HCI Practices in Agile Software Development

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Abstract—Software development field is becoming more productive day by day with the wonderful model name Agile. Agile is the main focus of research now a days. It is because of its abilities of handling changes in efficient way through iterative and incremental practices. Although it became famous because of its capabilities still there are some issues in it, which is ignorance of usability engineering in different phases of agile that is an important aspect to understand the software. Usability has deep roots in software quality and is a core construct of HCI. To develop interactive and usable systems there is a need of such a model which can integrate HCI with Agile. To address this issue. To solve this issue we have proposed a model which will work with both User Centered (main focus of HCI) and Agile by assembling different practices from both fields which will result useable products. It will enhance software life with user satisfaction by giving them running software with usability.

I. KEYWORDS

Agile methodology, Usability engineering, Human Computer Interaction, User Centered, UCAM, CASI

II. INTRODUCTION

Growing importance of softwares in daily lives of people have increased the need of such approach which can deliver product in short time along the ability to handle changes [1] [10] [11]. Software production must be iterative otherwise it will be hard or complex to handle [9]. Traditionally there were different models with different advantages for developing software but because of rapid changes in our society, Agile has taken place all of them because of its nature of giving warm welcome to changes [2]. instead of having different abilities, still there are some issues present in Agile too, that is developers focus on core functionalities only and ignorance of the main subject name HCI and interface design which is necessary to understand the whole project [2][3][4][5][6][7][8]. Different systems are developed which are accurate in functionalities but not easy to use for nontechnical users and led to failure. Only the usability can prevent the system from failure by giving deep understanding of users and their goals toward product in effective way, but the question(RQ1) here is how to integrate these two areas of software engineering and usability engineering to produce a quality and usable product? Many authors have tried to solve this issue. Agile promise for working piece of code but it is not sure about usability. Another question(RQ2) is will the proposed model solve the existing problems? To ressolve the issue of usability we have proposed a model in our paper which is UCAM (User Centered Agile Model) using HCI practices with Agile to achieve usability. This method will integrate both fields in

effective way. The idea of UC (User centered) is difficult to implement because of low priority given to usability [12] in agile. The Coaching method and CASI will used in proposed model to address this problem. At the end we have validated our model through case study that shows usable results.

A. Problem Statement

Many software's led towards failure because of lack of awareness about usability. Agile can produce working piece of software but it cannot provide interactive and understand-able interfaces which brings difficulties for non-technical users. Some corporations still focus solely on the usability analysis at the end of development instead of following a user-centered approach from the beginning. Lack of usability, late interaction with usability, complex interfaces, is probably the main reason leading towards the failure in achievement of usability. To remove these barriers from the way of success we will incorporate usability with agile through integrated framework.

III. BACKGROUND

A. Agile Methodology

As we all know about the active topic of today's world is the Agile that have overcome time barrier and deliver the required product within given time frame along the involvement of customers [15]. It also has to ability to manage changes with the help of its ultimate abilities and practices that are shown in figure 1. They all support agile to do work in impressive way but still there is need of Agile integration with different topics of HCI. There are a lot of work came in front regarding to the integration of these two fields for the production of usable software.

Fig. 1. Agile influences

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B. Usability Engineering

Usability is about developing interactive and simple de-sign interfaces that can be understandable, effectively and efficiently used by the people. Usability deals with different aspects like memorability, learnability and efficiency. The ISO 924 1- 1 1 defines usability as "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". Usability engineering provides structured ways for achieving usability within the system development method. It is an iterative style and analysis that facilitate customers to produce the feedback concerning the merchandise utility, usefulness and design during the overall development cycle. It emphasize that UCD is methodology for carrying out usability [28]. User's experience (UX) can be measured by usability when communicate with system whether or not its an online website, a software application, or any user-operated mobile device [22]. The practices and theories agile and usability have much in common are: Both follow cyclic development cycles, human centered and emphasize on team coordination and communication. [1].

IV. LITERATURE REVIEW

An authentic standard ISO 9241-210 are used these days for different HCI process like HCD (Human Centered Process) that consist of different phases including planning phase which are performed in iterative way [2].
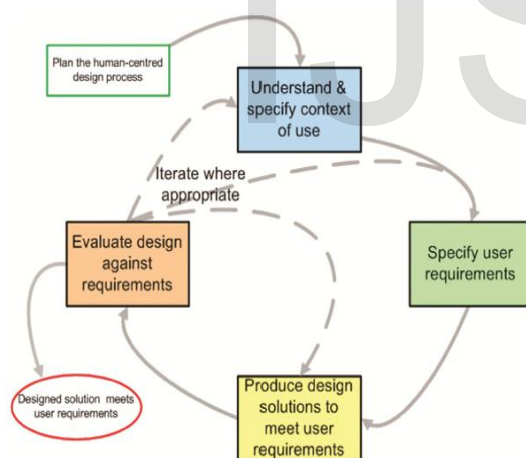

Fig. 2. design process

. The figure 2 is providing an overview of HCD but unfortunately, it does not providing the complete description and understanding about the integration of Agile into HCD. It can be a great model if agile start giving attention to the HCD aspects. This is an integrated model designed by Paelke et al. [6] named as Agile UCD process. This process give little explanation about the developer phase and HCI specialist but it is not quite clear about the sequence of activities. SBD (scenario-based design,) start with a comprehensive require-ment analysis process followed by iterative evaluation cycle

that was longer than XP iteration and it focused more on requirement gathering and low-fidelity prototyping early in development process. This design process result improvement in usability but it is not suitable in many agile practices which focus on continuous working of software and minimal up front design. Agile practitioners need to explore the way that can incorporate usability engineering into Agile [14].however there are many issues in integrating them because agile is incremental and iterative in nature and do not support any kind of overview about architecture interface which is most important aspect to develop usable software with interactive interfaces [1]. Kollmann et al., 2009 states that the amazing methodology agile can deliver quality code but it does not assure consistence interfaces [16], because its main focus is to deliver working piece of software after each iteration. Microsoft also focused on the usability advantages in software development. The reason behind the involvement of usability engineering is to minimize the cost of training that is necessary to for users to understand the software and enhance the life of software by getting long lasting acceptance and satisfaction from end-users [17]. Another issue argued by Sohaib and khan (2010) is the identification of real end users because in many cases others business representator presents theirselves as end-user. Identification is important because end-users are the important aspect while requirement elicitation and during over-all project development [18]. Another model for integration was developed by lee et al (2009) named Extreme Scenario-based Design (XSBD). The main concept of this model was central design record (CDR) to maintain the communication between stakeholders, agile experts and usability tester. Sharp et al (2013) focus on customer and Extreme programming collaboration and effectiveness of integrating UCD to improve usability in XP [19]. McNeil (2013) states that low-reliability prototyping and storyboarding is an iterative approach that focus more on interface design than code module [20] and it can be improved by involving main topic of HCI (UCD) in agile. Therefore agile need to adopt usability engineering for the production of quality and usable products [20]. Although usability and agile have much in common still there are some issues in merging them. It often substitutes the client as the user-advocate as it has multiple iterations. In Extreme Pro-gramming (XP) Software engineers value the "input from the on-site customer", but they do not focus on the concept of user-centered design [22][23][24][25][27]. Najafi and Toyoshiba

[28] addressed that the agile development can be improve by incorporating the User Experience Design (UED) practices in it and it can also improve product usability by involving the User Experience team due to which user research and testing can be utilize to prioritize features in the product backlog which will result refine and better usability of products.

V. PROPOSED MODEL

We have proposed a model in our paper for the solution of previous problems. We have used different usability evaluation process to check the usability incorporation in our model. There

are different phases includes in our model. We have discussed them one by one. .
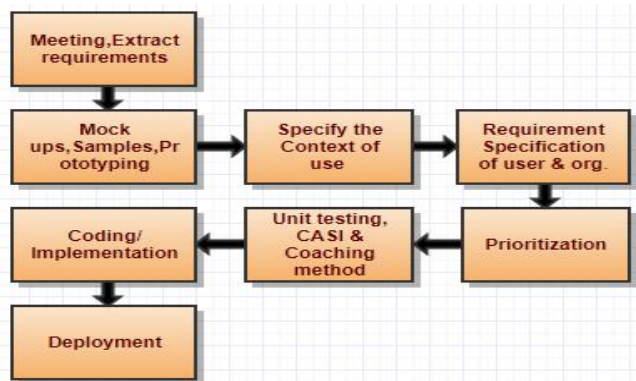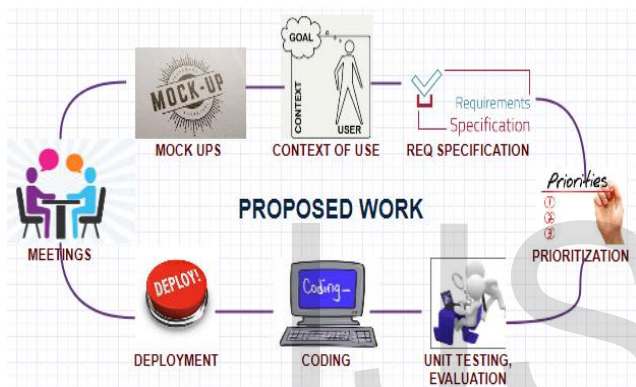

Fig. 3. Proposed Model

Fig. 4. Proposed framework.

A. Meetings

The first step in the process will be meeting. This step takes a lot of time and effort because all requirement gathering from different sources are held in this step and real user identification will also done in this step with the help of different open-ended question regarding to project. Identifi-cation of real user in necessary because the working of whole project is depending upon requirements. Unlike the traditional software development process agile has less documentation. It works in iterative and incremental manner which is very helpful for dividing a large project into small modules. If any change occurs according to customer feedback will be added in next iteration. This process will collect all the necessary requirements of the first module to perform task before meeting deadline in efficient way.

B. Mock-ups

In this phase designers used the Mock-ups mainly to accumulate feedback from user side regarding styles early within the process of design. Its very early prototype made from low-fidelity materials or cupboards. The user power-associated by the designer, might take a look at model (imagining

that it works) and therefore give valuable feedback regarding practicality, usability, understanding of the fundamental style plan etc. The design of mock-ups, can be collectively change by the user and designer using commonly used tools like scissors, pencils and pens etc. As such, mockups are discussion to help and bridge gaps between user and designer.

C. Specify the Context of Use

In this step which is the actual practice of HCI, beneath that a given artifact/software product is employed or are employed in a traditional day to day scenario. Its vital to hold out usability related tests, meetings, prototyping sessions, user studies and alternative user-dependent sessions within the context of use to include as high rationality of your discoveries as doable.

D. Requirements Specification of User and Organization

The user necessities specifications define the desires of business for what user need from the system during this step. They are written in an early phase within the validation method before the system is formed. Specifications are unit written by the end-users and system owner, with input from Quality Assurance. Public necessities in this step are tested usually by User acceptance testing and performance qualification. It must not be a technical document so readers having solely a knowledge concerning system ought to be able to perceive the necessities highlighted.

E. Requirement Prioritization

In this phase requirements will be prioritize which is used in software product management for outlining that someone needs of a software package must be enclosed and enforced in a very bound unharness. Leader of the team will collect all requirements of the customer then he will prioritize the elicited requirements according to user level of interest. Prioritization is also done to minimize risk during development so that the designer will implement the most important or high-risk requirements first.

F. Unit Testing, CASI (Cognitive Analysis of software inter-faces) and Coaching Method

Phase of software system testing in which individual units/elements of a software system are tested is termed as unit testing. The purpose of this testing is to validate that each unit of the software performs its tasks as designed. In coaching method, we will allow participants to raise associate degree system related queries to a professional coach and the coach will then answer to the best of his/her ability. Basic goal of this system is to find the data wants by the users, so as to produce higher coaching and documentation. Moreover, as probably plan the interface to avoid the requirement for the queries which will enhance the usability. Tester and expert users will serve as a coach [29]. After understanding of users CASI evaluation is start. CASI is an evaluation expert which will check all mockups according to user defined requirements with the help of some questions: Is this easy to use? (Simple and

easy) AND is this easy to learn? (Easy to learn so user can perform task again without thinking too much) AND Easy mastery? (Interface has enough information, no need of help centers) AND Memorable? (User can use software next time without training) The process will stop working if answer of any question will be NO from the user side. The mock up will send back to previous iteration for modification according to user perspective until all answers become YES.

G. Coding and implementation

In the coding phase development of code and implementation of interactive and simple design interfaces will be done that will be understandable and learnable for each user. The basic job of this part is to convert designing into source code using the programming language agreement/decided in designing part. The well-developed code in this phase can help to reduce the efforts required in testing and maintenance.

VI. METHODOLOGY

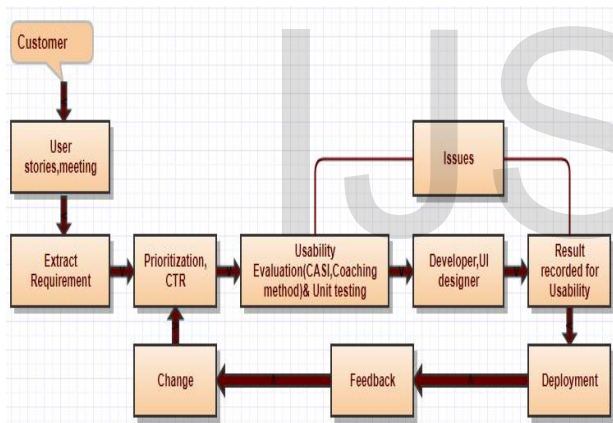In methodology flow of framework is described.

Fig. 5. Methodology

A. DEPLOYMENT

At the end of iterations software is ready for deployment at customer side. If user want any changing ,the proposed model is able to welcome and fix that change to reduce the failure chance.

B. INTEGRATION

Integration of proposed model with agile UI designer will enhance the working and usability of software. It will also reduce the cost which causes because of failure and short life of software and occurence of changes again and again due to lack of understanding. Table no.1 will show the integration of proposed with Agile.

TABLE I
INTEGRATION OF PROPOSED SOLUTION WITH AGILE.

	Agile methodology	Proposed work
Requirement elicitation	Manuals,wish list	Meetings
Usability	Not defined	CASI,Usability Expert
Testing	Unit, Acceptance testing	CASI,Coaching Method, Unit and Acceptance test
Achievements	Working software	Working Software along usability
Deployment	Not Defined	Get users feedback

VII. CASE STUDY

For the validation of our proposed model's feasibility, we have applied our model step by step in a organizations project who were using Agile approaches but they were unaware of usability. Main objective of this potion is to check wheather our proposed model is working according to its promises and generating the project with usability features or not. The case study of Gophers project, will be presented describing the integration of HCI practices in agile. The Gophers project successfully adopted proposed model and generates positive results in contrast to previous project. The one reason of success is the proper involvement of user with project throughout the development. Main concern of the project was to create websites with attractive interfaces for online shopping, because online shopping trend is increasing now a days, but still some people especially women face a lot of complexities in interfaces during placing their orders. Division of project was based on three iterations and had team of five members including Domain expert, UI designer, Coder, Tester, Usability expert.

A. Proposed Model in Action

First step of our model was meeting with client to gather data and extract requirement from different sources including domain expert. Every requirement was noted in a wish list then the wish list got prioritized according to the stakeholder priority. In the next step UI designer designed the mockup's according to priority with keeping in mind the context of project for which user want the software. Developer designed attractive interfaces for easy use and only having the important features to make interfaces simple. After this mockup were evaluated through users and sent back those having errors or any difficulty in understanding. The evaluation part was done by tester and Usability expert using CASI and Coaching methods. These methods were considered as surety that product is understandable and easy for user. At the end of testing, Coder starts the coding and implementation of only those mockups which were accepted. Rejected mockups were return to UI

designer. The final phase was deployment and feedbacks from user side were recorded to fix in next iteration.

VIII. RESULTS

When all the process done results were concluded which shows the difference. The project done by integrating HCI practices in Agile was much better than the old techniques. It also increases the life of software and decreases the failure rate with the achievement of usability features. Our proposed model made product more impressive and useful. The graph shows the increasing success rate of usability with agile. Because more people can understand and use the web site.

Fig. 6. Success rate with Agile

Fig. 7. Success rate after integration of proposed work

IX. CONCLUSION

In this paper, we have discussed that agile alone cannot guarantee usable software. To increase software life cycle many HCI techniques should be incorporates in Agile method-ology, for example a lot of unvaried/iterative approach and testing of usability during the whole project lifecycle which is able to enhance the usability. Agile method need to work with aspects of usability like developing mockups in the starting phase and usability specialist in the team. We have proposed a model (UCAM) in which we have integrate the HCI methods in agile methodology which will produce interactive software. We have shown the answer of RQ1 and RQ2 with the help

of evaluation which shows that our proposed model will con-tribute in achieving usability. The future can still provide work for a lot of elaboration about integration and fix /bridge the gap between HCI and Agile for better results in development field.

REFERENCES

[1] Lee, J.C. and McCrickard, D.S., 2007, August. Towards extreme (ly) usable software: Exploring tensions between usability and agile software development. In Agile Conference (AGILE), 2007(pp. 59-71). IEEE..

[2] Balbir, S., 2016, August. Do You Own a Volkswagen? Values as Non-Functional Requirements. In Human-Centered and Error-Resilient Systems Development: IFIP WG 13.2/13.5 Joint Working Conference, 6th International Conference on Human-Centered Software Engineering, HCSE 2016, and 8th International Conference on Human Error, Safety, and System Development, HESSD 2016, Stockholm, Sweden, August 29-31, 2016, Proceedings (Vol. 9856, p. 151). Springer.

[3] Forbrig, P. and Herczeg, M., 2015, September. Managing the Agile pro-cess of human-centred design and software development. In INTERACT (pp. 223-232).

[4] Kuusinen, K., 2015, September. Task allocation between UX special-ists and developers in agile software development projects. In Human-Computer Interaction (pp. 27-44). Springer, Cham.

[5] Memmel, T., Gundelsweiler, F. and Reiterer, H., 2007, September. Agile human-centered software engineering. In Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI... but not as we know it-Volume 1 (pp. 167-175). British Computer Society.

[6] Paelke, V. and Nebe, K., 2008, February. Integrating agile methods for mixed reality design space exploration. In Proceedings of the 7th ACM conference on Designing interactive systems (pp. 240-249). ACM.

[7] Paul, M., Roenspie, A., Mentler, T. and Herczeg, M., 2014. The Usability Engineering Repository (UsER). In Software Engineering (pp. 113-118)..

[8] Sy, D., 2007. Adapting usability investigations for agile user-centered design. Journal of usability Studies, 2(3), pp.112-132.

[9] Forbrig, P. and Herczeg, M., 2015, September. Managing the Agile pro-cess of human-centred design and software development. In INTERACT (pp. 223-232).

[10] Olsen, G., The emperor has no lab coat, Interactions, vol. 9, no. 4, 13-17, 2005.

[11] Chamberlain, S., Sharp, H. and Maiden, N., 2006. Towards a frame-work for integrating agile development and user-centred design. Extreme programming and agile processes in software engineering, pp.143-153.

[12] HAL Id: hal-01055490 https://hal.inria.fr/hal- 01055490 Submitted on 12 Aug 2014

[13] Paul, M.O., 2016. Systemgestutzte Integration des Usability-Engineerings in den Software-Entwicklungsprozess (Doctoral dissertation, Lbeck, Univ., Diss., 2016).

[14] Sharp, H., Biddle, R., Gray, P., Miller, L. and Patton, J., 2006, April. Agile development: opportunity or fad?. In CHI'06 Extended Abstracts on Human Factors in Computing Systems (pp. 32-35). ACM.

[15] "What is agile software development," May 14, 2009, (Online) Avail-able: http://www.agilealliance.org/show/2. Retrieved on December 2013.

[16] Kollmann, J., Sharp, H. and Blandford, A., 2009, August. The impor-tance of identity and vision to user experience designers on agile projects. In Agile Conference, 2009. AGILE'09. (pp. 11-18). IEEE.

[17] Microsoft Corporation: Usability in Software Design, (Online) Avail-able http://msdn.microsoft.com/enus/library/ms997577.as px. (Retrieved: December 2013).

[18] Sohaib, O. and Khan, K., 2010, June. Integrating usability engineering and agile software development: A literature review. In Computer design and applications (ICCDA), 2010 international conference on (Vol. 2, pp. V2-32). IEEE.

[19] McNeill, M., 2000. User centered design in agile application develop-ment. ThoughtWorks Ltd.

[20] Saad et.al /International Journal of Software Engineering and Computer System 1(2015) 29-40

[21] "Usability basics," [Online] Available:http://usability,gov/basicsiindex,html[Acce ssed: December 2009]

[22] Fox, D., Sillito, J. and Maurer, F., 2008, August. Agile methods and user-centered design: How these two methodologies are being successfully integrated in industry. In Agile, 2008. AGILE'08. Conference (pp. 63-72). IEEE.

[23] Ungar, J. and White, J., 2008, April. Agile user centered design: enter the design studio-a case study. In CHI'08 Extended Abstracts on Human Factors in Computing Systems (pp. 2167-2178). ACM.

[24] Chamberlain, S., Sharp, H. and Maiden, N., 2006. Towards a frame-work for integrating agile development and user-centred design. Extreme programming and agile processes in software engineering, pp.143-153.

[25] Dchting, M., Zimmermann, D. and Nebe, K., 2007. Incorporating user centered requirement engineering into agile software development. Human-computer interaction. Interaction design and usability, pp.58-67.

[26] Lee, J.C. and McCrickard, D.S., 2007, August. Towards extreme (ly) usable software: Exploring tensions between usability and agile software development. In Agile Conference (AGILE), 2007(pp. 59-71). IEEE.

[27] [27] Lee, J.C., McCrickard, D.S. and Stevens, K.T., 2009, August. Examining the foundations of agile usability with eXtreme scenario-based design. In Agile Conference, 2009. AGILE'09. (pp. 3-10). IEEE.

[28] Najafi, M. and Toyoshiba, L., 2008, August. Two case studies of user experience design and agile development. In Agile, 2008. AGILE'08. Conference (pp. 531-536). IEEE.

[29] Butt, Dr Saad and Vera Anatol'evna Gnevasheva and Subashi, Brunilda and Gattaz, Cristiane and Zaheer, Shazia, Using Community Heuristics for Crowdsourcing Platforms Interface Evaluation (February 20, 2018). International Journal of Scientific & Engineering Research Volume 9, Issue 2, February-2018 ISSN 2229-5518 . Available at SSRN: https://ssrn.com/abstract=3127019