Creativity and Innovation in Requirements Engineering

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Structure

Introduction

- **What is creativity?**
  - "the ability to produce work that is both novel and appropriate"
- **How does it fit into requirements elicitation?**
  - "Elicitation" - the word "capturing is avoided"
  - –> discovering, understanding and documenting requirements. In the recent years it is considered that they should be rather invented or envisioned instead of just gathered from them.

Current state in research and practice

- **Traditional techniques** do not cover gathering requirements in a creative way.
- Typically, **problem analysis** and system specification is the focus.
- This is embodied into many of the current processes and frameworks such as ___i*___ , **KAOS** or **RUP**.
- In **innovation management**, there is usually a focus on short-term market trends. Most of them don't focus on a practical elicitation of ideas, but are rather abstract models or recommendation for the higher management.

Why dös it mätter

- Requirements engineering itself is a **creative process**: In practice, many stakeholders express themselves creatively.
- The industry expects that creative design is expected to increase in the **future**.
- This is because the analytical, reactive view is considered narrow and might not provide enough **innovation in the long term**.
- The assumption that **invention is part of the design process** is considered outdated.

Why dös it mätter

- The assumption that the generation of requirements depends on the **knowledge of individuals** is outdated.
- Innovation depends on the gathering of new ideas. **Requirements are an abstraction of these ideas**. This suggests that the creative process is a part of the requirements elicitation process.
- There is also a broad range of stakeholders that could be leveraged for the innovation process. The **restriction of design to the design phase** limits innovation.

Why dös it mätter

- To conclude: **Creative requirements engineering techniques and idea gathering are important for the innovation of a product, project or company. The biggest issues are lack of available methods, awareness and risk-aversity. We will now introduce two techniques that aim at eliciting new, innovative requirements.**

We introduce two processes:

RESCUE

Background

- Inspired by scientific approaches from **creativity theory**
- **Concurrent engineering process with different modelling and analysis techniques.**
- Focus on **system goal and use-case modelling.**

RESCUE

Principles

- **Based on creativity workshops to support three different models from creativity theory**

1. Designed to support **divergence and convergence** on ideas
2. Each workshop encourages three different **types of creativity: exploratory, combinatorial ans transformational**
3. Support four different **creative processes: Preparation, Incubation, Illumination and Verification.**

RESCUE

Experience

- The model was tested using **six iterations** of workshop series.
- The first one was considered successfull and created **200 ideas** and requirements.
- The second and subsequent workshops were all successfull. This led to **refinements** in the structure, which were then tested in a workshop with MSP (??).
- Existing **use-cases** provided the **basis** for the workshop.
- Different activites took place over the days of the workshop.
  - **Brain storming, Constraint identification and removal**
  - **Analogical mappings** to other domains were achieved by listening to experts from other domains.
  - Expert presentation on **visualization**

RESCUE

Experience

Findings:

- **First iteration**:
  - **200 ideas were invented by 20 people**. **50** of them were found to be **useful**.
  - Important **learnings and improvements** were made to the structure, such as running the workshops early in the project.
  - The **existing creativity theories** are not sufficient for requirements elicitation. Dedicated techniques might need to be invented.

RESCUE

Experience

Findings:

- **Last iteration**:
  - **Brainstorming** generated more ideas than **analogical reasoning**.
  - **Combining ideas** was most effective when done during storyboard development
  - **Removing constraints** provided more ideas than presenting knowledge from the solution-space.
  - Reassured to run workshops after a first scope was defined
  - They did not find issues with runninng **one-day workshops** instead of two

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Background

- Focus on short-term financial security makes is harder to see beyond today's needs and distinguish between ongoing and soon-to-be initiated projects
- This leads to incoming requirements concentrate around current projects
- However, it is necessary to look forward (especially in software companies) to achieve long-term success

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Idea

- Companies use their employees' capability for innovation because the development organization must have a deeper domain-understanding than a customer that usually uses a company's products in a single domain. (Robot Example)
- Making innovation a part of day-to-day business

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Requirements for such a System

- Proper decision making processes and justification materials that help balancing long term innovation with indispensable short term development efforts
- Focus on long-term Requirements
- Inputs from entire organization (devs, sales, etc.)
- Cost effective
- Produces quality material that managements can base their decisions on

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Process (4 Steps)

1. Call for Innovation
2. Audition (Value Case)
3. Preparation (Business Case)
4. Decision (Business Case)

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Step 1: Call for Innovation

- Made by Audition Group (AG) chair
- Can be directed towards a certain product line or process
- Make form and information available to all people
- People/Groups with ideas sign up

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Step 2: Audition

- Informal setting with AG
- Flexible presentation/discussion style
- Important to give feedback to contender
- If case is dismissed, give reasons and publish case with reasoning
- Create Value Case (light version of a business case)

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Step 3: Case Preparation and Screening

- AG passes value cases from auditions to the Case Preparation Group (CPG)
- CPG focuses on further refining the case into a in-depth business case
- Contender my be consulted
- Consult with experts to assess feasibility and long-term impact
- Should a case be dismissed at this stage, the same “rules” apply as in the Audition Step

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Step 4: Case Decision

- CPG passes business cases to the company's Case Decision Group (CDG)
- CDG already exists in all software development companies
- Bring Star Search cases into requirements selection and priorization in addition to regular business cases

Star Search

Results and Conclusions

- Authors ran Star Search for 1 year at different organizations
- Generally positive results
- Face-to-face meetings are favored by employees, compared to static/passive techniques of innovation
- Fast feedback and immediate discussion of ideas considered more important than thorough evaluation

Company 1

- 25% increase in innovation candidates on roadmap
- 25% of of items in development-pipeline are from Star Search cases

Company 2

- 1 innovation candidate per 10 employees
- 5% of all innovation candidates make it to market

Comparison/Conclusion of the two