The Indonesian Journal of Computer Science
www.ijcs.net
Volume 13, Issue 6, December 2024
https://doi.org/10.33022/ijcs.v13i6.4466

Integration of User Experience and Agile Software Development: A Systematic Literature Review

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Article Information

Received : 25 Oct 2024
Revised : 1 Nov 2024
Accepted : 3 Dec 2024

Keywords

user experience; agile software development; systematic literature review; agile methodologies; UX in agile

Abstract

New methods and best practices are being used to enhance the software lifecycle because of the recent expansion of the software industry. Agile development approaches have also been widely used, and they have positively affected people's lives and the operations of enterprises. Although agility makes working with developers easier, it does not offer enough chances to collaborate with users. In early Agile formulations, User Experience (UX) was not recognized as a distinct part of software development. The tricky part is figuring out where to integrate them and how to merge them so that the two parts interact. Combining user experience with Agile approaches is the subject of this research's proposed systematic literature review (SLR). This research found ten relevant studies highlighting the growing interest and research in merging these two critical areas of software engineering. In conclusion, this research found some papers or studies integrating user experience into Agile methodologies. Many techniques are used, and all studies have different approaches to integrate them.

A. Introduction

New methods and best practices are being used to enhance the software lifecycle due to the recent expansion of the software industry. Agile development approaches have also been widely used, and they have had a positive effect on people's lives as well as the operations of enterprises. Agile development methodologies are increasingly being employed to speed up product development. However, using Agile approaches alone is not enough to produce a positive user experience (UX) [1]. Although agility makes working with developers easier, it does not offer enough chances to collaborate with users. UX was not recognized as a distinct part of software development in early Agile formulations [2].

Modern software development demands excellent flexibility to respond to changing market and user needs. Agile methods offer an iterative and incremental approach that allows the development team to quickly adjust the product based on user feedback [3]. One of the studies also claims that Agile methods support the development of innovative products by providing flexibility to respond to change [4]. VersionOne's annual report (2020) shows how Agile helps organizations manage changing priorities and increase flexibility. Thus, Agile is a relevant methodology for dealing with flexibility demands in modern software development.

Additionally, several well-known Agile methodologies avoided the practice of prior design by beginning with a user research phase to comprehend people and their demands fully. Since then, specific methods, like individuals, have assimilated into the agile mainstream. One of the biggest obstacles for UX specialists is integrating UX activities into Agile development. UX and Agile have two aims: product interaction with the user and code production for a product. The tricky part is figuring out where to integrate them and how to merge them so that the two parts interact [5].

Integrating UX and Agile makes organizations involve UX practitioners in the Agile development cycle [2]. This condition makes UX practitioners play an active role in assisting team developers because UX practitioners focus on User-centered Design tasks, which are then integrated with software development, such as user research, market research, prototyping, usability inspection, user testing, visual design, and providing feedback [2]. Even so, many organizations still have difficulty maximizing the role of UX practitioners, where design is also related to the success of a product or brand. Communication problems, integration difficulties, and different levels/hierarchies within a team are barriers often encountered when involving UX in Agile.

This research explores practical strategies and approaches in integrating UX with Agile software development, identifies the main challenges faced, and provides best practice recommendations to improve product quality and user satisfaction. This research summarizes how UX and Agile can be integrated into software development. Therefore, this research aims to answer these research questions:

RQ1: How can user experience be integrated into Agile software development?

RQ2: Which methods are appropriate for UX management in an Agile environment?

The first research question is how user experience can be included in Agile software development. Not every study includes a method that can be immediately applied to UX. Instead, this research believed that research describing the integration of Agile software development with user experience approaches would be available. These factors also need to be considered and examined. The second research question seeks to pinpoint strategies that might be applied to UX management. This research did not anticipate that the methods discovered might be explicitly used in UX management. Otherwise, this research might have found strategies through the literature search previously. This research aims to analyze the pinpoint Agile software development UX methodology techniques that were generally successful or received considerable support.

B. Research Method

The team followed the proper systematic review procedures, notably adhering to the SLR guidelines in software engineering [8]. This approach was chosen for its ability to thoroughly and objectively examine existing literature, helping to identify patterns, gaps, and inconsistencies. The methodology aligns with the research goals, adding depth to the study and ensuring that findings are well-supported to guide future Agile and UX integration practices and research. These rules dictate that the SLR has three primary phases. The phases include reviewing the plan, conducting the review, and analyzing the documents—the details are in Fig 1.

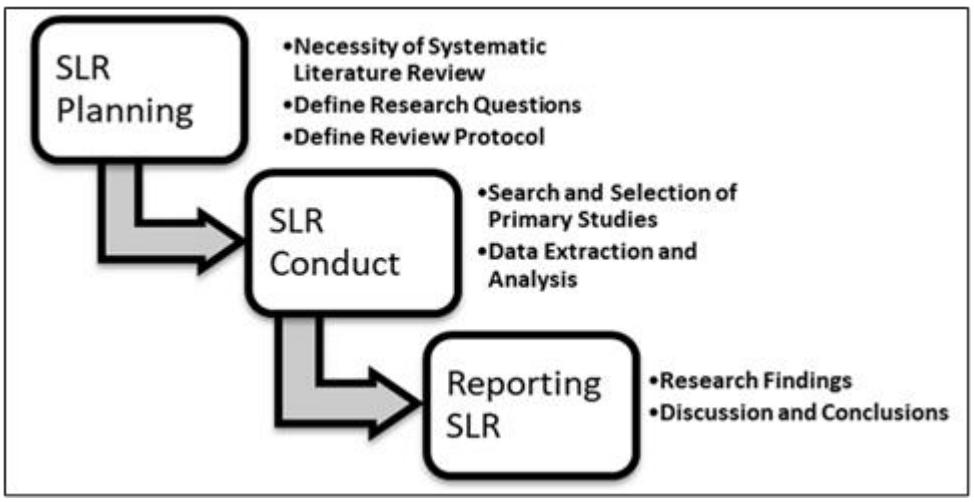

Figure 1. Systematic Literature Review Phase

This research initially conducted informal research on UX in Agile or associated terms. This research used the informal terms "user experience in agile" and similar terms like "agile ux" in Science Direct, IEEEXplore, Scopus, and ACM. Nevertheless, this research discovered during the investigation that the term "user experience in agile" is not adequately defined nor described in the literature. Additionally, the research informal investigation concluded that the number of publications was too low, and their content was too dispersed. However, this research discovered methods that permit UX in Agile.

This research created a search strategy based on the research questions and goals. This strategy includes the search term, the search area, and the method for choosing the relevant papers. At the start, create a list of keywords. Since the literature has not fully covered UX management, include only Agile and user experience in the keywords. Practitioners frequently do not explicitly address Agile; instead, they use Kanban and Scrum. Use Agile Methods as a keyword with Agile frameworks like Scrum or Agile methods like Kanban. As a result, Agile frameworks and techniques should be included in the search phase of this research. Also, include the term 'design thinking' in this research because, according to experience, it has led to the discovery of relevant publications.

In the second step, the research expanded the keywords with synonyms and alternate spellings. We took these from the literature that we had previously analyzed. Finally, we compiled and improved the keyword list for this research. Table 1 displays the complete list of keywords. In the following step, we converted the group of keywords into a search string as follows:

(agile OR Kanban OR Scrum OR lean OR "extreme programming" OR "design thinking")
AND
("user experience" OR ux OR usability)

Table 1. Complete Keywords

Category	Keywords
Agile	Agile, Kanban, Lean, Scrum, Extreme Programming, Design Thinking
UX	User Experience, UX, Usability

Due to some grammatical differences between the two search spaces, we modified this search string. However, we did not alter the actual reasoning. We included digital libraries, journals, and conference proceedings in the search space. Table 2 displays the comprehensive list of the search area. We used all search spaces for the operation in July 2024.

Table 2. Paper Library

Library	Number
IEEEXplore	99
Science Direct	3,441
SCOPUS	429
ACM	22,470

The next step is to eliminate and select the papers. This research only includes papers that state that user experience can be integrated with the Agile software development method. The title should indicate that the article is primarily about 'agile' and 'user experience.' We disqualified the paper if the title stated that it only used agile and UX methodologies. We used a set of selection criteria in each reduction stage, separated into inclusion and exclusion standards.

The papers must be published in English and peer-reviewed, and they must provide strategies for integrating user experience methods (or similar) into Agile development processes. We excluded whole books, papers with no full text available, papers offering lessons learned, concepts, suggestions, or recommendations, and papers introducing a panel discussion or a workshop at a conference.

C. Result and Discussion

After the eliminated and selected papers, this research has selected nine relevant studies. This research shall offer studies in this area to address the research questions, individually or together, as necessary. This research has identified and analyzed 20 studies. Figure 2 illustrates the year-wise distribution of the studies. The research on integration between user experience and agile software development was relatively stable from 2017 to 2023. However, it peaked in 2022. It shows that researchers are interested in the user experience of Agile. Hence, it can be stated that it commenced gaining popularity in 2022.

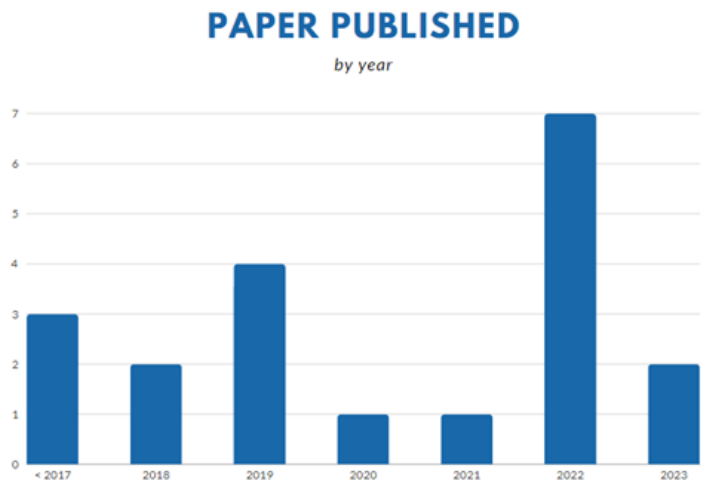

Figure 2. Paper distribution by year

The recognized User Experience in Agile studies was presented at conferences and published in journals. About 40% of the research was published in conferences and 60% in journals. The journals and conferences have been reviewed in this research. Most publications were published in Q1 journals, indicating their increased prominence or influence in the scholarly community. Journals in Q1 published 12 publications. Table 3 displays study details based on publication names.

Table 2. Paper Library

Publication Name	Type	Rank	Quantity
Journal of Systems and Software	Journal	Q1	3

Information and Software Technology	Journal	Q1	7
International Journal of Human-Computer Studies	Journal	Q1	2
ICSE-SEET '22: Proceedings of the ACM/IEEE 44th International Conference on Software Engineering: Software Engineering Education and Training	Conference	-	1
2019 Conference on Information Communications Technology and Society (ICTAS)	Conference	-	1
On the Move to Meaningful Internet Systems. OTM 2017 Workshops	Conference	-	1
2022 8th International HCI and UX Conference in Indonesia (CHIuXiD)	Conference	-	1
CAiSE (Doctoral Consortium)	Conference	-	1
Human-Computer Interaction–INTERACT 2015: 15th IFIP TC 13 International Conference	Conference	-	1
NordiCHI '18: Proceedings of the 10th Nordic Conference on Human-Computer Interaction	Conference	-	1
2019 ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM)	Conference	-	1

A summary of the chosen studies and the related research question will be provided. The search result is, therefore, quite popular. The main differences between the numerous studies' descriptions of how UX approaches are incorporated into Agile software development are minor. The unifying objective of all the studies is to use integration to create a better product or service with a high

UX. The solutions to the research questions are based on this objective. The literature has addressed and explored the incorporation of UX approaches in Agile software development. However, there is a glaring shortage of methods that facilitate integration that have been thoroughly validated. This research investigated methods that enable integration in the chosen research.

For the first research question, some studies reveal that integrating UX work with Agile software development is difficult, complex, and varies by context. Detailed user stories often create tension between Agile developers and UX professionals, leading to defensive behavior. [9][10][11]. This finding underscores the need for balanced communication strategies between both teams to reduce friction and enhance collaboration. One of the studies used the hybrid method that combines traditional lectures and activities with PBL to help students learn and used the integration of Lean UX and Scrum [6]. They also selected six lessons learned that highlight crucial factors to consider when merging Lean UX and Scrum in commercial and academic environments. One of the studies also claims that UX and Agile were used in the requirement-gathering process[7]. The study focuses on how UX principles are applied during requirement gathering within Agile environments, suggesting that UX methods add value by grounding requirements in real user needs. By including UX perspectives early, this study illustrates a proactive approach to integration that can potentially reduce rework and ensure user-centric development from the onset.

For the second research question, the most commonly used strategy is "Upfront UCD Design." However, this approach has been criticized because it doesn't fully address how to integrate UX methods into Agile software development[11][12][13]. The work of the UX and development teams is only coordinated using this strategy. Instead of creating a true partnership, it mainly coordinates the work of UX and development teams, resulting in limited integration[14][15][16][17]. Many studies highlight the importance of teamwork and communication, which can either be a key goal of the strategy or happen by chance [11][12][13]. To overcome these limitations, a more collaborative approach like Lean UX can be beneficial. Lean UX focuses on rapid prototyping and testing during Agile sprints, allowing UX insights to be continuously included in the development process[6][7]. This method supports real-time adjustments and helps break down barriers between UX and development teams.

The UX and development teams are two distinct entities that often make up the team; it should be emphasized. Both employ various techniques to complete their work. The UX team, for instance, employs some techniques in the literature. It turns out, though, that using a solitary UX technique is not the answer. Instead, it demonstrates how UX techniques are always included in a higher-level structure (such as a framework, process, or life cycle)[18][19][20]. The UX methods support the anticipated output, whereas the superordinate structure delivers it. Thus, both are required.

D. Conclusion

Integrating UX into Agile software development aims to create user-centered, high-quality products, but studies show that it's challenging due to the complexities of merging these two approaches. Issues like overly detailed user

stories can create tension between Agile developers and UX professionals, making teamwork harder. Although approaches like combining Lean UX and Scrum help, they need to be flexible to fit different settings, whether in commercial or academic projects.

One common approach, "Upfront UCD Design," mainly focuses on planning UX work before development. However, it doesn't fully integrate UX into Agile, as it coordinates rather than blends the two teams' work. Successful integration requires ongoing communication and teamwork, rather than just occasional collaboration. Lean UX with Scrum is one alternative that brings UX activities—like prototyping and user testing—into each sprint, allowing real-time feedback and adjustments, which makes the process more responsive and user-centered.

Overall, single UX methods alone don't suffice for full integration within Agile; a more comprehensive framework is needed. Such a framework should embed UX work into Agile processes, fostering real collaboration and enabling both teams to achieve shared goals. Studies suggest that this level of integration will likely require creating new frameworks or processes that support both UX and Agile, promoting a smoother and more effective collaboration. Further research could also examine the effectiveness of multi-technique frameworks that support a variety of UX methods within Agile projects, identifying best practices for different types of projects or industries.

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