Overcoming Challenges
in Agile User Experience Work

Cross-Case Analysis of Two Large Software Organizations

Kati Kuusinen

Department of Pervasive Computing
Tampere University of Technology
Tampere, Finland
kati.kuusinen@tut.fi

Abstract—**User experience (UX) has become an increasingly important factor in the success or failure of software systems. However, established agile practices for ensuring desired UX of the software under development are largely missing. Consequently, companies are facing problems in conducting UX work in agile development. This paper contributes towards understanding those problems and developing means to overcome them. We present results from a cross-case analysis of survey data from two large international software companies in this paper. Altogether, we surveyed 128 practitioners regarding challenges in agile UX work, the actual and desired contribution of UX specialists, and means to improve the current situation. For tighter integration between the disciplines, we suggest including the UX specialist in the development team itself.**

Keywords—Agile software development; user experience work; process improvement

I. INTRODUCTION

Agile [5] development methodologies have become a norm in software development [3]. Simultaneously, user experience (UX) has become a significant competitive advantage in software markets (e.g. [2]). However, agile methodologies do not give guidance on how to conduct UX work as part of agile software development practices: They do not recognize the role of UX specialist (UXS) nor guide developers in the work related to UX. In spite of attempts to integrate UX work with agile practices, researchers are reporting problems in conducting UX work in agile software development [9].

We consider UX as a person's perception of the value that results from the use or anticipated use of software in a certain context of use [6]. By UX work we refer to activities that aim at developing software that is usable, fulfills user needs, and provides desired UX. Most of the research on agile UX work suggests conducting some upfront design before starting agile development iterations [1]. During the implementation phase, current approaches on agile UX work understand UX work as a stream separate from development work [1]. Despite the increasing utilization of these approaches in companies, researchers are reporting problems in agile UX work [9]. Thus, we argue that UX work is not sufficiently integrated into agile development practices with the current approaches of separate early design phase before the agile implementation and

separate UX stream during the software implementation. Therefore, other approaches are needed.

In this paper we report a study conducted in two large software companies with UX teams and established UX work and agile development practices. We report results from cross-case analysis of survey data collected from 128 practitioners in those companies. The majority of participants were software developers, R&D managers or product owners (PO). Despite the established ways of working in the companies, participants reported several challenging issues related to agile UX work in their practices. We also identified a gap between the current contribution from UXSs and the desired one. In order to overcome the challenges, participants suggested more collaborative practices between developers and UXSs.

II. METHODS AND DESCRIPTION OF PARTICIPANTS

Our research goal was to gain understanding of common challenges in established agile UX work in order to enable improving the situation. We selected multiple exploratory case study with cross-case analysis as the research approach [12]. Thus, we selected participant companies to offer rich, holistic data that is comparable to reveal patterns in similarities and dissimilarities in cross-case analysis. As cases, we selected two large multinational companies utilizing agile software development practices and having established UX resources and practices. The methodology including sampling and analysis methods is described in [7, 8].

A. Studied Companies

At the time of the study, Company A was developing specialized software systems and tools for both business and consumer users. The main product of the company was a software system with massive yearly releases. Large multinational customer companies were dominant when deciding of the feature content for the next release. Company A had about 800 employees worldwide and a centralized UX team with about 15 members and a few distributed UXSs. Company A was advanced in agile development utilizing their own Scrum-based [10] process model in their development.

Company B operated in information technology service business with around 18 000 employees worldwide. It

454

CPS

developed mainly customer-ordered enterprise software including both large IT systems and mobile enterprise applications. It utilized mainly customers' process models in the development work but had also own product development. Company B had a centralized UX team with about 25 members and numerous distributed UXSs across business lines.

B. Survey Contents

We asked the participants the following open-ended questions in a web-survey:

General situation in the company:

- What are the three most challenging issues in agile UX work at the moment?

- When is the cooperation with UXSs unsuccessful or frustrating, why?

- How would you improve the current situation?

Ongoing or previous project:

- Describe the work contribution of UXSs during the last project you were involved in?

- What would have been the most desirable work contribution from UXSs?

In addition, we asked demographic information of the participant and the development methodologies the participant used in their work. We defined UX work in the survey as activities that aim at developing software that is usable, fulfills user needs and provides desired user UX. We added that we do not limit the work by work roles such as work conducted by UXSs only: anyone can contribute. We did not define agile development but welcomed everyone who considered that they worked with agile methodologies to participate.

C. Description of Participants

We got valid responses from 71 respondents working in R&D related roles in Company A. Of those 60.5% were from Finland, 15.5% from France, 8.5% from Malaysia, and 4.2% from Russia, 11.3% did not provide a country. Mean age of the respondents was 35 years (standard deviation (SD) 7.0). They had 12.8 years (SD = 4.4) of total working experience, of which 5.7 years (SD = 4.1) in Company A. Of the respondents, 32.4% were software developers or architects, 31.0% worked in R&D related managerial roles excluding project management, 11.3% were POs, scrum masters or project managers, 7.0% were UXSs, 4.2% were testers, 5.6% worked in other roles, and 8.5% did not provide their work role. The most used development methodologies included Scrum (65.3% of the respondents used it), and incremental model (26.4%). Of the respondents, 16.7% utilized no development methodologies in their work.

We received valid responses from 57 respondents in Company B. Of those respondents 64.9% were from Finland, 14.0% from Sweden, 7.0% from Czech Republic, 3.5% from India and 1.8% from Lithuania. 8.8% did not provide a country. Mean age of respondents from Company B was 37 years (SD = 7.0). They had 15.4 years (SD = 6.8) of total work experience of which 9.5 years (SD = 5.5) in Company B. Of the respondents 52.6% worked mainly as developers or architects, 17.5% as managers, 12.3% as product owners, scrum masters or project managers, 8.8% were UXSs, 5.3% worked in other roles, and 3.5% did not provide an answer. The majority (73.0%) utilized Scrum in their work. Other common methodologies included waterfall or stage-gate development (33.3%) and incremental model (29.9%).

III. RESULTS

A. Most Challenging Issues in Agile UX Work

Altogether, we included 195 individual items in the final analysis of the most challenging issues in agile UX work (each respondent (N=102) enlisted one to three issues). Those issues were categorized into 41 themes which were arranged under 11 upper categories during the content analysis (Table 1). The most often reported problems included understanding and fulfilling user needs, managing the big picture of the project, and differences in working practices of developers and UXSs. Issues related to user needs included acquiring the needed understanding, deciding on the implementation scope, communicating the user need in implementable form and deciding on implementation details. Challenges related to the product vision included different conceptions of the project focus and separated architectural and UX design. Differences in work practices included that developers considered that UXSs did not work following agile practices.

TABLE 1. THE MOST CHALLENGING ISSUES IN AGILE UX WORK IN COMPANIES A AND B. TOTAL N = 102 (N = 60 IN COMPANY A, AND N = 42 IN COMPANY B).

1. Understanding and fulfilling customer and user needs		30
1.1	Understanding user needs and the context of use	8
1.2	Overcoming (technical) limitations	6
1.3	Feature number vs. quality and fulfilling actual user needs	5
1.4	Communicating user needs as implementable items	5
1.5	Fulfilling user needs	3
1.6	Fulfilling conflicting user needs	3
2. Managing the big picture		29
2.1	Separate UX and architecture work (mismatches)	9
2.2	Lacking common focus on the project level	7
2.3	Inconsistency between products and platforms (UX architect)	5
2.4	Fragmented UX work prevents creating an overall picture (designing essential features)	5
2.5	Inadequate understanding of own products	3
3. Differences in work practices		28
3.1	UX work is not iterative / incremental / agile	7
3.2	Expectations and understanding of UX, and attitude towards UX work	7
3.3	Transformation from waterfall practices to agile	6
3.4	Task allocation between UX specialists and developers	3
3.5	Ways of working should be improved	3

3.6	Separate design upfront phase	2
4. Getting participants and user feedback		**20**
4.1	Getting early user feedback	5
4.2	Getting user feedback	4
4.3	Getting real, representative users	3
4.4	Usability testing	3
4.5	Involving the customer	5
5. Lack of cooperation		**18**
5.1	Separate UX and development teams	8
5.2	Lack of cooperation	8
5.3	Marketing / product management and R&D/UX not communicating	2
6. Too late UX work / no time for UX work		**17**
6.1	Too late UX work	5
6.2	Too little time for designing UX	5
6.3	Developers do not get UX design in time	5
6.4	Other issues constrict UX (because of late UX work)	2
7. Unfit processes and business models		**15**
7.1	Hindering business and sales models in UX	4
7.2	Good UX costs more for the customer	4
7.3	Schedules	4
7.4	Process	3
8. Welcoming late change		**12**
8.1	Late changes slow down development (rework and refactoring)	6
8.2	UX design version control, communicating changes in design	5
8.3	Handling ad-hoc UX tasks	1
9. Lack of competence		**11**
9.1	Lack of UX competence (in teams)	8
9.2	Lack of competence (not specified)	3
10. Quality assurance		**10**
10.1	Ensuring quality of the implementation	6
10.2	Lacking 'attention to details' (follow style guides, standards etc.)	4
11. Development should be prototype-driven		**5**
11.1	Prototype-driven development	5

B. Different Roles' Perceptions of Challenging Issues

There were differences in how different roles considered the problematic areas (Fig. 1). Developers were most concerned of their ability to fulfill user needs and to maintain the big picture of the project. Managers, in contrast, saw biggest challenges in getting user feedback and adopting agile practices. Developers were rarely in direct contact with users although they were responsible of the actual realization of responding to user needs by implementing the system. Thus, developers often were not aware of possible user problems with the system, or even the actual user need behind a feature request. On the other hand, UX specialists were the most

concerned of managing the big picture of the project and adopting agile practices. UXSs often saw their role holistic, and they considered that they are the ones who are responsible of the overall quality. They were also often working outside the development teams who had been using agile methods usually for some years. In contrast, UXSs were often working closer to product management who used plan-driven approaches with holistic long-term focus. Thus, they were in between two organizations utilizing both agile and plan-driven approaches.
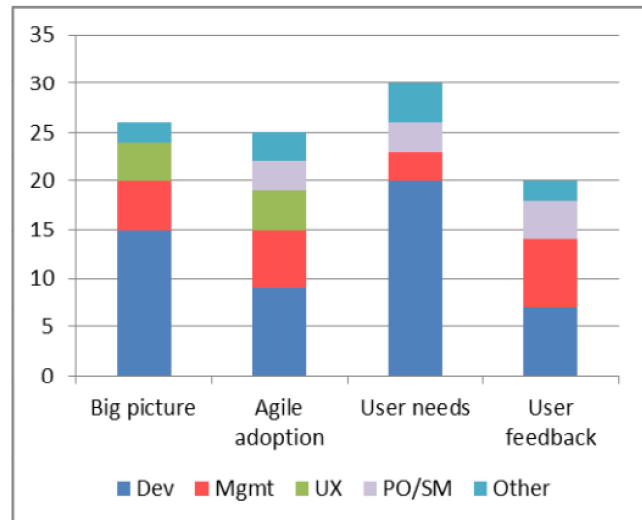

Fig. 1. The most common challenges in agile UX work by respondent role. N = 102. Legend: Y-axis is the number of respondents. Dev = developers, Mgmt = managers, UX = UX specialists, PO/SM = product owners, scrum masters, and project managers, Other = other roles.

C. Unsuccessful UX Work

Reasons for unsuccessful UX work and their consequences included the following issues:

- Problem: Not having allocated money, time, or process for the UX work (5.7% of the respondents mentioned this reason).

  ➤ Impossible to have a meaningful impact on the outcome by UX work, "*only selecting nice colors or rounding corners of the UI*" (UXS, Company B).

- Problem: Starting cooperation too late: making decisions without involving all relevant parties (business, UX, and technical people) (17.9%).

  ➤ Bad overall decisions and sub-optimization.

- Problem: Unclear allocation of responsibilities between persons and roles in the project (7.5%).

  ➤ Poor commitment and power struggles "*a know-all person started 'mastering' the UX design*" (manager, Company B).

- Problem: Not negotiating UX design decisions with developers (17.9%).

  ➤ Poorly implementable UX design.

456

- Problem: Poor reasoning behind UX design decisions (14.2%).
  - Developers making bad implementation decisions because they misunderstood the user need behind the UX design solution.

In addition to above listed problems, 18.9% of respondents only mentioned that UX work is unsuccessful when there is no or too little cooperation.

D. UX Specialists' Contribution

The contribution of UXSs varied significantly between respondents. A major part (33.7%) of respondents reported that there was no contribution from a UXS in their latest project. In some projects (15.8% of respondents), UXS had consulted the team few times regarding design decisions the team had made or reviewed the implemented UI designed by software developers. In a large part of projects (23.2% of respondents), a UXS had designed the user flow and communicated it via wireframe images to the team; in some cases the UXS had also designed graphics. In few cases respondents reported that a UXS had conducted user studies or tests (4.2% of respondents). In a couple of cases in Company B UXSs had conducted implementation of the user interface (2.1% of respondents).

There were some differences in the desired contribution from UXSs between Company A and B. In Company A, participants wished particularly for tighter cooperation; 46.7% of the respondents in Company A mentioned cooperation in their answer. The desire for cooperation was not as outstanding in Company B (16.2%). Respondents in Company A especially wished that planning activities such as product vision and feature planning would be conducted in cooperation with a UXS; 17.8% of the respondents in Company A mentioned cooperative planning. Of those (in Company A) who mentioned planning activities, 66.7% desired that it would be done cooperatively. Respondents in Company A also wished for more collaborative UX design activities; 41.7% of respondents who mentioned UX design, stated that it should be done in collaboration together with UX designers and developers. In contrast, quality issues were mentioned more often in Company B responses. Of the respondents in Company B, 29.7% mentioned issues such as better clarity or implementability of the UX design, or that if they had had UXS in the project, the UI design would have been better. In Company A, only 6.8% of respondents mentioned such issues.

Of the total respondents (Company A and B), 22.0% described that UXSs should have participated to user needs clarification and creating the product vision. In addition, 26.8% desired that a UXS would have created the user interaction design whereas 11.0% described that UXSs should have guided developers and provided feedback on the UI design created by developers. Also, 11.0% mentioned testing and evaluation practices.

In general, it seems that there was a large gap between the actual contribution from UXSs and the desired one. UXSs mainly concentrated on delivering the UX design for development whereas respondents desired for more comprehensive and communicative contribution. In the ideal

state, there would be a UXS involved from early on throughout the project regardless of the desired amount of input from the UXS: Some of the respondents desired for significant impact from the UXS including understanding the user need, creating the product vision, delivering the design and evaluating the outcome whereas others wanted continuous feedback and guidance from the specialist throughout the project.

E. Means to Improve the Situation

The most often mentioned suggestion to improve the situation was to *include UXSs in development or project teams*: 26.8% of the respondents suggested it (Fig. 2). In Company A, especially developers proposed this whereas in Company B, there were no differences between respondent groups. The second popular suggestion was *closer collaboration* between UXSs and other development-related roles, 17.5% of the respondents mentioned it as a means to improve agile UX work. 9.3% suggested *improving knowledge* in UX issues. Several developers and UXSs were concerned of developers' ability to understand UX issues and they mentioned that the cooperation would be more fluent if developers were more knowledgeable in UX work. Also, especially in Company B, respondents suggested that managers should be more knowledgeable in UX issues since they have the most power of decision to impact UX on organization level. 15.6%, all from Company B, suggested *changes in the process* to ensure tighter integration of UX work with agile development practices. In contrast, only respondents from Company A (7.2%) suggested *starting UX work earlier* or allocating more time for UX work.
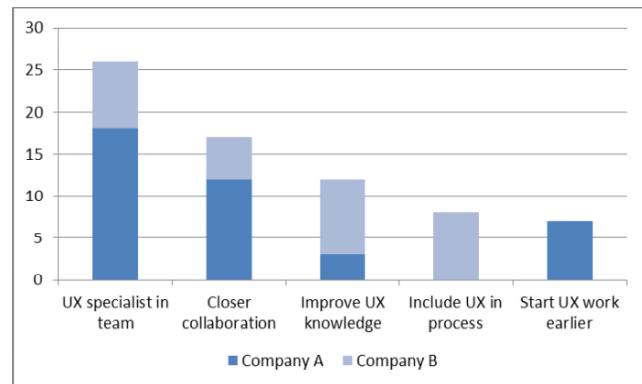

Fig. 2. Means to improve the current situation of agile UX work in the case companies. Y-axis is the number of respondents. N = 97 (N = 58 in Company A and N = 39 in Company B).

Other commonly mentioned suggestions included increasing the number of UXSs so that one could be allocated to each project. Indeed, to be able to ensure sufficient UX work in all projects necessitates more UXSs in both companies; currently of the total staff, 1.8% were UXSs in Company A and we estimate that less than 1% of the staff in Company B were UXSs or working in such roles.

F. Summary of Results

There were challenges in the fundamental aspects of agile UX work. The most challenging issues included understanding and meeting user needs, maintaining the project vision, and

457

conducting UX work in agile manner. Lack of cooperation between developers and UXS led to several problems such as difficultly implementable UX design. There was a noticeable gap between the actual and desired contribution from UXSs. UXSs mainly concentrated on delivering the user interaction design for developers to implement whereas participants desired for a more holistic contribution throughout the project and especially during planning activities. In order to improve the situation, participants suggested for more collaborative approach and to include UXSs in development teams. In addition, changes in processes and increasing developers' and managers' knowledge in UX issues were suggested.

IV. DISCUSSION

There is contradictory evidence in the earlier research on whether the software development team and UX team should operate separately or in cross-functional teams [1]. Frameworks for agile UX work have primarily suggested utilizing approaches where a UXS works on their own track, such as in [11]. However, e.g. Ferreira et al. [4] suggest that cross-functional teams including a UXS are more efficient than those operating with a separated UXS. Our study strongly supports the latter approach of cross-functional teams: one of the most common suggestions on how to improve the current situation in agile UX work was to include a UXS in the development team. In fact, respondents saw separate UX teams as a hindering issue in agile UX work. Problems related to separate teams were weakened communication, differences in timing of tasks, and differences in work practices.

Our study suggests that ensuring good UX for end users necessitates teamwork between different disciplines. In addition to understanding the user need and designing fluent user flow, the team needs to consider various issues related to UX development. Such issues include considering technical limitations and cost of different design possibilities, balancing between the feature number and development quality, and means to fulfill conflicting user needs. Also, understanding of when the implementation corresponds to the UX design closely enough (implementation quality) requires knowledge both on UX and software design issues.

Problems regarding separate UX and development work include that projects operating without a UXS need to be able to recognize the limit of their own incompetence; they should be able to identify the point when they need help from a UXS early enough. In addition, when they consider they need a UXS, they need to know whom to contact. Usually, UX teams are busy and they cannot allocate resources immediately on demand which means waiting time for the development team. In addition, it requires some time to examine the project content before the UXS will be able to help the development team. Thus, we conclude that on-demand UX work requires considerable facilitation, flexibility and orchestration in order to be efficient.

Based on our results, we suggest allocating a UXS in agile development teams. In projects where UX is less critical, for instance when user needs are well understood or in projects where no major new user features are designed, a UXS should be available to guide and provide feedback for the development team. In more UX-critical projects, a UXS (or several when needed) should be participating in the daily development work from the beginning. Clarifying the user need and creating the product vision should be collaborative activity in the team. Also, user interaction design ought to be created together with developers in order to ensure implementability. However, more research is needed on the actual daily work of these cross-functional teams in order to develop better methods and ways of working for such teams.

V. CONCLUSION

This paper presents results of a multiple case study in two large software organizations. In total, 128 persons working in various roles related to agile development activities responded to our web survey. We studied the most challenging issues in agile UX work, the gap between the actual and desired contribution of UXSs, and means to improve the current situation in the companies. We found various challenging issues related to, for example, the ability to respond to users' needs, managing the product vision, and reconciling divergent working practices. There was a significant gap between the desired and actual contribution of UXSs: UXSs mainly contributed on the UI design whereas the participants wished for more holistic contribution throughout the project. Our results indicate that development organizations would benefit from tighter cooperation between UXSs and developers. Thus, we argue for including a UXS in the development team.

REFERENCES

[1] Brhel, M., Meth, H., Maedche, A., Werder, C. Exploring principles of user-centered agile software development: A literature review. *Information and Software Technology,* 61, 2015. pp. 163-181

[2] Cyr, D., Head, M., & Ivanov, A. Design aesthetics leading to m-loyalty in mobile commerce. Information & Management, 43(8), 2006, 950-963

[3] Dingsøyr, T., Nerur, S., Balijepally, V. Moe, N. B. A decade of agile methodologies: Towards explaining agile software development, Journal of *Systems and Software*, 85(6), 2012, pp 1213-1221, Elsevier

[4] Ferreira, J., Sharp, H., Robinson, H. User experience design and agile development: managing cooperation through articulation work. *Software: Practice and Experience* 41(9), 2011, John Wiley & Sons, 963-974

[5] Highsmith, J., Cockburm, A. Agile software development: the business of innovation. Computer, 34(9), 2001. IEEE

[6] ISO 9241-210:2010. Ergonomics of human-system interaction. Part 210: Human-centered design for interactive systems. 2010

[7] Kuusinen, K., Mikkonen, T., Pakarinen, S. Agile user experience development in a large software organization: Good expertise but limited impact. In: Human-Centered Software Engineering (HCSE'12), LNCS 7623, Springer, Berlin/Heidelberg (2012), pp. 94–111

[8] Kuusinen, K., Väänänen-Vainio-Mattila, K. How to make agile UX work more efficient: management and sales perspectives. Proc. 7th Nordic Conference on Human-Computer Interaction: Making Sense through Design (NordiCHI '12). ACM, 139-148. 2012.

[9] Salah, D., Paige, R. and Cairns, P. A systematic literature review on agile development processes and user centred design integration. *Proc. 18th International Conference on Evaluation and Assessment in Software Engineering (EASE'14)*. ACM, (2014). Article 5, 10 p.

[10] Schwaber, K. Agile project management with Scrum (Microsoft professional), 1st. ed., Microsoft Press. 2004.

[11] Sy, D. Adapting usability investigations for Agile user-centered design. *Journal of Usability Studies* 2, 3 (2007), 112–132

[12] Yin, R. K., Case Study Research: Design and Methods. 3rd ed. 2003 SAGE Publications.