TEIM- THE EVOLVED INTEGRATED MODEL OF SE AND HCI

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Abstract-In this paper we are proposing a new model for product design and development. This new model is named as TEIM. In this paper the model is presented first and afterwards comparison with other models is done. Also a note on how this model evolved is given.

Keywords— **Software Engineering, Human Computer Interaction, PS prototype, Persona, Scenario, Representative Contextual Inquiry, Software requirement Specification, Empathy Map, Wireframes.**

1. INTRODUCTION

This work is part of the research work being carried out which explores prior research work for smooth integration of software engineering life cycle with human computer integration[1] [2][3][4][5][6][7][14].

Dr.Anirudha Joshi [1] [2], Seffah [5], Jerome [6] and Kazman [7] and Nielsen [12] are some of the researchers who are at the forefront as far as integration of human computer interaction activities are concerned. These people and their works are inspiration for the authors to explore this area. In this paper we are proposing a new model of product design and development. This model evolved when we were half way thru the development phase of product by name **PS** [15]. We can say this model is a byproduct of PS product development. Whatever steps[15] on the lines of integration of software development life cycle and human computer interaction design were and are being used to develop product PS, collection and compilation of those steps lead to the development of the new model "TEIM-The Evolved Integrated Model of SE and HCI".This model can also be a contending model with waterfall model[16] or Extended Waterfall Model[2].The model is not a tightly fitted model in the sense the authors have taken the liberty of picking up methodologies from various models[2] [16][17] including UML and Agile methodology for developing the product PS.The authors strongly believe that none of the conventional talked about models say waterfall, Agile, scrum, RUP, UML are followed to the tee during software development rather each project in itself is a unique experience using various mix of models and methodologies. Hence this flexibility in selecting the techniques and methodologies from various software development philosophies and merging them with human computer interaction activities. Again the merger of software engineering activities with human computer

interaction activities is done because of the authors strong belief in relevance of HCI in SE after exploring prior research[1][2][3][16].

TEIM-The Evolved Integrated Model of SE and HCI is as depicted   in   Figure   1
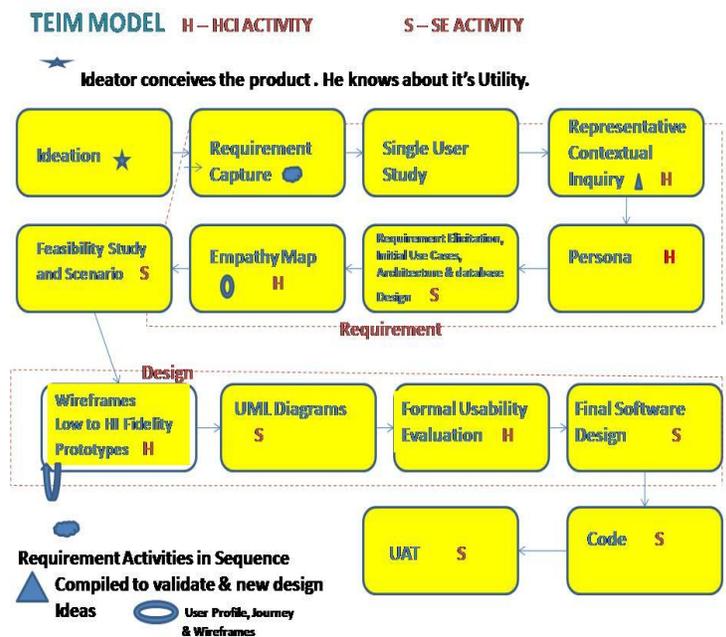

FIGURE 1 *TEIM-THE EVOLVED INTEGRATED MODEL OF SE AND HCI*

1. TEIM COMPONENTS AND THEIR OUTCOMES

Here we are going to discuss the TEIM model, its components and their outcomes. This model evolved naturally while we were using our instincts to develop PS product using integrated model of software engineering and human computer interaction. The model TEIM as depicted in Figure 1 has colors and visual indicators, their explanation is as depicted in table 1.

The model TEIM, its components and their outcomes are depicted in Table 2.

In the next section a discussion on prior work related to

sno	Visual indicator	meaning	remark
1	Blue Rectangle	Steps of product development executed in sequence	Some steps can be done in parallel
2	----------------- Red dotted box	Phases of software Development	Two major phases : Requirement Capture and Design are depicted while code and UAT are not depicted as we are half way thru the product development phase
3	Red bold letter **S**	Software Engineering	Indicate the methodology of product development
4	Red bold letter **H**	Human Computer Interaction	Indicate the methodology of product development
5	☆ Blue Stars . Blue Filled Circle	The purpose of the step is indicated at the bottom left side of the table	

TABLE 1
VISUAL INDICATORS OF TEIM

Integration of software engineering and human computer interaction is made based on [2].

2. SE and HCI INTEGRATION

A comparison chart of TEIM with extended waterfall model as proposed by Dr.Anirudha Joshi [2] is depicted in Table 3. TEIM evolved as a result of PS product development steps followed by the authors more on the lines of "OK what should I do next and what simpler tool is available to do that" .Here the product came first and the model came later. Nearly same number of steps is seen in both the models in the comparison chart.TEIM focused more on requirements and user understanding in the initial stages, the design part started very late. Step number 3,4,5,6 can also be done in parallel as in real

sno	Step	Outcome
1	Single User study	Understanding the Ideators beliefs regarding the product
2	Representative Contextual Inquiry	Conduct 6-7 CIs, compile them and identify additional design Ideas
3	Persona	A fictitious representation of target user of the product
4	Requirement Elicitation	SRS (software requirement specification) for the product PS It will give a good idea about the product being conceived. The SRS is developed using googled SRS template available on internet
5	Empathy Map	To understand User Profile To generate User Journey To create initial wireframes To identify partners
6	Feasibility Study	What kinds of problems the PS product will solve What are the Technology challenges for the PS product
7	Prototype	Create low and high fidelity prototype
8	UML diagrams	To create model of software
9	Formal usability Evaluation	Testing technique used in user centered design to evaluate a product
10	Final software design	Consist of low level components and architectural view
11	Code	Coding and deployment
12	UAT	Test to confirm whether the requirements specified by the user are met

TABLE 2
TEIM COMPONENTS AND OUTCOMES

Industry scenario teams are involved with lean thinking and agile approach being adopted.TEIM assumes some of the phases and steps as implied say deployment and maintenance. Other activities are left untouched say planning in waterfall model as the model was need based and planning and management activities were not taken up by the authors. While extended waterfall model [2] is based on pressman's waterfall model and structured and process based. For a conventionalist addition of empathy map may not be likeable but the authors felt for initial wireframes, user journeys and user profiling this is the best tool. Some of the steps are named similar in both the models say ideation but they are initiated at different times and the objectives are also slightly varying which can be derived from Table 2 and Table 3.

At a broader level TEIM looks similar to what Allen Cooper said [2 p.88]- generate idea, design, build and

sno	Steps in extended waterfall model in sequence and outcomes	Steps in TEIM in sequence and outcomes
1	Project Initiation-initial project brief, business goals, technology capabilities, and constraints	Ideation-A new product idea conceived by a creative thinker
2	User Studies-user observation, contextual inquiry, focus groups, stakeholder interviews	Single User study- Utility and need of the product as envisaged by the owner of the idea
3	Ideation- Compilation of product ideas	Representative Contextual Inquiry- Complied to validate the initial idea as well as additional design ideas and understand constraints
4	Product definition-high level design	Persona- Fictitious representation of the user of the product
5	Usability evaluation 1 and Refinement- Low fidelity prototype is tested and product is refined	Requirement Elicitation, Initial Use case, architecture and database design
6	Requirement Specification-Requirement gathering	Empathy map- for user profile, User journeys, Initial Wireframes
7	Planning	Feasibility study and Scenario-Product abilities and technology challenges, a brief walkthrough
8	Modeling- UML, Software architecture, low level detailed design	Prototyping- Wireframes and prototypes iterated from low to high
9	UI prototyping- screens, mockups	UML diagrams
10	Usability evaluation 1 and Refinement	Formal usability evaluation
11	Construction – coding and testing	Final software design
12	Development support	Code
13	Usability evaluation 3	UAT- user acceptance test
14	Deployment	Implied step

TABLE 3

COMPARISON OF TEIM AND EXTENDED WATERFALL MODEL

and construct. The extended waterfall model [2 p.97] kept number of phases as it is as they are in the base waterfall model by pressman which is communication, planning, modeling and deployment. In TEIM two phases are depicted explicitly and are named as Requirement Capture and Design while the rest of the phases are implied as the activities are nearly same.
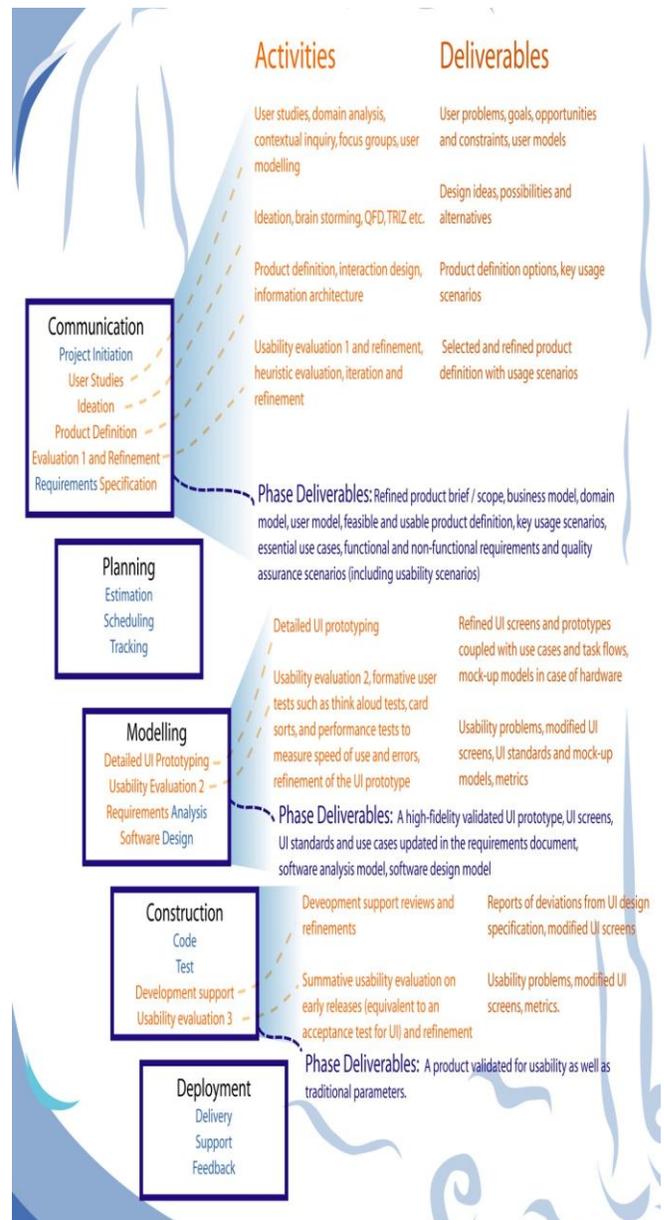

FIGURE 2

ANIRUDHA JOSHI'S EXTENDED WATERFALL MODEL

When compared to Costabile model [2 p.85] again in costabile model ideation is not explicitly mentioned and empathy map is a new addition in TEIM.

All the integration models core theme and activities look similar but their placement and need to place at that specification location vary.
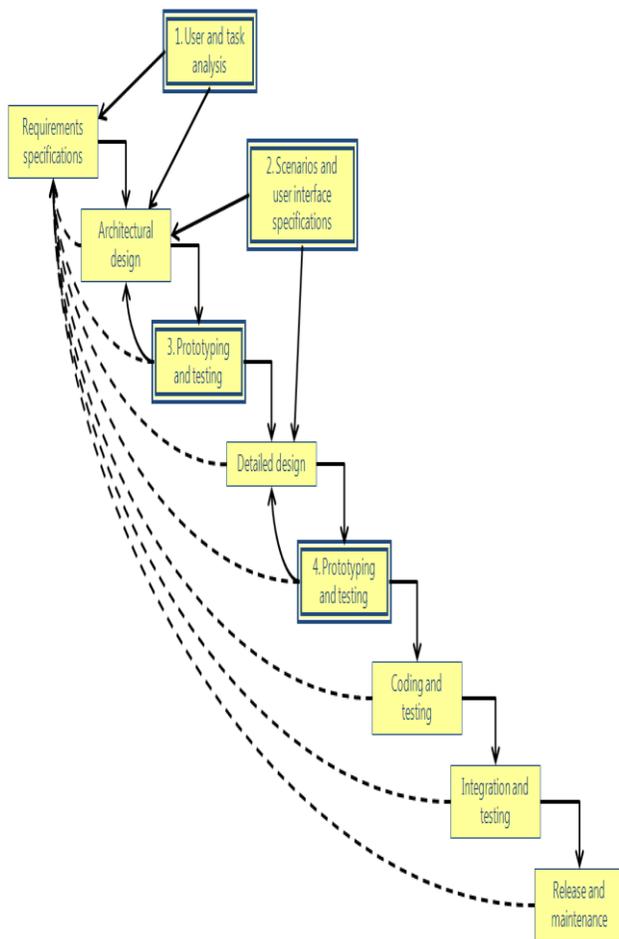
FIGURE 3
COSTABILE'S INTEGRATED WATERFALL MODEL

3. CONCLUSION

In this paper a new integration model of software engineering and HCI is proposed. The question remains is of its utility and acceptability. The answer to this will be derived after the entire product development life cycle of PS is complete. The authors intend to do regression analysis and also apply UGAM tool and IOI tool [2] to PS and compare results with prior research of [1][2].

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