

Integrating Agile Human-Centered Design with Lean UX and Scrum

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Abstract: The integration of Human-Centered Design into agile product development can be challenging. In particular, the application of established user research and UX design methods within short feedback cycles frequently leads to discussions. This article provides an overview of the development and current state of research in Agile UX. In particular, we analyse Lean UX and answer the following questions: How can user research be implemented in agile product development and which best practices can be used to achieve it? For this purpose, we conducted a literature review and analysed how user research in agile product development has progressed in recent years. We discuss an approach that leverages identified best practices for Agile UX by introducing a new model for integrating Lean UX with Scrum to address the needs of the users more strongly in agile product development. We conclude that existing best practices and patterns already aim to adapt established user research methods to the agile framework. Lean UX provides a suitable approach to integrate such user research methods for use in agile product development. This approach has the potential to improve the user experience.


1 INTRODUCTION


The annual “State of Agile” study (VersionOne Inc., 2020) shows that the interplay of agility and user centrality in product development has taken on an important role for companies. In this context, the study points to a widespread use of agile practices and process models. In addition, the study shows that customer/user satisfaction is one of the most frequently cited criteria for measuring project success.

As a result, interdisciplinary teams (Beck et al., 2001) are often faced with the challenge of implementing stakeholder requirements in a user-centric manner and reacting flexibly to rapidly changing requirements from both stakeholders and disruptive innovations (Schön et al., 2020). In particular, the integration of classical user research methods of Human-Centered Design (HCD) (ISO 9241-210, 2020) into the short feedback cycles of agile product development is a constantly recurring point of discussion. The frequent and regular involvement of customers and users in product development is indispensable

for the HCD process. However, the availability of sufficiently suitable test persons over the short feedback cycles cannot always be guaranteed. As a result, the classical user research methods are perceived by agile teams as too slow, too costly, and too cumbersome. Ultimately, UX design and user research are neglected. To help interdisciplinary teams solve this problem, the integration of HCD into agile product development has assumed an important role in research (Salah et al., 2015; Silva et al., 2018). Additionally, the integration of methods such as Lean Startup (Ries, 2011) and Lean UX (Gothelf and Seiden, 2016) have been listed in the literature as a way to better engage customers and users in the agile product development cycle (Zorzetti et al., 2021).

The motivation of this article is to show a way forward for solving the aforementioned problems that enables UX professionals and agile teams to collaboratively and human-centeredly develop products that meet the needs of users and stakeholders. This article examines which best practices already exist for integrating user research into agile product development. It also proposes a model based on Lean UX that can be used for best practices. According to Aarlien

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and Colomo-Palacios (2020) as well as Zorzetti et al. (2021), an essential aspect of Lean UX is the combination of agile and human-centered methods with the concepts of Lean Startup. Therefore, this article addresses the following two research questions:

- RQ1: What methods and practices can be used for Agile UX?
- RQ2: How can user research be practically implemented in agile product development?

Section 2 provides an overview of related work. Section 3 explains the research methodology used to analyse the evolution and current state on Agile UX. Section 4 presents best practices for Agile UX and a model for integrating Lean UX into the Scrum process. This is followed by a discussion in Section 5 on the use of the developed model. Finally, Section 6 summarises the findings and provides an outlook.

2 RELATED WORK

The following studies can be cited for the integration of classic user research methods according to HCD into agile product development. For instance, Bertholdo et al. (2014, 2016) describe that there is not enough time for user research under agile conditions. They therefore recommend regular meetings with the team, customers, and users in which usability tests and user research methods are conducted. This approach of collaborative and participatory design ensures that the results of the last Sprint are evaluated and the requirements for the following Sprint are defined. Olsson and Bosch (2015) created a conceptual model that highlights the need to combine qualitative user feedback in the early stages of product development with quantitative user observation in the later stages of product development. Bellucci et al. (2015) examined in a field study, how users interact with prototypes. They combined methods of Extreme programming (Beck and Andres, 2004) with co-design sessions to develop the product with strong user involvement. The case study by Kautz (2010) examines how stakeholders are involved in practice within agile product development using participatory design. He states that the involvement of customers and users in

the design and development process has a positive influence on usability. Users were thus enabled to perform their tasks to their own satisfaction and in an effective, efficient, and economical manner. Furthermore, studies by Schön et al. (2019, 2020), prove that agile methods and practices have an impact on how user research is conducted. They conclude that agile teams have problems, among other things, to continuously involve all relevant stakeholders in the agile development process. Furthermore, the authors found that companies regularly face the challenge of developing requirements together with the users of the product. For this reason, among others, Schön et al. recommended building a user pool and developed a pattern that enables UX professionals to jointly develop solutions for the aforementioned challenges.

From all the above studies, it can be concluded that research has already been conducted on the topics of user research and the direct involvement of users and customers in agile product development. However, the approaches presented in the literature do not show a structured process of how the continuous integration of users and customers as well as methods of HCD should take place in the agile product development cycle. The goal of this paper is to show how Agile Human-Centered Design (Agile HCD) can be done by using a model for integrating Lean UX into Scrum.

3 RESEARCH METHOD

The motivation of this paper is to help UX professionals and agile teams to better understand user and stakeholder requirements and to show how Agile and HCI methodologies can be combined in a single feedback cycle. Therefore, this work aims to capture existing best practices for Agile UX and to develop a model for the practical application of these best practices. For this purpose, we chose the following procedure (see Figure 1) to answer RQ1: Which methods and practices can be used for Agile UX? and conducted literature research in Step 1 and Step 2. Based on the results from RQ1, a model was developed to help answer RQ2: How can user research be practically implemented in agile product development?



Figure 1: Overview of research approach.

The first step is to identify the existing methods and practices for Agile UX via a literature review. For a more complete overview of existing research on Agile UX, we use the systematic literature reviews by Silva et al. (2011, 2018) and Schön et al. (2017a) as well as the studies by Bertholdo et al. (2014, 2016); Burkart and Schön (2019), and Schön et al. (2017b, 2020).

The second step is a literature review on Lean UX to identify the concepts of the approach and the best practices for Agile UX contained therein. This integrative approach has not yet received sufficient critical attention in the scientific literature (Liikkanen et al., 2014; Aarlien and Colomo-Palacios, 2020). For this reason, the systematic literature review by Aarlien and Colomo-Palacios as well as the case study by Zorzetti et al. (2021) and the Converge model by Ximenes et al. (2015) were used.

In the third step (see Figure 1), the practical application of the Agile UX best practices identified in RQ1 and their positive impact on improving the user experience (UX) were investigated. For this purpose, a model was developed based on the findings on Lean UX using Scrum (Schwaber and Sutherland, 2020) as an example. The given framework conditions with regard to team composition, dependencies on other teams, and the continuous involvement of users and stakeholders were taken into account when determining the sprint length.

4 RESULTS

As described at the beginning, the motivation of this work is to present a development approach to interdisciplinary teams to develop human-centered and value-added products. The literature review identified several studies that present methods and practices for Agile UX. These studies demonstrate, among other things, that the increasing prevalence of agile ways of working has an impact on how user research and UX design are practiced.

4.1 RQ1: What Methods and Practices Can Be Used for Agile UX?

Silva et al. (2018) state that integrating agility and HCD requires mutual team understanding across three domains and they are understood differently: The Processes and Practices domain is understood and People and Social is nearly understood. For the Technology and Artefacts domain, a full understanding does not yet exist. An important aspect here is that

agile teams understand HCD methods as a team discipline rather than a role, and a common understanding of both disciplines should be developed. Therefore, Silva et al. (2011, 2018) recommend developing clear integration guidelines and evaluate them empirically. Bertholdo et al. (2014, 2016) define patterns for the phases of the HCD cycle (ISO 9241-210, 2020). For example, they recommend a UX expert as part of the agile team for planning the human-centered design process (Bertholdo et al., 2014). For the creation and evaluation of design solutions, Bertholdo et al. (2016) recommend collaborative as well as participatory design on the one hand. On the other hand, performing user tests and exploratory tests during Sprints is useful as evaluation by inspection. Schön et al. (2017a,b, 2020) developed the pattern Lean User Research based on their findings on Agile Requirements Engineering (RE). It enables interdisciplinary teams to adapt user research methods according to HCD to agile procedures and to anchor basic user research skills in the team. For this purpose, Schön et al. recommend adapting the extensive methods of user research and the documentation to the agile cycle for shorter lead times, among other things. Furthermore, the authors, recommend continuously integrating UX evaluations as well as user research methods into the agile development process in order to develop value-added products. Burkart and Schön (2019) developed another framework for Agile UX. Six work steps show that continuous user research and UX design as well as continuous UX evaluations are in focus. To support agile teams, Burkart and Schön suggest a set of agile methods and practices as best practices for each work step. For example, for the step of understanding problems, they recommend, among others, contextual interviews, and for the step of experimenting, they recommend, for example, the Minimum Viable Product (MVP) approach or Agile Usability/UX testing.

The identified case studies on Lean UX deal with the combination of the agile product development concepts (Beck et al., 2001), Design Thinking (Brown, 2008) or HCD (ISO 9241-210, 2020) and Lean Startup (Ries, 2011). Here, according to Signoretti et al. (2019) and Zorzetti et al. (2021), Lean Startup complements the disciplines of agile and HCD with the approach of validated learning using the Build-Measure-Learn cycle. Design Thinking, according to the Converge model of Ximenes et al. (2015), provides an approach how interdisciplinary teams within continuous product development work together and create a common understanding of application problems on the one hand. On the other, the study shows how teams can overcome the challenge

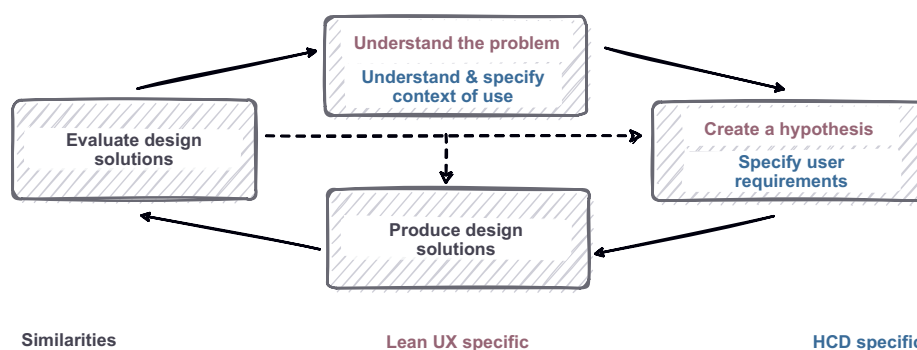


Figure 2: Comparison of the HCD process with the Lean UX Cycle.

of involving customers and users more closely in the process. For this purpose, the authors of the aforementioned work recommend the use of different best practices such as interviews, the 5-W method, paper prototypes, and Likert scale questionnaires. Zorzetti et al. conclude that adopting an integrative approach to Lean UX can bring about positive changes in mindsets, activities, practices, and techniques. The teams in these case studies recognised that agile methods alone do not help to identify whether they are building the right product for users. Validated learning through build-measure-learning, on the other hand, provided the teams with a comprehensive understanding of the goals and needs of customers and users.

4.2 RQ2: How Can User Research Be Practically Implemented in Agile Product Development?

In order to examine the practical use of user research methods according to HCD in an agile environment, a model was developed based on the findings from RQ1 and the Lean UX approach (Gothelf and Seiden, 2016; Zorzetti et al., 2021) using Scrum (Schwaber and Sutherland, 2020) as an example. The model is applicable for interdisciplinary teams that work according to Scrum. For this model, they consist of representatives from different disciplines such as software development, user research, UX design, management, and are characterised by a high degree of interaction and collaboration (Schwaber and Sutherland). However, they can be confronted with heterogeneous target groups as well as plan-oriented developer teams and the associated technical dependencies. Therefore, based on Scrum, we assumed that a sprint length of three weeks reduces the risk of sprint cancellation due to excessive complexity.

As shown in Figure 2, the Lean UX approach and the HCD process have clear similarities in comparison. Both approaches are iterative and put people at

the centre of the design process. HCD and Lean UX focus on understanding the application problem and evaluating solutions until the result is the right product for users and customers. Since Lean UX is based, among other things, on the concept of Lean Startup (Ries, 2011), this approach dispenses with the strong focus on user research before the actual design or development.

Figure 3 presents our model for integrating Lean UX and Scrum. Before Sprint Planning, a workshop is held with the team and all relevant stakeholders. The goal of this workshop is to understand the problem to be considered as well as the users and to visualise it, for example, using a customer journey map. Based on this, hypotheses are created in the team and recorded, for example, as user stories in the hypothesis backlog for Sprint Planning. According to Hinderks (2021), the application of the UX Poker method can support the interdisciplinary team in better assessing the influence of a User Story on selected UX factors such as attractiveness, dependability or convenience. In the subsequent Sprints, the hypotheses are verified collaboratively through experiments with the users. The interdisciplinary team ensures, among other things, that all team members develop a common understanding of the goals and needs of the users through continuous usability tests with prototypes and the Minimum Viable Product (MVP). In addition to weekly user tests, we also introduced short interviews and online questionnaires. To ensure knowledge transfer to the team, two independent preliminary studies showed that the weekly user tests could be conducted on a Thursday, which allows their results to be evaluated on Friday. The findings from the tests and evaluations thus flow directly into the current product development cycle and the hypotheses are continuously adjusted. The result is a product with obvious added value (outcome) and both customers and users are satisfied (Ximenes et al., 2015; Schön et al., 2017b; Zorzetti et al., 2021). To verify the success of this product, it is recommended to

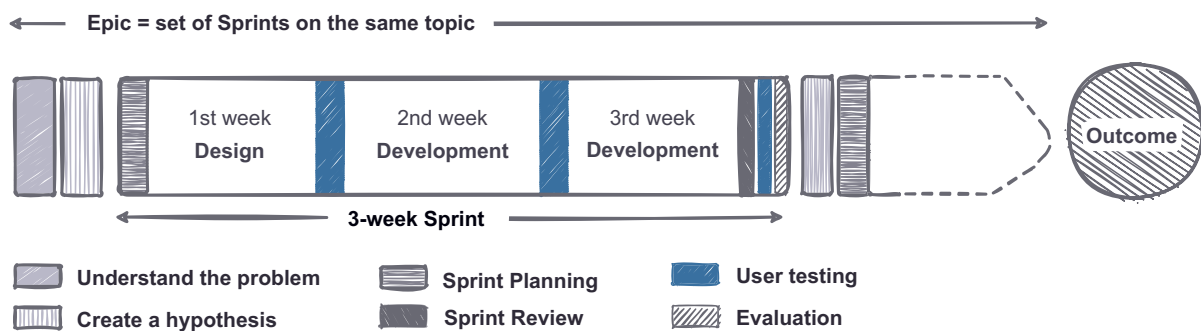


Figure 3: Model for Lean UX using the example of Scrum.

conduct further usability tests shortly after the Sprint Review, for example, with subsequent questionnaires to evaluate hedonic and pragmatic quality, such as the UEQ+ (Schrepp and Thomaschewski, 2019). A final UX Retrospective according to Hinderks (2021) offers the interdisciplinary team an opportunity to review the results of the last Sprint in terms of UX factors and optimize them for the next feedback cycle.

5 DISCUSSION

Agile practices and process models are used for dynamic stakeholder requirements, among other things (Beck et al., 2001). Our presented model (see Figure 3) provides an approach which is particularly suitable for use in agile product development (Ximenes et al., 2015; Burkart and Schön, 2019; Zorzetti et al., 2021). Since Lean UX is based on the concepts of Lean Startup and agile product development (Zorzetti et al., 2021), the approach integrates well with existing agile process models such as Scrum (Schwaber and Sutherland, 2020). The concepts of hypothesis, experimentation, and minimum viable product (MVP) enable the team to develop a better understanding of the customers' and users' application problems through continuous involvement of users and relevant stakeholders (Zorzetti et al.). For this purpose, the methods of user research, UX design, and UX evaluations do not take place as an upstream phase to development, but are carried out continuously throughout the entire product development cycle. In this way, interdisciplinary teams are supported in developing human-centered and value-added products (Ximenes et al., 2015; Silva et al., 2018; Schön et al., 2020; Zorzetti et al., 2021). Consequently, integrating the Lean UX approach into the Scrum framework can help to increase UX.

For the successful use of the model, it is necessary that a fundamental understanding of the principles of the two disciplines of agility (Beck et al.,

2001) and HCD (ISO 9241-210, 2020) exists in the team. Otherwise, the relevant user research methods will not be adapted to the agile pace and will be perceived by the team as too extensive (Schön et al., 2018). The single case study by Zorzetti et al. (2021) shows that integrating UX professionals into the agile team as user advocates helps the team to develop user research skills. The interdisciplinary teams of the aforementioned study came to the conclusion that the approach as well as the participation in user interviews brings a number of benefits. These range from better code quality and more trust between team members to quick feedback and reduced development effort. As UX has become a relevant quality attribute for companies (VersionOne Inc., 2020), UX professionals will increasingly take on a business analyst or coach role to also support companies in their culture change (Silva et al., 2018).

The chosen methodology of the literature research can be seen as a limitation of this work. Due to the restriction to already existing systematic literature reviews, further research results on Agile UX and Lean UX may not have been considered.

6 CONCLUSION AND FUTURE WORK

This article provides the successful answer to the research questions RQ1: Which methods and practices can be used for Agile UX? and RQ2: How can User Research be practically implemented in agile product development? For this purpose, we conducted a literature review on common methods and practices for integrating user research methods into agile product development (RQ1). Based on this, we developed a model for integrating Lean UX and Scrum (RQ2). Our model is based on the three concepts agile product development, HCD as well as Lean Startup and supports the approach of validated learning. In addition, this model provides a clear requirement to con-

duct weekly user tests followed by short interviews and online questionnaires. This enables the continuous involvement of customers and users throughout the product development cycle. Agile teams are supported with this model in the development of user-centric and value-added products. Further research is needed due to the lack of evaluation of the model. In the future, multi-case studies in different companies will be used to investigate how effective the model is regarding the continuous integration of all users and stakeholders in agile product development. To this end, one of the objectives is to investigate the effectiveness of establishing a pool of users to ensure the availability of sufficient suitable test subjects in the short feedback cycles.

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