Supporting Consensus-based Software Development: a Vision Paper

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Agile teams are not created equal

Each “flavor” emphasizes certain Agile principles.

“The best architectures, requirements, and designs emerge from self-organizing teams.”
Is consensus decision making a "thing"?

• **Zappos**: Online shoe selling company using the *Holacracy* leaderless framework for their web development.

• **Medium.com**: Online publishing platform who started with *Holacracy* but still retain some principles like striving for partial consensus.

• **Loomio**: Cooperative developing decision assistance tools using a consensus-based decision process.

• **Koumbit**: Web-hosting company based in Montreal uses explicit consensus-based decision processes.

“Consensus-Based Communities”
Why consensus?

• **Beyond managers**: agile teams may forego the use of managers and instead spread the responsibilities within the team

• **Increasing complexity**: software engineering is constantly getting more complex; not one person is an expert in everything

• **Risk of majority tyranny**: a team with a majority of non-experts can overrule a minority of experts

• **Political roots**: organizations like Loomio, that grew out of the Occupy movement, emphasize empowerment, anti-oppressive politics and worker emancipation
Why study Consensus-Based Communities?

• **Potential research insights**: niche organizational structures might offer perspectives not obvious in conventional software development (“outlier case”)

• **Conway’s Law + Software ecosystems**: if the team’s organization influences its design, what is the impact in the era of open software ecosystems?

• **They are interesting!** so why not?
Contributions

1. Highlight the existence of Consensus-Based Communities that build software

2. Describe their process and challenges

3. Analyze the capabilities of existing tools (modelling, development, collaboration)

4. Outline how model-based techniques can help
Consensus group decision-making

Main difference between conventional/hierarchical software development and Consensus-based Software Development:

How decisions are made

Leaderless group decision-making requires good **self-discipline** to function
Key to success: decision-making **process**
Consensus

Defined as “general agreement” and “group solidarity in sentiment and belief” (Merriam-Webster)

Formal meetings: problem statement, proposals, amendments, votes, but...

Different voting system:

- **Agreement**: Everything is A-OK!
- **Reservation**: I have some issues with the proposal but I can go forward with it.
- **Stand aside**: I will not help you with this proposal, but if you still want to go ahead, I will not block you.
- **Block**: This should not be implemented, period. If implemented, I’m out. (To be used parsimoniously)

Strive for perfect consensus, but weak consensus (no blocks) is acceptable
Process

A1: Introduction
A2: Discussion
A3: Concerns
A4: Proposal
A5: Refinement
A6: Consensus test
A7: Implementation

Abort

Weak consensus?

10
Roles

A1: Introduction
A2: Discussion
A3: Concerns
A4: Proposal
A5: Refinement
A6: Consensus test
A7: Implementation

Hand takers
Participant
Facilitator
Minute takers

Abort
Weak consensus?

Minute takers
A1
A2
A3
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Facilitator Responsibilities

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A7: Implementation

Abort

Weak consensus?

Hand takers

Participant

Facilitator

Minute takers

Active Listening
Summary

Synthesis

Minute takers

Participant

Facilitator

Summary

Active Listening
Outline

- Introduction
- Requirements
- Process
- Tools
- Next steps
Challenges

**Language differences:** Each expert comes with their own jargon

**Evaluate expertise:** Consensus implies persuading others with facts, not feelings

**Breadth of alternatives:** Are the generated solutions varied enough?

**Groupthink:** Aware of informal domineering

**Self-monitoring decisions:** Ensure that solutions are implemented as decided

**Documenting rationale:** Future team members must know how a decision came to be

**Organization education:** Any meeting can result in a process change, requiring organization-wide re-learning

**Introspection:** The team must continually strive to improve its process
Top-level Requirements for CBSD Tools

1. Present the issue
2. Manage proposals
3. Document arguments
4. Detect consensus
5. Monitor decisions
6. Support whiteboarding
7. Identify expertise
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Diagram:
- A1: Introduction
- A2: Discussion
- A3: Concerns
- A4: Proposal
- A5: Refinement
- A6: Consensus test
- A7: Implementation

- Weak consensus?
- Abort
- Test for consensus
- Record votes

Roles:
- Participant
- Hand takers
- Minute takers
- Facilitator
- Summary
- Synthesis
- Active Listening
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Evaluate expertise

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Warn consensus?

Abort

Participant
Hand takers
Minute takers
Facilitator
Summary
Synthesis
Active Listening
Introspection Requirements

8. Evaluate alternatives
   - Evaluate breadth of studied alternatives

9. Detect dysfunctions
   - Identify groupthink

10. Understand decisions
    - Educate members on organizational context
    - Document rationale
Studied Tools

1. **Argunet**: Tool for structuring debates into logical propositions
2. **bCisive**: Pictogram-rich modelling tool for structuring debates
3. **Carneades**: Tool for structuring debates into logical propositions
4. **DebateGraph**: Mind-mapping concept modelling tool
5. **Discourse**: Time-based discussion framework
6. **holaSpirit**: Implementation of the *Holacracy* framework
7. **Loomio**: Voting assist tool which enable consensus evaluation
8. **Planning Poker**: Prioritisation tool based on card-based pictograms
9. **Reddit**: Voting-based discussion framework

Non-exhaustive list compiled using [1] and our own investigation.

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Results

Of the tools we found and analyzed:

• Few support more than for/against vote types
• Few consider expertise
• Few consider the risk of groupthink
• None connect with project management tools
• None connect with organization knowledge tools
• None help evaluate the quality of alternatives
Outline

- Introduction
- Requirements
- Process
- Tools
- Next steps
Areas of Improvement

**Inter-tool communication:** Current tools focus few aspects of the consensus-based decision process; no tools cover everything.

**Fuzzy argumentation:** Current tools focus on rational decision-making; software development needs naturalistic approaches where arguments are more fuzzy.

**Evolving decision models:** Current tools only present snapshots of decisions; practice shows that decisions change over time.

**Team dynamics:** Current tools neglect internal team dynamics.
Open Questions

• How to integrate produced models with team software development processes

• How to integrate rational decision modelling with naturalistic modelling and fuzzy argumentation

• How to reason about dynamic decision-making in the presence of team heterogeneity (e.g. expertise) irrationality (e.g. groupthink)
How MDE is Relevant

MDE raises the level of abstraction and places explicit emphasis on heterogeneity

Some connections are obvious:
• Metamodelling, language globalization can address interoperability concerns
• Modelling and management of design rationale, compliance and QA
• Design space exploration, model management, versioning
• Collaborative modelling, flexible tools can help with whiteboarding

Some are trickier:
• Need DSLs for modelling discussions, megamodelling to connect with development artifacts
• Need to model “consensus debt” incurred by provisional decisions
1. Consensus-Based Communities that build software exist and are interesting

2. The have unique processes and face unique challenges

3. Existing tools do not address the needs of CBCs

4. MDE can help