

Supporting Decisions in Requirements Negotiations Dynamically

Annika Lenz

University of Hohenheim, Information Systems Department 1, 70599 Stuttgart-Hohenheim
annika.lenz@uni-hohenheim.de

Motivation

16 years after the agile manifesto [1], agile software development has been established in both practice and research. The software development paradigm affects requirements engineering in many ways. In general, agile requirements engineering comprises the same activities as traditional requirements engineering, even though in other ways or at other points. For example, agile requirements engineering is conducted continuously along the implementation cycles [2]. Since agile software development embraces changes [1], tasks in agile requirements engineering must deal with changes efficiently and effectively. One of the decision tasks in agile requirements engineering is the utility analysis of requirements [2]. Due to higher occurrence of changes, it is more likely that new requirements or solutions arise, obsolete requirements or solutions are omitted, or existing requirements or solutions change. In the case of new or changing requirements and solutions, these must be assessed with regards to existing requirements and solutions to analyse their utility, e.g. for evaluating the backlog. Re-evaluation of all requirements and solutions causes enormous effort, while the sole evaluation of new requirements and solutions does not ensure overall consistency of the assessment.

The context of the decision situations considered in this paper relates to negotiations as part of requirements engineering, subsequently called requirements negotiations. Hence, the decision problems considered cover the structure of a negotiation agenda with negotiation issues reflecting requirements and issue values reflecting solutions [3]. Changes are perceived as consequences of an increasing information level. If the information level increases, the negotiation agenda will change in so far that new requirements or solutions are added, or obsolete requirements or solutions are omitted. If the agenda does not change, preferences for existing requirements or solutions may change nonetheless because of new information.

Problem

Various approaches exist to provide decision support in requirements negotiations [4] and in requirements engineering, inter alia the application of preference measurement methods [e.g. 5]. The problem is that having outdated preferences, the preferences must be measured again, since the preferences are related to each other. In agile requirements negotiations continuous preference adjustments are indispensable, since changes occur often and thus preferences become obsolete faster. Nonetheless, requirements changes or solution changes and

all their consequences occur in traditional requirements negotiations as well.

A concept for dynamic preference adjustment is developed to remedy this problem. The concept makes use of decision support in negotiations, which is transferred to decision problems in requirements negotiations.

Solution

To solve this problem, a dynamic preference measurement process, comprising preference elicitation and preference adjustment, is designed. In the preference elicitation process, preferences are elicited for the requirements and solutions already known, while in the preference adjustment process, new requirements or new solutions can be assessed with little effort in relation to the existing preference structure.

Preference measurement methods have been developed in market research to measure preferences of potential customers for product development [6]. However, since then, they have been applied in other domains, e.g. to measure user preferences in design decisions in information systems [5]. Likewise, preference measurement methods are applied in negotiation research as well as in requirements negotiation research [7]. These preference measurement methods are designed to capture ‘one-shot’ preferences. Hence, they cannot be applied in their status quo to the dynamic domain of requirements negotiations [8].

Negotiation processes in general are also of dynamic character, because new information may become available during the negotiation. Thus, one-time preference measurement is not expedient in this domain as well [9]. To apply preference measurement methods to the domain of requirements negotiations, these methods must be adapted for dynamic purposes. Therefore, a dedicated dynamic approach for requirements negotiation based on the Adaptive Self-Explication method [10] was developed, which enables preference adjustment within the decision support process (see Fig. 1).

At the beginning, an agenda, e.g. the requirements and solutions, are elicited, which is followed by an initial preference elicitation based on the currently known information. The resulting preferences are used to calculate a utility model. At this point, an optional check may be performed to evaluate the consistency of the preference structure. Additionally, an optional interactive check validates the preferences to the user. Based on the utility model, analyses to provide decision support may be conducted.

With an increasing information level and resulting agenda changes respectively preference changes, the regarding preferences are adjusted dynamically. For this, repeating the entire preference elicitation is not required. Following the extension of the Adaptive Self-Explication method, only few paired comparisons related to existing, still valid preferences, must be conducted. The utility model is re-calculated after two adjusted respectively two new paired comparisons to keep the utility model continuously up-to-date. Subsequently, an optional interactive check can be performed again to ensure the validity of the preferences to the user.

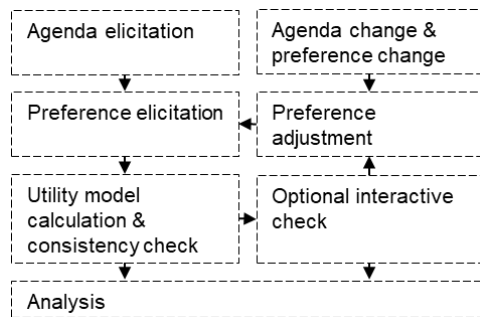


Fig. 1. Preference elicitation and preference adjustment within decision support in requirements negotiations

Using the latest preferences, up-to-date utility analyses [2] can be performed at any point of time. These analyses form a basis for further decisions. In the context of requirements negotiations, continuously up-to-date preferences allow accurate negotiation analyses, e.g. comparison of own specification offers and drafts with the negotiation partner's; progression analysis of own offers, of the negotiation partner's concessions, of both negotiation parties' concessions, and of comparisons of specification offers to be accepted with the own aspiration level and reservation level.

Summary

Changes are likely in agile requirements engineering as well as in traditional requirements engineering. The concept of dynamic preference measurement in the context of requirements negotiations enables to include preference changes without eliciting the entire preference structures again to provide an accurate decision basis build upon continuously accurate preferences.

Acknowledgements

The author gratefully acknowledges the funding provided by the Faculty of Business, Economics, and Social Sciences at the University of Hohenheim within the research area "Negotiation Research - Transformation, Technology, Media, and Costs".

References

[1] Beck, Kent; Beedle, Mike; van Bennekum, Arie; Cockburn, Alistair; Cunningham, Ward; Fowler, Martin et al. (2001): Manifesto for Agile Software

Development. Available online at <http://agilemanifesto.org/>, last access 12/12/2016.

[2] Bergsmann, Johannes (2014): Requirements Engineering für die agile Softwareentwicklung. Methoden, Techniken und Strategien. 1st edition. Heidelberg: dpunkt.

[3] Lenz, Annika; Schoop, Mareike (2017): Decision Problems in Requirements Negotiations – Identifying the Underlying Structures. In: Mareike Schoop und D. Marc Kilgour (Eds.): Group Decision and Negotiation. A Socio-Technical Perspective: 17th International Conference, GDN 2017, Stuttgart, Proceedings. Cham: Springer International Publishing (Lecture Notes in Business Information Processing, 293), pp. 120–131.

[4] Lenz, Annika; Schoop, Mareike; Herzwurm, Georg (2016): Electronic Requirements Negotiation – A Literature Survey on the State-of-the-Art. In: UK Academy for Information Systems Conference (Ed.): Proceedings of UKAIS 2016. Oxford, UK, Paper 23.

[5] Matzner, Martin; von Hoffen, Moritz; Heide, Tobias; Plenter, Florian; Chasin, Friedrich (2015): A Method for Measuring User Preferences in Information Systems Design Choices. In: ECIS 2015 Completed Research Papers, Paper 131.

[6] Eckert, Jochen; Schaaf, René (2009): Verfahren zur Präferenzmessung – Eine Übersicht und Beurteilung existierender und möglicher neuer Self-Explicated-Verfahren. In: Journal für Betriebswirtschaft 59 (1), pp. 31–56.

[7] Grünbacher, Paul; Köszegi, Sabine; Biffel, Stefan (2006): Stakeholder Value Proposition Elicitation and Reconciliation. In: Stefan Biffel, A. Aurum, B. Boehm, H. Erdogmus und P. Grünbacher (Eds.): Value based software engineering. Berlin, Heidelberg: Springer, pp. 133–154.

[8] Lenz, Annika; Schoop, Mareike; Herzwurm, Georg (2015): Requirements Analysis as a Negotiation Process. In: Bogumil Kaminski, Gregory Kersten, Przemyslaw Szufel, Michal Jakubczyk und Tomasz Wachowicz (Eds.): The 15th International Conference on Group Decision & Negotiation letters. Warsaw: Warsaw School of Economics Press, pp. 303–309.

[9] Reiser, Andreas (2013): Entscheidungsunterstützung in elektronischen Verhandlungen. Eine Analyse unter besonderer Berücksichtigung von unvollständigen Informationen. Wiesbaden: Springer Fachmedien Wiesbaden; Imprint: Springer Gabler.

[10] Netzer, Oded; Srinivasan, V. (2011): Adaptive Self-Explication of Multiattribute Preferences. In: Journal of Marketing Research 48 (1), pp. 140–156.