

Elicitation of Information Needs in Precontract Requirements Engineering

Christian Müller, Matthias Koch, Sebastian Adam

Fraunhofer Institute for Experimental Software Engineering, Kaiserslautern, Germany
{christian.mueller,matthias.koch,
sebastian.adam}@iese.fraunhofer.de

Abstract. The precontract phase of a software project is of high importance for the employer as well as the contractor, because this phase yields the basis for a contract between the parties. The main interest of the contractor is to provide an offer which addresses the requirements of the employer in a convincing way and proposes a solution for a reasonable price. In order to decide about the acceptance of an offer, decision makers of the employer require certain information to be contained in the offer. In this paper the results of a survey about the information needs of decision makers are presented. It yields first indications about the relevance of certain information and where in a document decision makers would like to find it. The paper includes a description of the method that has been used to acquire the knowledge.

Keywords: Precontract, offer, information needs.

1 Introduction

Before the implementation of a software project can start, there is the need to develop solution ideas as well as to estimate their costs as precisely and reliably as possible. These are to be packaged into an offer that a customer is able to understand, assess, and finally accept. In the end of the so-called “precontract phase” a contract is created to which all partners have to commit. Errors in this contract, for example, because of wrong cost calculations, ambiguously formulated requirements, or unconsidered functionalities, can lead to a failure of the project [1].

Although the precontract phase precedes every project, many organizations are facing difficulties in this phase [2] [3]. To increase the chances of acceptance of the offer, the requirements of the customer towards the system have to be captured and understood exactly in order to identify suitable solutions and to determine the costs of their realizations precisely. This is hampered by the asymmetry of information, i.e. the potential services provider does not know the employer’s requirements and budget [4]. Subsequently, the solutions have to be presented in an understandable and convincing way such that decision makers can judge the offer appropriately. Despite having an economical relevance for the competitiveness of organizations, the precontract phase is hardly addressed in the literature and is not present in common process models [5].

However, there is a demand for suitable methods which support the generation of appropriate offers [6].

As basis for the development of such methods it is important to know the information needs of decision makers. Because these form the foundation of the offers to be created, methods have to be aligned with them. The main goal is to be able to create the offers with limited effort in such a way, that they contain exactly the information that the decision makers need – not more and not less.

This paper summarizes the information needs which have been identified in a survey with three partner organizations and three of their customers. Therefore, interviews have been conducted and the insights about the participants' information needs have been aggregated.

The remainder of the paper is structured as follows: In chapter 2 the method for the elicitation of information needs is described. In chapter 3 the outcomes of the conducted study are elucidated. Chapter 4 contains an explanation of the threats of validity that have to be taken into account when considering the presented results. Finally, an outlook to future research in this area is given in chapter 5.

2 Method for the Elicitation of Information Needs

This chapter describes the method which has been applied to gather the information needs of decision makers.

The elicitation of information needs has been done in interviews following a fixed agenda. During these interviews the participants have been asked, what motivates them to read the offer completely from beginning to end, and what prevents them from reading it completely. The answers have been collected in an unsorted list of indications. Furthermore, the participants have been asked for information that is expected to be included in the offer by all means. This can for instance include information about the product, the vendor, or the project. All the mentioned elements have been noted on cards.

Next, the order in which the information should be present in the offer has been elicited. For this purpose, the card-sorting technique [7] has been applied. The participants ordered the cards with the information elements to express which information they would like to have in the beginning, middle, or end of the document.

As a last step, the participants were supposed to prioritize the information elements with respect to their importance for a decision to accept or reject the offer. The prioritization has been done using a five-point Likert-scale, whereas "1" stands for *very important* and "5" for *very unimportant*.

After the workshops, the gathered information has been consolidated, i.e. the terminology has been unified, and the results have been aggregated.

3 Information Needs

In this chapter, the results of the survey are presented. The method, which is described in the previous chapter, has been applied with three partner organizations and

three of their customers. This means the results depicted in this chapter contain the aggregated outcomes of six interviews.

At first the identified positive and negative criteria is elaborated, afterwards the information elements required by decision makers are depicted.

3.1 Positive and negative criteria

The organizations and their customers have been asked what motivates them to read the offer from beginning to end. Table 1 shows these criteria sorted by the number of indications by the interviewees. The most important criterion is that the offer has to justify the price of the solution. In particular, the description of the individual modules should convey their value and degree of innovation. Furthermore, a comprehensible textual presentation of the concepts and a clear layout motivates half of the participants to read the offer entirely.

Table 1. Positive criteria

Criterion	Description	Indications
Price	Description of the individual modules has to convey the value and degree of innovation of the solution	67%
Textual presentation	Comprehensible, written in German language, no anglicisms, no generic standard texts	50%
Layout	Clear layout, optionally optimized for mobile end devices	50%
Graphics	Not only plain text, but graphics and illustration should make the offer less monotonous	33%
Requirements	The offer has to make clear, that the customer's requirements are fulfilled; precisely described initial situation of the customer	33%
Extent	Not too much information, focus on important information, short and crisp management summary, more extensive technical document for the respective expert staff of the customer	33%

Besides the factors that motivate the customers reading the offer, the interviewees have been asked for criteria which prevents them from reading the offer. Table 2 gives an overview of the identified negative criteria. The first two criteria relate to a bad readability of the textual descriptions of the concepts and too much content in the offer. These fit to the identified motivation criteria that has been described before.

Table 2. Negative criteria

Criterion	Description	Indications
Readability	Usage of too many anglicisms and marketing phrases, no common thread leading through the offer	33%
Extent	Too long document, too much text, too many technical details	33%

Criterion	Description	Indications
Textual presentation	Usage of generic standard text elements which do not react to the requirements	17%
Layout	Poor formatting, no loosening graphics	17%
Price	The price is way too high and exceeds the price limit	17%
Requirements	The previously defined requirements of the customer are not addressed	17%
Technical information	No technical information of the proposed solutions is present	17%
Reference projects	No description of successful similar projects with other customers is given	17%

3.2 Required information elements

In addition to the criteria mentioned in the previous section, the interviewees have been asked specifically about information elements that have to be present in the offer. Table 3 shows an overview of all the identified information needs. They are sorted by the average importance that has been assigned to the information. The values of the importance have been transformed to labels according to the following scheme:

1.0 – 2.33: Important 2.34 – 3.66: Neither nor 3.67 – 5.0: Unimportant

Table 3. Information needs

Information element	Description	Position	Avg. Importance
Initial situation	Description of the initial situation of the customer along with the planned procedure in the project	Beginning	Important (2.0)
Price information	Total costs, costs of single modules, follow-up costs	Beginning	Important (2.2)
Modules	Overview of modules, detailed description	Beginning	Neither nor (3.1)
References	Brief depiction of similar projects that have been conducted with other customers	End	Neither nor (3.3)
Visual information	Design drafts, wire frames, prototypes	Middle	Neither nor (3.5)
Technical background	Technical description of the proposed solution	End	Unimportant (4.0)
Milestones	Definition of milestones and temporal breakdown of the individual project phases	Middle	Unimportant (4.0)
Temporal procedure	Starting point, overall duration of the project, duration of the single phases	Beginning	Unimportant (4.2)
Contract conditions	General business terms, confidentiality agreement, payment terms	End	Unimportant (4.2)

Information element	Description	Position	Avg. Importance
Contact persons	Contact data of the project responsible or project management	End	Unimportant (4.2)
Optional services	Optional, but recommended services / modules including their costs	Middle	Unimportant (4.2)
Resources	Efforts to be made by the customers, such as coaching or maintenance	End	Unimportant (5.0)

4 Threats to Validity

The results of the survey have to be regarded carefully because of several threats to validity which are explained in this section. They are classified into the categories conclusion, internal, construct, and external validity [8].

The conclusion validity is concerned with the degree to which conclusions about relationships in the data can be drawn. This validity is threatened by the small sample size of only six participants. This means it has to be stated that the implications drawn from the data most likely have a limited reliability.

The internal validity is concerned with the causal relationships between a treatment and the results. The internal validity is threatened by the way the information has been gathered in interviews. There is a risk that participants are influenced by recent occurrences and might have forgotten aspects that used to be important in the past.

The construct validity is concerned with the relation between theory and observation. In the scope of the survey, the construct validity is threatened by the fact, that the only means for gathering the information has been interviews. In these interviews the participants expressed what they think is important to them. Their perception might deviate from reality.

The external validity is concerned with the generalizability of the results. This validity is seen as rather high, because all the participants of the survey were representatives of real organizations who are involved in writing and reading offers in their business.

5 Conclusion

The survey presented in this paper aims at gathering the information needs of decisions makers who decide about the acceptance of offers that are created in the precontract phase of software development projects. Additionally, the survey covers the criteria which motivates them to read the offer completely, and the criteria which has negative influence on the willingness to read the document. The identification of the information needs is required in order to propose methods which help contractors to write offers with reasonable effort in such a way that decision makers find exactly the information they are looking for.

A comparison of the information elements currently included in offers and the identified information needs reveals that the information required to judge an offer is already present in today's "as-is-offers". Deviations mainly arise in the order of the presentation. An important indicator for decision makers is the price, which is currently only present in conjunction with the list of modules and their descriptions. Another important criterion is the temporal procedure. In the "as-is-offers" this information is given after the description of modules. However, it should be presented more prominently in the beginning of the document.

The results of this study provide a first indication about the information which decision makers expect to be present in offers. Because of the described threats to validity, further studies need to be performed in order to increase the level of confidence. In future research it is necessary to repeat the survey with more participants in order to minimize the threats to conclusion validity. To counter the threats to construct validity, i.e. the risk that the measured perception of the information needs deviates from the actual needs, it is beneficial to acquire the information from participants during their reading of such documents instead of purely relying on interviews. This could for example be supported by the usage of observations or eye tracking.

References

- [1] The Standish Group, "CHAOS Manifesto 2013," 2013.
- [2] A. Tarhan, C. Gencel and O. Demirors, "Pre-Contract Challenges: Two Large System Acquisition Experiences," in *Enterprise Architecture and Integration: Methods, Implementation and Technologies*, 2007, pp. 75-91.
- [3] B. Paech, R. Heinrich, G. Zorn-Pauli, A. Jung and S. Tadjiky, "Answering a Request for Proposal – Challenges and Proposed Solutions," in *REFSQ*, Essen, 2012.
- [4] R. Weiber and F. Jacob, "Kundenbezogene Informationsgewinnung," in *Technischer Vertrieb - Grundlagen*, Berlin, Springer, 2000, pp. 523-612.
- [5] J. Ludewig and H. Lichter, *Software Engineering: Grundlagen, Menschen, Prozesse, Techniken*, dpunkt.verlag, 2013.
- [6] O. Demirors, E. Demirors and A. Tarhan, "Managing instructional software acquisition," *Software Process: Improvement and Practice*, vol. 6, no. 4, pp. 189-203, 2001.
- [7] D. Spencer, "Card sorting: a definitive guide," 7 4 2004. [Online]. Available: <http://boxesandarrows.com/card-sorting-a-definitive-guide/>.
- [8] C. Wohlin, P. Runeson, M. Höst, M. C. Ohlsson, B. Regnell and A. Wesslén, *Experimentation in Software Engineering: An Introduction*, MA, USA: Kluwer Academic Publishers Norwell, 2000.