Approach to a Quality Process for the Ubiquitous Software Development

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Abstract

The continuous technical advances conducted to the proliferation of very small and very cheap equipped microprocessors with sensors and with capacitance of wireless communication. The prosecution of the information is returning to him ubiquitous and is impregnating to him in all kind of objects. In this article propose the general lineaments towards a methodology of securing of the ubiquitous software quality basing in your main characteristics: centered in the user and highly interactive. Moreover, it considers oneself 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, centered technology in the person, while that the industry adopted therefore the “Pervasive Computing” term, or amply 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 e-commerce and for techniques of businesses based on the web

This sight of “informatization” with the time also will be able to be successful from a commercial viewpoint and will have undoubtedly enormous economic and social repercussions. Also it will put in debate question about the bill 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 persists extremely relevant if consider the critical components of many of these applications.

2. A quality process for the Development of ubiquitous software

If you want measure to him the “Quality”, understudied as the perception that has the client of certain 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, this imply that the goals established for the product quality are about to decide the objectives to establish of the development process quality, since the quality of the first is about to depend, between other aspects, of this. Without a development process well defined is almost impossible obtain a product of quality.

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

Other of the pillars basing these methodologies is in the incorporation of the evaluation in all phases of development, in an iterative way. By centering in the evaluation, as become muddled primordial in this model of design, considers to him indispensable know from a phase early of the development, the information about the tastes of the user, preferences and needs, as
well as identifying the requirements in the current environment. To achieve these objectives been applied someone of the techniques of investigation, together with other known as techniques of sketch (sketching techniques), sceneries, models, prototypes and simulation, between other, belonging to the whole of techniques of envisioning design [3].

2.1. Centered Design in the User

It proposes to him a centered design in the user, that it is the one which the HCI area it established for recognizing the importance of the intervention of the user in the activities of evaluation [3]. It deals with of a centered closeness in the people, your work and your environment. The outline to follow along the development process is the one which appears molded in the figure 1, the one which names to him model of iterative process.

2.2. The envisioning design method

Without place to doubts, the model before definition escapes of all habitual existent trainings nowadays on time to face to an interactive system. Producing a good design below the sing characteristic requires considerable creativity and perspicacity of the designer. With object to adapt to these circumstances appear the techniques of the envisioning design [3].

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. Contributions from a agile sight

For some years it a growing interest in the agile methodologies, characterized alternately as an 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 your weight but your adaptative nature and your orientation to the peoples [6].

In the environment of the ubiquitous software development, proposes consider the Alistair Cockburn Crystal family. It is a family because he create that the different types of projects require different types of methodologies. This variation along two axises: the peoples number in the project, and the consequences of the errors as for the cricity of the system. Each methodology fits a different part of the matrix, unwillingly for a project of forty appear in person that it can lose money discretionally has a different methodology to those of a vital project of six appear in person.

The methodology has a strong human orientation, but this centralization in the peoples is made of a different way. Cockburn consider that the peoples find difficult follow a disciplined process, so more which follow the high discipline, explores the less disciplined methodology that even could be successful, interchanging consciously productivity for facility of execution. He consider that although Crystal is less productive that other agile methodologies, more appear in person will be capable of follows this.

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

All the previous considering, for above all, the factor of criticism 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 Usability as measure of the ubiquitous software quality

It is undoubted that the characteristic Usability constitutes a qualitative parameter that the interactive systems can, and it must, offer to your users. The International Standardization Organization, ISO, defines six characteristic first-rate for the model of external quality and penetrates of the software between those who is found the usability [7].

The characteristics of the ubiquitous software( centered in the user and highly interactive) do then consider in this work to the usability as the quality characteristic of more relevant in the development of

![Figure 1. Model of Iterative Process](image-url)
this type of systems, without forgetting the importance
of the other characteristics.

The peoples are accustomed to the valuations in
numeric terms and, therefore, not only must say to him
that a system offers facility in your use or not or even a
lot of or little facility of use; the interest is in disposing
of some type of measure that permits obtain float
securities that reflects quantitative the level of usability
of the evaluated system. It verifies to him therefore the
difficulty of valuation of the usability concept that in
herself is a subjective concept and it enters this terrain
with a concept so difficulty measurable is to venture in
a truly difficult and interesting task.

3.1. A proposal to measure the Usability in
ubiquitous software systems

The main objective of the work presented in this
article takes root in explaining the proposal of a new
measurement concept of the usability for ubiquitous
systems as of the activities carried out during your
development, by following a centered design in the
user (CDU).

Concretely the proposal is based on the model of
process of the engineering of the Usability and of the
accessibility, MPIu+a [8] and the work made by
Granollers and Lorès of the GRIHO: HCI group
research of the Lleida university [9].

The MPIu+a, that has your foundations in the
software engineering and in the discipline of the
human-computer interaction, provides the bases and
the methodology that permit know how the
development equipment must proceed to design
interactives applications useable and accessible,
following clearly marked focussings of CDU.

The work of Granollers and Lorès hatches the
development of experimental cases in applications with
diverse technologies (local web, multimedia,
applications and distributed), different interaction
paradigms (augmented reality, ubiquitous computation,
tablecloth), and environments of application that go
from institutional and corporate applications to
industrial applications by passing by developments
with educational ends, of e-commerce or with dying
benefices for organizations not government without
mind of profit.

4. The effort of Usability Ubiquitous

The intention here is, by basing in [9], it can 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 [9], 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.

The main problem springs up in the moment to
analyze the concept of usability in him. As knows to
him, trade of a distinguished term for the subjectivity
of the users and of the evaluating that takes part in your
quantization; the results of an evaluation indicate
aspects that to be or not to be easy to be accustomed in
function of the valuations that the evaluating and/or the
users contributed. Valuations those are so vulnerable
that they even can vary in function of the states psychic
of these participants. More still in the case of the
ubiquitous computation, where the simplicity (or
complexity) of the devices of interaction acquire great
relevancy.

After defining the concept, the following step is to
extend the focusing of [9], 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.

4.1. Definition of the effort of Usability
Ubiquitous

Basing us in the definition of [9], but by coloring
the focusing in ubiquitous computation, proposes the
following definition of the effort of Usability
Ubiquitous term: 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.

4.2. Measurement of the effort of Usability
Ubiquitous

It tries to get quantize the effort made by the
development equipment during a process of
implementation of a system of ubiquitous software
following a CDU and use the obtained present worth to
value the usability and afterwards the quality of the end
product.
It knows to him that in any development the obtained results never are directly proportional to the effort dedicated during your realization. They can be obtained, at best, 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 him how gain courage useless person or not effective (that gain courage that produce an improvement of the objectives).

With this reflection wants highlight to him that by obtaining a high present worth of the FUU carried out, never will be able to secure to him 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 him capable of it resolves the problem below these parameters.

4.2.1. Calculate Mathematician. The work will be centered in the activities of proposed evaluation in the MPIu+a [8] for the centered in the user development process proposed in the figure 1. So will be calculated the of the correct weight functions corresponds 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 who are being applied, the fact is that a prototype if afterwards not it evaluates of little serve: it cannot ponder a prototype without your corresponding evaluation because inasmuch as not knows to him the purpose of such prototype.

4.2.2. Consideration of each appraisal method. Each appraisal method has your own conditioners that distinguish you a few of other and that, consequently, agree directly the present worth that of the correct weight function happiness 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 you to him. 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 used 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 your 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).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter Value</th>
<th>Result Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1: Phase</td>
<td>Requirerments</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Design</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Implementation</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Liberation</td>
<td>100</td>
</tr>
<tr>
<td>A2: Users Number</td>
<td>1 – 5</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>6 – 9</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>&gt; 9</td>
<td>80</td>
</tr>
<tr>
<td>A3: Evaluators Number</td>
<td>1 – 3</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>4 – 6</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>&gt; 7</td>
<td>70</td>
</tr>
<tr>
<td>A4: Prototype</td>
<td>Paper</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Story Board</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Model</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Scenarie</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Video</td>
<td>100</td>
</tr>
</tbody>
</table>

The values assigned to every one of these parameters for each appraisal method been assigned to him manually as of the experience. The table 1 shows the values assignment (function result column) for the different corresponding parameters to the Focus Group [9] appraisal method. By completing the table with all valued parameters for all appraisal 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.

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 [9]:

\[
\begin{align*}
  f(E) & \rightarrow R \\
  f(x) &= (\sum A_i)^* completed
\end{align*}
\]

The of the correct weight function, \( f(), \) of a certain appraisal method, \( E, \) it is the present worth, \( f(E), \) of the
whole of real float securities, \( R \), that it is obtained to add all prudent float securities in the table for each 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 been evaluated and not it been.

Then, to the resultant present worth to add all obtained weights of each of the evaluations carried out, \( f_i(x) \), you are 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:

\[
FUU = \sum_i f_i(x)
\]  

(2)

5. Conclusions and work future

In this article a proposal in the field of the usability metrics is presented 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 the centered design 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 your 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 “cleanroom software development”.

6. References


