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to an Agile Process Model**

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Abstract

From an HCI point of view, actual development design processes do not consider adequately aspects of interaction design, nor participatory techniques for involving end users. Bonacin et al. [7] have proposed the Agile Inclusive Process Model (AIPM), a process model, based on agile methods, as well as on practices, methods and theories from Human-Computer Interaction, Participatory Design and Organizational Semiotics. In this technical report, we clarified and justified some of these practices and methods to emphasize and show the viability of considering them in software development processes.

1 Introduction

Software development process models are either very complex and defined on a rather abstract level (e.g. the IBM Rational Unified Process [14]) or, in the other extreme, very developer-centered and focused on the production of code (e.g. agile methods like eXtreme Programming [5]). From an HCI point of view, neither approach adequately considers aspects of interaction design, nor participatory techniques to involve end-users.

Creating systems to be used by a user population that is as diverse as the Brazilian, requires a holistic socio-technical vision of the problem. Baranauskas et al. [3] detail this problem and propose a research approach to cope with it. In this technical report we investigate the question of how to introduce semiotic, participatory and inclusive activities into the design project to adequately consider user requirements and feedback in order to yield a successful system design.

Bonacin et al. [7] propose the Agile Inclusive Process Model (AIPM) for developing systems that support social inclusion and actions of citizenship. Since we believe that, for this context, agile models are superior to traditional ones, this report tries to investigate how aspects of interaction design can be injected into an agile process model. To exemplify, we illustrate the results of our investigation with the instantiation of the agile model proposed by Bonacin et al. [7]. Figure 1 shows an overview of the AIPM Lifecycle.
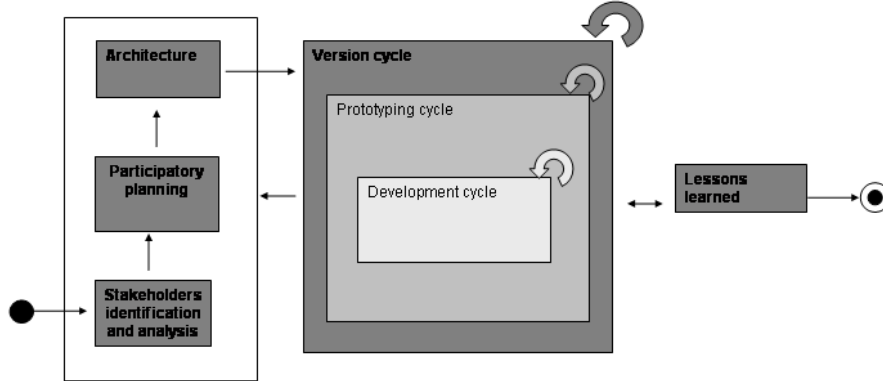

Figure 1: An Overview of AIPM Lifecycle [7]

This technical report is organized as follows: Section 2 explores how to consider semio-participatory workshops during system design, Section 3 is dedicated to participatory practices, Section 4 explores continuous evaluation, Section 5 proposed extensions of the development cycle, Section 6 concludes.

2   Semio-participatory workshops

Making available systems that make sense to and are accessible by the users - and thus also bring benefits for society as a whole - requires a socio-technical vision of the problem. Therefore, as a frame of reference for problem understanding, modeling of the organizational context, as well as user and system requirements gathering we base our approach on Organizational Semiotics (OS) [15, 25, 24] combining OS artifacts with participatory [23] and inclusive techniques [17, 9].

Organizational Semiotics as a theoretical and methodological frame of reference permits a treatment of the problem that equally considers the informal, formal and technical levels of the social group and the system in question. Various artifacts and methods of Organizational Semiotics are considered from the phase of problem elicitation up to system specification and design, thus comprising among others stakeholder analysis, valuation framing, semiotic diagnosis, semantic and norm analysis [4].

These artifacts and methods lead to better results if used in workshops that consider the participation of users, designers, developers and other stakeholders. We call these workshops "Semio-participatory" as we combine the use of artifacts from Organizational Semiotics with

techniques from Participatory Design. The execution of a Semio-participatory workshop involves the selection and preparation of the artifacts and techniques that will be applied. This selection should consider the workshop objectives and also the abilities of the participants. Depending on the context of the workshop, panels/white boards and "post-its"or only sheets of paper are used by the participants to express their contributions. Often it is necessary to adapt some artifacts to promote the total integration of all participants. For more details about artifacts adaptation, see [17].

Taking into consideration that the highest priority in an Agile Model is to satisfy the customer through early and continuous delivery of valuable software[1], we think about Semio-participatory workshops to better clarify, elicit and validate interaction requirements, enhancing the chances of getting valuable software. Also, through the participation of the users, designers, developers and other stakeholders, these workshops enable face-to-face discussion on meaning as well as on design and development solutions. The artifacts that result from these workshops can also be considered as documentation to the development team and are obtained with no extra effort.

In the AIPM, proposed in Bonacin et al. [7], Semio-participatory workshops appear explicitly as the last activity in a version cycle. Figure 2 shows the version cycle; the workshop activity is highlighted in blue. However, semio-participatory workshops can be used as the first activity in the model, supporting the *Stakeholder identification and analysis* and *Participatory planning* (see Figure 1). As each version cycle can take few months, each workshop can have different objectives, according to the system status, as elicitation requirements, participatory prototyping and evaluation. As a result of the workshops, we shall achieve a shared understanding of the problem between team and partners and possible solutions, interaction model specification, validation and new goals for the next cycle.
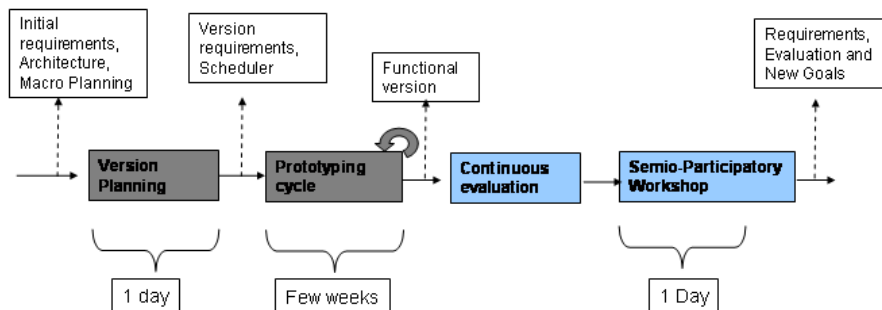

Figure 2: Version cycle. Adapted from Bonacin et al., [7].

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[1]According to the Agile Manifesto, 2001 - `http://agilemanifesto.org/`

3   Participatory practices

The principles of AIPM [7] are based on concepts of Universal Design - or Design for all - and Participatory Design [23]. In AIPM, users have an active role in the development of the system and their participation is vital throughout the whole process. Here we briefly conceptualize Participatory Design and describe some of the ways participatory activities can be conducted.

Since the system to be developed is for the user, no one is suited better to take part in the design process than the users themselves. They are the ones who know about their context and their needs. The users participation in the process helps developers to guarantee that their needs are fulfilled and that the system is appropriate and meaningful for them. This is the essence of Participatory Design; the users' opinions and decisions are taken into account when planning the system and their response to the prototypes determines the directions of the project.

There are many different kinds of activities that the researchers can perform with the users, and they vary according to the developers' objectives at a specific phase of the project. Muller et al. [19] compiled a comprehensive list of Participatory Design practices and classified them into three dimensions. The first one considers the position in time when the practice takes place, being it earlier or later in the development cycle or iteration. In the second dimension, the authors classify the activities from the point of view of participation: "who participates with whom in what", i.e. if the designers participate in users' world(s), if the users directly participate in design activity, or something in between. Finally, the third dimension is defined by the size of the group for the practice.

The activities can include games or role plays among users as well as simple and straight to the point computer use. The objectives of a practice vary from system test, system evaluation, user and context recognition (know who your user is), brainstorming, or other types of eliciting ideas.

Actually, all practices involve the following steps: preparation, application and analysis.

Preparation. In the preparation phase, besides thinking about the purpose of the activity, the activity itself, and the size of the groups, it is also necessary to consider simple organizational aspects like the room size (Will all participants, plus researchers, fit in the room? Will there be enough chairs?), and gather all material that might be needed (pen, paper, scissors, cardboard, etc). Researchers should also consider the duration of the activity (If it is too long, should there be a break? Should coffee snacks be offered? If so, who and how should provide it?). For the data analysis phase, it is important to register all interaction with users, through video, photos, mp3 or any other media. During the preparation phase, researchers should organize all these materials and do some dry-runs in order to avoid unexpected situations.

Because of activities with people, it might be necessary that the project obeys some rules of ethics. These rules may vary from country to country or from institution to institution. In most cases, it involves the use of a declaration of consent signed by the user. That declaration should be written and printed during the preparation phase.

It might come in very useful to have printed observation forms, so that researchers will be able to remember every aspect they should pay attention to. These forms should be

prepared and printed before the activity.

The activity. After the preparation of the activity follows the activity itself. For this step, some techniques might be considered to facilitate the progress of the practice.

The *ThinkAloud* technique [10] is important when the user is using the system by himself/herself and the researchers need to know her impression or the way he reasons and deducts paths or ideas.

We recommend that the encounters should start with a clarification of the activity to be performed and at the end, a discussion about the activity should be conducted to filter users results and opinions on what they did.

Analysis. During the activity it is probable that the facilitators will have different concerns, so that they might not be able to pay close attention on users' reactions or results. For that, it is important to analyze the videos and listen to the voice recordings of the practice. When looking at the collected material, researchers might want to consider and extract both quantitative and qualitative aspects related to the objectives of that practice. The structure described is flexible and can be adapted to each case.

The AIPM has four principles that are directly related to Participatory Design. Whenever we read the word "participatory"in the AIPM [7], it is understood that the user is involved, either in a Participatory Practice within a group of users - following the above-described steps for an activity, or in a designers meeting where user representatives take part. As per PDs definition, the user that participates in any of the activities does not have a passive attitude, i.e. he is not just listening and commenting. He rather engages in the decision making processes and determines many results. Figure 3 shows the prototype cycle; participatory practices activity is highlighted in blue.
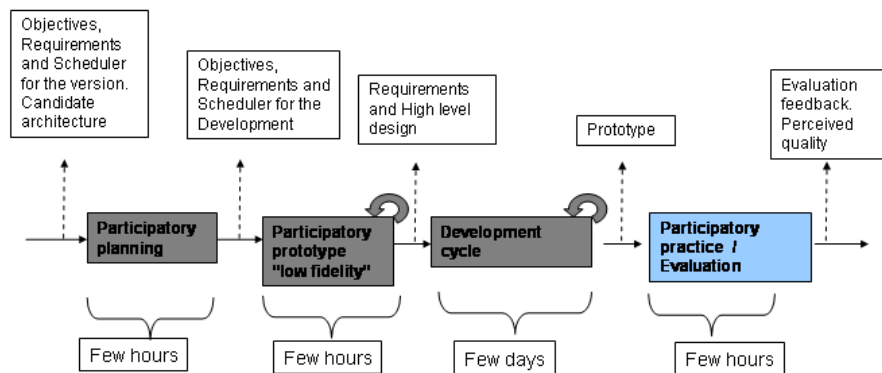

Figure 3: Prototype cycle. Adapted from Bonacin et al., [7].

These practices are also intended to promote digital inclusion, as many users will be exposed to technology and will end up learning about them. It is expected that these practices will serve researchers with a very rich material about users and their reality that may be transferred to the system to be implemented.

4   Continuous Evaluation

Evaluation is an important issue in social networks due to the diversity of users' needs and behaviors. Consequently, there is a number of recent works in this context [18, 6, 12, 8, 11]. As pointed out by Mislove et al. [18], unlike other Web applications, which are focused on content, social networks focus on people and on their interaction. Since the focus is on people, it is necessary for the development of evaluation methods to retrieve information about people's interaction as a continuous process.

Evaluation methods can differ in a number of aspects such as project stage, performing technique and purpose. Many systems are only evaluated when they are completed which results in high costs to correct possible failures or, in some cases, in abandoning the whole project. Ideally, evaluation should be used as a proactive mechanism, acting in every phase of the project. We can find many works about evaluation methods in literature. Neale et al. [20] pointed some problems to evaluate cooperative systems: logistical difficulties in collecting data, number and complexity of variables to consider, and focusing on the re-engineering of work practices. Other interesting methods employed are: scenarios of use [13], graph and statistical analysis [18] and participatory evaluation [16]. Beyond the complexity of variables, in a social network evaluators should discover which of them are related to a specific focus to direct their research. Pinelle et al. [22] proposed the Collaborative Usability Analysis which allows designers of collaborative systems to use discount usability evaluations, enabling the iterative design of collaborative systems.

In the context of AIPM, we decided to employ a continuous evaluation method that will capture the users' interaction with artifacts aiming to identify changes such as users' behavior, learning curve, communication styles, etc. (see Figure 2). Relevant information is the group dynamics to reach specific objectives in the social network. In AIPM, the data captured by the continuous evaluation will be processed in the version cycle, after the prototyping step. This way, it will be possible to perform fine grained evaluation of the prototype produced in the cycle and keep track of the dynamics of features released previously. As a result of the continuous evaluation analysis, we expect to produce meaningful information for adaptations of the released prototypes and guide future version cycles.

Continuous evaluation can be performed by using: scripts embedded in the collaborative system that will periodically send statistics to a server, online questionnaires, face-to-face interviews, monitored activities, among others. Due to the fact that there is no absolute best performing option, the choice of instruments should be based on the specific situation's needs. For example, when a designer releases a contacts management tool he/she will probably be interested in questions such as the number of contact links created using the tool and some statistics about the level of success in performing the activity of finding a contact. For the first question, a script can be used to capture the data each time a contact is added while for the second question it could be more interesting to use an online questionnaire or a face-to-face interview.

The evaluators' profiles can vary with the kind of information that is expected to be produced. For example, if the purpose is to analyze the social aspects of the network and consequences of the use of a collaborative system in the community, an anthropologist will have the necessary skills while computer scientists are required when investigating

performance questions.

5   Extension of the development cycle

We see two possible activities to merge HCI or interaction design with the development cycle: user acceptance and expert usability and accessibility evaluation. Figure 4 shows the development cycle; the cited activities are highlighted in blue.
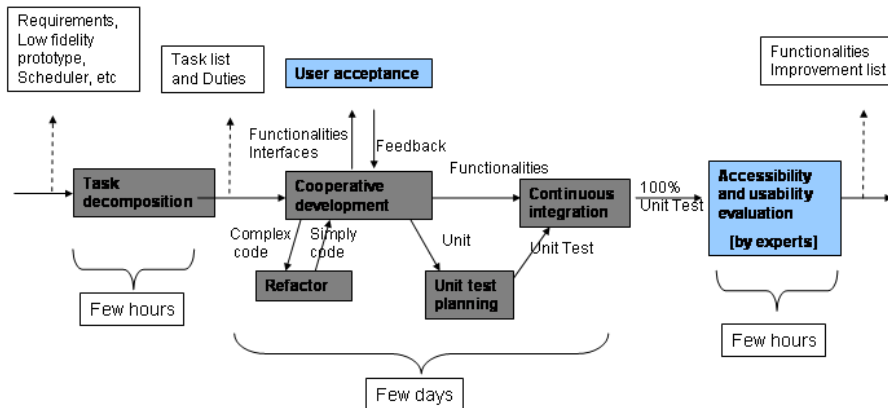

Figure 4: Development cycle. Adapted from Bonacin et al., [7].

User acceptance

The step "user acceptance"offers another possibility to include user representatives into the design process. Users would be able to influence design on a level with an even finer granularity than at the end of each prototype cycle. The challenge to realize this is twofold. First of all, the schedules of the developers have to be synchronized with those of the user representatives. In our context, that task is more difficult than for example during system development in an enterprise context, where it is easier to get hold of users than in our informal context where users are expected to use the system in their leisure time. Apart from this organizational challenge, we face the operational challenge of adequately involving user representatives to conduct micro-acceptance tests that yield meaningful results. Accordingly, potential user representatives need to have a special profile. Whereas during other activities participants should represent the whole spectrum of the potential user population, we need a special mix to extract results from user acceptance tests. On the one hand, in many cases, the user representatives should have the profile of a power user who is very familiar with the system, since only this kind of user representative will be able to evaluate very subtle results of a relatively small cooperative development activity. On the other hand, it might be desirable to sometimes work with user representatives with very

special needs or competencies, for example when developing a resource of interaction for users with some kind of impairment.

Expert Usability and Accessibility Evaluation

As an extension to the development cycle we propose an evaluation of usability and accessibility by experts at the end of each iteration. Since one iteration of the development cycle takes only a few days, we envisage a time span of not more than a few hours for this evaluation. An evaluation by experts guarantees a high quality of results, however this doesn't mean that developers don't need to have at least a basic notion of accessibility and usability related issues.

Since each iteration of the development cycle will provide a well defined and relatively small piece of new functionality we propose the following evaluation procedure: each expert evaluation should start with a simplified usability and accessibility evaluation (e.g. [21, 2, 1, 26], of the broader context in which the new functionality is embedded to ensure that there don't exist any side effects that introduce new accessibility or usability problems. After that, a thorough evaluation of the new functionality itself should be conducted. The challenge of this approach is to recognize possible side effects in order to determine the broader context for which to execute the simplified evaluation. This contextualization will always depend on the functionality to be evaluated. For example, if a new interface element is introduced to the community page and there exists a functionality that automatically generates summaries of community content to be displayed in another area, the simplified evaluation should include this area as well.

Regarding the required profile of the evaluators, besides of being specialists in accessibility and usability, they also need to have a thorough knowledge of the system, i.e. in contrast to the final accessibility and usability evaluations, the evaluators should be part of the project team. Although it is often recommended that usability and accessibility evaluators should point out problems without thinking about solutions, we think it is adequate to do so during the evaluations within the development cycle. This feedback will improve the development process since developers can thereby expand their knowledge about accessibility and usability. Hence, the evaluators should have enough knowledge of the implementation techniques to indicate starting points for possible solutions.

6   Final considerations

Nowadays, researchers, practitioners, and educators from Human-Computer Interaction and Software Engineering fields are trying to work together more closely. However, we still don't have many development process models that consider practices from both fields in an integrated fashion, and more than that, considering the participation of users in the development process.

The development of software applications to promote digital inclusion and the process of constitution of a fairer society, embracing different competencies and needs among people asks for a development process that allows a shared view of the problem, considering designers', developers' and users' as well.

Bonacin et al. [7] have proposed the Agile Inclusive Process Model (AIPM), a process model, based on agile methods, as well as practices, methods and theories from Human-Computer Interaction, Participatory Design and Organizational Semiotics. In this technical report, we clarified and justified some of these practices and methods to emphasize and show the viability of considering them in software development processes.

Next step in this research is to refine the model as a whole and its interaction aspects. This will be possible within the development of a "virtual space of communication"in the context of e-Cidadania project.

Acknowledgments

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