

Eliciting Requirements from Citizens – What Can We Learn from Other Disciplines?

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Abstract

[Context and motivation] The elicitation of requirements is an essential step for requirements engineers to build products and services that fit the needs of users and customers. In environments with connected systems, such as cyber-physical systems or digital ecosystems, several different stakeholders exist that have diverse requirements. One such environment is the smart city district that is the focus of our research project “EnStadt:Pfaff”. **[Question/problem]** One main question in such a context is how to elicit citizens’ requirements and needs and how to motivate them to participate in creating digital services and apps that support their lives. **[Principal ideas/results]** Traditional requirements engineering and elicitation activities (such as workshops) are also relevant in such contexts, but we are also looking for new formats that may-be are more suitable for citizen crowds. We assume that we can learn from other disciplines about their methods and ways, e.g. to motivate citizens. **[Contribution]** We identified four disciplines and present their benefits for requirements engineering from our perspective. Our goal is to foster further discussions when presenting the corresponding poster.

1 Introduction

Software undeniably permeates almost all areas of our daily life and business today, which leads to the emergence of opportunities for companies regarding new services and apps emerge, but also creates various new challenges. At the same time, companies developing software and systems must deal with trends that have a tremendous impact on software engineering in general, but also on requirements engineering (RE) in particular. Such trends include, for example, the well-known shift towards agile practices, which started in the 2000s and has also had a big influence on RE processes and activities. Recent trends include, for example, a shift towards connected and large digital ecosystems or the power of users due to the large number of different feedback channels. Villela, Groen and Dörr argue that a paradigm shift in RE is necessary – a shift from wishing for experienced end users to empowering newbies, so that RE is there for everyone [11]. Such a shift is necessary for this reason: “Now that digital transformation impacts society as a whole, digital solutions affect everyone.” Furthermore,

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according to these authors, a paradigm shift is also necessary from focusing on software to holistically taking into consideration people, things and services. Both paradigm shifts are highly relevant in smart city districts, where software is part of everyday life of very diverse citizens and where software is a means for accessing things and services, such as bike-sharing. The software is supposed to be used by all citizens, teenagers as well as elderly people, experienced technology users as well as laypersons. In our research project “EnStadt:Pfaff”, the goal is to create a climate-neutral city district. One aspect is to provide digital solutions and services to inhabitants or visitors of this city district. In order to identify those requirements that are relevant for a diverse crowd, we are looking for new requirements methods. Concretely, we face the following challenges:

1. How to get in touch with all groups of citizens? Citizens use different media. Elderly people still read the newspaper whereas young people often prefer digital media. It would be helpful to know which media should be used or combined in order to reach all citizens in the best possible way.
2. Which methods apply to citizens? Classical requirements elicitation methods could be applied, such as workshops and interviews. However, workshops might exclude some people. They require citizens to visit a certain location at a predefined time and thereby exclude mobility-impaired persons and citizens working at that time. Therefore, other methods need to be developed to potentially address everyone.
3. How to motivate citizens to participate? If citizens do not see a personal benefit, it is likely that they will have no interest in participating.
4. How to document the results? Novel methods might not require the presence of a requirements engineer, who would normally take care of the documentation. Furthermore, the requirements need be documented in a way that is accessible to the stakeholders. A typical specification might not be understandable to citizens.

We assume that it is worth seeking inspiration from other disciplines to support this creative process and to find inspiration for the other challenges. Our process for identifying new methods and ideas to address the challenges is as follows: First, we plan to identify disciplines to seek inspiration from. The criteria for such disciplines will be presented in the third section. Second, we plan to get familiar with the discipline, that we think has the highest potential for addressing our challenges. While researching this discipline, we might already find some measures to address our challenges. Third, we plan to conduct workshops to identify more methods and ways to address our challenges. The workshops could be similar to the workshop format used in “Learning from Other Disciplines for RE” (D4RE)¹. D4RE is a workshop organized by Fraunhofer IESE, which took place two times at the RE-Conference and one time at the REFSQ. The D4RE workshop consists of three steps: (1) idea collection, (2) elaborating synergies, and (3) benefits and next steps. Fourth, we want to evaluate the methods and measures that could be useful for addressing the challenges. Thereafter, the next discipline should be selected and investigated.

In this paper and the respective poster, we present criteria for selecting disciplines. Moreover, we present disciplines we already identified and the reasons why we consider this discipline a potential source of inspiration. However, we might misjudge the potential of these disciplines and there might be disciplines we have not thought about yet. We invite the readers of this paper and the visitors of the poster session to discuss the potential of the identified disciplines with us and share their ideas regarding other disciplines and what we could learn from them.

2 Background and Related Work

In the field of requirements engineering, the topic involving citizens (which hereafter we will call Citizen RE) is discussed from different perspectives. In [9], different ways of involving citizens according to their roles are discussed. According to the authors, citizens have the role of democratic participants, co-creators, and ICT-users. In their role as co-creators, they could be involved through interviews and focus groups. In [6], the challenges of mass participants are discussed. One challenge is how to motivate citizens. This challenge is also mentioned in a paper presenting the landscape and challenges of Crowd-based Requirements Engineering (CrowdRE) [4]. In [10], it is discussed how citizen participation could benefit from systems engineering, for instance, by applying SCRUM. However, no methods are mentioned for eliciting requirements from citizens. Furthermore, the discipline ‘participation’ is explained. In [2], a suggestion for how to create new methods is presented. The authors suggest

¹<http://d4re.iese.fraunhofer.de/>

combining different characteristics of methods (e.g., location: public buildings; presence of moderator:remote) and creating a new method based on these characteristics. This creation process requires creativity. Inspiration from other disciplines could enhance this creativity process. To sum up, motivating citizens to engage in Citizen RE activities is a challenge. Furthermore, there is not much literature about elicitation methods that require only little effort from citizens.

3 Criteria for Disciplines

First, we defined criteria that other disciplines should fulfill to be acceptable in our context. The disciplines should use methods that

- aim at obtaining data from citizens, such as their opinions, ideas, or usage data
- address various groups of citizens
- are applicable to a high number of persons
- should not be a central event, but give citizens the freedom to decide how and when to participate.

Using these criteria, we want to find disciplines that inspire new methods and provide solutions to the challenges mentioned above.

4 Disciplines and What We can Learn from them

So far, we identified the following disciplines and approaches: (1) ‘citizen science’, (2) ‘opinion polling’, (3) ‘co-creation’, and (4) ‘public participation’. In this section, we describe the disciplines and provide an example of what RE could learn from them when working with citizens.

4.1 Citizen science

Citizen Science is defined as “a series of activities that link the general public with scientific research. Volunteers and non-professionals contribute collectively in a diverse range of scientific projects to answer real-world questions”. [3]. Citizens provide data they elicit, for instance, data about sea water for analyses of its color and transparency in the project “citclops”². We assume that requirement engineers can learn from citizen scientists about tools for documenting and transmitting data, how to address and motivate citizens. One lesson learned from this discipline is the principle “Both the professional scientists and the citizen scientists benefit from taking part” [5]. Citizen scientists could be motivated by learning from professional scientists and by influencing national issues and policy. We assume that this principle could be transferred to requirements engineering. During the elicitation process, requirement engineers could teach the citizens about RE or software engineering. Furthermore, requirement engineers should give citizens feedback about what they have achieved in local issues, such as digital services in smart city districts. So far, we consider citizen science a discipline worth further investigation since it addresses our third challenge.

4.2 Opinion Polling

Opinion polling is the discipline of gathering opinions from a particular sample. The outcome is designed to be representative of the group of people from which the sample is taken. The most common and popular form of opinion polling are surveys political issues, conducted for example by institutes like Forsa or YouGov. In opinion polling, the sample has to be representative, so all kinds of sub-groups of the target group have to be identified. In the context of requirements elicitation, we assume that requirement engineers can learn how to identify sub-groups of stakeholders. Furthermore, we could learn from opinion polling how to address the public. For instance, the company ‘civey’ cooperates with online media companies. These companies have short polls on their websites, so the participants participate take part in them on a website they are already visiting anyway. In our opinion, requirement engineers should also try to get in touch with citizens on locations or on websites they are visiting anyway, instead of requiring them to spend extra effort on visiting another place. So far, we consider opinion polling a discipline worth further investigation since it addresses our first challenge.

²<http://www.citclops.eu/the-project/overview>

4.3 Co-Creation

Co-Creation, in the context of business, is a design process, where the focus lies on joint creation of value by the company and the customer. It involves customers in a joint problem definition and problem-solving process and lets them “co-construct the service experience to suit [their] context” [8]. We assume that we can learn from co-creation how to motivate people and how to address them. For ‘co-creation’, the innovation lab ‘josephs’ could be a source of inspiration. Josephs is located at a central place in downtown Nuremberg. Everyone can walk in, test services and prototypes, and provide feedback and ideas. Thus, no invitation or appointment is necessary. The lab has similar opening hours as the surrounding shops. The feedback on the products and services is forwarded to the companies, which pay to present their product or service. Such a central, physical place for eliciting requirements and feedback might be valuable for a smart city district. We consider Co-Creation a discipline worth further investigation since it addresses our first challenge.

4.4 Public Participation

Public participation processes are processes in which persons who are not entitled to participate in collective decisions by virtue of their office or mandate are given the opportunity to communicate their knowledge, preferences, assessments, and recommendations [7]. The involvement of citizens in the planning and decision-making processes in the public sector can be legally required but may also follow informal processes [7]. This description refers to the latter kind of processes in Germany. In these processes, representatives of a municipality, communication experts, architects, or city planners commissioned by a municipality might take charge of the process. We assume that we can learn from such public participation processes about how to involve diverse groups of citizens and large numbers of persons and how to document the findings in a way that is comprehensible for the citizens. We found inspiration in a tool used in a project in the town of Herrenberg (Germany). There, citizens can mark spots for improvement (e.g. a dangerous intersection) in an app, add a picture, and assign an emoji via an app [1]. This information is then displayed in a digital representation of the town. The 3D visualization of the town and all marked spots provide a lot of contextual information, so people who do not know the marked spot can still understand the issue. We assume that in RE, the use of an app for communicating requirements and the as-is-situation, expressing the respective emotions via emojis, and visualizing the summarized findings in an interesting way is beneficial when working with citizens. We consider public participation a discipline worth further investigation since it addresses our fourth challenge.

5 Discussion

Our research project is in the area of a smart city, currently focusing on a concrete district that is being built. In such a district, several different stakeholders will live, work, and stay for various reasons. Therefore, it is necessary to consider all these different stakeholders in order to be able to develop digital solutions that fit their needs. We do not claim that our work is only applicable to citizens in a smart city district. However, one characteristic of smart city districts is that the citizens whose requirements we want to obtain are located within a limited physical space. This allows methods and procedures that might not be applicable to a wider area such a whole city or region. Our selection of disciplines is not complete by far, but this was also not our intention. We started with some initial disciplines where we see learning potential. We plan to take a closer look at these disciplines and adapt the methods and lessons learned to our project “EnStadt:Pfaff”. Of course, one relevant step is to test such methods and explore the benefits as well as the limitations. Moreover, it should be considered which method fits which citizen sub-group and which methods could be combined to reach a wider range of citizens. We plan to identify even more disciplines to learn about requirement elicitation with citizens.

6 Conclusion and Outlook

In this poster paper, we discussed the need for new requirements elicitation methods for environments such as city districts, where several different stakeholders should be involved in creating ideas and requirements for digital services and solutions. Such crowds are typically very diverse, and various methods are needed to cope with the different needs of citizens. In the “EnStadt:Pfaff” research project, we want to apply lessons learned from other disciplines, explore how to gather requirements from different stakeholders, and find out which methods are most suitable best for whom. In addition, we plan to perform workshops with requirements experts and potentially other experts to identify new ways of including many different stakeholders. The results will also help us also

identifying new requirements, especially for our context in the “EnStadt:Pfaff” project. We plan to include the results from such workshops on the poster, as well.

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