses the meaning of the findings, the limitations of our evaluation study, and the improvements that could be made in it. The paper ends with Section VI, with conclusions and ideas for future work.

II. Background and Related Work

In general, requirements are collected and sorted in agile methods in a product backlog. At least that is what the Scrum Guide [13] requires. Also, ISO 9241-210 [2] and ISO 9241-220 [3] recommends a sorted list of requirements. In all cases, it is not defined which criteria would be used for sorting.

In the literature, there are many papers that investigate the integration of UX Methods and Agile development. The range of methods includes usability engineering, user-centred design (UCD) or human-centred design (HCD) [3], and UX methods in general. [19] conducted a systematic mapping study in 2017. The purpose was to investigate artefacts used in communication between Agile methods and user-centred design. A total of 20 artefacts were identified and examined, such as prototype, user story, scenario, sketch, persona, and card, like the design card or the task-case card. During the development iteration, about 56% of the artefacts were used. The rest were used during the discovery or planning phase.

User stories, prototypes (low and high), sketches and mock-ups are the artefacts with which a UX professional can communicate goals or requirements between developer and stakeholder [19], [20]. These artefacts are usually good at representing both UX and functionality [19], [21]. In practice, the items in the product backlog, mostly written as a user story or epic, are sorted by their importance. A user story is typically described according to the following pattern: “As a [persona], I want [some goal] so that [some reason]”. The goal of this writing style is to present the requirements shortly and understandably. With “persona” the target group of the user story is named, with “some goal” the actual requirement is named and with “some reason” a justification for the user story is named.

In a product backlog the most important user story is at the top of the list, the least important user story, further down. Here there is no clear definition of what is or is not important. There are different methods to determine the importance. Classically, the product owner decides which items are important based on discussions with the stakeholders. But business or marketing requirements can also influence the importance of a product backlog item. Another possibility could be to include the expected user experience in the sorting.

Choma et al. [22] extended or supplemented the grammar of a user story with user experience aspects and usability requirements. New or replaced components of a UserX Story include personas, goals, interactions, contexts, and feedback. Nielsen’s heuristics serve as the acceptance criterion. Expected user experience aspects can be specified as heuristics. Based on these heuristics, the user experience could be estimated by extending and using a suitable method.

Joshi at al. [23] provide a Usability Goals Achievement Metric (UGAM). This metric is calculated by using individual parameters per usability quality (such as learnability, speed of use, and ease of use) weighted to a goal parameter score. This is the goal to be achieved. After each usability evaluation, UX professionals calculate the achieved score based on the values from the usability evaluation. This makes it possible to determine whether the goal has been achieved by comparing the goal with the archived value. If the goal has not been achieved, it is possible to determine where it has not been achieved for each usability quality.

The last two described approaches are not directly based on product backlog items or requirements. Neither approach provides the possibility of estimating the user experience. In the end, both approaches can be used with an appropriate estimation method. Instead of the goal value, an estimated value of the user experience can be specified. The necessary prerequisites for a user experience value to be compared before development are given in both the approaches.

In our view, it is necessary to consider not only usability aspects [23], [24], but also user experience in general. Besides, from our point of view, the agile team should be involved, so that its expertise is also used. In addition, all team members should have the same or similar understanding of UX for their product. Therefore, we have developed UX Poker as a new method, presented in the next section.

III. Research Methodology

In this section, we will describe our approach in detail. Our approach is divided into two main steps:

- Step 1: Method to estimate user experience for a given user story or epic (see A).
- Step 2: First Evaluation of the method from Step 1 by conducting a study with four development teams (see B).

The different steps are explained in greater detail in the next two paragraphs.

A. UX Poker

UX Poker is inspired by Planning Poker [25]. The goal of Planning Poker is to estimate the complexity of a user story or an epic. This estimation is used as a basis for the selection of user stories for the next development iteration. It is a support to fill the next iteration with realizable user stories so that they can be implemented within the iteration. Planning Poker focuses on the technical implementation of the functionality described in the user story. The objective of Planning Poker is to create a consensus about the complexity of a user story. The result of Planning Poker is recorded in a user story and ideally reviewed in a retrospective. The review should result in improvements in the use of Planning Poker. If possible, Planning Poker should result in realistic values of complexity. However, this is an individual and iterative learning process of the Agile team. We applied this idea of Planning Poker to UX Poker as well.

UX Poker is a method that aims to estimate the possible impact of a user story or an epic on the user experience, that is produced at the user’s site. Before prototypes are created, or the actual development begins, the influence of a user story or an epic on the user experience must be determined. In the end, a user story has been evaluated not only in terms of technical implementation but also in terms of the expected UX. Thus, before the actual development starts, the user stories for the next iteration can be explicitly selected based on the expected UX. For example, if the attractiveness of the product is to be increased, user stories that have a significant expeceted influence on the UX factor attractiveness can be specifically selected.

Besides, the team should adopt the user’s perspective through UX Poker. This is to train the team members to look at the development of the product more from the user’s perspective. As a general practice, most of the team members are developers. Therefore, they tend to focus more on the technical implementation of the user stories.

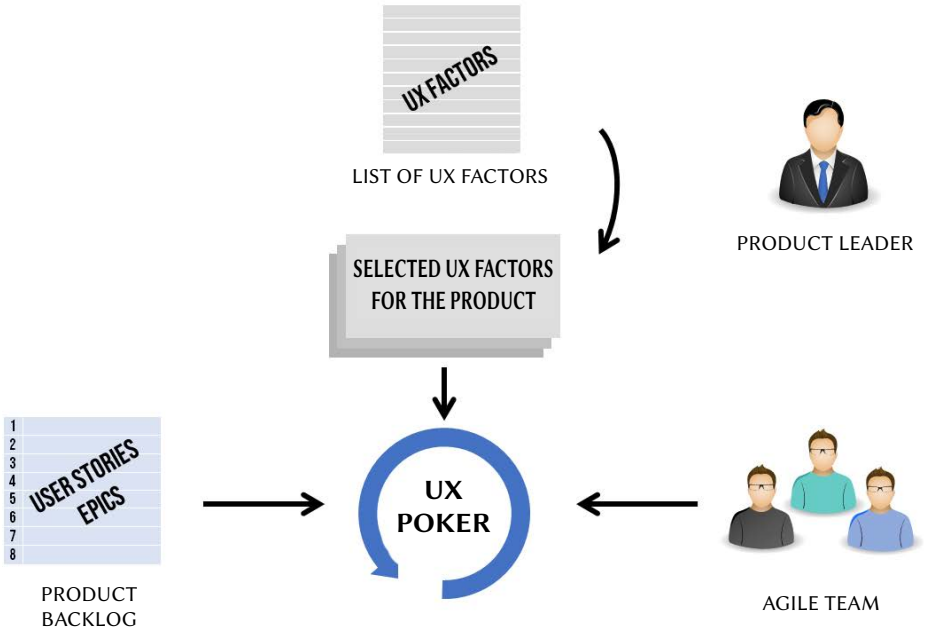

Fig. 1. Procedure of UX Poker with selection of UX factors and UX Poker with product backlog items.

In our opinion, UX Poker makes sense if a product is to be improved in terms of user experience. With UX Poker, a targeted selection of user stories or epics can be made based on the UX estimation before the actual development is made. The goal is to create a basis for a decision about the UX before development starts. If at least a UX estimate of user stories is known before development, the user stories can also be selected specifically.

The procedure of UX Poker is shown in Fig. 1. To use UX Poker, a selection of UX factors for a product is necessary, as described in the next section (see 1). UX Poker as a method is described in sections 2 and 3.

1. Selection of UX Factors

To use UX Poker, a selection of UX factors for a product is necessary. As mentioned in the introduction, user experience can be described using UX factors. This allows to description of specific aspects of the user experience in UX factors. These aspects can be, for example, Efficiency (The user can reach their goals with a minimum time required and minimum physical effort), Quality of Content (Subjective impression if the information provided by the product is up to date, well-prepared and interesting), Attractiveness (Overall impression from the product.), or Trust (The product appears trustworthy to the user). The listed examples of factors are certainly not complete. A good overview is provided by Schrepp and Thomaschewski [26] or Hinderks et al. [27].

UX Poker is based on UX factors to describe aspects of user experience and estimate these aspects for user stories or epics. Instead, the introduction of UX Poker must determine which aspects of the user experience are important for the product. For example, trust is certainly a critical UX factor for banking software, but it plays a secondary role in a computer game.

There are different methods to select the important UX factors for a product from a list of UX factors. For example, the method Ranking (sorting UX factors in a team) or Dot Voting [28] (sorting UX factors by prioritizing). Informal consultation between the product owner and a UX professional can also be carried out. In the end, the method used is not decisive. However, no more than 5-7 factors should be selected, or else meaningful estimation of the factors will no longer be attainable. The recommendation for the number of factors is based on the experience of the authors. If the number of factors is too high, there is a risk that UX Poker will become inefficient and therefore the actual goal will not be achieved.

This list of UX factors can be changed after each iteration. It may well be that after a retrospective, it is recognized that UX factors are missing or do not fit. This list of UX factors can be changed after each iteration. It may well be that after a retrospective, it is recognized that UX factors are missing or do not fit. In this case, the list of UX factors should be revised.

It has been shown in practice that the selection of UX factors is quite unproblematic and hardly needs to be adjusted B.

2. Workflow of UX Poker

To use UX Poker, relevant UX factors must be defined in advance to be handled with UX Poker. The selection of UX factors is described in greater detail in section 1. The UX factors must represent important UX aspects of the product being developed so that UX Poker estimates the correct UX factors. The selection of UX factors is done once and can be changed over time.

UX Poker uses the same idea as Planning Poker in agile methodologies, but with a focus on the possible impact of the user story or epic on the user experience. In UX Poker, the following steps are carried out in a team meeting:

1. The Product Owner or Product Manager presents the user story or epic to the team. The team should understand the goal of the user story or epic.
2. For each selected UX factor, the team estimates the potential impact of it on the user experience. Each team member is asked to rate the possible influence of the user story or epic on user experience using a scale from -2 to +2:

   -2: strong negative impact

   -1: slightly negative impact 0: no impact

   +1: slightly positive impact

   +2: strong positive impact

   It is important that all team members make their evaluations secretly and then disclose them together, as Planning Poker in agile methodologies does.

3. If there are deviations of more than two scale steps, the variations are discussed within the team. The goal is to understand why this deviating assessment has occurred. Afterwards, a new estimation is made, as described in step 2.
4. If there are no or slightly deviations within the team, the average value is recorded in the User Story or Epic.

At the end, for every user story or epic, there is a possible impact for each UX factor.

3. Example of UX Poker

For a better understanding, we give an example of a Twitter app. The UX factors Attractiveness, Quality of Content, Trustworthiness of Content and Trust were selected from the list of UX factors as important UX factors for the Twitter app by the product leader.

User story: As a Twitter user, I want to see if a tweet contains an untrue statement so that I can critically question it.

Ratings and explanation for each UX Factor:

1. Attractiveness: +1. It has a positive impact on Attractiveness, because the new function is new and helpful.
2. Quality of Content: 0. It has no impact on this factor, because it is just a new category for the content and has nothing to do with the content itself.
3. Trustworthiness of Content: +2. It has a very high impact on this factor, because it categorizes the content as far as its trustworthiness if concerned.
4. Trust: +1. Overall, it has a positive impact on trust because of its positive impact on trustworthiness of content.

Overall, this user story has a possible influence on most UX factors. This rating can help the agile team to select this epic if the Twitter app has to improve in terms of Trustworthiness of Content. In addition, UX Poker promotes communication and a common understanding within the agile team.

B. First Evaluation of UX Poker

In a first evaluation, we have used the new method UX Poker in a real-life application with four teams from different companies. On the one hand, the goal was to determine whether the method could be implemented with an agile team. On the other hand, we wanted to identify potential for improvement during and after UX Poker use.

For this reason, we split the evaluation into two parts. First, we conducted a workshop with the agile team, using UX Poker on their user stories or epics. After the workshop was conducted, participants were asked to fill out a questionnaire.

1. Workshop

The workshop, which we conducted with various teams, was organized by us as follows:

- Introduction of the participants.
- Presentation of the UX factors previously selected with the product leader.
- Presentation of the user stories or epics by the Product Owner (see 2).
- Estimation of the UX for the user stories or epics (see 2).

Afterwards, the participants had to fill out the questionnaire, which was concluded with a short retrospective. The workshop should not last longer than 1.5 hours.

2. Construction of the Questionnaire

The questionnaire is intended to determine the subjective assessment by the participants of the usefulness of UX Poker. To this end, we developed a questionnaire with two types of items. On one side there were items with a 7-point Likert scale and the other side featured open-ended questions. The results of the items with the rating scale could be statistically well evaluated. For the open-ended questions, we wanted to get feedback, or opinion on the potential for improvement, from the participants.

The questionnaire contains the following items:

1. With UX Poker we were able to talk in a structured way about the influence of the epic on UX. [Do not agree - agree with a 7-point Likert scale]
2. UX Poker helped me to get a better understanding of the targeted UX for our product. [Do not agree - agree with a 7-point Likert scale]
3. What added value do you see in using UX Poker? [open question]
4. How easy was UX Poker to use? [not easy - very easy with a 7-point Likert scale]
5. Can UX Poker be applied to Epics? [absolutely not - absolutely yes with a 7-point Likert scale]
6. What tips would you have if you recommended UX Poker to others? [open question]
7. What worked well when using UX Poker? [open question]
8. What did not work well when using UX Poker? [open question]

We implemented the questionnaire in an online version using LimeSurvey.

3. Context

The study was conducted in Germany with four agile teams via online video conferencing due to the corona pandemic. It was conducted between October 2020 and January 2021. The agile teams work on different products in different companies. An overview of the products developed by the agile teams is shown below.

- Agile team 1 (7 participants): Internal ordering system in the construction industry for enterprise customers.
- Agile team 2 (7 participants): Soccer Portal App for End Users.
- Agile team 3 (9 participants): Platform for mediation craftsmen and customers.
- Agile team 4 (7 participants): Portal for buying and selling real estate.

A total of 30 (5 females, 23 males, 2 not specified) participants took part in the study. The average age is 36 years (37 for females, 35 for males). Table I shows the distribution of the participants' roles within the teams.

TABLE I. The Role in the Team

Role	Count	Avg. Years of Experience
UX Professional	1	10.0
UX Researcher	1	4.0
UX Designer	3	12.3
Product Owner	5	3.6
Programmer	19	10.0
Other	1	4.0
Sum/Avg	30	8.8

The number of programmer participating in the study is noticeable. However, the distribution of the teams is balanced. At least one product owner and one person responsible for UX are involved in the teams. All teams use Scrum as an agile method.

IV. Results

The individual workshops showed that UX Poker was applicable in practice. This was reflected in the results of the questionnaire.

In the next sections we present the results of the individual items of the questionnaire. For items with rating scale, the corresponding statistical data were presented. For items with open text questions, the answers are summarized and presented accordingly.

A. Q1: With UX Poker We Were Able to Talk in a Structured way About the Influence of the Epic on UX

On average, the subjects answered this question with 'mostly agree' (median 2), as shown in Fig. 2. The small confidence interval and the low standard deviation related to the small number of participants indicate a homogeneous evaluation, despite there being the four different teams.

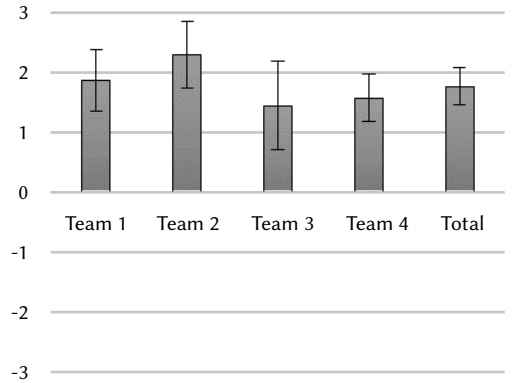

Fig. 2. Result of Question 1 with 95% Confidence Interval as Error Bar.

The total mean value is 1.767 with a variance of 0.737 (Std. Dev. 0.858). The Confidence (95%) is 0.307.

B. Q2: UX Poker Helped Me to Get a Better Understanding of the Targeted UX for Our Product.

Team 1 and Team 3 rated the second question as 'agree' on average, as shown in Fig. 3. Team 2 and Team 4 tended to rate it as 'mostly agree'. On average, the overall result is exactly between 'agree' and 'mostly agree'.

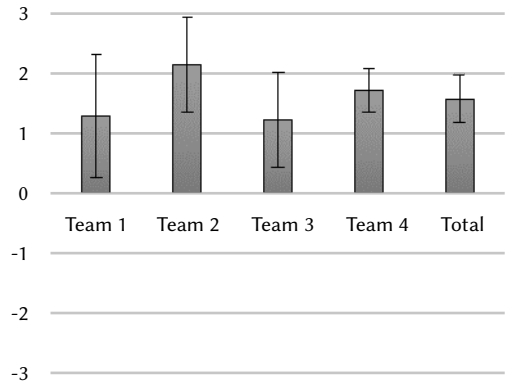

Fig. 3. Result of Question 2 with 95% Confidence Interval as Error Bar.

The total mean value is 1.567 with a variance of 1.220 (Std. Dev. 1.104). The Confidence (95%) is 0.395.

C. Q3: What Added Value Do You See in Using UX Poker?

Almost all participants were optimistic about getting into a conversation and talking explicitly about the user experience. It helped to develop a shared understanding of user experience. It was also noted that UX Poker helped determine which epics had a negative impact on the UX. In Refinement, it was stated that a participant talked, more about the technical implementation. In UX Poker, the user is in the foreground.

It was also stated that UX Poker supported the entire team's ability to participate in the UX process. The UX professional can share their knowledge with the whole team. The authors have similar findings when applying the morphological analysis of 'context of use' [29].

D. Q4: How Easy Was UX Poker to Use?

The result for Question 4 (see Fig. 4), however, ranges from 'agree' (team 4) to 'totally agree' (team 2) if, the confidence interval is taken into account. It is noticeable that the confidence interval in the evaluation of teams 1 and 4 is high compared to that of teams 2 and 3. This is due to the different evaluations provided by the participants and the low number of participants, which is noticeable in the individual result, but is lost in the total (see Total in Fig. 4).

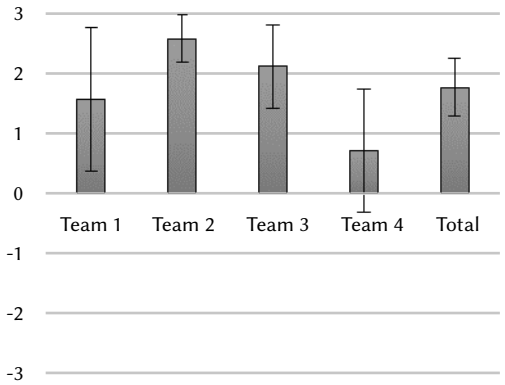

Fig. 4. Result of Question 4 with 95% Confidence Interval as Error Bar.

The total mean value is 1.767 with a variance of 1.771 (Std. Dev. 1.331). The Confidence (95%) is 0.476.

E. Q5: Can UX Poker Be Applied to Epics?

The results for the fifth question are between 'agree' and 'mostly agree', as shown in Fig. 5. As with the previous question, the confidence interval for two teams (teams 1 and 3) is higher than that of the other two teams (teams 2 and 4).

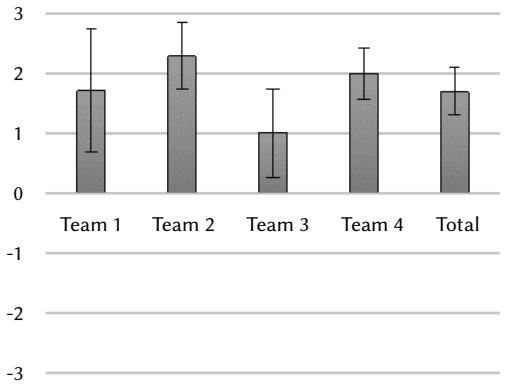

Fig. 5. Result of Question 5 with 95% Confidence Interval as Error Bar.

The total mean value is 1.700 with a variance of 1.183 (Std. Dev. 1.088). The Confidence (95%) is 0.389.

F. Q6: What Tips Would You Have if You Recommended UX Poker to Others?

The main tips provided by participants are to guide the discussion that inevitably takes place during estimation; otherwise, it may run the risk of quickly losing focus. Besides, the presence of fewer participants may unnecessarily prolong the discussion.

For estimation, some test persons indicated that one should use a polling and/or voting tool. This would speed up the process.

However, the participants demanded that the UX vision of the product should be clear in any case. Besides, the UX factors to be estimated should be explained clearly and understandably. Only in this way can UX Poker be used successfully.

G. Q7: What Worked Well When Using UX Poker?

On the positive side, participants stated that UX Poker was very quick to learn and that one could, start right away. It promoted communication within the team about the UX to be achieved. Furthermore, in the constructive discussion, the advantages and disadvantages of the individual Epics could be better assessed from the user's perspective.

Further, the participants stated that the inclusion in the UX processes was positively received. This also promotes visibility of UX processes and resulting activities outside UX Poker.

H. Q8: What Did not Work Well When Using UX Poker?

Some participants were unable to provide any information due to lack of experience. As a point of criticism, the participants stated that a better understanding of the rating scale for UX Poker needed to be created. The scale should be better described so that everyone has the same understanding.

Besides, a common and deeper understanding of the selected UX factors should be created. The participants were sometimes very unsure of what was meant by the UX factors.

V. Discussion

In the results of questions Q1 2, Q2 3, Q4 4 and Q5 5, some differences in the degree of agreement between the individual teams can be seen. We attribute these differences to the different target groups of the teams' products. For example, the target group of Team 1's products is enterprise customers, Team 2's targets are private end customers, Team 3's are craftsmen and private end customers, and Team 4's targets are real estate marketers and private end customers. In addition, the maturity level of the individual teams is different, which would certainly influence the results. However, the tendency is that all results are in the same range when measured against the confidence interval. In the application of UX Poker, new insights have been gained on the use of the method. On the one hand it is the use of the method which is under the consideration of Personas [29]. On the other hand, there is the realization that UX Poker allows a different perspective on epics. We will discuss both points in greater detail in the next sections.

A. The Usage of Personas

In the workshops, a question was repeatedly asked as to which user the UX should be estimated for. It was sometimes not clear to the participants what type of users they should put themselves into the shoes of. The goal of UX Poker is to estimate the UX that will later be created for the user.

For this reason, it makes sense to introduce personas [30] as a prerequisite for UX Poker. Equipped with a clear picture of the personas, UX Poker participants can evaluate the UX from the perspective of these personas. This requirement also coincides with the 'UserX Story' method of Choma et al. [22]. Personas are also a component of this method.

In order to integrate the persona deeply into the development process, it is recommended that persona-driven user stories be used [31]. The user story makes it immediately clear which persona is being addressed.

B. The User Perspective

During the workshops, it became apparent that with UX Poker a different discussion about the implementation of the Epics took place vis-a-vis the exercise in Refinement. Since the participants put themselves into the role of the user, the Epics were analyzed differently. Therefore, things that did not stand out during the Refinement surfaced in the discussion.

For example, a live ticker for a soccer portal app would be implemented. The question that arose out of the discussion was how often the ticker should be updated. The problem was discussed controversially, because the update rate should be quite high when a soccer match was in progress. On the other hand, if no soccer match was being broadcast then a low update rate would be sufficient. In the end, however, everyone agreed that if the refresh rate were implemented 'incorrectly', it would have a negative impact on the UX. If implemented 'correctly', it would impact the UX in a positive way.

The previous example shows that the same Epics,

depending on their implementations, can have both a positive and a negative impact on the UX. During Refinement, Epics tend to be evaluated and discussed based on their technical implementation. During the UX poker, the user is in the foreground and it is evaluated from his or her perspective.

C. Limitations

In this study, the use of UX Poker as a method was proposed and evaluated. Whether the estimated UX was actually achieved after development was not evaluated due to the time factor. This needs to be verified in further studies.

Furthermore, the study was only conducted in Germany. International studies should be conducted to exclude cultural and linguistic effects.

VI. Conclusions and Future Work

We have presented a method called 'UX Poker' for estimating the user experience for user stories or epics. The method aims to estimate the UX before implementing the user stories or epics. This has provided another way to sort or filter the Product Backlog in accordance with the estimation. We were able to evaluate this method in an initial study in workshops with 30 participants from four different companies.

The results showed that UX Poker could be used in a real-life application. All participants were able to use UX Poker on concrete examples. It was possible to estimate the possible UX to be achieved for all previously selected UX factors. The use of UX Poker also provided essential insights for the agile team as it took the user's perspective. As best practice, the use of personas in connection with UX Poker has proved to be useful. It helps the participants put themselves into the persona's shoes and assess the UX from the persona's perspective.

In our study, we conducted UX Poker as a separate Agile meeting. It would be necessary to evaluate whether this is appropriate or whether UX Poker can or should also be performed in the Planning Poker meeting. The combination of UX Poker and Planning Poker would save the Agile team another meeting.

In addition, it should be examined whether the UX maturity level of the team influences the results of UX Poker. The results of our study show that even participants with a developer background are pretty capable of successfully applying UX Poker. This suggests that the UX maturity level does not significantly influence the results. However, this needs to be confirmed in further studies.

Finally, it can be summarized that UX Poker is applicable in a real-life situation and that it helps to focus the agile team's attention on UX.

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References

[1] J. Preece, Y. Rogers, H. Sharp, *Interaction design: Beyond human-computer interaction*. Chichester: Wiley, 4. ed. ed., 2015.

[2] ISO9241-210, "Ergonomics of human-system interaction - part 210: Human-centred design for interactive systems," 2020.

[3] ISO9241-220, "Ergonomics of human-system interaction - part 220: Processes for enabling, executing and assessing human - centred design within organizations," 2020.

[4] M. Hassenzahl, "The effect of perceived hedonic quality on product appealingness," *International Journal of Human-Computer Interaction*, vol. 2001, no. 13(4), pp. 481–499, 2001.

[5] N. Tractinsky, "Aesthetics and apparent usability," in *the SIGCHI conference*, 1997, pp. 115–122.

[6] M. Schrepp, J. Thomaschewski, "Design and validation of a framework for the creation of user experience questionnaires," *International Journal of Interactive Multimedia and Artificial Intelligence*, vol. 5, no. 7, pp. 88-95, 2019, doi: 10.9781/ijimai.2019.06.006.

[7] M. Rauschenberger, M. Schrepp, M. Perez- Cota, S. Olschner, J. Thomaschewski, "Efficient measurement of the user experience of interactive products. how to use the user experience questionnaire (ueq). example: Spanish language version," *International Journal of Interactive Multimedia and Artificial Intelligence*, vol. 2, no. 1, p. 39, 2013, doi: 10.9781/ijimai.2013.215.

[8] M. Schrepp, A. Hinderks, J. Thomaschewski, "Design and evaluation of a short version of the user experience questionnaire (UEQ-S)," *International Journal of Interactive Multimedia and Artificial Intelligence*, vol. 4, no. 6, pp. 103-108, 2017, doi: 10.9781/ijimai.2017.09.001.

[9] J. Sauro, "Supr-q: A comprehensive measure of the quality of the website user experience," *Journal of Usability Studies*, vol. 2015, no. 10, pp. 68–86, 2015.

[10] M. Moshagen, M. T. Thielsch, "Facets of visual aesthetics," *International journal of human-computer studies*, vol. 68, no. 10, pp. 689–709, 2010, doi: 10.1016/j.ijhcs.2010.05.006.

[11] M. Schrepp, A. Hinderks, J. Thomaschewski, "Construction of a benchmark for the user experience questionnaire (ueq)," *International Journal of Interactive Multimedia and Artificial Inteligence*, vol. 4, no. 4, pp. 40–44, 2017, doi: 10.9781/ijimai.2017.445.

[12] A. Hinderks, M. Schrepp, F. J. Domínguez Mayo, M. J. Escalona, J. Thomaschewski, "Developing a ux kpi based on the user experience questionnaire," *Computer Standards & Interfaces*, vol. 65, pp. 38–44, 2019, doi: 10.1016/j.csi.2019.01.007.

[13] M. Schrepp, R. Otten, K. Blum, J. Thomaschewski, "What causes the dependency between perceived aesthetics and perceived usability?," *International Journal of Interactive Multimedia and Artificial Intelligence*, vol. 6, no. 6, pp. 78–85, 2020, doi: 10.9781/ijimai.2020.12.005.

[14] K. Schwaber, *Agile project management with Scrum*. Microsoft professional, Redmond, Wash.: Microsoft Press, 2004.

[15] D. J. Anderson, *Kanban: Successful evolutionary change for your technology business*. Sequim, Washington: Blue Hole Press, 2010.

[16] P. Serrador, J. K. Pinto, "Does agile work? — a quantitative analysis of agile project success," *International Journal of Project Management*, vol. 33, no. 5, pp. 1040–1051, 2015, doi: 10.1016/j.ijproman.2015.01.006.

[17] B. Boehm, R. Turner, "Using risk to balance agile and plan- driven methods," *Computer*, vol. 36, no. 6, pp. 57– 66, 2003, doi: 10.1109/MC.2003.1204376.

[18] K. Schwaber, J. Sutherland, *The Scrum Guide: The Definitive Guide to Scrum: The Rule of the Game*. 2020.

[19] A. Garcia, T. Silva da Silva, M. Selbach Silveira, "Artifacts for agile user-centered design: A systematic mapping," in *Proceedings of the 50th Hawaii International Conference on System Sciences (2017)*, Proceedings of the Annual Hawaii International Conference on System Sciences, 2017, Hawaii International Conference on System Sciences.

[20] M. Brhel, H. Meth, A. Maedche, K. Werder, "Exploring principles of user-centered agile software development: A literature review," *Information and Software Technology*, vol. 61, pp. 163–181, 2015, doi: 10.1016/j.infsof.2015.01.004.

[21] D. D. Brown, "Agile methods + ux = agile ux," in *Agile User Experience Design*, Elsevier, 2013, pp. 39–69, doi: 10.1016/B978-0-12-415953-2.00002-9.

[22] J. Choma, L. A. M. Zaina, D. Beraldo, "Userx story: Incorporating ux aspects into user stories elaboration," in *Human-Computer Interaction. Theory, Design, Development and Practice*, vol. 9731 of *Lecture Notes in Computer Science*, M. Kurosu Ed., Cham: Springer International Publishing, 2016, pp. 131–140, doi: 10.1007/978-3-319-39510-4_13.

[23] A. Joshi, N. L. Sarda, S. Tripathi, "Measuring effectiveness of hci integration in software development processes," *Journal of Systems and Software*, vol. 83, no. 11, pp. 2045–2058, 2010, doi: 10.1016/j.jss.2010.03.078.

[24] A. M. Moreno, A. Yagüe, "Agile user stories enriched with usability," in *Agile Processes in Software Engineering and Extreme Programming*, vol. 111 of *Lecture Notes in Business Information Processing*, Springer Berlin Heidelberg, 2012, pp. 168–176, doi: 10.1007/978-3-642- 30350-0_12.

[25] N. C. Haugen, "An empirical study of using planning poker for user story estimation," in *AGILE 2006 (AGILE'06)*, 2006, pp. 23–34, IEEE.

[26] M. Schrepp, J. Thomaschewski, "Handbook for the modular extension of the user experience questionnaire," 2019.

[27] A. Hinderks, F. J. Domínguez-Mayo, A.-L. Meiners, J. Thomaschewski, "Applying importance- performance analysis (ipa) to interpret the results of the user experience questionnaire (ueq)," *Journal of Web Engineering*, 2020, doi: 10.13052/jwe1540- 9589.1926.

[28] S. Gibbons, "Dot voting: A simple decision-making and prioritizing technique in ux," 2019. [Online]. Available: https://www.nngroup.com/articles/dot- voting/.

[29] D. Winter, C. Hausmann, E.-M. Schon, J. Thomaschewski, "Morphological analysis of the 'context of use' application of morphological analysis to the collaborative understanding of the context of use," in *2020 15th Iberian Conference on Information Systems and Technologies (CISTI)*, 2020, pp. 1–6, IEEE.

[30] A. Cooper, R. Reimann, D. Cronin, *About face: Interface- und Interaction-Design*. Heidelberg and München and Landsberg and Frechen and Hamburg: mitp, 1 ed., 2010.

[31] D. Winter, E.-M. Schön, J. Thomaschewski, "Persona driven agile development: Build up a vision with personas, sketches and persona driven user stories," in *Information Systems and Technologies (CISTI)*, 2012.

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