OSS design communities: an emergent form of distributed participatory design

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ABSTRACT
Our research provides insights about an emergent form of distributed participatory design occurring in open source software communities. Our research contributions are threefold.

The design activity in OSS is oriented toward peer reviewing: our analysis of design discussions oriented toward new design proposals shows that activities are mostly evaluative enhancing the peer reviewing form of OSS design.

The design discussions are framed by key participants: our analysis shows that the project leader and the participant championing a new design idea have key roles in framing the design discussions.

The design activity is a specific form of participatory design: even though design discussions are framed by hierarchical roles, they stay open to all participants, allowing users-pushed design proposals. We have shown that users participation does not guarantee the design to be participatory. It occurs under the condition that cross-participants (an extended notion of cross-posters) in user-oriented and developer-oriented mailing-lists act as boundary spanners between users and developers.

On a methodological level, our research illustrates that the combination of structural analyses (such as social network analysis) and content analyses is necessary to capture the richness and complexity of the OSSD.

Author Keywords
Open source software design, participatory design, content-based methodology, online discussions

ACM Classification Keywords
C4. Design Sudies. H.5.2 User Interface. ergonomics

INTRODUCTION
In traditional user-centered design models, users take part in the design process as informants - in the functional analysis phase- or as evaluators - in the prototype and simulation phases. In Open Source Software Design (OSSD), users can be involved in all the phases of the design process (elicitation of needs and requirements, design and implementation), at least if they have the skills to do so. Hence, in OSSD, users can be highly skilled in computer sciences [5], as well as in particular application domains (e.g., education, biology, scientific computing...). This participation is usually seen as one of the most important factor explaining the success and the quality of the designed OSS. OSSD can be thus considered as a special case of participatory design (e.g. [4]). Moreover, it is a distant and distributed form of participatory design.

The objective of this research is to provide some insights about this emergent form of distributed participatory design and to characterize to which extent the participation of users in OSS communities guarantee their needs to be taken into account. After of presentation of Python, the community we focus on, and of our methodological approach, we will synthesize our research contributions around three points:

- The design activity in OSS is mostly oriented toward peer reviewing through evaluative activities.
- The design discussions are framed and boosted by key participants.
- The participation of users: users-pushed design proposals can succeed only under some conditions, and users activity is not only informing design and they are not the sole providers of knowledge regarding their needs and usages.

PYTHON COMMUNITY: FOCUS OF OUR STUDY AND METHODOLOGICAL APPROACH

Python and the PEP design discussions

We focus on the Python community. The designers of Python (a programming language) engage in a specific design process called Python Enhancement Proposal (PEP) as the main means for proposing new features and collecting community input on a design issue. PEP is quite similar to two design processes used in conventional software projects: Request For Comments (RFCs) and technical review meetings [1]. PEPs are discussed in the mailing-lists of Python (python-list, the general mailing-list and python-dev, the mailing-list for Python developers). All these discussions are archives and publicly available and constitute relevant traces of the design process, as the major part of the design occurs in this discussion space [8].

Users' role and statuses in OSS community

The literature on OSSD identify clearly, on one hand, the role of active users participating in the evaluation phase of design (bug reporting and patching, new modules proposals, e.g. [10]) and, on the other hand, the role of the project leader, administrators and developers of an OSS projects in the proper design process, that is to say their participations in generating, evaluating solutions and in taking decisions [2]. An open issue is still to characterize the role and participation of users regarding the proper design and the design decisions.

Combination of structural and content analyses

Our methodological approach combines structural analyses of online discussions (organization of messages into discussion graphs based on quoting, i.e. who is quoting who in online discussions, cross participation and organization of parallel discussions) and content analysis of messages based on a coding scheme which distinguishes activity-related categories reflecting the functions of a turn in the design discussion (e.g. making a proposal), from reference-related categories reflecting the knowledge which is shared (e.g. knowledge about use).

DESIGN ACTIVITY ORIENTED TOWARD PEER REVIEWING

Our content analysis of the messages in PEPs discussions [2] revealed that evaluation is the activity mostly performed by all participants (including users), enhancing the peer reviewing form of design. We found lower frequencies for activities such as clarification and design proposals. The clarification activity, less frequent than in face-to-face design meetings ([1] [9]) is framed by the project leader and reserved to specific locations in the online discussion space.

DESIGN DISCUSSION FRAMED BY KEY PARTICIPANTS

Our structural analysis of the messages in PEPs discussions [3] revealed links between the organized social structure of the Python project and the shape of the discussion space. A participant's assigned role in the project organization affects its quotation rate and, therefore, influenced the unfolding of the design process within the discussion space. Key participants led and ensured the thematic continuity of the PEP online discussions we studied: the project leader or an administrator relaying him, and the champion (proponent) of the PEP, who can be a user. They tend to be more quoted than other participants; the champion is the main provider of synthesis activities, boosting this way the community; and the project leader often close sub-thematic discussions or thematic drift.

DESIGN ACTIVITY AS A SPECIFIC FORM OF PARTICIPATORY DESIGN

Our ongoing research on a "pushed-by-users" design proposal (PEP 327) reveals cross-participants that act as boundary spanners between users and developers [7]. We define Cross-Participants (CP) as persons who participate at same-topic discussions, occurring in parallel mailing-lists at the same time (extended notion of cross-posters [6]).

To identify CP, we organise all discussions occurring in python-dev list (developers-oriented list) and python-list (users-oriented list) about PEP 327 in a temporal view (Figure 1). The python-dev and the python-list discussions about this PEP are represented in parallel. Cross-participation between parallel same-topic discussions in python-list and python-dev is labeled using dotted vertical lines. The analysis of the temporal organization of the PEP process helps us to select 5 discussions occurring in parallel in the two mailing-lists and were cross-participants appeared[1], among the 52 discussions. 4 out of the 5 discussions are at the beginning of the design process. To characterize cross-participants (CP), we first identified all the posters in these discussions. They are identified according to their status: project leader (PL); administrators (A), developers (D), the user-champion (U-C) and other users. We call users those that are not clearly identified as administrators or developers on the project webpage. 5 people were identified as participating to parallel same-topic discussion: the user-champion (he was not formally define as a developer at the beginning of the process and was the project leader of a financial project), 1 administrator who is known as an expert of the decimal domain; 2 developers, of which one had already worked on a decimal module; and 1 user.

To characterize more finely the role of CP and other participants in this design process, we combine a structural analysis of quoting links between messages and a content analysis of messages.

[1] Each discussion is labeled using its subject on the online archives. For a more precise description of the temporal organisation of the PEP process, please refer to [11]

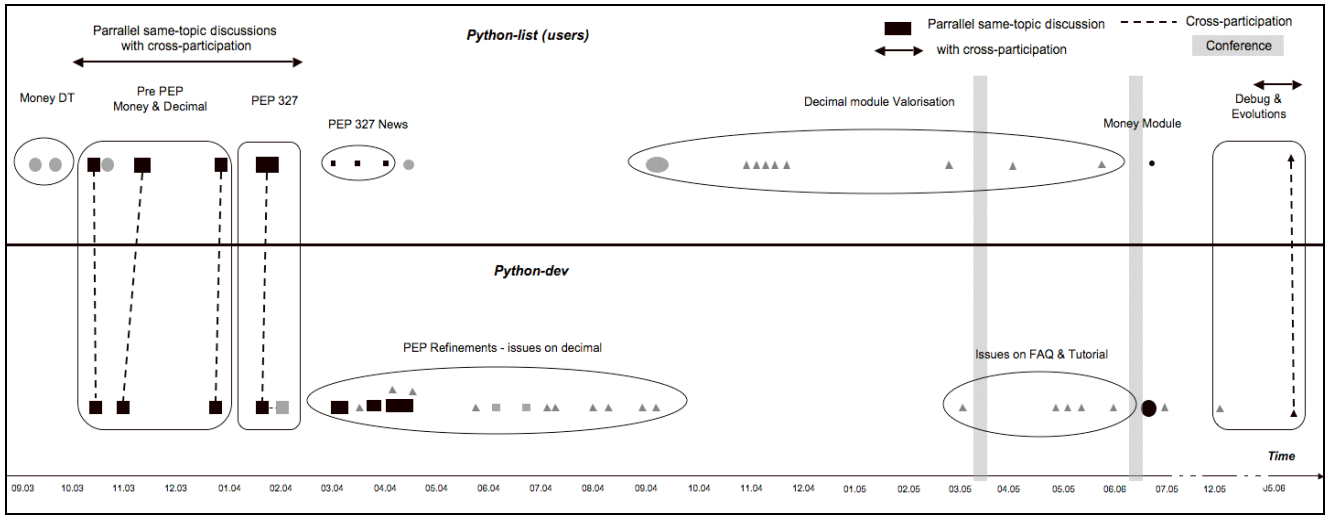

Figure 1. Temporal view of the PEP 327 discussions in a developers-oriented list (python-dev) and a users-oriented list (python-list)

The attraction graph[2] in Figure 2 represents who tends to quote who in both python-list and python-dev. It outlines that CPs tend to be the link between the users community (U) and the developers community (A-D and PL) with a specific position for the user-champion (U-C, who is also a CP) who quotes and is quoted more by the project leader (PL) and the administrators-developers (A-D) ,i.e. the developers community.

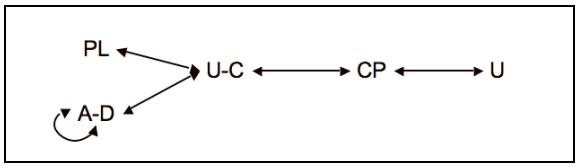

Figure 2. Attraction graph representing who tends to quote whom in the discussions

Our analysis of messages content (activities and references/knowledge sharing) highlights that CP (identified by a structural analysis) provide knowledge about both the user-oriented application domain and the developer-oriented programming domain: this way, they cross the boundaries between users and developers communities acting as boundary spanners. Being the main providers of knowledge about use in both users and developers communities they also maintain a strong focus on usage. The user championing the PEP is a key CP enhancing harmonious social relationships referring to other persons works, and a coordination agent doing synthesis and posting news about the design process in mailing-lists.

Finally, users do not refer more to use than other participants. The design-use mediation is rather supported by the boundary spanners who are not necessarily users (2 users and 3 administrators or developers). The boundary-spanners role seems to emerge in the collective activities based on technical, discursive skills and interest of participants.

DISCUSSION AND PERSPECTIVES

Our work provides insights on an emergent form of distributed participatory design in OSSD. An important result concerns key roles played in this distributed process, the cross-participants that relay and support users participation. An open issue is still to characterize necessary conditions and barriers for a design to be, or not, participatory.

Our contribution is also methodological. Considering the large quantity of data in OSS communities it is tempting, and it is often the case, to use only structural analyses such as social network analysis to characterize OSS design process. We have attempted to illustrate that the combination of structural and content analyses of online discussions is essential to capture the richness and the complexity of the OSSD process.

ACKNOWLEDGEMENTS

This research was supported by the France-Berkeley Fund and the French TCAN-CNRS program. It is now funded, through a Ph. D., by the CNAM and INRIA, via the French Research department.

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[2] This graph is based on the relative deviation (RD) analysis. RDs measure the association between two nominal variables. They are calculated on the basis of a comparison between observed and expected frequencies (i.e. those that would have been obtained if there was no association between the two variables). There is attraction when the RD is positive, and repulsion – when it is negative. By convention, we reported only attractions with values >.20.

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