Panel on ICSEA/Req&Dev
Validating Products versus Requirements; Dis(covering) the Gaps

Michael Gebhart
Our Panelists

Jon Geater
Thales e-Security-Ltd., UK

Heidar Pirzadeh
SAP SE, Canada

Mira Kajko-Mattsson
KTH Royal Institute of Technology, Sweden

Radek Koci
Brno University of Technology, Czech Republic

Luis Fernandez Sanz
Universidad de Alcalá, Spain
Human and organizational factors: impact on software quality

Panel: Validating Products versus Requirements; Dis(covering) the Gaps

Luis Fernández-Sanz, Universidad de Alcalá, Spain

This work has been partially funded by European Commission for project ICEBERG no. 324356 (7th Framework Programme IAPP Marie Curie program).

ICSEA 2016, August 21 - 25, 2016 - Rome, Italy
Human and organizational factors

- Software projects are a social activity
- Addressed up to some extent in software engineering research, less than technical topics: e.g. project estimation
- Connection to software quality: neglected in research
  - Open to real practice and lack of data
  - Different research methods, qualitative and quantitative
  - Multidisciplinarity and exploring hybrid fields not understood by traditional researchers
Example

• Work in software testing:
  • How training impact effectiveness of test case design, 71 professionals
    • Less training, more duplicated/useless cases
    • Unsystematic design (<50% coverage)
    • Only 30-35% of software professionals trained in testing (3 surveys)
Example in requirements: analyzing multicultural teamwork

- Effects of teamwork in requirements analysis, real case for experiment
- Discovering reqs thru answers to questions (368 people, 6 countries)
  - Individually and then looking for team consensus
- Analysis of results: promotion of teamwork spirit
- But, analyzing results of multinational settings (Hofstede’s indicators)
  - Yes, attitude’s trends match with Hofstede’s numbers
  - Higher IDV (individualism), poorer teamwork results
  - Higher UAI (uncertainty avoidance), better reqs. analysis results
Validating Products vs Reqs

Mira Kajko-Mattsson
KTH Royal Institute of Technology
Sweden
Software testing phases

Agile mainly concentrates on developer’s continuous integration and acceptance testing.
Agile Software Development Lifecycle, variant 1

Define Requirements → Design → Development → Deliver

Project Iteration

Iteration

Iteration

Iteration

Acceptance Testing

Acceptance Testing

Acceptance Testing

Iteration Preparation

Daily Status

Development

Iteration Completion
Challenges

- Humans
- Supporting tools
- Developers’ process
Status within one company

- Requirement definition: Word, PowerPoint
- Requirement management: Excel
- Project management: Excel
- Development: Physical wall and sticky notes
Traceability should be better supported by the tools
Developer’s individual process should be improved

- Unit testing is the heart of agile methods
  - No modification or refactoring of code is complete until 100% of unit tests have run successfully.
  - No story is complete until all its acceptance tests have passed successfully.
- Is this enough?
Managers wind up (clockwork) developers to follow the methods
Solution

SGD Process Model

Pre-Work
- Preliminary Activities
- Planning Activities

Work
- Preparatory Activities
- Coding Activities
- Unit testing Activities
  - Evaluation Activities
  - Debugging Activities

Post-Work
- Self-assessment Activities
- Deliver and Sign-off Activities

Feedback

Guidelines

My SGD Process

The SGD Framework’s activities to be used in individual developer processes

My improvements

Go to

My Implementation and Testing Work Space

My Pre-Work Space
My Work Space
My Post-Work Space
Validating Products versus Requirements; Dis(covering) the Gaps

Heidar Pirzadeh
Gap in Implementation

- Developers misunderstand the requirements, make implementation mistakes, or the requirements change during or after development.
- Validation Testing
- Release Testing
- Requirement Based Testing
- Freeze Requirements During an Increment
Gap in Requirements

- Requirements are incomplete or incorrect
  - Lots of space for interpretation
  - Partial market research
  - Literal translations of customer needs
  - Outdated
Processes for gathering requirements (as an initial step of problem solving) might not work depending on the complexity of the problem.

- Simple Problems
- Complicated Problems
- Complex Problems [1]
References


Panel discussion: Mind the gap!

Validating Products versus Requirements; Dis(covering) the Gaps
The problem with defining requirements
The problem with defining requirements

Things we know it should do
The problem with defining requirements

Things we know it shouldn’t do
The problem with defining requirements

Things we don’t know it shouldn’t do
The problem with defining requirements

Things we don’t know it shouldn’t do
Unintended consequences
Unintended consequences

Seeing this does not always mean you are at risk.

You are at Risk!
The search for perfection
"The perfect is the enemy of the good"
“Better a diamond with a flaw than a pebble without.” - Confucius

“The best is the enemy of the good.” - Voltaire

“Striving to better, oft we mar what's well.” - Shakespeare
The commercial ‘creative process’
The commercial ‘creative process’
The commercial ‘creative process’
How can we possibly win?
Can models implement software requirements?

Radek Kočí

Brno University of Technology, Faculty of Information Technology
Czech Republic
koci@fit.vutbr.cz

ICSEA 2016, 21.-25.8.2016, Roma, Italy
Questions on modeling and implementation (maybe) of software functional requirements using formal methods.
Questions on the Requirements Specification

How to specify functional requirements?
- unrestricted natural language
- structured natural language
- predefined statement templates
- semi-formal specification language (ERD, DFD, UML, …)

What the requirements specification has to meet?
- it has to be readable and understandable for users
- the requirements has to be specified exactly (?)
- the specification has to be valid (how to do it?)
Valid Specification?

How to validate the requirements specification?

- inspections and reviews, evaluation at review meetings, . . .

- an animation of specifications
  ⇒ the need of executable form of the specification,
  e.g., Petri nets, state machines, Executable UML, . . .

- requirements verification through formal methods
  ⇒ the need of the formal specification,
  e.g., Petri nets, temporal logic, . . .

Formal methods

- provide higher precision and richer forms of analysis

- (but) are usually harder to use and less widely applicable
Executable/Formal Models?

Does the model adequately reflect the original specification or the developed system?

- how to create **valid** formal models from the specification?
- is it possible to specify requirements using formal models directly? (but it has to be still readable and understandable for users)
- is it possible to develop the system using models?
How to create valid formal models from the specification?
- it is difficult
- model transformations are too complicated

Is it possible to specify requirements using formal models directly?
- yes
- formalisms with clear syntax and semantics
- these formalisms have to be usable by developers having no power mathematical background, e.g., some kinds of Petri nets

⇒ it is possible use simulation or formal methods to verify specifications
⇒ it is possible to validate the requirements immediately they are specified
Is it possible to develop the system using models?

- yes (partially)
- it is needed to combine specification models with other ones including programming language $\Rightarrow$ the code is part of models $\Rightarrow$ models implement requirements
- for instance, use cases, Petri nets, DEVS, Smalltalk, Java, ... 
- it can be a problem for time-critical systems, the transformation or final implementation would be needed
Tool support needed

- **Renew (Hamburg)**: a combination of Petri nets and Java
- **PNtalk (Brno)**: a combination of Petri nets, DEVS formalism, and Smalltalk (so far the experimental version only, the new release is awaited this year)
- both concepts are able to run Petri nets on embedded system as a control software
Thank you for your attention!