Twelve Steps to Robust Decisions: Building Consensus and using ConsensusBuilder in Product Development and Business

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Who I am

• Professor Mechanical Engineering Design, 20 years
• Fellow, American Society of Mechanical Engineers
• Professional designer: founder and chief designer for BikeE Corp (www.bikee.com)
Who I am

• Design methods researcher

• Author of *The Mechanical Design Process*

• Founder of the ASME Design Theory and Methodology Committee

• Short Course Teacher: Modern Design Methods, Taguchi’s Method of Robust Design, 10 Steps to Robust Decision-Making.

• Principal in Camas and developer of iDecision
An example of a typical problem faced in business, industry or our personal lives

My friends Bob and Carol, and I want to go to a restaurant for dinner. Our conversation is as follows:

- Bob: *I wouldn’t mind Mexican, I know a place that’s cheap.*
- Carol: *Is the food any good?*
- Bob: *I don’t really know. I haven’t been there in years.*
- ME: *I’m not in the mood for Mexican. I know a Thai place that has great food.*
- Bob: *You mean the place on 2nd.*
- Me: *Yeah!*
• Bob: *I ate there a couple of weeks ago and didn’t like it at all. Also I can’t afford that place.*
• Carol: *How was the service?*
• Bob: *It was ok.*
• Me (at the same time): *It was slow. But, do we care? We aren’t in a hurry.*
• Bob: *We aren’t getting anywhere very fast and I am hungry. What about the steak place around the corner?*
• Me: *At least its close!*
• Carol: *I became a vegetarian last week. No steak places for me.*
• Bob: *I am sure it has a veggie menu also. I can call and double check on this.*

......and so on until hunger or fatigue forces a choice........
3 truths about decision-making

• The solution of most problems is the evolution of information punctuated by decisions.

• For the vast majority of problems, there are no right answers, only satisfactory answers.

• A decision is a commitment to use resources.
Four key questions, asked either consciously or unconsciously, every time a decision is made:

1. What is the best alternative?
2. Do we know enough to make a good decision yet?
3. What do we need to do next to feel confident about our decision?
4. Is there team consensus about the decision?
Value of Information

![Diagram showing the hierarchy of data, relationships, models, behavior, knowledge, judgment, and decision, with an arrow indicating increasing value.](image-url)
Design Problem Solving Research Results

• Planning is about 75% deduction
  If <situation> then do <this activity>.
• Design work is only 13 % deduction
• Design is mainly search
  – Develop criteria
  – Generate alternatives
  – Compare alternatives to criteria
  – Decide what to do next
Decision-making flow

1. **Clarify the Issue**

2. **Generate Alternatives**

3. **Develop Criteria**

4. **Evaluate Alternatives Using Criteria**

5. **Decide what to do next**

6. **Generate New Issues**

7. **Document Decision**
Robust Decision-Making Model

Issue

Criteria = 
Description of a satisfactory solution

NOISES

Evaluate Alternatives and Decide

Alternatives

A selected alternative
Noise = any factor that you cannot or choose not to control.

- Poor personal problem solving style
- Conflicting interaction of problem solving styles on a team
- Weak understanding of the issue
- Poorly developed team shared understanding
- Team disagreement about what is important
- Considering too few alternatives
- Insufficient evaluation of alternatives
- Following a poor decision-making strategy
- Limited resources of time, people or equipment.
Robust decision-making means following a strategy that eliminates all possible noises within the resources available, then making a decision that is as insensitive as possible to the remaining noise conditions.

Such a decision is the best possible and least likely to need changing later.
12 Steps to Robust Decisions

Step 1.  Maximize personal decision-making effectiveness.
Step 2.  Insure team and organization effectiveness.
Step 3.  State the issue.
Step 4.  Identify the customers.
Step 5.  Itemize solution features.
Step 6.  Define targets for the features.
Step 7.  Measure feature importance.
Step 8.  Generate alternative solutions.
Step 9.  Measure decision-makers’ knowledge.
Step 10. Determine belief in alternatives’ ability to meet targets.
Step 11. Determine overall satisfaction in alternatives.
Step 12. Decide what to do next.
Benefits of using the methods

- Encourage sound decision-making skills.
- Organize decision-making to be most effective.
- Support robust decisions.
- Analytically support decision-making.
- Develop a strategy to resolve issues.
- Rationally decide what to do next.
- Communicate what is important.
- Develop a common understanding.
- Enable effective meetings.
- Develop documentation of the decision.
- Support information review and reuse.
- Reduce “fire fighting.”
Introduction to
ConsensusBuilder/iDecision
Genesis of ConsensusBuilder/iDecision

- IPS (Information processing system, Herb Simon, 1972)
- Protocol studies of mechanical designers (Stauffer, 1985-88)
- IBIS (Issues, alternatives, and options, Conklin, 1980s)
- IBIS/DT (Decision theoretic extension of IBIS, 1995)
- Theory-W (Boehm, requirements negotiation, 1995)
- ConsensusBuilder (stand alone, 1998)
- iDecision (marketed by NexPrise, Summer 1999)
Example with Alternatives A1 and A2 and Criteria C1 and C2
Very high knowledge and confidence for A1 meeting C1 and C2

I am an expert and I am sure that the alternative fully meets the target set by the criteria.
Neutral confidence for A1 meeting C1 and C2

I am an expert and I am not sure whether it meets the target or not
Low knowledge results

I am a Flaming optimist

I am Eeyore from Winnie the Pooh
Evaluation for A1 with even weightings for C1 and C2
Evaluation for A1 with weightings skewed toward C2
Example with Alternatives A1 and A2 and criteria C1 and C2
With 2 decision makers
From M1’s viewpoint
From M2’s viewpoint
Strategy for what to do next 1/2

If, regardless of viewpoint, more evaluation will not change which alternative is chosen,
Reach agreement and document the selection of the alternative with highest satisfaction

If confidence in an alternative’s ability to meet a criterion varies greatly,
Further interpret and discuss evaluation information. Refine alternatives, criteria and belief maps

If knowledge about a highly weighted characteristic of an alternative is low,
Develop more evaluation information using experiments, analysis, or experts.
If a criterion is weak, and is important from at least one viewpoint, or is prominent in the expert knowledge evaluation, Refine characteristics and target for criterion.

If confidence in all alternatives is low, Generate new alternative solutions

If previous items do not bring consensus, Negotiate changes in criteria characteristics, targets and importance.

If an alternative or criterion leads to a new issue, Decompose the issue into sub-issues

Strategy for what to do next 2/2
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End of Introduction