

# Lessons Learned on Applying an Ontology-based Approach to Engineer Trustworthiness Requirements

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## Abstract

New and disruptive technologies have rapidly advanced, affecting almost every area of our lives. The adoption of such technologies largely relies on *user trust*. A major challenge for Requirements Engineering today is to propose techniques that support requirements engineering activities for incorporating high-level societal concerns and goals, such as *trustworthiness*, into the software development processes as explicit requirements. But what exactly is trust? How to identify the stakeholders' trust concerns? And what makes a system trustworthy? In a previous work, we proposed an Ontology-based Requirements Engineering (ObRE) method that aims to systematize the elicitation and analysis of complex requirements, such as trustworthiness, by using an ontological account for such class of requirements. Then, we conducted a real case study in collaboration with the Central Bank of Brazil, in which ObRE was applied to help with the elicitation of trustworthiness requirements for Pix, the Brazilian Instant Payments Ecosystem. In this work, we discuss lessons learned in the experience of applying ObRE to Pix. Our reflections focus on the nature of trustworthiness requirements and their life cycle, besides contributing to understanding how to apply ontologies in engineering trustworthiness requirements. In more detail, applying ObRE to Pix led us to understand that trustworthiness requirements depend on the system-to-be, going beyond intuitive non-functional requirements such as security and privacy. For Pix, for example, availability (i.e., operating 24/7), instantaneity, usability and transparency are also crucial. Another important finding of this study concerns the need of constant monitoring trustworthiness requirements, which can change overtime after the system is operational. Finally, we also draw some conclusions about the use of ObRE in the elicitation of complex non-functional requirements such as trustworthiness. Ontologies can: a) shed light on the concepts related to such requirements; b) support the elicitation of requirements based on questions elaborated on the basis of these ontological concepts, and c) assist requirements specification based on ontology instantiation. Overall, the Brazilian Central Bank's Pix experts that we interviewed had a positive impression about the use of ObRE, highlighting the potential of the developed ontology to make explicit user's intentions besides system's capabilities and vulnerabilities, all of which influence user's trust (or lack thereof) in the system.

## Keywords

Trustworthy Systems, Trustworthiness Requirements, Ontology-based Requirements Engineering

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