

Towards Ubiquitous Requirements Engineering

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Abstract: We have perceived barriers that prevent requirements engineers from contributing properly to the development of the software systems that underpin the digital transformation. We have also realized that breaking down each of these barriers would contribute to requirements engineering (RE) becoming ubiquitous in certain dimensions. In this paper, we point out the transformation that is required to break down each barrier and briefly discuss each dimension of ubiquity. Our goal is to raise the interest of the research community in providing approaches to address the barriers and move towards ubiquitous RE.

Keywords: distributed RE; RE with the society; RE for IoPTS; CrowdRE; RE for ecosystems

1 Dimensions of Ubiquity and Required Transformations

RE Everywhere (from geographic colocation to worldwide distribution): While companies can decide about the geographic location of their units and about whether or not to outsource their software development, partners in a strategic digital ecosystem may be located anywhere in the world. Requirements engineers should be capable of conducting RE activities with end users remotely and even asynchronously, depending on the time zone. We envision the development of software environments to support Virtual RE based on augmented reality and motivation mechanisms.

RE with Everyone (from wishing for experienced end users to empowering newbies): In smart rural areas, for example, the end users are mainly citizens who have never contributed to the development of a software system and have no special technology affinity. We envision both the adaptation of Participatory Design techniques to empower citizens to actively participate in the process of digital transformation of their cities and the development of a framework to support requirements engineers in finding the appropriate fit between end users' characteristics and RE methods.

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RE for Everything (from focusing on software to holistically taking into consideration people, things, and services): Nowadays, people, things, and web services can have a digital identity and be interconnected via the Internet (IoPTS). This requires a completely different way of understanding the context and the components of a software solution, due to the nature of the entities. A Digitalization Potential Analysis could be a top-down, human-based approach for defining the vision of the software solution, whereas automatic context modeling followed by the derivation of context-aware requirements would be a bottom-up, automated approach.

Global Automation (from supporting direct interaction with a set of representative end users to also allowing a crowd to indirectly provide requirements): In some situations, the group of users might be so heterogeneous that it might be easier and more effective to allow anyone to provide potential requirements rather than to try to identify a set of representative end users or think about appropriate personas. Crowd RE stands for performing RE with the support of a crowd of stakeholders in an automated way through two complementary mechanisms: User Feedback Analysis and Usage Mining. Both mechanisms aim at extracting requirements for the evolution of the target software and allow stakeholders to contribute requirements without being aware of it.

Openness (from wishing for well-understood processes and groups of end users to accepting openness) & Cross-Domain (from dealing with one domain at a time to dealing with multiple domains): The business value of a software ecosystem relies on new processes made possible only by orchestrated cooperation among partners. However, concrete partners might still be unknown or might change; even if the actual partners are known, their contributions to the ecosystem might still be unclear/undecided. In this context, groups of end users and processes tend to be not well understood and requirements – in the sense of a perceived need for a functionality or quality attribute – might not exist. Furthermore, a software ecosystem is, by nature, cross-domain, as partners from different sectors with different services decide to combine their strengths and offer upper-level services. Approaches for performing RE for software ecosystems are under development. Creativity techniques are expected to play an important role, while software tools can support the search for the right partners and the mapping of relevant concepts across domains. In any case, the skills of requirements engineers need to shift from being able to elicit requirements to being able to propose requirements and thereby strongly support stakeholders in shaping the ecosystem vision.

These dimensions of ubiquity provide an overview of the future directions for RE from our mixed practitioner / researcher perspective. For more details, see the full paper [Vi18], where references to related work in each dimension are provided.

References

- [Vi18] Villela, K; Hess, A; Koch, M; Falcão, R; Groen, E; Doerr, J; Valero, C; Ebert, A: Towards Ubiquitous RE: A Perspective on Requirements Engineering in the Era of Digital Transformation. In: International Requirements Engineering Conference. IEEE, pp. 205–216, 2018.