

# Requirements Engineering - Applying Theory to Reality

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## Abstract

*A Requirements Engineering process must take account of the user, the nature of the work, the environment in which that work is carried out and the resources available to the user. Creativity work is essential when designing future systems but should be carefully linked to the lifecycle of the project. Use Cases and Scenario Authoring, though time consuming, provide benefits, both in completeness of requirements capture and in strength of structure. For a "Socio-Technical System", system goal modelling must take account of the human perspective.*

## 1. Introduction

Over a 15-month period a Requirements Engineering process, developed and tailored by City University, London, was applied in an Air Traffic Management Research & Development Environment by Eurocontrol's CORA (CONflict Resolution Assistant) project team. Eurocontrol is the European Organisation for the Safety of Air Navigation. The CORA project is housed in the Automated Support to Air Traffic Services Programme, whose mandate is to design and develop concepts, requirements and prototypes for future decision-support tools for Air Traffic Controllers.

The application of the theoretical RE process: (i) emphasised the importance of its tailoring to the user and (ii) provided useful lessons on Creative Design, Use Cases and Social Modelling.

## 2. Tailor the process to the user

In this context, the CORA project team is the user. Our environment, i.e. the concepts and technologies on which CORA is dependent, is constantly evolving given the nature of our work - research and development of future concepts. The RE process to be applied should enable the user to meet the challenge of coping with a lack of stable requirements for systems adjacent to CORA. Assumptions regarding stakeholder commitment and availability should be cautious given their (a) scarcity as resource, (b) spread throughout Europe, (c) commitment to multiple projects.

## 3. Some lessons learnt

- Recommended Creative Design Workshops brought many new and original ideas. However, the relevance of creativity work is dependent on its timing in relation to the lifecycle of the project or concept. An 'open' creative workshop, i.e. no constraints considered, is very valuable at the beginning of a project and less relevant later, when creativity work could be more beneficial if focussed on working within constraints, thus limiting the 'problem space'.
- Use Cases and Scenario authoring, though time consuming, were useful for complete requirements elicitation. In addition a beneficial and essential facet of Use Cases is that they provided structure for requirements and system modelling. Requirements elicitation is the main objective of the RE process, but elicitation must be structured: 'richness only makes sense with structure'.
- System goal modelling was recommended. The widely used term "Socio-Technical System" means that both human elements and technical elements construct the overall system. Therefore, the system should be modelled using both technical AND human perspectives. Integrating a human perspective into system modelling echoes the problem of how knowledge on the social nature of the work, gained via e.g. ethnographic studies, could be suitable for use in the design process [1]. The CORA team is currently extending the I-star formalism [2] to integrate complex human activity in the overall system model from various viewpoints, e.g. individual and collective, and with various perspectives, e.g. high level goal or precise cognitive process.

## 4. References

- [1] Viller, S. & Sommerville, I., "Social analysis in the RE process: from ethnography to method", in *Proceedings of RE'99*, Limerick Ireland, IEEE Computer Society Press, 1999.
- [2] Yu, E., "Towards modelling and reasoning support for early-phase RE", in *Proceedings of RE'97*, Washington DC USA, IEEE Computer Society Press, pp.226-235, 1997.