

Knowledge Management in the Ubiquitous Software Development

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Abstract

The continuous technical advances have lead to the proliferation of very small and very cheap microprocessors, equipped with sensors and capacity of wireless communication.

The information processing is becoming ubiquitous and it is being impregnated in all type of objects.

In this article the general delineations set out towards a methodology of securing of the quality of software ubiquitous based their main characteristics: centered in the user and highly interactive. Moreover, it considered to the usability as the quality characteristic of more relevant in the development of this type of highly interactive software systems.

1. Introduction

The “Ubiquitous Computing” term, was proposed does more than fifteen years for Mark Weiser, an investigator of the Palo Alto Research Center of XEROX [1].

Weiser see the “ubiquitous computing” term in a more academic sense and idealistic, as a sight of discrete technology, centered in the person, while that the industry adopted for that reason the “Pervasive Computing” term, or widely diffused with a lightly different focusing [2]: although your sight follows being still integrate the prosecution of the information in daily objects of almost invisible form, your main objective is to use such objects in the environment of the electronic commerce and for techniques of businesses based on the Web.

This sight of “informatization” with the time will be successful from a commercial viewpoint and will have undoubtedly enormous economic and social repercussions as well. Also it will put in debate question about the acceptance of the technology and of the creation of a world where the reality will remain tightly related with our cyberspace based on the information. However, it exist an aspect that few authors treated: the measurement of the quality of the computational applications ubiquitous, subject extremely relevant if consider the critical components of many of these applications.

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2. Quality process management for the ubiquitous software development

If you want measure to “Quality” concept, understood as the perception that has the client of determined product or service respect to the same, and specially, the software quality, first it must differ between the product or service (software) quality and the process of manufacture (development) quality of this one, this implies that the goals that settle down for the product quality are going to determine the objectives to establish of quality of the development process, since the quality of the first is going to depend, among other aspects, of this one. Without a good process of development it is almost impossible to obtain a good product.

In this sense most ubiquitous software development methodologies follow the line that make stand out diverse authors about striving for involve to the user in the development of the interactive system [3], it is knows like that design centered in the user.

Other of the pillars basing these methodologies is the incorporation of the evaluation in all phases of development, in an iterative way. By centering in the evaluation, like a primordial element in this model of design, considers indispensable to know from a phase early of the development, the exactly information about the tastes of the user, preferences and needs, and identifying the requirements in the current environment as well. To achieve these objectives have been applied something of the investigation techniques, together with other to call that sketching techniques, sceneries, models, prototypes and simulation, between other, belonging to the whole of techniques of “imagine design” [3].

2.1. Centered Design in the User

It proposes a centered design in the user, that it is the one which the HCI area (Human Computer Interaction) it established for recognizing the importance of the user intervention in the activities of evaluation [3]. It deals with of a centered closeness in the people, the work and their environment. The scheme to follow throughout the

development process is the one that appears shaped in the figure 1, this denominates like model of iterative process.

This scheme consists of the classic life cycle in cascade, although, as it can be seen reflected, the evaluation is not built-in, occupying a strict order within the cycle, but that becomes an activity in continuous operation. This allows the development process feedback.

2.2. The method of imagine design

Without place to doubts, the model before defined escapes of all habitual existent practices nowadays on time to face to an interactive system. Producing a good design below this characteristic requires considerably creativity and perspicacity of the designer. With object to adapt to these circumstances appear the techniques of “imagine design” [3].

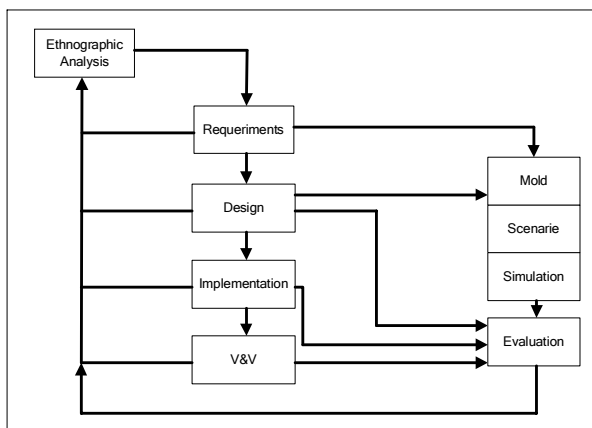


Figure 1: Model of Iterative Process

These techniques are centered in the visual appearance of the interface and its behavior. For it resorts to different visual representations from the conceptual model of the system that, like that intuitive sketches, try to explore the design space. Also, these first representations of the design are going to be object of revision and analysis to be outlining progressively, throughout all the process, different aspects from the functionality of the system, following a strategy of progressive refinement, as that can be appraised in Figure 1.

In this family of techniques, two they begin to appear is highlighted to guarantee the quality of the ubiquitous applications design: sceneries of future [4] and prototyping [5].

2.3. Knowledge management from a agile sight

Since some years it a growing interest in the agile methodologies, characterized alternately like antidote to the bureaucracy of the traditional methods calls in

the panorama of the software development. Respect to the topic that gives origin to this investigation the main reasons to include the agile methods, are not so much their weight but their adaptive nature their people orientation [6].

In the environment of the ubiquitous software development, proposes consider the Alistair Cockburn Crystal family. It is a family because they believe that the different types of projects require different types of methodologies. They see this variation along two axes: the people number in the project and the errors consequences as for the criticality of the system. Each methodology fits in different part of the matrix, so that for a project of forty people, where they can lose money discretionally has a different methodology to a vital project of six people.

The methodology has a strong human orientation, but this centralization at the people is made of a different way. Cockburn consider that the people find difficult follow a disciplined process, so more than to follow the high discipline, explores the less disciplined methodology that even could be successful, interchanging consciously productivity for facility of execution. They consider that although Crystal is less productive that other agile methodologies, more people will be able to follow it.

Also it puts a lot of weight in the revisions at the end of the iteration, animating to the process to be the best. This assertion is that the iterative development permits find the problems early, and then to correct them. These puts more emphasis in the supervising of the process and by refining the in agreement development.

All the previous considering, for above all, the factor of criticality that the Crystal family consider explicitly and that this present in most applications of ubiquitous computation, do viable choose for an agile development for this type of projects.

3. The effort of Usability Ubiquitous

The intention here is, by basing in [8], to define the Usability concept for ubiquitous software systems, which will be named as Factor of Usability Ubiquitous (FUU), and calculate a present worth that permits indicate the level of usability with a belonging number to certain rank (for example between 0 and 10). The idea is proposed initial in [8], to quantize the characteristic usability in the software development that is in interaction with the user, principally through man-machine graphics user interfaces. This appears simple, notwithstanding exists a series of problems, above all when it tries to apply to the ubiquitous software development.

After defining the concept, the following step is to extend the focusing of [8], appears feasible tries to

value the dedication or efforts that is carried out during the development of a certain application to achieve that this is useable, now in the environment of the ubiquitous computation, in a different way to the original idea. Here results interesting center in the new methodologies of development of the ubiquitous software. It springs up so the “Effort of the Usability Ubiquitous” concept: the measure that indicates the employees resources and the activities carried out during the development of a ubiquitous software system with the end to get a certain level of facility of use.

3.1. Measurement of the Effort of Usability Ubiquitous

It tries to get quantize the effort made by the development equipment during a process of implementation to ubiquitous software system following a CDU and use the obtained present worth to value the usability and afterwards the quality of the end product.

It knows that in any development the obtained results never are directly proportional to the effort dedicated during this realization. They can be obtained, in the best one of the cases, best results with a minimum effort and contrarily the result of an enormous effort can be catastrophic. Notwithstanding the experience indicates that habitually, exists this direct report between improving resulted as of bigger and it improve dedicated efforts.

At any rate in this initial phase of the study of the term it ignores which knows to how gain courage useless person or not effective (that gain courage that produce an improvement of the objectives).

With this reflection wants highlight that by obtaining a high present worth of the FUU carried out, never will be able to secure that an application is nothing, little or very easy to be accustomed. However, if will be capable of guess that an application with a great carried out effort will be, in principle, more useable and of quality major that one with a smaller effort. In this work it will try to be to capable of it resolves the problem below these parameters.

3.1.1. Calculate Mathematician. The work will be centered in the activities of proposed evaluation in the MPlu+a [7] for the centered in the user development process proposed in the Figure 1. So will be calculated the correct weight functions correspondents to each activity of carried out evaluation. The motive of this consideration is that in spite of being certain that it is bases the obtaining of the usability of the system in repeated prototypes and evaluations of realizations, whose result reverberates directly in the phase of the life cycle to the which are

being applied, the fact is that a prototype if afterwards not it evaluates of little serve: a prototype without its corresponding evaluation can not be weighed since the intention of such prototype is not know.

3.1.2. Consideration of each appraisal method.

Each appraisal method has their own conditioners that distinguish a few of other and that, consequently, agree directly the present worth that of the correct weight function must give. By analyzing the whole of conditioners reaches to the conclusion that it can consider for each appraisal method an unique whole of parameters they will define the resultant present worth. To begin given value for each parameter of method by basing in the experience so that reflects the sense that it tries to get give that. These parameters are the following: the phase in which is applied; each method contributes improve resulted in function of the phase of development in which is applied, the users number they take part in the proof; this parameter associates the users they take part in the evaluation with the need of these in the application of this method, the evaluators number that carry out the proof; the different methods are necessary of major or smaller evaluators number for this realization and the used prototype; by considering that for certain proofs of evaluation a few prototypes are more appropriate than other (someone even not require not of prototypes).

The values assigned to every one of these parameters for each appraisal method been assigned to manually as of the experience. The Table 1 shows the values assignment (function result column) for the different corresponding parameters to the Focus Group [8] appraisal method. By completing the table with all valued parameters for all appraising methods of the usability will be capable of calculate the weight of each of the activities of evaluation become a partner of the process of development of the Figure 1.

Table 1. Values assignment for the corresponding parameters to an evaluation of the “Focus Group” type

Parameter	F(Focus Group)	
	Parameter Value	Result Function
A1: Phase	Requeriments	80
	Design	80
	Implementation	80
	Liberation	100
A2: Users Number	1 – 5	80
	6 – 9	100
	> 9	80

A3: Evaluators Number	1 – 3	40
	4 – 6	65
	> 7	70
A4: Prototype	Paper	25
	Story Board	50
	Model	65
	Scenarie	75
	Video	100

How to the main interest is more in which conclusions obtain to calculate the FUU present worth that in the own calculation, the chosen function to ponder each activity would not vary respect to the proposal in [8]:

$$f(E) \rightarrow R \quad (1)$$

$$f(x) = \left(\sum A_i \right) * \text{completed}$$

The of the correct weight function, $f()$, of a certain appraisal method, E , it is the present worth, $f(E)$, of the set of real values, R , that it is obtained to add all the values weighed in the table for each one of the parameters, A_i , and multiply the result for the present worth of completed, that it is a percentage present worth that values the percentage of the system that evaluated in each session, this parameter penalizes the final result of the carried out evaluation in a proportional way to the number of aspects that must be evaluated and not it been.

Then, to the resultant present worth to add all obtained weights of each of the evaluations carried out, $f_i(x)$, this is called Factor of Usability Ubiquitous, FUU, and, as can be deduced, it is a different present worth for each totally dependent project of the activities of carried out evaluation:

4. Conclusions and future work

In this article this appear a proposal in the field of the knowledge management for the quality securing in the ubiquitous software development that proposes quantize of the effort that the development equipment carries out during the implementation of the system that contributes information about the degree of usability of implementation. This quantization it outlines, for first time, from a ubiquitous system designs by following the methodologies of design centered in the user and more concretely by valuing the activities carried out.

It exposed the advantage it has weight it approaches the measurement of the usability to measure the quality of this type of applications concern to the traditional methods based on questionnaires and software tools so how the idea of valuing this gain courage and a mathematical

formulation of carrying out this calculate. It tries to get apply the proposed methodology in future ubiquitous development projects and continue this line of investigation by means of approaches from methodologies of “clean room software development”.

$$FUU = \sum_i f_i(x) \quad (2)$$

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