

## The Role of Goals in Design Reasoning

Roel Wieringa

University of Twente, Department of Computer Science, Information Systems Group  
P.O. Box 217, 7500 AE Enschede, The Netherlands  
[r.j.wieringa@utwente.nl](mailto:r.j.wieringa@utwente.nl)

Designers reason from real or imagined stakeholder goals about a problem context, to desired properties of artifacts that should contribute to these goals in this context. The general pattern of reasoning is the same in software engineering, information systems and industrial product design: Given stakeholder goals  $G$  and assumptions about a context  $C$ , find artifact requirements  $R$  such that  $C \times R \Rightarrow G$ . Design reasoning is creative, as goals are usually not given ready-made to designers, the problem context is often partly unknown, assumptions about it are usually incomplete, and the artifact does not exist yet. Increased understanding of one of the three components (goals, context, artifact) changes the designer's understanding of the other two. This is not a stepwise refinement process but a non-monotonic process in which earlier beliefs may have to be retracted. The result, the contribution argument  $C \times R \Rightarrow G$ , is defeasible (it may turn out to be wrong).

After an analysis of design reasoning, I will zoom in on the role of goals in this kind of reasoning. I will define goals as stakeholder desires for which the stakeholder has committed resources (time and money) to achieve them. Stakeholders have different levels of goal awareness, ranging from unaware to actively pursuing the goal. Goals change, and in particular they can change by introduction of an artifact. Pursuing a goal entails having a problem theory that provides explanations, right or wrong, of the current state of the world, and predictions, right or wrong, about the future evolution of the world, and about the impact of different possible events on goal achievement.

I will end the talk by discussing implications for goal-oriented requirements specification languages such as i\* at two levels. At one level, my analysis has implication about what aspects of goal-oriented design reasoning can be represented in a goal-oriented language. At another level, my analysis can be used to assess the role of i\* as artifact used in a requirements context to contribute to goals of requirements engineers.