Requirements for Context-Aware Systems

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Abstract. Originating from ubiquitous computing and augmented by the rapid onset of mobile technology, the field of intelligent environments (IE) is maturing to a level at which a range of sophisticated applications are emerging. By its very nature, an IE typically comprises a fusion of sensors, networks, intelligent software and end-user interfaces with intrinsically complex interoperability [1]. Such systems aim to be context-aware, especially being adaptable to dynamic circumstances, and possibly unpredictable circumstances. Deploying a reliable IE system can be critical. For instance, in the case of a pervasive system designed to facilitate ambient assisted living (AAL), in which the end-user could be vulnerable to some degree, a system failure could have disastrous consequences. Recently, it has been acknowledged that numerous IE systems have been developed without adopting best practices in software engineering. The reality is that the development of such a promising area is so far guided by ad hoc and disconnected initiatives and there is an increasing acceptance that IE researchers and system developers share a responsibility to design holistically safer, more efficient, and more user-customised systems. However, engagement with core software engineering principles has, to date, been quite limited within the IE community [2]. Our work focuses on the requirements engineering stage and presents a framework for IE systems, in which an intrinsic component is context-awareness. Our study of previous work in this area has highlighted a number of prominent themes which provide focus for our research. In particular, we are currently working as part of the POSEIDON[1] consortium towards a distributed technological infrastructure to foster the development of services (based on both static and mobile smart environments) which can support people with Down's Syndrome [3]. Aspects of the POSEIDON project have some affinity with the work by Sutcliffe et al. [4]. Each incorporates a higher-order goal of 'empowerment' of an individual with disability, recognises the benefit of scenario-based elicitation techniques, and identifies a demarcation between individual user requirements which demand a degree of personalisation, or customisation, and distinct user groups that support an individual who also present distinct sets of requirements. In particular, we nominate five requirements stakeholder categories as part of our framework. Another salient feature of our work is the introduction of a core ethical model. Previous work has addressed the issues of

[1] http://www.poseidon-project.org

social context (as an aspect of geographical context), cultural issues and ethnicity. We have enhanced this idea with the adoption of a set of ethical principles within the overall framework that also considers the important issue of privacy. More specifically, within our research group we have created an ethical framework based on services which collectively are consistent with a number of higher level ethical principles which are designed to protect users from informal and rushed system development. The framework for context-aware systems that we propose can be described as a form of workflow model, whereby we have identified a series of core requirements gathering categories (establish high-level objectives and scope, identify tasks and performance qualities, determine stakeholder profiles for context users) against which dedicated requirements elicitation activities proceed, which are complemented by two further activities that play a vital supporting role (operational support and harmonisation). Central to the process is a determination of stakeholder profiles for those users who require context data capture (not all stakeholders will require context profiles). This phase comprises a number of sub-activities which include the use of psychological questionnaires, scenario-based techniques and the application of the ethical framework that is mentioned above. Whilst our requirements engineering framework targets context-aware systems in general and our intention is to apply it to a range of projects, the first application of the model has commenced with the POSEIDON project. The POSEIDON project is in its early stages. In terms of our framework, high-order objectives and scope have been established having been considered at early stages through the definition of the project and subsequent interaction with the European Commission (who are funding the project). The POSEIDON consortium has designed online questionnaires which have been filled in by more than 300 users. Approximately 30 families have been interviewed, and a user-focused workshop event has taken place. It is envisaged that this real-world application of the framework will endorse its conception and facilitate refinement of the model.

References

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