Requirements Negotiation

Software Requirements and Design
CITS4401
Lecture 19
Content

- Introduction
- Why Negotiation?
- Aims
- Sharing the Research Experiences
Introduction to the Problem

- Errors are difficult and expensive to fix. The cost of repairing defects rises exponentially the later they’re found in the software life cycle (Boehm 1997) – argued by Kent Beck 2000, Ambler 2007.

- Many organizations have poorly defined and informal RE process (Sommerville 1994).

- Few firms have a structured process for RE while most firms approach RE in an ad-hoc manner. (Sadraei et al 2007).
Introduction - Project Failure

- Well known reason for project failure (Hatton 2008)
  - Unrealistic or unarticulated project goals
  - Badly defined system requirements
  - Poor communication among customers, developers and users
  - Inaccurate estimates of needed resources
  - Poor reporting of the project’s status
  - Unmanaged risks
  - Use of immature technology
  - Inability to handle the project complexity
  - Sloppy development practices
  - Poor project management
  - Stakeholder politics
  - Commercial pressures
Introduction
Dealing with stakeholders

- Stakeholders have their own perspective and perception
- They don’t always know what they want.
- They don’t always agree with each other
- They aren’t consistent in the information they give
Several keynote speakers in the International Conference on Software Engineering (ICSE) emphasized the importance of requirements negotiation as follows:

- “How the requirements were negotiated is far more important than how the requirements were specified” (Tom De Marco, ICSE 96)

- “Negotiation is the best way to avoid “Death March” projects” (Ed Yourdon, ICSE 97)

- “Problems with reaching agreement were more critical to my projects’ success than such factors as tools, process maturity, and design methods” (Mark Weiser, ICSE 97)
Why Negotiation?

Findings: Current RE (Kamata et al 2007)

- Based on the literature survey and interviews with the authorities of RE and practitioners.
  - The literature survey targeted over 700 papers and reports from 2001 to 2005 in major RE conferences and journals.
  - The interviews targeted 13 authorities in RE academic field and 7 practitioners.

- Negotiation is one of the 18 major research areas in RE

- Few RE studies focused on the communications with users or customers, such as stakeholder analysis or communication-related issues. (i.e. negotiations)
Sadraei et al. (2007) looked at 28 projects across 16 firms.

- Sectors included finance, pharmaceuticals, health and telecommunications.
- Primarily business systems with some embedded systems.
Why Negotiation?

Findings: Effort Distribution

Average efforts invested in RE activities among all projects (Sadraei et al 2007)
Why negotiation?

- Negotiation is introduced to facilitate requirements elicitation and analysis.
  - Encourages communication
  - Aids in understanding
  - Reveal conflict, solution exploration, collaborative resolution.
  - Improves agreement level.
  - Develop stakeholders’ satisfaction.
  - Improves requirements quality.
Negotiation for agile software development

- Negotiation for traditional software methods focuses on revealing conflicts and improving understanding of requirements.

- As agile methods focus on involvement of customer, whose role is to provide and prioritize new system requirements, negotiation for agile software development should therefore focus on resolving these system requirements, e.g.,
  - Can they be implemented within the time frame?
  - Can they be implemented within the budget?
  - Can these requirements be prioritized?
Agile methods have to rely on contract where customer pays for time spent on system development rather than the time on developing a specific set of requirements.

- Negotiate on what to be delivered, i.e., the product
- Software developer should be realistic on what they can deliver (i.e., do not over-promise just to get the contract signed)
Sharing the research experience…

- Experiments have been done to measure the effectiveness of negotiation.
Aims of Negotiation Experiments

- The first experiment was designed to demonstrate the improvement in agreement between the stakeholders.

- Second experiment was designed to demonstrate the movement of agreement towards ideal result.
Both Experiments

- Case study named Course Unit Registration System

- A list of fifteen requirements provided.
Both Experiments

- Role play experiments
  - Participants play roles as system stakeholders
  - 4 stakeholders in a team consist of administrator, finance officer, lecturer and student.

- Both experiments were done in a classroom setting and each experiment took approximately an hour.
Both Experiments

R13: Notify all students by email once the schedule has been processed.

Before negotiation:

 ICC = -1

After negotiation:

 ICC = 1

-1 < ICC < 1

ICC = Interclass Correlation Coefficient
Scale Reference

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<th>Meaning</th>
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<tr>
<td>4</td>
<td>Must have this</td>
</tr>
<tr>
<td>3</td>
<td>Should have this if at all possible</td>
</tr>
<tr>
<td>2</td>
<td>Could have this if it does not affect anything else</td>
</tr>
<tr>
<td>1</td>
<td>Won’t have this time but would like in the future</td>
</tr>
<tr>
<td>0</td>
<td>Will not have this</td>
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- **ICC: Interclass Correlation Coefficient**
  - 1: total agreement
  - -1: total disagreement
Observation Findings

- Encourage communication.
- Reasoning
- ‘Give and take’ approach.
- Middle ground.
- Persuasive.
- Negotiation exist, not simply free conversation.
The Results and Analysis

Agreement level before and after the Negotiation in Experiment 1

<table>
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<th>Before</th>
<th>After</th>
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<tr>
<td>G1</td>
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<td>G7</td>
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</table>
The Results and Analysis

Agreement level before and after the Negotiation in Experiment 2
The Results and Analysis

Number of Requirements Dropped and Affected in Experiment 1
(Total of 15 requirements)
Consensus produce good requirements?

- Assume that an ideal result exists. An ideal set of requirements are identified.

- Set as a benchmark and called a Gold Standard.

- **Gold Standard** criteria:
  - A core set of requirements with no external dependencies.
  - Contains all the key requirements necessary for the system.

- Experiment 2 is designed to measure progress towards this Gold Standard.
Cohen’s Kappa

- Kappa measures the agreement between
  - the gold standard
  - and
  - the set of requirements obtained through negotiation

Cohen’s kappa coefficient measures the inter-rater agreement for qualitative items.

If the raters are in complete agreement then \( \kappa = 1 \). If there is no agreement among the raters then \( \kappa = 0 \).
The Results and Analysis

The Agreement between the Requirements Identified by Each Group and the Gold Standard.

- Group A: 0.53
- Group B: 0.7
- Group C: 0.21
- Group D: 0.21
- Group Q: 0.4
The Results and Analysis

Relationship between Kappa and Negotiation Effort
Conclusions

- Experiment 1 demonstrated that negotiation improves agreement level.
- Experiment 2 demonstrated that the consensus moved closer to the Gold Standard.
- The negotiation results were improved in proportion to the amount of effort spent.
References

  - Section 7.2.4 “Negotiation”
  - Section 7.7 “Negotiating Requirements”

  - 12.5.4 “Issue Modelling and Negotiation”