ABSTRACT
Requirements is too often seen as a "stenographer's task", one where the requirements engineer passively listens and records while the stakeholders state their needs. However, this approach relies on stakeholders knowing what they need, and what they want. Experience tells us that except for rare visionaries, people do not know what they want until they see it. Many of the useful products that we take for granted today, did not come about from the stakeholders' imagination, but from an invention. In this tutorial we explain and illustrate how to use creative techniques to invent requirements that result in more useful, usable and competitive products. We provide a guide for invention, and show participants how to use this guide to invent innovative requirements for a familiar system.

Categories and Subject Descriptors: D.2.1 [Requirements/Specifications] Elicitation methods (e.g., rapid prototyping; interviews; JAD); Methodologies (e.g., object-oriented, structured).

General Terms Design, Human Factors

Keywords Use cases, requirements, creativity.

1. CREATIVITY AND REQUIREMENTS
Requirements engineering is a creative process in which stakeholders and designers work together to create ideas for new systems that are eventually expressed as requirements. The importance of creative product design is expected to increase over the next decade. Creativity is indispensable for more innovative product development, and requirements are the key abstraction that encapsulates the results of creative thinking about the vision of an innovative product. It is a trend that requirements engineering researchers and practitioners, with their current focus on elicitation, analysis and management, have yet to grasp fully.

As we have reported previously [4,5], little requirements engineering research has addressed creative thinking directly. Brainstorming techniques and RAD/JAD workshops [2] make tangential reference to creative thinking. Most current brainstorming work refers back to Osborn’s text [9] on principles and procedures of creative problem solving (CPS). The CPS method describes six stages of problem solving: mess finding, data finding, problem finding, idea finding, solution finding and acceptance finding. It was originally intended to help people understand and use their creative talent more effectively [3]. The six stages are arranged into three groups – understanding the problem, idea generation, and planning for action. A recent CPS manual [1] describes activities for supporting each model stage. Examples include the matrix, which involves making lists then selecting items from each list at random and combining them to generate new ideas, and parallel worlds, which uses analogical reasoning to generate new ideas. However, there are no reported applications of the CPS model to requirements processes.

In the requirements domain, Robertson [11] argues that requirements analysts need to be inventors to bring about the innovative change in a product or business that gives competitive advantage. Such requirements are often not properties that a stakeholder would ask for directly. Nguyen et al. [8] observed that teams restructured requirements models at critical points when they re-conceptualize and solve sub-problems, triggered by moments of sudden insight. Mich et al. [7] report the successful use of the elementary pragmatic model from communication theory in a controlled environment to trigger combinatorial creativity during requirements acquisition. However, none of these approaches exploit creativity theories or models directly, and there are few other references to creativity in mainstream requirements and software engineering journals and conferences. Requirements analysts lack processes and models that can be applied to guide their creative processes.

2. THE TUTORIAL
This tutorial sought to fill the creativity gap in current requirements engineering and software design research and practices. It set out to provide tutorial attendees with:
1. An awareness of state-of-the-art thinking and practice in creativity research, and definitions of creativity based on established theories from disciplines such as cognitive psychology and artificial intelligence;
2. Guidelines to enhance existing requirements and design processes with creativity techniques;
3. Practical creativity techniques such as the removal of constraints, analogical reasoning and rich storyboarding;
4. Advice on using domain experts to support exploratory and transformational creative thinking;
5. Guidelines to integrate creativity workshops and the results from creativity techniques into established requirements and design processes such as the Rational Unified Process and representations such as UML;
6. Access to software tools that can be used to encourage creative thinking about requirements and software designs. Some of these tools result from recent requirements research and are tailored to support scenario-driven requirements processes, whilst others emerge from creativity research but can be applied to software development processes;
7. Practical guidelines on how to set up and run creativity workshops.

The tutorial is based on the authors’ experiences over the last 5 years researching creativity, setting up and facilitating creativity workshops, and prototyping new creativity tools embedded in requirements and software engineering environments. Case studies that describe results from previous creativity workshops applied during the requirements process for European air traffic management systems are reported in [4,5,6], whilst other workshops applied to specify new police biometric technologies are reported in [10]. Similarly the results are based on ongoing research to integrate creativity tools with established requirements and software engineering tools. We look forward to reporting the results of this work at this and future tutorials.

The tutorial itself has evolved over the last 4 years. We have refined the tutorial since its first instance at the IEEE International Conference on Requirements Engineering in 2002. Subsequent versions have been held at the Requirements Engineering Conferences in 2004 and 2005, as well as at a range of national and industrial events and seminars.

3. REFERENCES