The Prevalence of UX Design in Agile Development Processes in Industry

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Abstract — **The gap between how the academic world develops usability and user experience (UX) methods, and how the industry employs these methods is perceived as both broad and deep. But is that the real picture – and has there been a change in how companies work within these fields over the past two years? By conducting interviews with eight companies, this paper tries to answer these two questions. The companies were initially interviewed in 2013 and by follow-up interviews in 2015 the paper draws a picture of how the companies work with UX and usability in an agile development environment. We identify the challenges they are facing and if, and how the work progresses. We found that the UX maturity during these two years had changed significantly. This was revealed by the fact that almost all of the companies in 2015 had implemented or were in the process of developing a UX strategy together with more formalized UX processes. They also allocated more resources to conduct UX and usability work than earlier. We found that all of the companies made use of low-fi prototyping, followed by usability testing, workshops, personas, expert evaluations, user or customer journeys, customer visits and user task analyses. Almost all the companies carried out development using the Scrum framework. All of the companies were interested in the idea of agile UX, and found the idea of using the developers as a UX resource interesting. This, together with an idea of modifying existing usability methods to be used in an agile, industrial setting could be a solution to bridge the gap between academia and the industry.**

Keywords - User Experience Design; Usability; Agile Development; Industry

I. INTRODUCTION

For more than a decade discussions concerning the gap between how the academic world develops usability and user experience (UX) methods, and how the industry employs these methods, have floated back and forth. In 2003 Wixon stated that: *"The literature evaluating usability methods is fundamentally flawed by its lack of relevance to applied usability work"* [1]. Sadly that still seems to be the case, even though many companies - especially within software development, now have in-house usability and UX teams [2].

In 2013 Moreno and colleagues stated that *"...the integration of usability engineering methods into software development life cycles is seldom realized in industrial settings."* [3]. Methods addressing usability and UX are often mentioned in research papers, but rarely applied to the current practice of software development [4]. Even though different steps have been taken to both reduce the gap

between academia and industry e.g. [5]–[12] and to facilitate an integration between UX design and agile development e.g. [4], [13]–[21], the industry still finds this type of work challenging.

In this paper we set out to investigate how companies work with usability and UX in an agile environment and if, and how this work has evolved over the past two years. We do this by interviewing nine people from eight different Danish companies both in 2013 and again in 2015. In the remaining part of the paper we will: Summarize related work (Section II), provide an overview of our research method (Section III), present our findings (Section IV), discuss and conclude on our findings (Section V and VI) and present tips for practitioners (Section VII).

II. RELATED WORK

Several studies and surveys on how industry conducts usability and UX work can be found in the literature and many papers discuss the benefits and challenges of conducting usability and/or UX work in industry e.g. [22]–[27]. Fewer have studied specific industrial organizations in order to understand the different reasons of the limited role of usability and UX processes in practice. However, in the following some findings related to this hurdle are presented.

In [28] Ardito and colleagues conducted a comparison study between Denmark and Italy concerning how companies perform usability evaluations. The studies were conducted three years apart. They found no difference between the number of companies conducting usability work, regardless of whether the comparison was made between companies from different countries, or over time. However, the understanding of the concept of usability had changed during the three years. Furthermore, they found that developer mindset and resources were the two most common problems when introducing and working with usability evaluations within the companies.

Bruno and Dick [29] conducted 12 interviews with usability practitioners to learn about successful and less successful usability outcomes. They found that in order to both provide a successful usability outcome of a project and ensure stakeholder involvement, the usability process should be iterative, have clear usability goals and requirements, and it was critical that technological constraints could be avoided. They also stress that; to increase the likelihood of involvement, usability should be evangelized.

In the study reported in [30], Bygstad and colleagues conducted a survey in Norway investigating the integration

between usability and software development. They found that usability testing was perceived less important than usability requirements, and the companies believe that software development frameworks and usability frameworks were already integrated.

A survey with 92 respondents is reported in [31]. Here, Hussain and colleagues found that the majority of the respondents experienced the integration of usability and the agile framework added value to the processes and teams, hence resulting in an improvement of both usability and quality of the product developed – entailing an increased satisfaction for the end-users (i.e. better UX). Furthermore, they found that companies primarily make use of low-fi prototyping, followed by conceptual designs, observational studies of users, usability expert evaluations, field studies, personas, rapid iterative testing, and laboratory usability testing. These findings are quite similar to the findings from a study conducted by Jia et al. [32], who found that in a Scrum environment the most used usability methods were workshops, followed by lo-fi prototyping, interviews, meetings with users and scenarios.

Lárusdóttir and colleagues reported findings from interviews with 21 informants from four different professional roles within software development in [33]. They found that; usability and UX work being conducted were typically informal, unplanned, conducted with few users, and the focus were on gathering qualitative data. This is supported by Bornoe and Stage [7] who conducted interviews with 12 representatives from different Danish software development companies. They found that companies primarily focus on up-front usability and UX work to support the design and implementation process. The companies furthermore implemented usability via informal and ad hoc evaluations.

These studies indicate that industry indeed perform usability and UX work of various complexity and extent. They reveal that methods often diverge from those developed and used in academia, and are adapted towards more informal use.

In our study we are interested in extending this research and uncover whether any trends can be found over time regarding the consolidation of methods and/or increase in the usage of UX and usability work in industry in recent years. Furthermore, we wish to collect the experiences and recommendations from practitioners in industry.

III. RESEARCH METHOD

We find that it is fundamental to analyze current development practices within the industry and investigate how this type of work is evolving. This paper describes and discusses the results and differences of the findings from two interview studies conducted respectively in 2013 and 2015. In both studies the same Danish companies were interviewed about how they work with UX in an agile environment and if something has changed during this time span. The purpose of the interviews was to identify and map the changes to the following research questions:

- How is UX oriented work initiated and matured within the companies?
- Are the companies working agile – if so how?
- How do the companies work with UX in an agile development environment?
- How do the companies make decisions within the UX design field?
- Do the companies embrace agile UX[1]?

Furthermore, we investigate which skills and background UX practitioners have, what usability/UX methods are being employed and what the current view on UX is within the companies.

A. Interviews

The interviews were constructed as in-depth, semi-structured interviews. Empirical data was collected from interviews with nine interviewees from eight Danish companies - see Table I (in 2015 seven of the same companies and interviewees participated).

B. Selection criteria

The companies were selected so the following profiles were represented:

1. Companies that develop pure software products and companies developing physical products with embedded software.
2. Different size companies as defined by [34]:
   - Small companies: <50 employees
   - Medium-sized companies: <250 employees
   - Large-sized companies: over 250 employees
   - Companies already doing usability and UX work and companies who had expressed an interest in starting doing UX work.

From the selection criteria, eight Danish companies were selected, see Table I.

TABLE I: OVERVIEW OF THE COMPANIES, 2015 NUMBERS.

Company	Type	Employees in Denmark
Atosho [35]	Software	15
BAE Systems Detica GCS [36]	Software	200
Brüel & Kjær [37] **(2013 numbers)**	Software and hardware	500
FOSS Analytical [38]	Software and hardware	550
GN Netcom [39]	Software and hardware	200
NN (anonymous)	Software	4,000
Radiometer Medical [40]	Software and hardware	1,000
TC Electronic [41]	Software and hardware	80

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[1] The term *Agile UX* denotes the attempt of integrating UX design and agile development methodologies.

C. Interviewee profile

The interviewee profiles can be seen in Table II. The presentation of the profiles is randomized and does not correlate with Table I.

TABLE II: OVERVIEW OF INTERVIEWEE PROFILES, 2015 INFORMATION

Interviewee	Job title	Education	Industry Experience
I1	User Experience Designer	Engineering Psychologist	3.5 years
I2	Development Engineer	Acoustic Engineer	17 years
I3	Product Manager	Master in Philosophy and Media Science	15 years
I4	Team and Product Manager	Electronics Engineer	12 years
I5	UX Engineer	Engineering Psychologist	2.5 years
I6	R&D manager	Bachelor in Computer Science	15 years
I7	UX Specialist	Engineering Psychologist	4 years
I8	Senior Method Consultant	Master in Informatics, PhD	10 years
I9	Concept Developer	Optical Engineer, PhD	19 years

D. Procedure

All interviews were conducted in Danish. The duration of the initial interviews was between 45 and 75 minutes and all were conducted face-to-face. The interview guide included the following themes:

- Background and presentation of the company
- Initial work with UX and UX maturity
- The interviewee's definition of UX and the company's UX vision
- Organizational placement of the UX team
- UX responsibility and UX decisions
- The UX processes, tools and user involvement
- The dissemination of UX findings
- The development process
- Agile UX
- Final remarks

The duration of the follow up interviews was from 26 to 51 minutes. The follow-up interviews followed the interview guide, but were more focused on the change between 2013 and 2015. These interviews were carried out over the telephone.

E. Data analysis

All interviews were recorded and afterwards transcribed. To analyze the initial interviews we first performed a meaning condensation of the data as described by [42], followed by performing Yin's five phase cycles, consisting of: compiling, disassembling, reassembling (and arraying), interpreting and concluding [43]. This iterative process resulted in eight overall themes. The follow-up interviews were analyzed in the same manner, using the themes from the initial interviews as codes. During this process one more theme emerged. All nine themes are described in the following, including quotes from the interviews related to the respective themes.

The quotes have been translated from Danish to English.

IV. FINDINGS

In all of the following tables, percentages are used to make comparisons between the two studies, due to the different number of companies between the studies.

A. The interviewees describtion of UX

In both interview rounds we started by asking the interviewees to give their definition of UX, in order to have a baseline to discuss from.

When the interviewees in 2013 were asked to describe UX in their own words, their approaches were very pragmatic e.g.: "*It is something that permeates a product. From the specification phase, where you have to have it incorporated [...] So actually it permeates all the way through the development, where there are continuously testing. So I see it as a major integral part of the product development, in which you have to be acute, because in the end it is what the users see - they do not see the machinery*". [I1]

The interviewees' descriptions verged on the edge of being a description of usability. Furthermore, two of the interviewees did not use the terms usability and UX design, and when asked, they revealed they did not perform any usability or UX work at all in the companies. However, further along in the interviews they started using terms as user interface expert, key product drivers, customer satisfaction etc., and it was clear that, although they might not use the terms usability and UX design, they did in fact perform both usability and UX work.

In 2015 all of the interviewees stated that their companies perform a variety of usability and UX work. Furthermore the interviewees were more aware of the concept of UX, especially the experience part of the concept, and that the experience stretches from before purchasing a product until the product has been discharged. I7 puts it very well: "*It (UX) is a umbrella for both classic usability and interaction design, where you look at the human limitations on how to understand and remember things, and it is a user journey from the beginning when you buy or hear about a product, to trying it, and to after you have used it, recommending it and maybe buying a new from the same brand. It is something both before during and after use. It is both at the physical level, but also the mental and socio-economy level - there are many levels.*"

B. UX initiative and how UX has matured

The 2013 interviews revealed that in all of the interviewed companies the interest for UX design had been initiated from grass-roots movements within the company. The grass-roots movements consisted of people with an interest for the end users and how the end users use the developed products. Within the interviewed companies the start of the UX movement had either been in the mechanics or the software department.

The 2015 interviews revealed that the companies have kept an interest in UX design and furthermore the UX design has matured. Five of the companies have employed more people to perform UX work, see Table III.

TABLE III: THE CHANGE IN THE NUMBER OF UX PRACTITIONERS IN THE COMPANIES

Company	No. of UX practitioners 2013	No. of UX practitioners 2015
Atosho	1	1
BAE Systems Detica GCS	1	2
Brüel & Kjær (2013 numbers)	0	-
FOSS Analytical	4	5
GN Netcom	8	12
NN (anonymous)	0	1
Radiometer Medical	3.5	7 + 5 student workers
TC Electronic	0	1

In 2015 almost all of the companies now have described UX processes integrated into the company's overall development processes. This is presented in more details in section *E*. I6 describe the nature of the maturity: *"It (UX) is a well-defined processes and it is matured organizational, as it is now a stronger organization that is not hung up on individuals as it was previously, but a professional UX group that is not quite so vulnerable."*

Four of the seven interviewed companies in 2015 have had a specific strategy for UX work the past two years. Especially in the past year UX strategies have emerged, as I8 put it: *"We have had a strategy to make it (UX design) more visible and we succeeded. In my position, I have the last year had a concrete goal of bringing UX forward in the company"*. This is supported by I1: *"We got a UX strategy about a year ago – when UX started to gain more focus and we were to develop a brand new product from scratch. It became clear to the managers that it was an important area because the UX designers, in principle, are the ones who work across users."*

C. Agile development within the companies

In 2013 all of the companies used or had the opportunity to use Scrum as their primary development framework. In 2015 one of the companies did not use Scrum anymore, but the rest were still using Scrum as the primary development framework. This had been the case for a variety of years, see Table IV.

TABLE IV: YEARS OF EXPERIENCE WORKING WITH SCRUM WITHIN THE COMPANIES, 2015 NUMBERS

Number of years using Scrum	0	1	2	3	4	5	6	7	8+
Number of companies	1	0	1	0	1	0	1	1	2

Not all of the companies used pure Scrum in 2013. Some used a combination with other development frameworks, see Table V. Serval interviewees in 2013 pointed out that their company stated they worked agile and with Scrum, however the fact was that the companies were not that agile as they said they were, as I1 pointed out: *"Even though we (the company) say that we are agile and constantly are testing and changing, it still seems more like a Waterfall approach"*. When asked how the companies had taken the idea of working with Scrum, I4 said: *"They (the company) said: Just do it – but by the way, we have a Waterfall model and you should of course still go through these phases."* I9 pointed out: *"We are developing in an agile environment and using Scrum on our software platforms. Our hardware process is gate ruled and thereby quite similar to the Waterfall approach"*.

TABLE V: DEVELOPMENT FRAMEWORKS IN THE COMPANIES

Development framework	% of companies 2013	% of companies 2015
Scrum	63%	71%
Scrum + Waterfall approach	12%	15%
Scrum + Lean	25%	0%
Ad hoc	0%	15%

In 2015 almost all of the companies used pure Scrum, see Table V. However, this should be read with modifications, as I8 pointed out: *"We are running it (the agile development) by the book as closely as we can, but there are always changes"*, and I6 pointed out that: *"Scrum development, in our company, is adapted to an overall stage gate model"*. However, I8 also pointed out that: *"More projects are running agile. We have definitions of what it means to develop in an agile environment in our company and a lot of our employees are undergoing further training in the agile framework"*.

In the company that no longer applies Scrum, the reason, when asked, was that: *"A lot of replacements in the management team"* and she continued: *"We never reach a stage where we are able to make second iterations. We launch and then we bug fix"*. [I5]

D. Decision making within the UX field and resources

The interviews in 2013 revealed that UX design decisions within the companies were often based on the employee's experience, sometimes in combination with a small, internal user test, see Table VI. The interviews also revealed that there were no resources to make several user tests or time to consult theory within the given field. The companies were very result orientated and they had a lot of focus on resources and on the cost, as I3 pointed out: *"We choose which features to remain and which ones to cut out in the products. If a design should have e.g. one less button than the existing product, it would entail that we should invest in a new mould that maybe costs $20.000. So we, by all means, try to find a function for that extra button".*

In 2013 two of the interviewees pointed out that UX takes time and sometimes the companies do not show an understanding for that, as one of them pointed out: *"I find that UX decisions to others seem like something that can be made quickly, and then we do not get enough time devoted to the UX work".* [I5] Furthermore, several of the interviewees were met with the attitude in the companies, that UX is just common knowledge, as I8 pointed out: *"Anyone can comment on something being easy to use […] this also means that everyone has an opinion about usability and user experience."*

TABLE VI: HOW UX DECISIONS ARE MADE IN THE COMPANIES

Strategy	% of companies 2013	% of companies 2015
Experience	38%	15%
Experience + test	50%	43%
Experience + test + theory	12%	29%
Experience + theory	0%	15%

In 2015 the companies still have a great deal of focus on resources, but also the understanding of the importance of UX, as described in section *B*.

The companies seem to have more resources for conducting UX work, as I7 pointed out: *"We have fewer projects, but higher quality and ideally more money for them. So now we have the option to choose solutions with a higher quality rather than solutions that are quickly on the market. Even though we have fewer projects, we have hired several extra UX designers. This means that we make solutions that are better and more thought through".* I8 pointed out: *"We have different ways of making decisions. We try to get away from it being based on attitudes. So we try to argue from scientific concepts and talk about consistency, Gestalt Theory, etc. Something that is more tangible, which will gain more weight than "I like...""*

Furthermore, there now is an understanding of UX as a profession, I6 pointed out: *"Our UX employees have a theoretical background within the field of UX, so we rely on their background and experiences in our user tests."*

However, the companies still prioritize the usability and UX findings, I2 told: *"We use experience and user tests. We take in assessing how important it (findings) is to correct. Is it achievable to correct and how important is it for product success versus how much of a burden it is for developers to implement it."*

E. UX processes

In 2013, 63% of the companies pointed out that their UX processes are ad hoc, see Table VII. This can be problematic, as I9 told: *"We made a concept, where we forgot to integrate the software part".* This was supported by I2, who told: *"We had a product, and just a week before release, it was decided what a big button in the middle of the products' front plate should be used for".*

However the companies were aware of the lack of processes and some of them were trying to develop different processes regarding UX design, as I1 said: *"I am building a knowledge database, which contains user profiles and some small user stories. Then there will be a clear structure for what the developers should have in mind, which tools they should use and which steps they should take".*

TABLE VII: OVERVIEW OF UX PROCESSES IN THE COMPANIES

UX Process	Percent of companies 2013	Percent of companies 2015
Ad hoc	63%	42%
Are developing processes	25%	29%
Have processes	12%	29%

In 2015 only 42% of the companies stated that their UX processes were ad hoc and entire 58% of the companies stated that they now have a UX process or are developing one. The interviewee of one of the companies conducting ad hoc UX work said: *"Our tester judges when it makes sense to conduct a user test".* [I2]

One of the interviewees from a company currently developing a process said: *"We are in the in the middle of developing a UX process. We have defined the overall lines, but not yet the details of each step e.g. we do not always start with a clear specification of requirements - sometimes we make them ourselves, other times there will be requirements from the outside. Furthermore, personas are not yet properly integrated. The details are not in place, but the overall lines are laid."*[I1]

The interviewee from the company having a UX process in 2013, in 2015 pointed out that: *"Now it is more that we are trying to see if the process is right, more than if the design is. It is about getting the right process, change and update the processes, IT support them or make them more efficient, skip some steps, make use of other entrants etc.".* [I8] He continued: *"We have introduced some new principles - let's say the business analysis falls behind. We do not want our developers to work on something without it having been tested and analyzed. So instead of having them*

work on something that has not been tested, the developers start to gold plate and reduce technical debt." [I8]

Again the supply of more resources has had an effect: *"The area (UX) has been strengthened by several people - hence more money and the second thing is that things have become much more formalized in our overall development process. Now it is a formal, integral part, but it still leaves little room for interpretation of how to do it on the different projects. But you cannot get around it (UX)"*. [I6]

F. Usability and UX methods used within the companies

In 2013 most of the companies used a combination of usability tools and methods. The most popular methods can be seen in Table VIII.

TABLE VIII: OVERVIEW OVER THE USED USABILITY METHODS WITHIN THE COMPANIES

Method	% of companies 2013	% of companies 2013
Low-fi prototyping (incl. sketching and mock ups)	100%	100%
Usability test (incl. think aloud and IDA[2])	75%	71%
Workshop	25%	43%
Personas	37%	29%
Expert evaluation	25%	29%
User or customer journey	25%	29%
Customer visits	25%	14%
User task analysis	12%	29%

In 2015 the overall picture was fairly the same. However, there seemed to be a more systematic approach to how the methods were applied. Furthermore, two of the companies experimented with a couple of other methods – AB-testing and Contextual Inquiry. These two companies were collaborating with universities and it was through this work, they were introduced to the methods. Furthermore, one of them experimented with modifying existing usability methods by making them more lightweight and suitable to be used in the company's development sprints.

G. Developers as a UX ressource

In 2013 the software developers within the companies were very interested in observing how the company's products were handled by the users. Three of the companies had developers observe user tests. Five of the companies were keen on the idea of either having the developers make small, internal UX tests themselves, testing some of the features on e.g. test subjects from HR, marketing etc. or have the developers participate in/observe the user test.

In 2015, six out of seven companies were keen on having the developers performing minor usability and UX

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[2] Instant Data Analysis - a description can be found in [44]

work on their own and two of the companies were already experimenting with this approach. In five out of seven of the companies the developers participate as observers in UX work. As I8 said: *"Moving the developer from his desk and out into the world gives a lot… Often it is our technical profiles that are those who have insight into what is new within a framework. The business analyst can have a tendency to think that we just do things like we always have done. The developer might have kept an eye on what is emerging within the field."*

In the company where I6 works, they are experimenting with having the developers conduct minor UX work on their own, I6 told: *"As something new, we are trying to have them (the software developers) execute minor tests or observing the users on their own. So they can perform minor UX tasks."* In I2's company it is the same tendency emerging, as he told: *Five of us (developers) have participated in mini-project concerning usability and UX. So half of the team has been taught and gained insights in the different (usability and UX) methods."* [I2]

H. UX work conducted within an agile framework

As pointed out earlier all of the companies in 2013 use or had the opportunity to use Scrum as the development framework. However only three of the companies used Scrum in their UX development, see Table IX. Two of the companies using Scrum for their UX activities, did not have employees working explicitly with UX design in 2013. Only in one company do the UX designers participate in the Scrum rhythm and it is only when the UX designers are working on a specific project, using Scrum. Here, the UX designers participate in the Scrum development almost on equal terms as the software and hardware developers, but they do not have their own story points.

TABLE IX: OVERVIEW OVER UX WORK CONDUCTED IN AN AGILE FRAMEWORK

Type of team	Percent of companies 2013	Percent of companies 2015
UX work without UX employees	25%	0%
UX work with UX employees	12%	43%
UX work performed in a non-agile framework	63%	57%

In 2015 all of the companies have employees working with UX design and all of the interviewees pointed out that the UX designers now work much more iteratively. This is illustrated by what I1 told: *"In the past, we were e.g. told that a feature should be implemented somewhere in this this big behemoth, and then we did that. Now we have more ideas on the drawing board and run these iterative loops."*

In 43% of the interviewed companies the UX person or team works profoundly agile. I6 told: *"We have a process for how we are doing UX backlog grooming in Scrum, how*

we get from a high level user story to have it described and ready for the developers to use. There it is written that we have to have a UI concept before the developers can start – so UX is integrated. If the UI concept requires that we go out and make a small user test to find out whether this or that works best, then we do that. It is integrated in the process. When they are finished with the code, there is a review of if the UX is as intended and finally more features are picked up in a release and then a usability/UX test is made."

The support for agile UX within the companies can be seen in Table X. In 2013 one of these companies would like to have the UX department as customers to the software development department, so that the software developers feed the UX department. Only one company was not supporting the idea of agile UX, see Table X. All of the interviewees could see a potential in increasing the work with UX design.

TABLE X: SUPPORT OF THE IDEA OF AGILE UX

Agile UX	Percent of companies 2013	Percent of companies 2015
Support the idea	50%	71%
UX in separate teams	38%	29%
Do not support the idea	12%	0%

In 2015 all of the interviewees support the idea of agile UX. Four would like to have the UX designers fully integrated in the agile development team and two would like that the UX designers have their own UX team. I7 likes the idea of agile UX, however: *"Agile UX makes very good sense. […] But typically we are working on maybe two or three projects at the same time."*

The organizational placement of the UX designers in 2013 gave an indication on which approach the companies have taken in order to integrate UX design and agile development, see Table XI. The two companies without any UX employees are placed under *Other* in Table XI.

TABLE XI: OVERVIEW OVER UX APPROACHES

UX approach	Percent of companies 2013	Percent of companies 2015
Parallel [45]	38%	57%
Satellite [46]	38%	43%
Other	25%	0%

In 2015 the approaches are almost the same as in 2013, however one of the companies is working with a mix between the satellite and parallel approach, this was described as: *"I am sitting on a project and act as a consultant on three others. The reason I must be the consultant on three projects is that we need to develop something to the same portal, so I have to work for*

consistency. I make sure to talk design manual on the other projects, so they preferably can be self-running in the end. They have to show me the designs they make, then I make sure that they are within the limits of the overall framework." [I8]

I. The companies' view on UX

In the 2015 interviews the interviewees were asked about their company's view on UX. For all of the companies the view was described as being very good.

I8 told that his company's overall development had been changed for the benefit of UX: *"Previously we built the architecture first and then we built the user experience on top. Now we start by designing the user experience and then we find the architecture that can support that. So we have swapped the architecture and user experience around."* [I8]

I1 told about how they in her company have seen the profit in focusing more on UX design: *"The last few years it has gone from that; yes, we have someone making it (UX) and we do it because it is a buzzword to it is very important and the UX designers have a great power and much to say, cause they understand what it is about and they can talk across users and they can write user requirements. It has been a cornerstone of the company."* [I1] and I6 stated that: *"It (UX) is indeed recognized as a key competitive factor in our organization.* [I6]

V.   DISCUSSION

Take note that the company sample is quite small – eight companies in 2013 and seven companies in 2015. Even so, some tendencies emerged and are discussed here.

A.   The interviewees describtion of UX

The interviews from 2013 showed there was a lack of understanding of the concept of UX, which was voiced when the interviewees were asked to describe UX in their own words. On the other hand this lack of understanding also entails that the companies made more usability and UX work than they believed they did. This is something to have in mind, when discussing UX design and agile UX.

The interviews from 2015 clearly demonstrated the concept of UX had matured within the companies. The interviewees were better at distinguishing between usability and UX and had a more in-depth understanding of the concept of UX. This corresponds to the findings found in [28].

B.   UX initiative and how UX has matured

The forming of UX grass-roots movements in either the mechanics- or software departments can be seen as a natural starting point, since there within these two fields are a lot to win by having developed the right product or feature to the users early on, both with regard to time and money.

However, according to the usability maturity model put forward in [47] and [48], the movement can only grow to a certain extent without having the management encouraging

the UX work and allocating resources. However, if UX is not seen as a core element to the product development, it is inevitably in the risk of being one of the first fields to be cut away, which one of the interviewed companies had experienced almost a decade ago.

The 2015 interviews revealed that there has been an increase of focus on UX in the past two years and the companies have taken usability and UX seriously. Almost all of them have developed a strategy for UX activities during the resent years and employed several more UX practitioners. Two of the companies now consider UX as a key competitive factor within their companies. This should be seen in the light of some very competitive markets, where it is not enough the products work (have a good usability), but also focus on aesthetics, pleasure, etc. – all in all create a good *user experience*.

C. Agile development within the companies

Scrum was widely adopted in the companies in 2013 and they perform it very seriously and had applied many of the Scrum artifacts. Some of the companies had an overall stage gate model for their development process. This model is similar to the waterfall approach, however it is feasible for the companies to use Scrum within the development phases of this model. Within the resent two years all of the companies except one have become more secure in the way they apply Scrum and their Scrum framework is now perceived purer. This is something to consider in relation to conducting usability and UX work and an idea could therefore be to develop usability and UX methods, which could be suitable to be applied in an industrial, Scrum setting, making it possible to complete the method within one development sprint. This idea is supported by the findings in [28] where seven respondents pointed out a lack of agile methodologies for evaluation.

D. Decision making within the UX field and resources

In 2013 there was a tendency within the companies of not allocating enough resources to conduct proper UX work.

This was reflected in many UX decisions within the companies were made on the employees' experiences and not by e.g. a proper user test.

The tendency has shifted during the past two years and especially within the past year, the companies now have a deeper understanding of the importance of usability and UX and there therefore now exists more respect and understanding of UX as a profession. The result of the companies having more resources can be seen in the change of time allocated to conduct better and broader user tests and actually have time to consult theory both when developing, but also when analyzing the UX work.

E. UX processes

The interviews from 2013 revealed a lack in described UX processes and this seemed to be one of the most extensive challenges when working with UX in an agile development environment. This corresponds to the findings in [7] and [33], who both found that usability and UX work was conducted informal and unplanned. Furthermore, a couple of the companies pointed out, that the lack of UX processes were a problem, since no one was appointed the responsibility for the UX area and a lot of the UX work were only done, when someone remembered it. However, it was something the companies were aware of and they were working on having the UX work formalized.

The interviews from 2015 revealed that the companies have been successful in developing more formalized UX processes and three of the companies now has UX as a part of their overall development process. By having a process it is possible to record the work with UX and four of the companies have or are planning to have UX matrices, in order to be able to keep track of the UX work and the impact as well.

F. Usability and UX methods used within the organisations

In both 2013 and 2015 all of the companies used low-fi prototyping, which corresponds to the findings in [32]. The other methods correspond to the methods mentioned in both [30] and [31]. However, none of the two references mentioned the use of user task analysis and user or customer journeys, which two of the interviewed companies were using in 2015. In 2015 two of the companies were experimenting with introducing new methods. However, it is striking that the methods is introduced by academia, this is something to take note of, since this could be an indicator on that the methods developed within academia are not readily accessible and maybe too detailed or time consuming to be employed by the industry.

G. Developers as a UX ressource

The companies are very interested in having software developers take part in UX work. This is very promising in relation to a both a potential integration between UX and agile development, since the developers could be relied on as a UX work resource, and to the development of usability methods that is applicable within one development sprint.

An idea put forward by one of the interviewees is to use Rapid Iterative Testing and Evaluation (RITE). In this case, this method is described in [49].

H. UX work conducted within an agile framework

There is no tradition for UX practitioners to work within an agile development framework. In 2013 only one company had their UX practitioners working agile and it was only when they worked on a specific project using Scrum in the first place. The resent two years the companies have been very iterative in their development process and in three of seven companies the UX professionals now work agile. However, the companies do not perceive usability/UX and agile development as integrate as described in [30].

In 2013, 88% of the companies supported the idea of agile UX. 50% would like to have the UX designers fully integrated in the agile development team and 38% would

like that the UX designers have their own UX team. All of the interviewees could see a potential in increasing the work with UX design.

As one of the interviewees pointed out in 2013: *"When we started using Scrum, a much greater transparency emerged and it was easier to trace which tasks took the longest in the software development"* [I3]. This could be an indication that if UX design is integrated in the Scrum framework, the UX work can be more transparent as well. The UX work will then be broken down into tasks, fitting into one iteration (sprint). This could help make clearer goals for the UX practitioners and make value deliveries to the development more transparent. All in all, by using Scrum as a lifter for more in-depth UX processes, it would be possible to address the points stated in [29] for a successful usability outcome and to secure stakeholder involvement.

In 2015 all of the interviewees support the idea of agile UX. 71% would like to have the UX designers fully integrated in the agile development team and 29% prefer their own separate UX team. When working with UX design, the companies seem to be using either a parallel approach as described in [45] or a satellite approach as described in [46]. In 2015 the approaches were almost the same as in 2013, however one of the companies was working with a mix between the satellite and parallel approach, where the practitioner was working parallel with one team and as satellite on three other teams.

VI. CONCLUSION

In the past two years the investigated companies have obtained a better understanding of the concept of UX and UX has matured within the companies. This was revealed by the fact that almost all of the companies have had or are developing a UX strategy together with more formalized UX processes. It is also significant, that they allocate more resources to UX work in 2015. This combined with a deeper understanding of the importance of good usability and UX has induced more resources to conduct UX and usability work. In three companies UX is now a part of the overall development process and four have or are developing UX matrices in order to measure and keep track of the UX work and impact. All of the companies make use of low-fi prototyping, followed by usability testing, workshops, personas, expert evaluations, user or customer journeys, customer visits and user task analyses. Two companies are experimenting with new usability methods in collaboration with academia. This indicates that a closer collaboration between industry and academia can help introducing new usability and UX methods within the industry. Almost all of the companies are employing Scrum. UX work is carried out in a very iterative manner and 43% of the companies are conducting UX work within an agile development environment. All of the companies are interested in the idea of agile UX, and find the idea of using the developers as a UX resource interesting. This together with the idea of

modifying existing usability methods to be used in an agile, industrial setting could be a solution to bridge the gap between academia and the industry.

As a final note, it should be kept in mind that the study was limited to eight Danish companies in 2013 and seven in 2015. We can therefore not draw definite conclusions about the generalizability of the findings to other sectors or countries.

VII. TIPS FOR PRACTIONERS

The following are suggestions that companies can have in mind when working with usability and UX design in an agile development context:

- Consider to use the Scrum framework as a lever for the us ability and UX work
- Consider to modify usability and UX methods so they suit within the agile development framework used within the company
- Consider to use the software developers as a UX work resource by enhance their qualifications within the field of usability and UX

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