

Analyzing the Understandability of Requirements Engineering Languages for CSCW Systems: A Family of Experiments*

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1 Context of the proposal: Collaborative Systems

Nowadays, even classic applications like text processors are collaborative. For instance, Google Docs [2] enables several users to edit a text document simultaneously. These collaborative text processors are a good example of CSCW (*Computer Supported Cooperative Work*) systems [3], which are systems whose users can perform collaboration, communication and coordination tasks (3C). Collaborative systems, in a similar way to classical single-user systems, have to be specified by means of a set of requirements, whose accuracy and suitability are key to achieve the quality of the developed system. The main difference between the requirements of single-user systems and CSCW systems is the highly non-functional nature of the latter, because of the users' need of being aware of the presence of other users with whom to perform the above mentioned 3C tasks, that is, the *Workspace Awareness* (WA). In order to deal with the specification of this special type of systems, we conducted several empirical evaluations in order to check which is the most adequate Requirements Engineering technique to model both awareness and quality requirements of CSCW systems. We concluded that the *i** Framework [1], was the most promising one. However, we identified several issues when modeling collaborative systems with this language that led us to extend the original *i** language by creating CSRML (Collaborative Systems Requirements Modeling Language) [4] and evaluate it empirically.

2 A Family of Experiments

A family of experiments has been carried out whose general goal is to test which language, CSRML or *i**, has a better understandability when modeling requirements of CSCW systems. This family of experiments consisted of an experiment and two repli-

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cas, all of them carried out by students of Computer Science from three different universities.

Each conducted experiment consisted in understanding a piece of a requirements model, specified by using either i^* or CSRML, of two different CSCW systems. Moreover, the subjects were distributed into two groups (G1 and G2) in order to assign the two different system specifications of each one. Afterwards, they received an introductory session being the explanations neutral regarding the independent variable (whether using i^* or CSRML). It was decided that G1 performed the experiment first trying to understand the i^* model of the jigsaw activity and then just after that, the CSRML model of the reviewing process. G2 made exactly the opposite.

Null-Hypothesis	H_{0A} : CSRML has the same average score for understandability as i^* when modeling CSCW systems requirements. H_{1A} : $\neg H_{0A}$
	H_{0B} : The average score for understandability is the same regardless the domain used in the experiment. H_{1B} : $\neg H_{0B}$
	H_{0AB} : CSRML has the same average score for understandability as i^* when modeling CSCW systems requirements, regardless the domain used in the experiment and viceversa. H_{1AB} : $\neg H_{0AB}$

The results of the original experiment and its replicas were analyzed by performing, first an ANOVA test considering the origin of students and, later a meta-analysis. According to the ANOVA test and due to the obtained p-value of 1,752E-17 for *Language* factor, the null hypothesis H_{0A} could be rejected. Therefore, definitively there was a statistical significant difference between CSRML and i^* . Additionally, as the obtained p-value for *Domain* was higher than the established α (0,05), it can be stated that the systems used for the tests did not have influence over the understandability. Afterwards, the meta-analysis was carried and it showed that the p-value was $\sim 0,000$ so that the null hypothesis could be rejected. Therefore, it can be definitively stated that there is a significant difference between CSRML and i^* for modeling CSCW requirements. Other important facts were detected while analyzing the students' answers. For example, it was found that CSRML models are more understandable due to its collaboration representation features, the new added awareness elements and the roles management approach used.

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