Creativity Techniques for Acquiring Privacy Requirements

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Overview

• Acquiring correct user requirements is crucial in producing effective software
  • Imagining requirements is inherently a creative endeavor
• Privacy requirements are particularly difficult because they combine
  • Users’ attitudes to privacy
  • Tradeoffs of privacy with functionality
  • The identification of corner cases where a privacy concern may arise
• How can facilitate crowdsourcing of privacy requirements to benefit from end users’ creativity as well as attitudes and other traits?
  • Identify strategies to reduce information overload
  • Understand the influence of privacy attitudes, personality traits and creativity potential on idea generation
Research Questions

• RQ 1. How effective is a sequential crowd RE process in acquiring privacy concerns and privacy-preserving ideas compared to traditional crowdsourcing?
  • Are there any tradeoffs between privacy and functionality?
  • Are certain crowd selection and idea exposure strategies better at acquiring privacy concerns and privacy-preserving ideas, and yet preserve functionality?

• RQ 2. How does a worker’s privacy attitude influence the creativity of the privacy-preserving ideas he or she produces?

• RQ 3. When a worker is exposed to ideas of others, how is this worker’s privacy-preserving idea influenced by the previous workers’
  • a. Privacy attitudes?
  • b. Creativity potentials?
A Sequential Crowd RE Process

P1: Idea Generation
- S1: Generate ideas
- S2: Identify concern
- S3: Refine to address concern

P2: Idea Rating
Rate ideas generated in S1, S2 and S3
Idea Generation

• S1. No exposure to ideas
  • Crowd participants generate ideas

• S2. Exposure to ideas from S1
  • Cognitive stimulation
  • Crowd participants shown ideas
  • Crowd participants rate and refine ideas, and identify privacy concerns

• S3. Exposure to ideas from S2
  • Cognitive stimulation
  • Crowd participants rate ideas, and refine ideas to address identified concerns
Idea Generation Template

Initial Idea Generation
As a <stakeholder role>, I want <feature>, so that <benefit>

Identifying Privacy Concern
As a <stakeholder role>, I have <privacy concern> with <feature>

Idea Refinement
As a <stakeholder role>, I want <refined-feature>, so that <benefit> while avoiding <privacy concern>
Idea Exposure in S2 and S3

Creativity survey
Personality survey
Privacy survey

Previous ideas
Idea selector
Selected ideas
Idea Generation
New ideas

Similar creativity
Dissimilar creativity
Mixed creativity
Similar personality
Dissimilar personality
Mixed personality
Similar privacy attitude
Dissimilar privacy attitude
Mixed privacy attitude
Idea Rating

• Rate ideas generated during idea generation phase
  • Privacy-preserving nature
  • Creativity
    • Novelty
    • Usefulness
Study Design

• Subjects: Workers from Amazon Mechanical Turk
• Surveys:
  • Privacy survey
  • Creativity survey
    • Gough’s creative personality scale
  • Personality survey
    • Mini IPIP
Requirements for a Smart Home

- Emerging domain that crowd could relate to
- Large space for exercising creativity
- Various privacy concerns

How to acquire privacy-relevant requirements?
Metrics

• Crowd worker
  • Creativity potential
    • High, medium, low
  • Personality trait
    • Big 5
  • Privacy attitude
    • Fundamentalist, pragmatist, unconcerned

• Idea
  • Creativity
    • Usefulness
      • Likert scale 1--5
    • Novelty
      • Likert scale 1--5
  • Privacy-preserving
    • Likert scale 1--5
Hypotheses

H1. [Exposure] Privacy-preserving quality and creativity of ideas differ for different steps (S1, S2, and S3) in the idea generation phase
   • Certain exposure strategies are better at acquiring privacy-preserving ideas

H2. [Self] A worker’s privacy attitude influences
   • how privacy-preserving his or her idea is; and
   • how creative his or her idea is

H3. [Exposure] Privacy-preserving quality and creativity of ideas proposed by a worker differ depending on whether he or she was exposed to ideas by privacy fundamentalists, privacy pragmatists, or privacy unconcerned
Success Criteria

• Human subject study demonstrate that the ideas generated during the later phases of sequential Crowd RE process are more creative and privacy-preserving than the ideas generated in earlier phases.
Anticipated Difficulties, Limitations and Criticisms

• Threat to validity of data quality
  • Crowd workers with over hundred tasks and 95% approval rate

• Threat of prior knowledge
  • Presurvey
  • Information about domain