Provoking Creative Design: Making it Scale

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ABSTRACT

Creativity is indispensable for more innovative interactive system development. This tutorial is relevant to anyone involved in large projects that are exploiting new technologies or developing new interactive systems and media. The tutorial will familiarize participants with both the need for creativity, and the techniques and tools to bring this about. It will interleave short presentations with group work activities that allow participants to use different techniques for stimulating creativity. No prior knowledge of creativity models or techniques is expected. Over the last 6 years, the presenters have designed and run 14 different creativity workshops in projects developing large-scale interactive systems for major clients. Neil Maiden is Professor of Systems Engineering in the Centre for HCI Design at City University, and Sara Jones is the RCUK academic fellow in creative socio-technical system design.

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

Management, Design, Human Factors.

Keywords

Innovation, creativity, requirements, creativity workshops.

1. INTRODUCTION

The development of interactive systems is a creative process in which stakeholders and designers work together to create ideas for new systems. The importance of creative product design is expected to increase over the next decade. Commentators are increasingly in agreement that the businesses which will thrive will be those which can innovate. For example, Nomura has identified creativity as the next economic activity, replacing the current focus on information, and the Cox review of creativity in business, commissioned by the UK government, sees exploitation of the nation's creative skills as 'vital to the UK's

long-term economic success', with greater creativity being a key to greater productivity. Creativity is indispensable for more innovative system development, and is a topic of increasing interest to those involved in designing new user experiences, exploiting new technologies and developing new interactive systems and media. The following sections describe the content of the tutorial.

2. OVERVIEW OF CREATIVITY

Participants will be presented with an overview of state-of-the-art thinking and practice in creativity research within HCI and related disciplines. The presenters will provide definitions of creativity based on established theories from disciplines such as cognitive and social psychology and artificial intelligence, and descriptions of existing processes and techniques that encourage creative thinking. For the remainder of the tutorial, we adopt Sternberg's [9] definition of creativity as prototypical of those available in the literature. Creativity is defined as "*the ability to produce work that is both novel (i.e. original, unexpected) and appropriate (i.e. useful, adaptive concerning task constraints)*".

3. CREATIVITY WORKSHOPS

Over the last 6 years, the presenters have designed and run 14 different creativity workshops to encourage creative thinking in a range of different projects aimed at developing large-scale interactive systems for major clients that include Eurocontrol, the UK's National Air Traffic Services and the UK's Police IT Organisation.

Workshop activities have been designed using 3 established models of creativity from cognitive and social psychology that we use for different purposes. The models provide us with taxonomies of creative thinking with which to structure processes in workshops. For example, we design workshops to support the divergence from and convergence towards ideas as described in the CPS model [2]. As such each workshop period, which typically lasted half a day, starts from an agreed current system model, diverges, then converges towards a revised agreed model that incorporates new ideas at the end of the session. We also design each workshop period to encourage one of 3 basic types of creativity identified by Boden [1] – exploratory, combinational and transformational creativity. These 3 types are based on computational creativity approaches that define a space, then explore and transform it. Finally, we design each workshop period to encourage 4 essential creative processes reported in [8] following Poincare's philosophical model, based on personal reflections about his own scientific processes: preparation, incubation, illumination and verification. We design incubation and illumination activities using the type of creativity (exploratory, combinational or transformational) that we seek to encourage.

The tutorial will provide examples from previous creativity workshops (see, for example, [3,4,5,6,7]) to demonstrate how this theory can be applied in practice. This will enable participants to understand how they can enhance their systems development processes. The presenters will describe how previous workshops were designed based on existing theories, models and taxonomies of creativity, how the workshops were run, and important workshop outcomes – both problems that were encountered in the earlier workshops and successful outcomes from them. These workshops, problems and successes will be demonstrated with detailed examples taken from academic publications that report the workshops in detail.

4. USE OF CREATIVITY TECHNIQUES

The tutorial will enable participants to learn some practical and important creativity techniques by practicing them throughout the tutorial on a running example that has been tried-and-tested in previous tutorials. Participants will work in groups to apply and investigate techniques for exploratory creativity – for example removing constraints and reasoning analogically – as well as combinational and transformational creativity with innovative storyboarding techniques. Analogical reasoning, for example, has been used in several of our workshops to stimulate creative thinking. We define 2 domains as analogous if the domains share a network of knowledge structures that describe goal-related behaviour in both domains. Studies have shown that people can exploit such analogies to identify ideas for the design of a new system if they are given support to recognize, understand and transfer the analogies. In creativity workshops we provide this support but encourage the participants to go one step further and use the transferred knowledge from the source domain to provoke creative thinking about ideas in the target domain. In previous workshops, we have exploited analogies with the composition of music and with textile design to discover requirements and design ideas for an air traffic control conflict resolution system, analogies with railway scheduling to discover requirements and design for departure management systems at Heathrow and Charles de Gaulle airports, and analogies with intelligent highway systems to discover requirements and design ideas for Eurocontrol's new multi-sector planning (MSP) system for more efficient aircraft movements.

5. STIMULATING CREATIVITY WITH NEW KNOWLEDGE

The tutorial will provide participants with techniques with which to introduce new knowledge, so important to creative thinking, into creativity workshops. Particular focus will be placed on the use of domain experts. The presenters will explain how to build networks of domain experts, how to select the right expert for the right creative activity, and how to use expert presentations to support incubation periods so important in creative thinking. All of this will again be supported with examples from reported creativity workshops.

6. INTEGRATING CREATIVE IDEAS IN STORYBOARDS AND SCENARIOS

The tutorial will explain to participants how to integrate creativity workshops and the results from creativity techniques with the use of other methods and tools such as storyboards and scenarios. Such integration is essential if explicit use of creativity techniques is to become mainstream in system development processes. The tutorial will give participants knowledge of when in the development process to hold creativity workshops, what are the essential inputs to a

creativity workshop, how to integrate workshop outputs with standard artifacts such as scenarios and storyboards, and when to apply different creativity strategies throughout the development process.

An example of the kind of storyboards produced during our creativity workshops is shown in figure 3, which shows part of the storyboard developed during our workshop for the MSP project.

7. CREATIVITY SUPPORT TOOLS

The presenters will describe and demonstrate to participants some simple software tools that can be used to encourage creative thinking in the context of interactive system design. Some of these tools result from recent requirements research and are tailored to support scenario-driven requirements processes, whilst others emerge from creativity research.

8. PRACTICAL ADVICE

Finally, the tutorial will provide participants with practical guidelines and advice on how to set up and run their own creativity workshops. Participants will learn simple guidelines on how to plan for a successful workshop, how to prepare workshop participants, how to get the timing of a workshop right, and what needs to be done when a creativity workshop ends.

9. REFERENCES

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