Requirements for User Experience Management - A Tertiary Study

Andreas Hinderks[1], Francisco José Domínguez Mayo[1], María José Escalona[1], Jörg Thomaschewski[2] *

[1] University of Seville (Spain)
[2] University of Applied Science Emden/Leer (Germany)

* Corresponding author. andreas@hinderks.org (A. Hinderks), fjdominguez@us.es (F. J. Domínguez Mayo), mjescalona@us.es (M. J. Escalona), joerg.thomaschewski@hs-emden-leer.de (J. Thomaschewski).

Received 25 March 2021 | Accepted 12 April 2023 | Early Access 30 January 2024

Abstract

Today's users expect to be able to interact with the products they own without much effort and also want to be excited about them. The development of a positive user experience must therefore be managed. We understand management in general as a combination of a goal, a strategy, and resources. When applied to UX, user experience management consists of a UX goal, a UX strategy, and UX resources. We conducted a tertiary study and examined the current state of existing literature regarding possible requirements. We want to figure out, what requirements can be derived from the literature reviews with the focus on UX and agile development. In total, we were able to identify and analyse 16 studies. After analysing the studies in detail, we identified different requirements for UX management. In summary, we identified 13 requirements. The most frequently mentioned requirements were prototypes and UX/usability evaluation. Communication between UX professionals and developers was identified as a major improvement in the software development process. In summary, we were able to identify requirements for UX management of People/Social, Technology/Artifacts, and Process/Practice. However, we could not identify requirements for UX management that enabled the development and achievement of a UX goal.

Keywords

Agile Methods, Tertiary Study, User Experience, UX Management.

DOI: 10.9781/ijimai.2024.01.004

I. Introduction

A successful product is characterized by its ability to generate a high level of satisfaction among users. Today's user expects to be able to interact with a product without much effort. The user also wants to be excited about interacting with the product. These hedonic interaction qualities must be taken into account in product development. They are usually characterized by the fact that they are not directly goal-directed [1]. In summary, the user wants to have a positive user experience while interacting with the product or service.

ISO 9241-210 [2] defines the term user experience among other terms. It is defined as 'a person's perceptions and responses that result from the use or anticipated use of a product, system or service'. The user experience is thus considered as a holistic concept. Any kind of emotional, cognitive or physical response, be it concrete or even suspected, is considered. The definition of user experience covers the period of time before, during and after the interaction with the product.

Agile methods have been established since the publication of the first version of the Scrum Guide [3]. Software development companies use agile methods (e.g. Scrum [4], Kanban [5], or Extreme Programming (XP) [6]) to develop products or services more efficiently [7]. The iterative approach makes it possible to react to new requirements or changes [8]. This distinguishes agile methods significantly from classic process models such as waterfall. By performing retrospectives [4] at the end of an iteration, both product quality and agile process quality can be improved.

To develop the best possible product with great user experience, it is essential to have the right management in place in terms of UX. To the best of our knowledge, there is no approved definition of UX management in literature. There is also no common understanding of what UX management is or how to apply it.

In this paper, we conducted a tertiary study to discover what requirements for UX management could be derived based on the literature. The research question for the tertiary study is:

RQ: What requirements can be derived from literature reviews for User Experience Management with the focus on agile development?

This paper is structured as follows: Section II briefly summarizes the related work and presents gap analysis. Section III presents the review method including search strategy, selection process, and data extraction. Section IV outlines the results and key findings of our study

Please cite this article as:
A. Hinderks, F. J. Domínguez Mayo, M. J. Escalona, J. Thomaschewski, "Requirements for User Experience Management - A Tertiary Study", International Journal of Interactive Multimedia and Artificial Intelligence, vol. 8, no. 6, pp. 160-167, 2024, http://dx.doi.org/10.9781/ijimai.2024.01.004

as well as the answers to our research question. Section V discusses the meaning of the findings and the limitations of our study. The paper ends with Section VI, with conclusions and ideas for future work.

II. Related Work

In the beginning, we did informal research on UX management or related terms. We conducted the informal research with Science Direct, Springer Link, IEEEXplore, Scopus, and ACM with the keyword 'user experience management' and variations of it. In the end, we found some relevant papers. In these papers, there are various approaches or descriptions of UX management. The term UX management is often used without any explanation. We present these papers in the next paragraph.

A. UX Management

The term UX management is used differently in literature. The main task of a UX manager, according to Szóstek [9], is the development of the UX team. Szóstek [9] describes the development of the team with the selection of the best career path for individual team members. This includes career planning and development, team management, and training of individual team members. UX management in this case is related to team building and empowerment.

In addition to building a UX team, Anderson et al. [10] proposed that C-level executives should be involved in it. C-level executives should understand that UX management is necessary to develop products with a high user experience. With the cooperation of C-level executives, UX teams can work successfully. For the implementation of UX management, Anderson et al. [10] and Rosenberg [11], for example, offer various patterns that provide support at the levels of planning, decision, tactics, and conflict.

B. UX Maturity Models

The use of UX Maturity Models is one way to at least measure the current state of implementation of UX activities within an organization. The advantage of using such a model is that it determines the current maturity level of the organization. Thus, its weaknesses can be identified. The result can be used to work specifically on improving UX Maturity. There are different UX Maturity Models that measure various aspects.

The *Total User Experience Management* (*TUXM*) [12] model contains elements such as UX objectives, integrated design system, strategic communication, continual improvement, fact-based decision-making, and a T-type design team. The N*ielsen Corporate Usability Maturity Model* [13], on the other hand, comprises dimensions such as the developers' attitude towards usability, the management's attitude towards usability, the usability practitioner's role, usability methods and techniques, and strategic usability. Another approach is the metric *Index of Integration* (*IoI*) [14]. This metric can be used to determine the maturity level of typical HCI activities in the development team.

It is noticeable that the approaches presented capture different dimensions of UX management. For example, the TUXM model measures the dimension 'UX objectives', which is not present in *Nielsen Corporate Usability Maturity Model*. The metric *Index of Integration* (*IoI*) in turn only includes HCI activities. Conversely, the Nielsen model is more focused on practical implementation. The testing of a suitable UX maturity model should be carried out before deployment and tailored to the needs of the organization [13].

C. UX Methods in Agile Development

In the literature, various UX methods are used in agile development. In the study of Hinderks et al. [15], 16 UX methods used in agile development were identified. The two most frequently used methods are *Prototyping* and *Personas*. Prototyping and personas can be used as artifacts for the communication between UI designers and developers. The UI designers either develop a prototype together with the developers, or work on it before the actual development. Personas, on the other hand, are usually used permanently. Various methods are used to determine the requirements— these are ta*sk/usage scenarios, focus groups, contextual inquiry, user evaluation, interviews, A/B testing, card sorting, brainstorming,* and *FlexREQ*. The following methods are used to measure and evaluate the user experience: acceptance test, expert reviews, UX questionnaires, usability testing, and usability inspection. It was impossible to determine at what stage (before, during, or after development) the UX methods were used.

D. GAP Analysis

We generally understand management based on the explanations of Drucker [16] and Stone [17]—it is a combination of a goal, a strategy, and resources.

When applied to UX, user experience management consists of a UX goal, a UX strategy, and UX resources (Fig. 1) based on the work of McKeown [18].

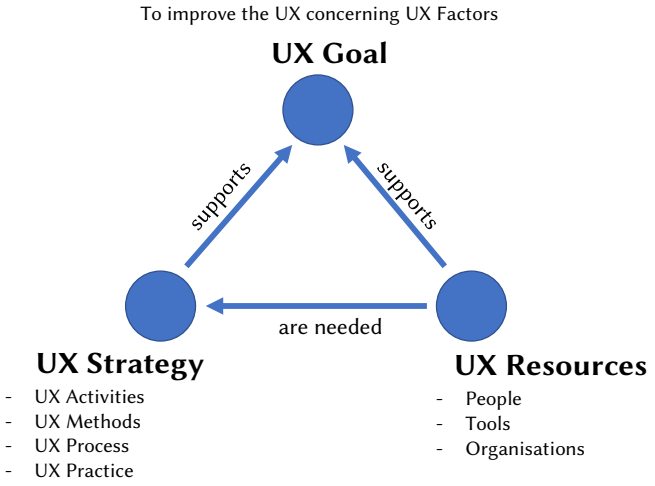

Fig. 1. User Experience Management based on McKeown [18].

For example, a UX goal can be set upfront based on user research to improve the UX for a selected factor of the UX. This can be, for example, the UX factor 'Trust'. To improve the UX factor 'Trust', a UX strategy can be developed by using various UX methods, which is then implemented by a UX team (UX resources). A subsequent evaluation with the User Experience Questionnaire Plus (UEQ+) [19] or the SUPR-Q [20] can be performed. In addition, a benchmark [21] or KPI [22] 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 [23]. The result can be used to determine whether the previously defined UX goal has been achieved or not.

Both UX strategy and UX resources are necessary to achieve the UX goal. It should be known before the next development iteration, whose requirements positively supported the UX goal. In this way the UX goal can be achieved in a goal-oriented manner.

In our view, it makes absolute sense to empower and develop a UX team. This is a necessary prerequisite to be able to successfully implement UX management at all. In our opinion, however, a UX goal and a UX strategy are also needed to be able to operate UX management successfully.

For this reason, we conducted a tertiary study to identify requirements from the analysed literature reviews that had their focus on user experience and agile development.

III. Research Methodology

In order to answer our research question, the first step is to conduct a literature review. We conducted the study according to the guidelines for SLR in software engineering by Kitchenham and Charters [24].

We used two main tools to conduct the study. We used the SLR tool [25] for conducting the search (managing the paper, developing the review protocol, documenting the search, and conducting quality assessment). In our literature database managed with Citavi, we imported the result of the SLR from the SLR tool to use the management and citation functions.

A. Objectives and Research Question

However, during the research on the related work (Section II), we also found that the term 'UX management' is neither sufficiently defined nor explained in the literature. Further, we found through GAP analysis (Section II.D) that there was a research gap in the goal, strategy, and resources concerning UX management.

In this context, we would like to answer the following research question:

RQ: What requirements can be derived from literature reviews for User Experience Management with the focus on agile development?

This question aims to identify requirements from the literature that can potentially be adopted for UX management in agile development. Our goal is then to create a consolidated list of requirements for UX management. This can then be used in practical implementation. Also, UX activities or UX processes can be derived based on this list of requirements.

B. Search Strategy and Data Sources

Based on the research question we have developed a search strategy. This strategy consists of a search string, the search space, and the process to select relevant papers.

Our search string consists of three groups, each covering one area. These are 'agile', 'user experience', and 'literature reviews'. Both 'agile' and 'user experience' are necessary search terms to narrow down the set of topics. We further decided to conduct a tertiary study. Accordingly, we extended the search string to 'literature reviews', since we wanted to base our study on literature reviews that had already been conducted.

In a second step, we collected possible keywords for each group of the search string and extended them with alternative spellings and synonyms. The search string developed in this way is as follows:

(agile OR kanban OR scrum OR lean OR "extreme programming" OR "design thinking")

AND

("user experience" OR ux OR usability OR hcd OR hci OR hmi OR ucd)

AND

("SLR" OR "Structured literature reviews" OR "mapping study" OR "systematic review")

This search string was logically adapted to the syntax of the search spaces. The search space included digital libraries, journals, and conference proceedings. A complete list of the search space is shown in Table I.

TABLE I. Search Space With Specification of Search Strategy (TAK = Title, Abstract, and Keywords) and Number of Papers

Library	Search Strategy	Number
SpringerLink	Full Text	974
IEEE Xplore	Full Text	8
SCOPUS	TAK	41
Science Direct	TAK	1
ACM	TAK	1

The search was conducted at all search spaces in February 2021. Without any restriction, that is plain full-text search of the search engine, $N_{P0} = 4{,}363$ papers were found.

C. Study Selection

The results from the individual search spaces were imported into the SLR tool. Duplicate entries were already removed during the import. As a result, 1,023 papers were imported and then analysed in further steps as described in the next paragraphs. The result is shown in Table II.

TABLE II. Search Process Comprising Phases

ID	Method	Base	Reduced	Res.
N_{P1}	Extended search	1,023	-977	46
N_{P2}	After scan title	46	-22	24
N_{P3}	After scan abstract	24	-2	22
N_{P4}	Apply quality criteria	22	-5	16
N_{P5}	**Final dataset**	**16**		

By using the internal search function of the SLR Tool [25], we were able to reduce the result by searching only on title, abstract, and keywords from $N_{P1} = 1{,}023$ to $N_{P2} = 46$. This was necessary because the search space 'IEEE Xplore' and 'SpringerLink' were explored initially through a full text-search.

In a further step, we reduced the number of papers from $N_{P2} = 46$ to $N_{P3} = 24$ going by the title. We only included those papers that were interesting and valuable for our study in terms of title. One should be able to readily recognize from its title that the paper is mainly about 'agile' and 'user experience'. Additionally, it should be a literature review. In the following step, we reduced the number of papers to $N_{P4} = 22$ going by the abstract. We applied the same criteria we used one step ago. All the decisions were traceably logged by the SLR tool.

The papers selected in the step before ($N_{P4} = 22$) were evaluated with a quality assessment. In the assessment, the papers were checked to see whether the literature review was carried out in a traceable manner. Also, we checked whether the literature review was performed according to a standard published in the literature. The papers were then reduced to $N_{P5} = 16$.

In each step of the reduction, a set of selection criteria were applied. They were then divided into inclusion and exclusion criteria. The inclusion criteria were: papers written in English; peer-reviewed papers; and papers presenting literature review to integrate user experience methods (or similar) into agile development processes. Exclusion criteria were: papers whose full text were not available; papers with results that had already been published; and papers that were not focused on agile development.

IV. Results

In our work, we have selected 16 relevant studies. The first part of this section gives an overview of the selected studies. In the second part, the individual research questions will be answered based on the studies.

TABLE III. Overview of the Included SLRs in Our Tertiary Study

ID	Author	Title	
[26]	Bruun	Training software developers in usability engineering	2010
[27]	Silva et al.	User-Centered Design and Agile Methods: A Systematic Review	2011
[28]	Salvador et al.	A systematic review of usability techniques in agile methodologies	2014
[29]	Jurca et al.	Integrating Agile and User-Centered Design: A Systematic Mapping and Review of Evaluation and Validation Studies of Agile-UX	2014
[30]	Salah et al.	A systematic literature review for agile development processes and user centred design integration	2014
[31]	Silva et al.	A Systematic Mapping on Agile UCD Across the Major Agile and HCI Conferences	2015
[32]	Brhel et al.	Exploring principles of user-centered agile software development: A literature review	2015
[33]	Magues et al.	Usability in agile development: A systematic mapping study	2016
[34]	Magues et al.	HCI usability techniques in agile development	2016
[35]	Caballero et al.	How Agile Developers Integrate User-Centered Design Into Their Processes: A Literature Review	2016
[36]	Garcia et al.	Artifacts for Agile User-Centered Design: A Systematic Mapping	2017
[37]	Hoda et al.	Systematic literature reviews in agile software development: A tertiary study	2017
[38]	Schön et al.	Agile Requirements Engineering: A systematic literature review	2017
[39]	Pereira et al.	Design Thinking Integrated in Agile Software Development: A Systematic Literature Review	2018
[40]	Silva et al.	The evolution of agile UXD	2018
[41]	Curcio et al.	Usability in agile software development: A tertiary study	2019

A. Overview of the Studies

Our search was limited to 'Agile', 'UX', and 'SLR'. An explicit restriction to UX mangement or similar was not made. Our experience in an initial literature search was that restricting by 'UX management' did not yield useful results. For this reason, we found publications dealing with the integration of 'Agile' and 'UX'. The search result then served us as a basis for deriving requirements for UX management.

In Table III we listed all included SLRs under the terms of author, title, and year.

In a further step, we investigated the research questions of SLRs. We wanted to figure out which of the research questions UX strategy, UX ressources, or UX goal was addressed. The classification was made based only on the purposes of the research questions. A total of 47 research questions from the 16 SLRs were examined. Twenty-nine research questions were assigned to the category UX strategy, 7 to UX resources, and 0 to UX goal. The remaining 11 research questions could not be assigned to any of the categories.

B. RQ: What Requirements Can Be Derived From Literature Reviews With the Focus on User Experience and Agile Development?

To answer our research questions, we examined each SLR in terms of the core statement and a corresponding categorization. We presented the result in Table IV. In doing so, we extracted the core statement as a citation from the SLR if it was possible. When this was not possible, we created our own summary.

We categorized the statements concerning the type of investigation. This classification will help us later to derive the requirements from the statements. We distinguish as follows:

- **Finding**: For us, a finding is an insight into agile development in terms of user experience. The insight or statement can be positive or negative. It can also be a recommendation based on the results found.
- **Problem**: Compared to a finding, the naming of a problem is more concrete and specific. This means that a problem is a substantial challenge.
- **Method**: The category method includes methods recommended or used in the area of agile development and user experience.

In the next sections, we present the findings, problems, and methods identified.

1. Findings

Hoda et al. [37] state that the integration of user experience and agile software development has not made significant progress between the years 1990 and 2015. According to the authors, there is still the challenge to combine research rigor with industrial relevance.

The lack of continuous involvement of stakeholders [32], especially in requirements elicitation and analysis [33] has been identified as a problem space. Failure to involve stakeholders in the early stages of requirements elicitation results in such a failure to create a shared understanding of the product and its goal [38]. As a result, the user perspective in agile software development (ASD) is not well established [38].

In addition to continuous involvement of stakeholders, Brhel et al. [32] derived four additional principles: separate product discovery and product creation, iterative and incremental design and development, parallel interwoven creation tracks, and artefact-mediated communication.

Silva da Silva et al. [31] answered the research questions on how Agile UCD was understood and which techniques were used in Agile UCD. In addition, the authors identified the benefits that could be gained from integrating agile software development and user experience. The benefits were as follows: improved communication, improved visibility, customer input during the release, business analysis improvement, priorization of the backlog, and improved usability.

TABLE IV. Overview Statements From the SLRs

Year	Author	Statement	Category
2010	Bruun [26]	"Fifth, as discussed previously, user based evaluation methods seem to provide the best wake-up call for software companies…"	Method
2011	Silva et al. [27]	"A very important point is to maintain the Big Picture, which is difficult given the characteristic of iterative development in agile projects."	Problem
		"The focus of integrating agile methods and UCD should be on design as well as on usability evaluation."	Method
2014	Salvador et al. [28]	"The most commonly used usability methods are: fast prototyping, individual inquiry, formal tests, and heuristic evaluations."	Method
2014	Jurca et al. [29]	"One issue that was common between most validation and evaluation studies, was the power struggle between UX designers and developers."	Problem
		"Furthermore, there are often not enough UX designers involved in the Agile projects."	Problem
2014	Salah et al. [30]	The identified key aspects are: lack of allocated time for upfront activities, difficulty of modularization, optimizing the work between developers and UCD practitioners, performing usability testing, and lack of documentation.	Problem
2015	Brhel et al. [32]	"The analysis resulted in a comprehensive coding system and five principles for UCASD: (1) separate product discovery and product creation, (2) iterative and incremental design and development, (3) parallel interwoven creation tracks, (4) continuous stakeholder involvement, and (5) artifact-mediated communication."	Finding
2015	Silva et al. [31]	The most commonly used HCI techniques are Usability testing on lightweight prototypes, Continuous Research, Evolutionary Prototyping, Upfront Design, Personas.	Method
		The benefits in integrating agile and UX are improved communication, improve visibility, customer input during the release, business analysis improvement, priorization of the backlog, and improved usability.	Finding
2016	Magues et al. [33]	"In conclusion, the authors concluded that there are no formalised suggestions for integrating usability techniques into agile software development."	Problem
2016	Magues et al. [34]	"Most of the human-computer interaction (HCI) techniques that the ASDP is adopting are techniques related to requirements engineering, especially techniques for requirements elicitation and analysis."	Finding
2016	Caballero [35]	The three main UCD methods, which represent 70% of the methods used, are Prototypes, User Stories, and Usability Testing.	Method
2017	Schön et al. [38]	"Based on a qualitative analysis of the included studies, we can conclude that building a shared understanding of the user perspective is not very well established in ASD."	Finding
		"We identified the following key artifacts for the documentation of requirements that are used in Agile RE: User stories, prototypes, use cases, scenarios and story cards."	Method
2017	Hoda [37]	"We did not find much evidence to support a significant progress toward resolving the 'grand challenge' of ASD: combining research rigor with industrial relevance, as a topic."	Finding
		The four most commonly used artifact used to faciliate communication are prototype, user story, cards, and persona.	Method
2018	Silva et al. [40]	"Finally, the authors concludes that Technology and Artifacts are still missing to achieve integration between Agile Methods and User Experience Design to Agile UXD."	Problem
2019	Curcio et al. [41]	"Regarding to the challenges for the integration seven main categories were also identified: issues related to tests, time, work balance, modularization, feedback, prioritization, and documentation."	Problem

2. Problems

One problem Silva da Silva addresses relates to the development and sustenance of a Big Picture [27]. This is openly a problem of iterative development. Because of the fact that requirements can change from iteration to iteration, the Big Picture can also change.

Another problem is the available capacity of UX professionals. Jurca et al. [29] found that there was often not enough capacity of UX professionals for individual projects. Another finding the authors noted was that the relationship between UX designers and developers tended to be poor, which negatively impacted the outcome of the collaboration. This conclusion was also reached by Salah et al. [30]. Optimizing the work between UX professionals and developers is a key aspect here [30]. In general, it seems that there is too little capacity for UX activities [30], [41].

According to Magües et al. [33], the integration of usability techniques into agile development is not formalized or institutionalized. This means that there are no formalized proposals for the integration of usability techniques or methods into agile development. As a result, the use of usability techniques may not deliver the desired result and, thus, the actual potential is lost.

3. Methods

Various artifacts have been established for communication and documentation. These are, for example, user stories, prototypes, use cases, story cards, and personas [31], [35], [36], [38]. The use of the artifacts not only facilitates communication between stakeholders and the development team [38], but also, as in the case of the prototype, provides the basis for an evaluation of the result [27].

It is important to note that UX or usability evaluation is one of the most frequently mentioned methods in SLRs [26]–[28], [31], [35]. Specifically, the evaluation of a prototype in the early stages of development is indicated as the most commonly used method. The goal is to gain new knowledge as early as possible, which can then be incorporated back into the development. The evaluation itself is carried out in a variety of ways which are not mentioned here.

Other UX or usability methods that can be named are individual inquiry, formal tests, heuristic evaluations [28], continuous research, upfront design, and personas [31].

4. Summary of Requirements

From the results, requirements for UX management can be

People/Social
- Improve and optimize collaboration between UX professionals and developers [25], [26], [27], [37].
- Create sufficient capacity of UX designers [25].
- Continuous stakeholder involvement [27], [28], [30], [34].

Technology/Artifact
- Apply evaluation methods such as usability evaluation, formal test, heuristics evaluation [22], [24], [26], [27], [31].
- Create and evaluate prototypes [24], [27], [31], [32].
- Use of artifacts such as user stories, cards, and personas to communicate artefact-mediated [28], [31], [32], [34].
- Create documentation [26], [34].

Process/Practice
- Create a Big Picture of the product [27].
- Formalised suggestions for integrating usability techniques into agile software development [29].
- Separate product discovergy and product creation [27], [28].
- Parallel interwoven creation tracks [28].
- Iterative and increment research, design, and development [27], [28].
- Allocated time for upfront activities [26].

Fig. 2. Overview of Requirements Categorised by People/Social, Technology/Artifacts, and Process/Practice.

formulated in summary. This means what should be implemented and how, or which method should be used. The following list in Fig. 2 is based on the summaries in Table IV.

We have classified the requirments according to Brhel et al. [32]. The three categories are People/Social, Technology/Artifact, and Process/Practice. To us, the division seems reasonable because the requisitions address different areas in the implementation.

As can be seen from the distribution of individual requirements, some requirements have been addressed in multiple SLRs, such as prototypes or evaluation methods. In the next section, we discuss the results in greater detail.

V. Discussion

Notwithstanding, it is clear from the requirements that prototypes and UX evaluation are established methods. The use of prototypes, in whatever form, was indicated as most commonly used methods in five of sixteen SLRs. UX evaluation methods were indicated in six out of sixteen SLRs. These two methods should definitely be part of UX management.

In this context, the question also arises as to when different UX methods should or can be used. In Hinderks [15], 18 approaches were analysed with regard to their temporal applicability in development. The aim was to examine the phase of development for each approach, in which the approach was to be, or was, used. The breakdown was structured according to whether the approach had been applied before, during, or after development. If an approach could be used in several phases of development, it was also assigned to those phases. In total, 21 (88%) approaches can be used before development while 15 (63%) approaches can be used during development, and 13 (54%) after development.

A. People/Social

It is not clear from the requirements whether there is one team responsible for product development and UX management, or whether there is an additional UX team that handles UX activities. In the first case, the UX professionals would be members of the team and would perform the UX activities during an iteration. In the second case, there is a UX team that handles the UX activities for multiple product teams. Based on the problems described [29], [30], obviously, there are still knowledge deficits as to how UX professionals and developers can work together smoothly or without problems. Furthermore, it cannot be determined whether the described problems arise due to the fact that the UX professionals are part of the product team or work for the product team. From the findings (Fig. 2), it can be concluded that UX management should improve and optimize the collaboration between UX professionals and developers. In addition, capacity for UX designers should be created. The requirement also matches the results from Hinderks [42]. UX Poker is a method to estimate the UX expected for a requirement per UX factor. The method has been conducted with UX professionals and developers. It has been shown that a common understanding about the UX of the product to be developed could be gained.

Stakeholders should also be integrated into the processes as a further requirement. This is also the requirement of Human-Centred Design (HCD) [2], for example. Human-Centred Design (HCD) is an approach to develop user-centred products by putting the user at the centre of the development process. The idea behind HCD is to develop a great understanding of the user and their requirements. The focus is placed on the user through the iterative process and continuous testing of alternative solutions. HCD itself does not describe the collaboration between UX professionals and developers. In this respect, HCD can only be a partial solution and can only be used in combination with other methods or processes.

B. Technology/Artefact

UX evaluation can be named as one of the most frequently mentioned requirements for UX management. Different methods can be used for evaluation. In addition to the developed product, prototypes should also be evaluated. Regarding UX management, we are convinced that the evaluation of prototypes as well as the developed product should play a decisive role in it. Only when evaluating, can it be determined whether the UX goal has been reached at all. It always makes sense to do a UX evaluation, but with a goal it is more focused. And with a UX goal, UX management can be performed. Another requirement is the use of different artefacts, such as user stories, cards, and personas. The use of artefacts supports communication between stakeholders, UX professionals, and developers.

C. Process/Practice

In the category Process/Practice, there are partly very specific approaches, such as *create a big picture of the product or allocated time for upfront activities*. On the other hand, general approaches are also mentioned under it, such as *parallel interwoven creation tracks, allocated time for upfront activities*, or *formalized suggestions for integrating usability techniques into agile software development*. In the sense of a process, *separate product discovery and product creation and iterative and increment research, design, and development* can be classified. How and when the corresponding processes or practices are to be used is not clear from the literature. It is also not clear how they can be used in relation to UX management.

An important conclusion from Section IV is that UX evaluation is an important method to apply. In this regard, the question is who performs the UX evaluations and when. From the results, it can be determined that UX evaluations are performed both before, during and after development. However, it is not suggested who should perform these evaluations. Classically, it is the responsibility of UX Researchers who are either integrated into the team or work for it. Also, ResearchOps [43], [44] can facilitate the required foundation for a UX Research by offering roles, tools and processes.

D. UX Goal

No UX goal can be directly derived from the results found. The analysis of the research questions of the SLR also reveals that none of these can be assigned to a UX goal. Twenty-nine research questions have been mapped to UX strategy, which is largely reflected in the requirements 4. This is remarkable because a UX strategy and UX resources are supposed to support the achievement of a UX goal. However, if no UX goal has been named, the success of the UX strategy cannot really be measured. While every UX strategy also has an impact, in our opinion this should be managed from goals.

E. UX Management

From the results presented in Section IV and requirements listed in Fig. 2, the requirements for UX management can be summarized into two key requisites:

- Enable and support collaboration between stakeholders, UX professionals, and developers.
- Evaluate the user experience in the context of a UX goal.

All other UX methods or approaches found can be assigned to one of the key requirements. The specific UX methods used are interchangeable or replaceable with other methods. For example, requirements can be collected as a user story. A user story can be used to capture a requirement briefly and comprehensibly. In addition, the artefact user story is very well suited for collaboration between stakeholders and UX professionals. Another example, questionnaires can be used for the evaluation of UX. But other evaluation methods can also be used. All that matters is that the UX is evaluated and the result can be compared to a UX goal. It should be decided in the specific project or team which methods are to be used.

F. Limitations

We have collected the requirements for UX management based on a literature review. Further studies on UX professionals, developers, and managers should validate or complement the list of requirements for UX management created in this study.

VI. Conclusion and Future Work

This paper presents a tertiary study of UX management to identify potential requirements for user experience management. The tertiary study was conducted according to the guideline offered by Kitchenham and Charters [24]. In an initial search, we found 4,363 studies. Our search process reduced the number of studies to 1,023. We analysed these studies by their titles and abstracts and performed a quality assessment. Finally, we selected and further analysed 16 studies.

The requirements we identified all related to UX methods or improvements in the software development process. The two most frequently mentioned UX methods were prototyping and UX or usability evaluation. Communication between UX professionals and developers was identified as a major improvement in the software development process.

We also analysed the research questions of the SLRs with regard to a possible assignment to UX goal, UX strategy, and UX resourcces. We wanted to determine to what extent all three areas were covered. For UX strategy and UX resourcces, we were able to identify corresponding research questions. For UX goal, we could not find any research questions or requirements.

In summary, we were able to identify requirements for UX management. However, we could not identify requirements for UX management that enabled the development and achievement of a UX goal.

References

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

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

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

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

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

[6] K. Beck, C. Andres, *Extreme programming explained: Embrace change*. The XP series, Boston: Addison- Wesley, 2. ed., 6. printing ed., 2007.

[7] 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.

[8] 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.

[9] A. Szóstek, "A look into some practices behind microsoft ux management,"in *Proceedings of the 2012 ACM annual conference extended abstracts on Human Factors in Computing Systems Extended Abstracts - CHI EA '12*, New York, New York, USA, 2012, p. 605, ACM Press.

[10] R. I. Anderson, J. Ashley, T. Herrmann, J. Miller, J. Nieters, S. S. Eves, S. T. Watson, "Moving ux into a position of corporate influence," in *CHI '07 extended abstracts on Human factors in computing systems - CHI '07*, New York, New York, USA, 2007, p. 1905, ACM Press.

[11] D. Rosenberg, "The business of ux management," *interactions*, vol. 26, no. 3, pp. 28–35, 2019, doi: 10.1145/3318131.

[12] H. B.-L. Duh, J.-J. Lee, P. L. P. Rau, M. Q. Chen, "The management model development of user experience design in organization," in *Cross-Cultural Design*, vol. 9741 of *Lecture Notes in Computer Science*, P.-L. P. Rau Ed., Cham: Springer International Publishing, 2016, pp. 163–172, doi: 10.1007/978-3-319-40093-8_17.

[13] D. Salah, R. Paige, P. Cairns, "Integrating agile development processes and user centred design- a place for usability maturity models?," in *Human-Centered Software Engineering*, vol. 8742 of *Lecture Notes in Computer Science*, S. Sauer, C. Bogdan, P. Forbrig, R. Bernhaupt, M. Winckler Eds., Berlin, Heidelberg: Springer Berlin Heidelberg, 2014, pp. 108–125, doi: 10.1007/978-3-662-44811-3_7.

[14] 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.

[15] A. Hinderks, F. J. Domínguez Mayo, J. Thomaschewski, M. J. Escalona, "Approaches to manage the user experience process in agile software development: A systematic literature review," *Information and Software Technology*, vol. 150, p. 106957, 2022, doi: 10.1016/j.infsof.2022.106957.

[16] P. F. Drucker, *The practice of management*. New York, NY: HarperCollins, 2009.

[17] J. Magretta, N. D. Stone, *What management is: How it works and why it's everyone's business*. London: Profile Books, 2013.

[18] M. Mckeown, *The strategy book: How to think and act strategically to deliver outstanding results*. Harlow, England: Pearson, 3rd edition ed., 2020.

[19] 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, 2019, doi: 10.9781/ijimai.2019.06.006.

[20] 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.

[21] 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.

[22] 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.

[23] 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. 2020, no. 6, pp. 78–85, 2020, doi: 10.9781/ijimai.2020.12.005.

[24] B. Kitchenham, S. Charters, "Guidelines for performing systematic literature reviews in software engineering," 2007.

[25] A. Hinderks, M. Schrepp, F. J. Domínguez Mayo, M. J. Escalona, J. Thomaschewski, "Ueq kpi value range based on the ueq benchmark." doi: 10.13140/RG.2.2.34239.76967.

[26] A. Bruun, "Training software developers in usability engineering," in *Proceedings of the 6th Nordic Conference on Human-Computer Interaction Extending Boundaries - NordiCHI '10*, New York, New York, USA, 2010, p. 82, ACM Press.

[27] T. Silva da Silva, A. Martin, F. Maurer, M. Silveira, "User-centered design and agile methods: A systematic review," in *2011 AGILE Conference*, 2011, pp. 77–86, IEEE.

[28] C. Salvador, A. Nakasone, J. A. Pow-Sang, "A systematic review of usability techniques in agile methodologies," in *Proceedings of the 7th Euro American Conference on Telematics and Information Systems - EATIS '14*, New York, New York, USA, 2014, pp. 1–6, ACM Press.

[29] G. Jurca, T. D. Hellmann, F. Maurer, "Integrating agile and user-centered design: A systematic mapping and review of evaluation and validation studies of agile- ux," in *2014 Agile Conference*, 2014, pp. 24–32, IEEE.

[30] D. Salah, R. F. Paige, P. Cairns, "A systematic literature review for agile development processes and user centred design integration," in *Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering - EASE '14*, New York, New York, USA, 2014, pp. 1–10, ACM Press.

[31] T. Silva da Silva, F. F. Silveira, M. S. Silveira, T. Hellmann, F. Maurer, "A systematic mapping on agile ucd across the major agile and hci conferences," in *Computational Science and Its Applications – ICCSA 2015*, vol. 9159 of *Lecture Notes in Computer Science*, O. Gervasi, B. Murgante, S. Misra, M. L. Gavrilova, A. M. A. C. Rocha, C. Torre, D. Taniar, B. O. Apduhan Eds., Cham: Springer International Publishing, 2015, pp. 86–100, doi: 10.1007/978-3-319-21413-9_7.

[32] 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.

[33] D. A. Magües, J. W. Castro, S. T. Acuña, "Usability in agile development: A systematic mapping study," in *2016 XLII Latin American Computing Conference (CLEI)*, 2016, pp. 1–8, IEEE.

[34] D. A. Magues, J. W. Castro, S. T. Acuna, "Hci usability techniques in agile development," in *2016 IEEE International Conference on Automatica (ICA-ACCA)*, 2016, pp. 1–7, IEEE.

[35] L. Caballero, A. M. Moreno, A. Seffah, "How agile developers integrate user-centered design into their processes: A literature review," *International Journal of Software Engineering and Knowledge Engineering*, vol. 26, no. 08, pp. 1175–1201, 2016, doi: 10.1142/S0218194016500418.

[36] 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.

[37] R. Hoda, N. Salleh, J. Grundy, H. M. Tee, "Systematic literature reviews in agile software development: A tertiary study," *Information and Software Technology*, vol. 85, pp. 60–70, 2017, doi: 10.1016/j.infsof.2017.01.007.

[38] E.-M. Schön, J. Thomaschewski, M. J. Escalona, "Agile requirements engineering: A systematic literature review," *Computer Standards & Interfaces*, vol. 49, pp. 79– 91, 2017, doi: 10.1016/j.csi.2016.08.011.

[39] J. C. Pereira, R. d. F. Russo, "Design thinking integrated in agile software development: A systematic literature review," *Procedia Computer Science*, vol. 138, pp. 775– 782, 2018, doi: 10.1016/j.procs.2018.10.101.

[40] T. S. Da Silva, M. S. Silveira, F. Maurer, F. F. Silveira, "The evolution of agile uxd," *Information and Software Technology*, vol. 102, pp. 1–5, 2018, doi: 10.1016/j.infsof.2018.04.008.

[41] K. Curcio, R. Santana, S. Reinehr, A. Malucelli, "Usability in agile software development: A tertiary study," *Computer Standards & Interfaces*, vol. 64, pp. 61– 77, 2019, doi: 10.1016/j.csi.2018.12.003.

[42] A. Hinderks, D. Winter, F. J. Domínguez Mayo, M. J. Escalona, J. Thomaschewski, " Ux poker: Estimating the influence of user stories on user experience in early stage of agile development," *International Journal of Interactive Multimedia and Artificial Intelligence*, vol. 7, no. 7, pp. 97-104, 2022, doi: 10.9781/ijimai.2022.11.007.

[43] M. de Bayser, L. G. Azevedo, R. Cerqueira, "Researchops: The case for devops in scientific applications," in *2015 IFIP/IEEE International Symposium on Integrated Network Management (IM)*, 2015, pp. 1398–1404, IEEE.

[44] E. Savarit, "Fitting user research into your organization," in *Practical User Research*, E. Savarit Ed., Berkeley, CA: Apress, 2020, pp. 47–79, doi: 10.1007/978-1-4842-5596-4_3.

Andreas Hinderks

Andreas Hinderks holds a PhD in Computer Science by University of Sevilla. He has worked in various management roles as a Business Analyst and a programmer from 2001 to 2016. His focus lay on developing user-friendly business software. Currently, he is a freelancing Product Owner, Business Analyst and Senior UX Architect. He is involved in research activities dealing with UX questionnaires, measuring user experience and User Experience Management since 2011.

Francisco José Domínguez Mayo

Francisco José Domínguez Mayo received a PhD degree in computer science from the University of Seville, Seville, Spain, in July 2013. He is currently an associate professor with the Department of Computing Languages and Systems, University of Seville. He collaborates with public and private companies in software development quality and quality assurance. The focus of his interesting research is on the areas of continuous quality improvement and quality assurance on software products, and software development processes.

María José Escalona

María José Escalona received her PhD in Computer Science from the University of Seville, Spain in 2004. Currently, she is a Full Professor in the Department of Computer Languages and Systems at the University of Seville. She manages the web engineering and early testing research group. Her current research interests include the areas of requirement engineering, web system development, model-driven engineering, early testing and quality assurance. She also collaborates with public companies like the Andalusian Regional Ministry of Culture and Andalusian Health Service in quality assurance issues.

Jörg Thomaschewski

Jörg Thomaschewski received a PhD in physics from the University of Bremen (Germany) in 1996. He became a Full Professor at the University of Applied Sciences Emden/Leer (Germany) in September 2000. His teaching and research focus is on Human-Computer Interaction, UX-Management, Agile Software Development, and Requirements Engineering. Since 2012 he has been the head of the research group 'Agile Software Development and User Experience'. Dr. Thomaschewski has extensive experience in user experience training, UX questionnaires, agile methods, IT analysis, and consulting.