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)**

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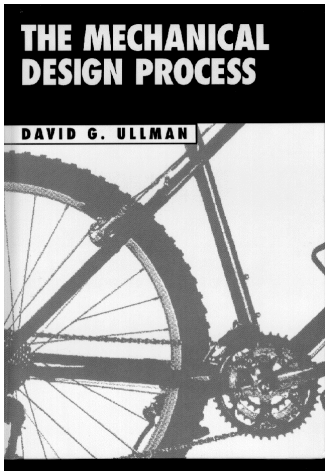
Who I am



- **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**

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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!*

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- 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……..

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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?

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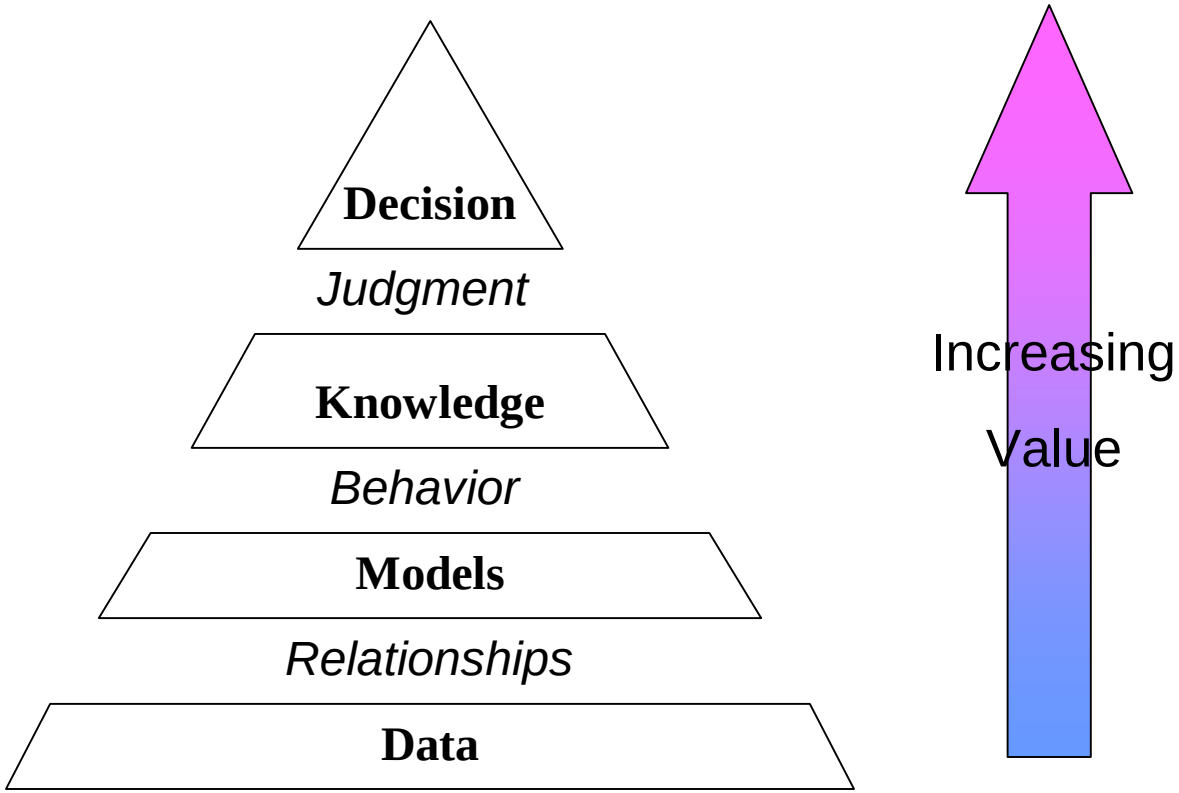
Value of Information



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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

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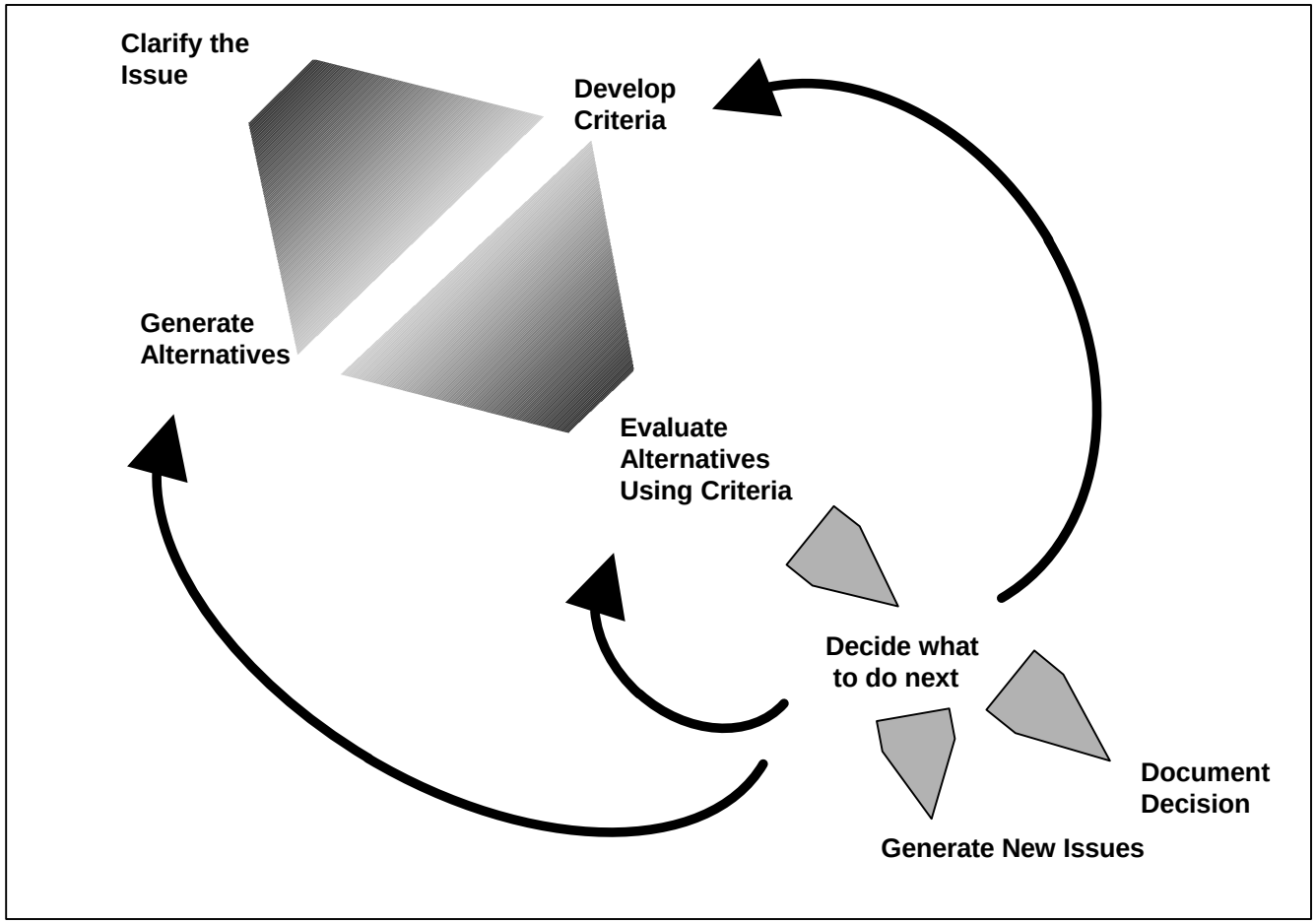
Decision-making flow



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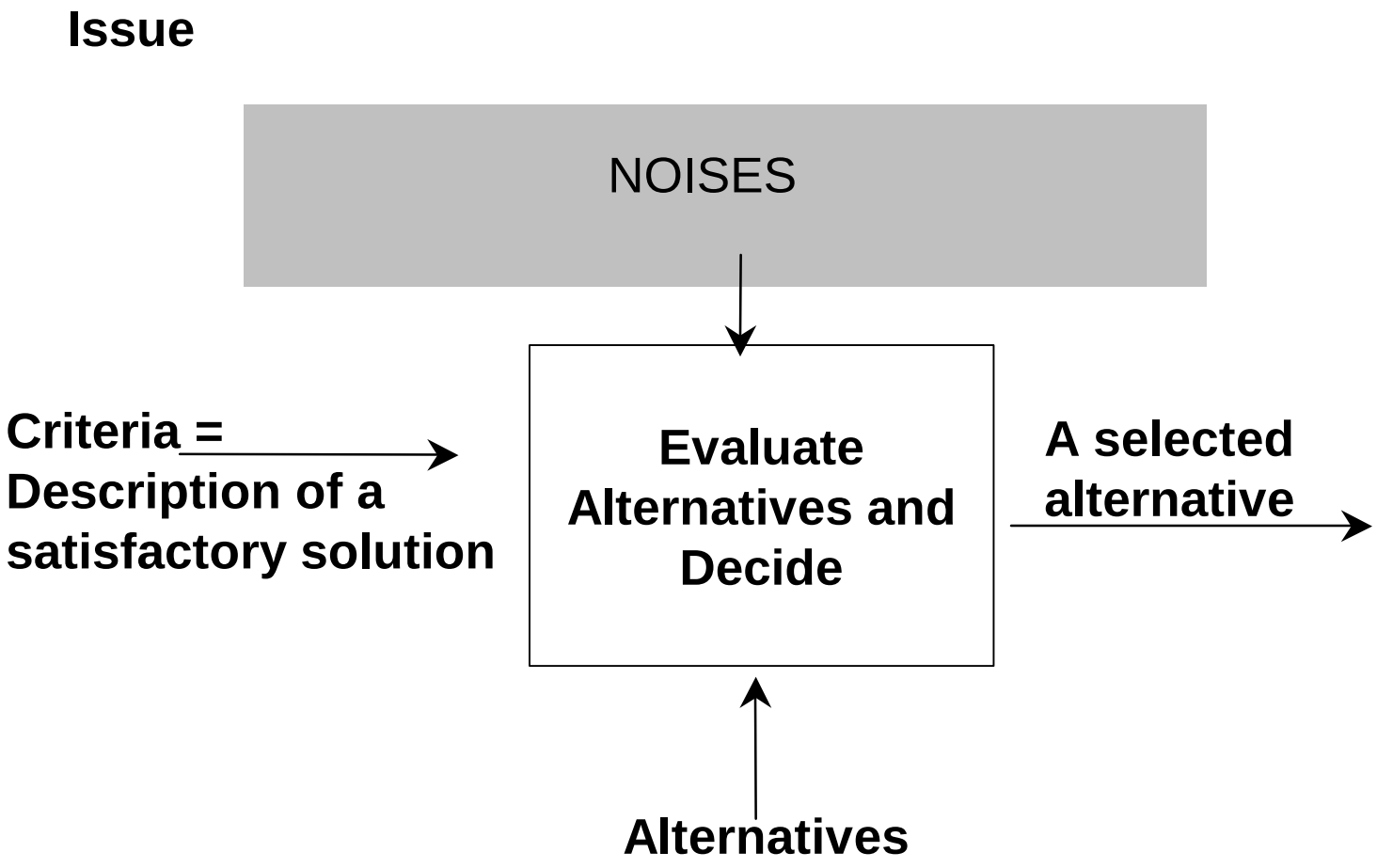
Robust Decision-Making Model



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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.

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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.

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12 Steps to Robust Decisions

Step 1. Maximize personal decision-making effectiveness.
Step 2. Insure team and organization effectiveness.
Step 3. State the **issue.**
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Step 5. Itemize **solution features**.
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Step 9. Measure decision-makers' **knowledge**.
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Step 11. Determine overall **satisfaction** in alternatives.
Step 12. **Decide what to do next.**

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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.”

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Introduction to ConsensusBuilder/iDecision

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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)
- *Ten Steps for Robust Decision-Making,* (2000)

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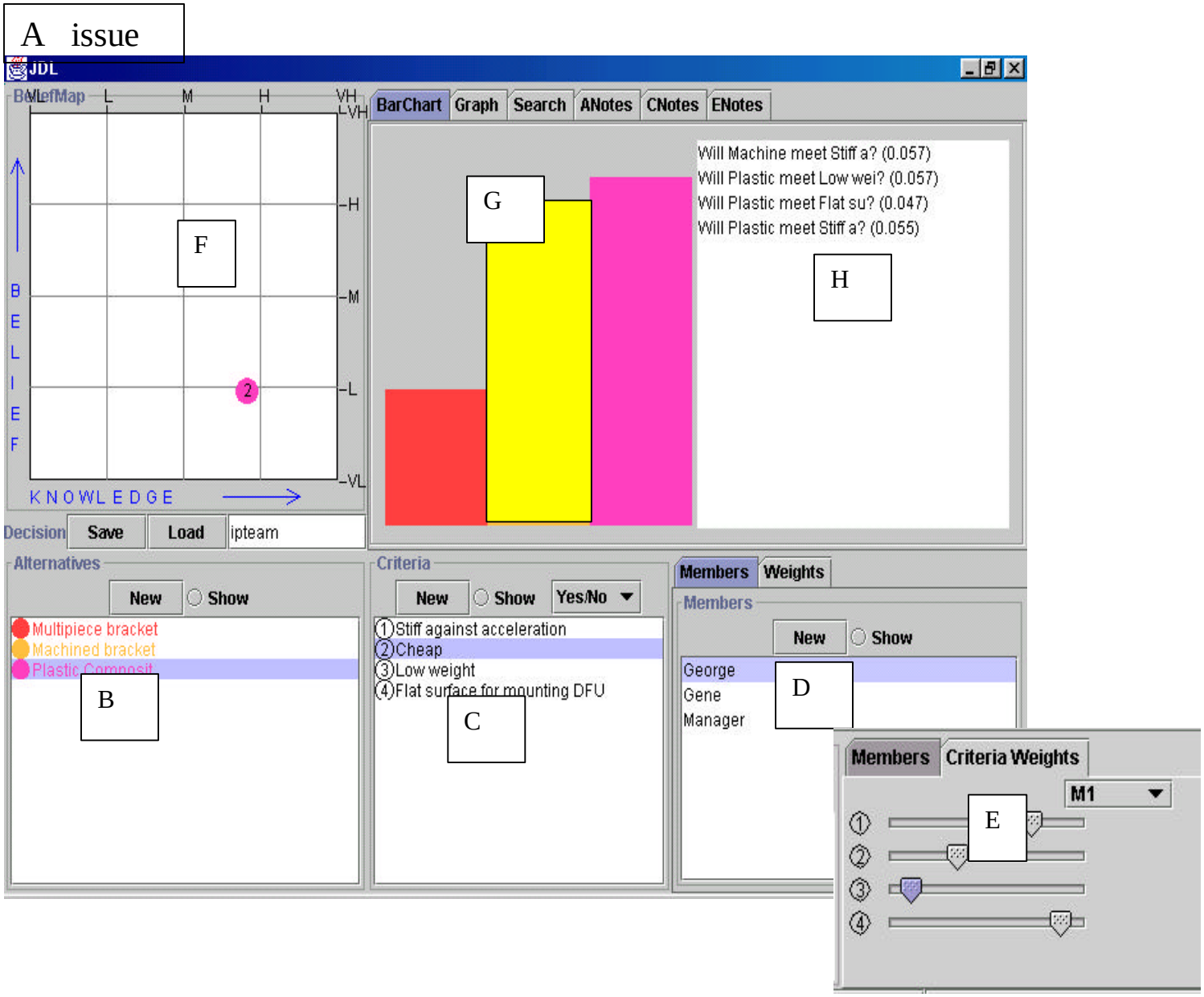
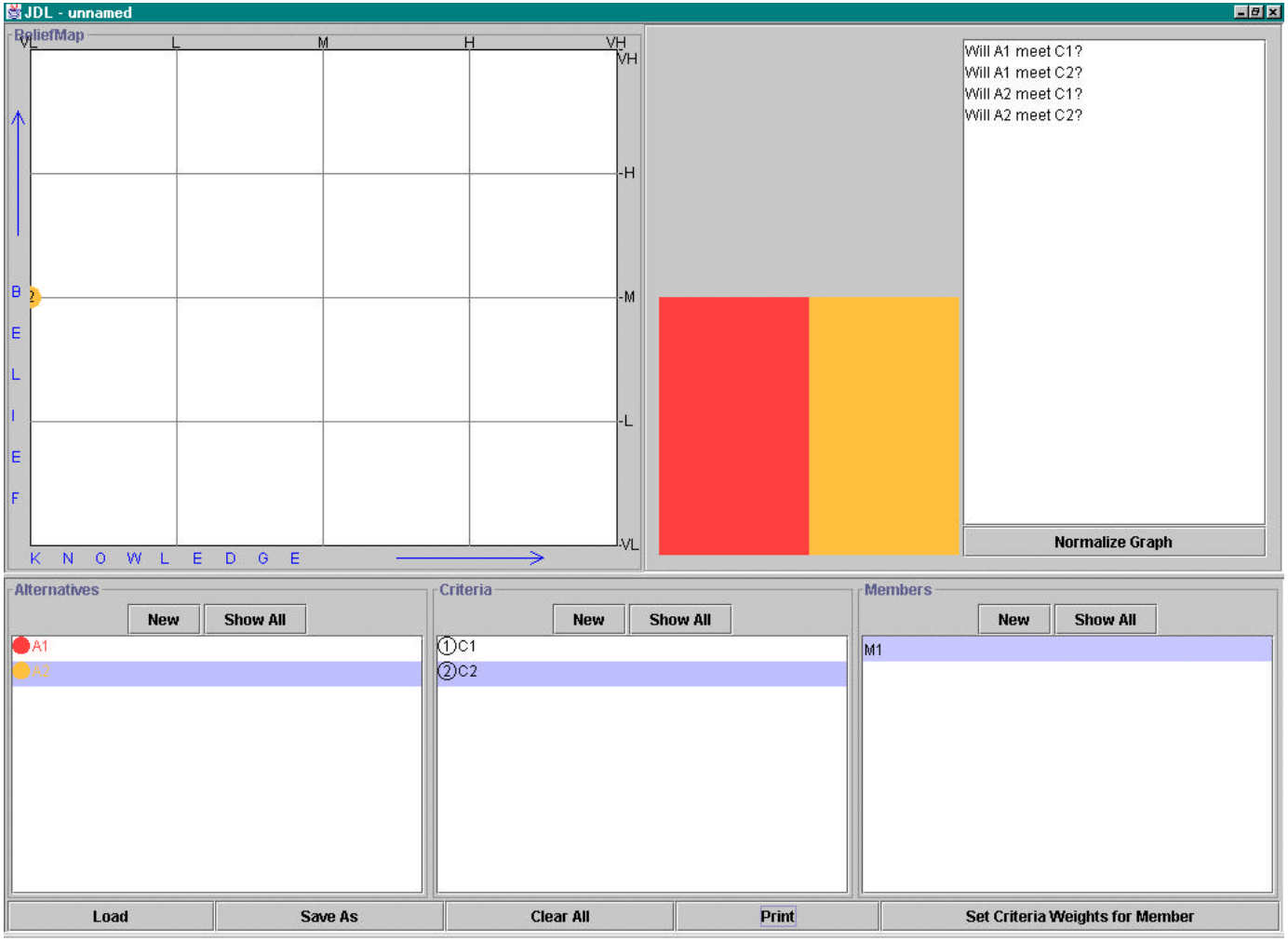

A issue
JDL
BeliefMap
L
M
H
VH
VL
BELIEF
KNOWLEDGE
F
2
BarChart
Graph
Search
ANotes
CNotes
ENotes
G
Will Machine meet Stiff a? (0.057)
Will Plastic meet Low wei? (0.057)
Will Plastic meet Flat su? (0.047)
Will Plastic meet Stiff a? (0.055)
H
Decision
Save
Load
ipteam
Alternatives
New
Show
Multipiece bracket
Machined bracket
Plastic Composit
B
Criteria
New
Show
Yes/No
1 Stiff against acceleration
2 Cheap
3 Low weight
4 Flat surface for mounting DFU
C
Members
Weights
Members
New
Show
George
Gene
Manager
D
Members
Criteria Weights
M1
E

Example with Alternatives A1 and A2 and Criteria C1 and C2



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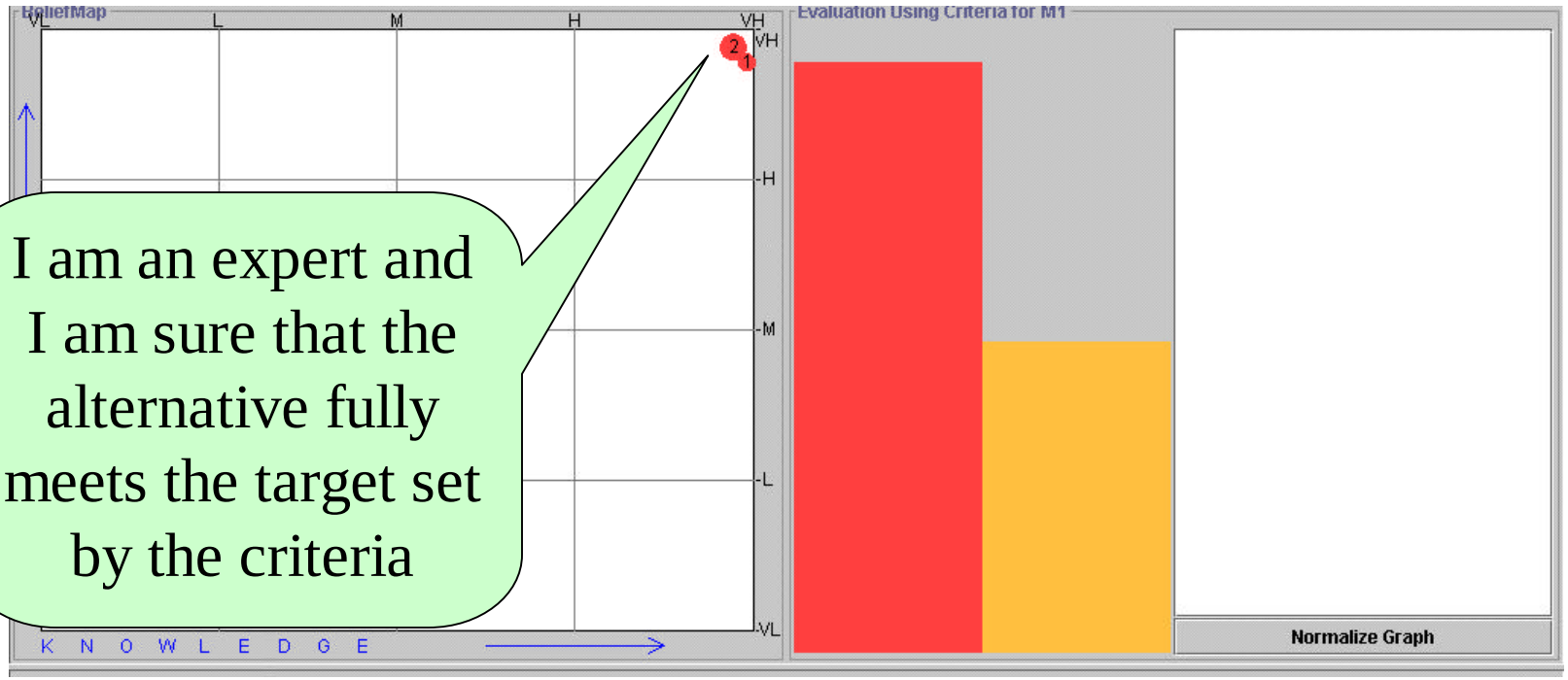
Very high knowledge and confidence for A1 meeting C1 and C2



I am an expert and I am sure that the alternative fully meets the target set by the criteria

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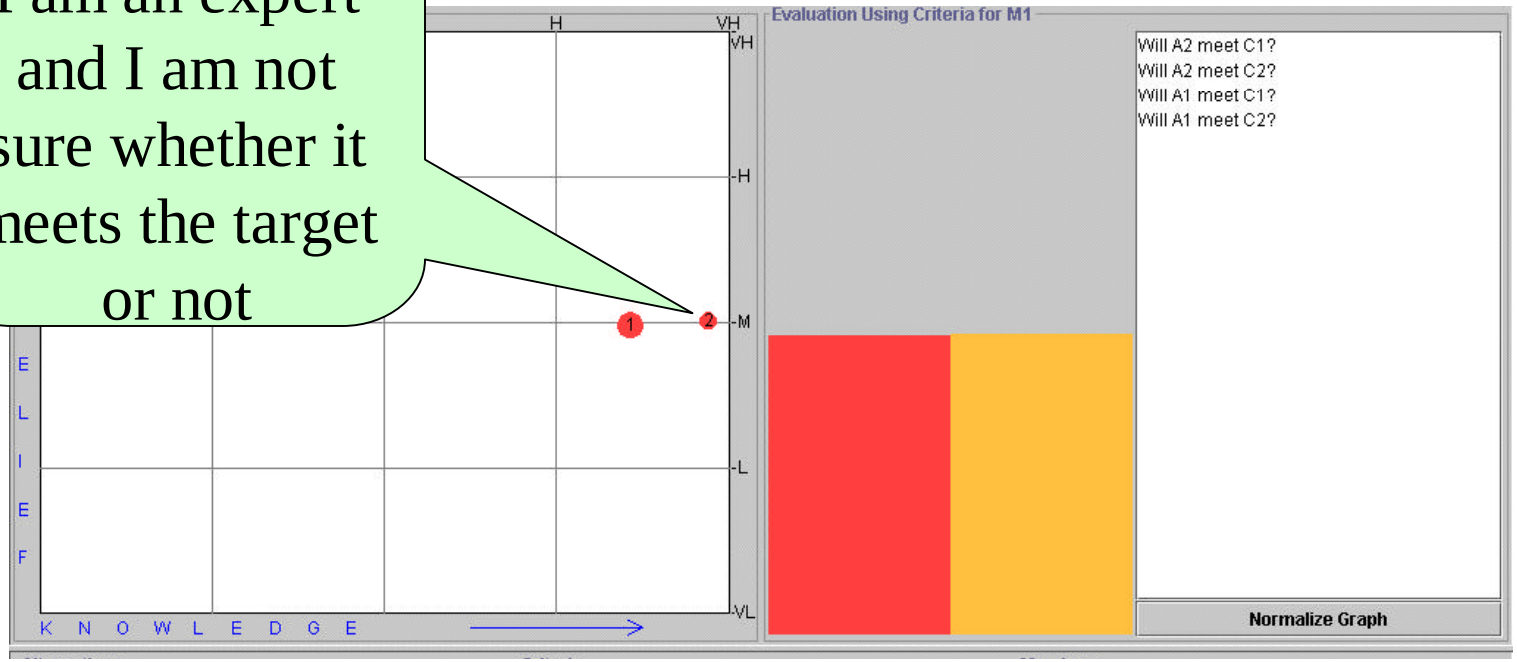
Neutral confidence for A1 meeting C1 and C2

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



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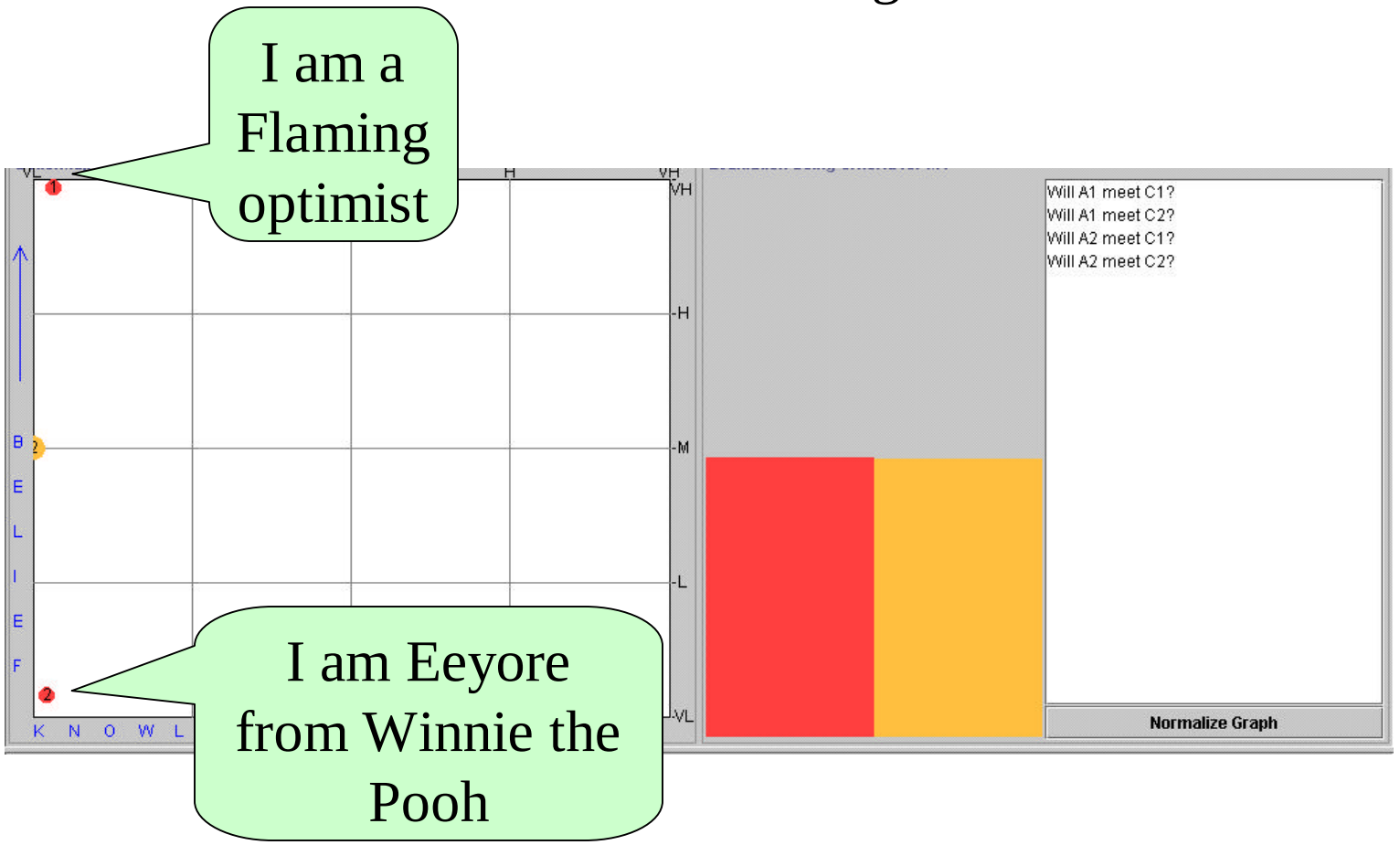
Low knowledge results



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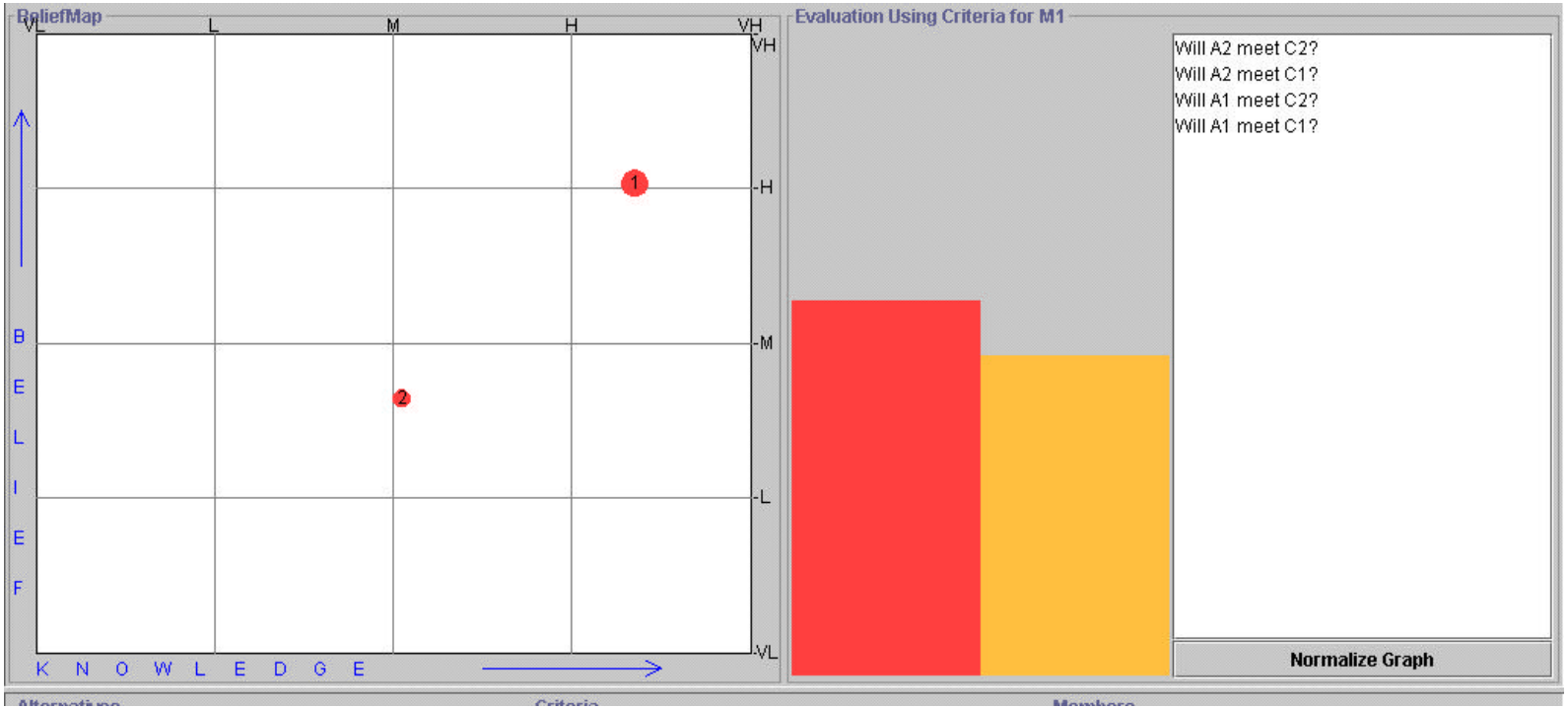
Evaluation for A1 with even weightings for C1 and C2



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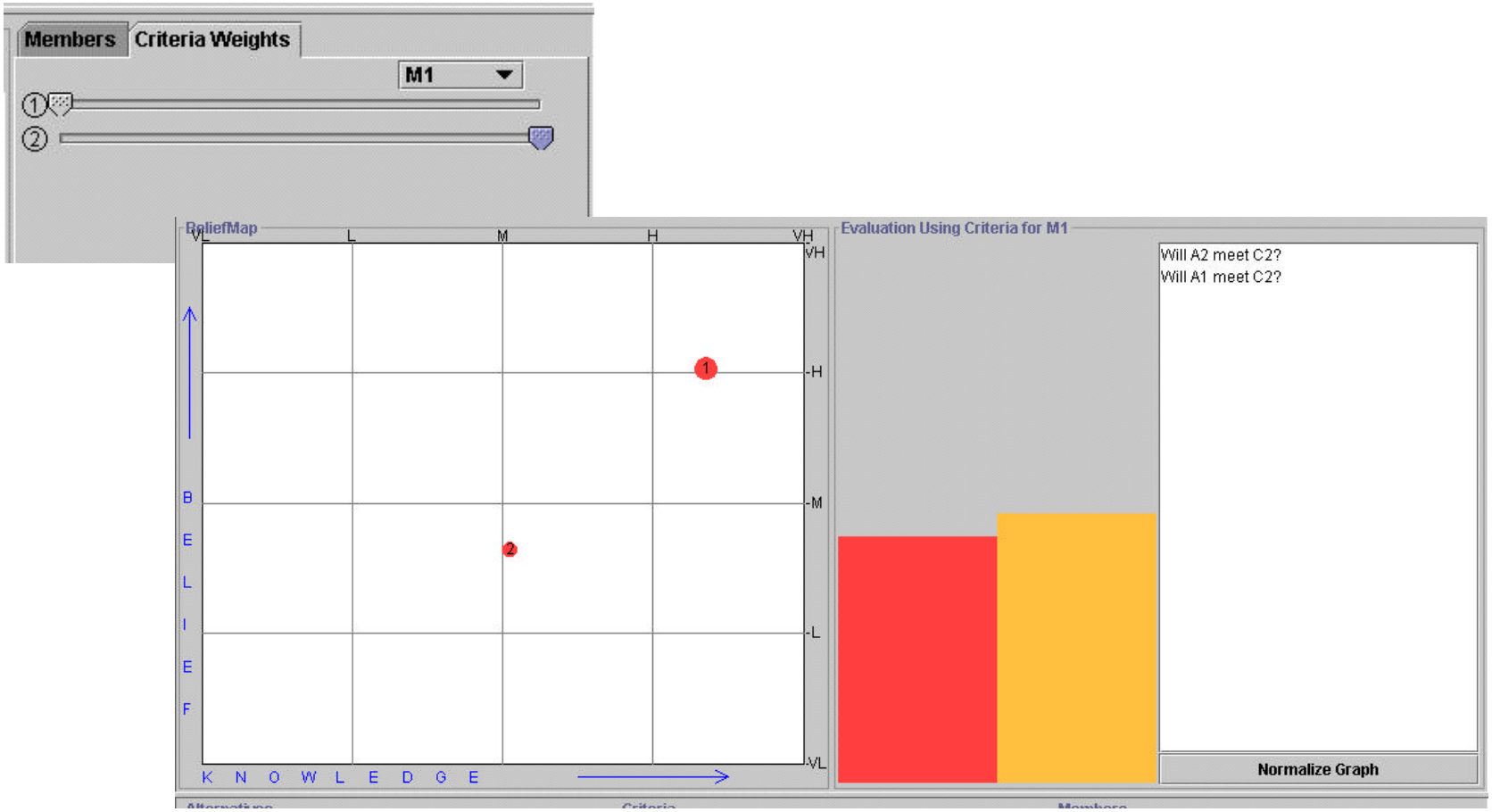
Evaluation for A1 with weightings skewed toward C2



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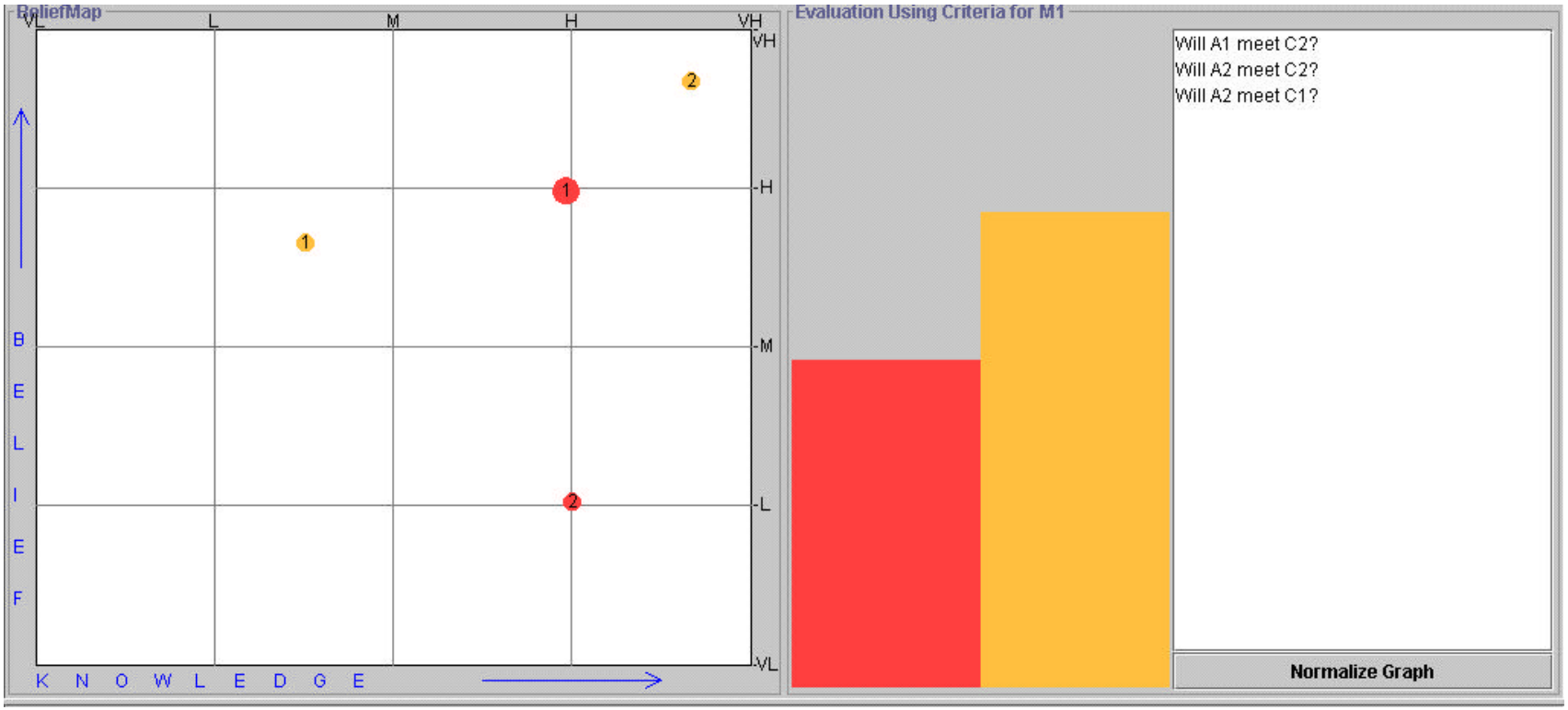
Example with Alternatives A1 and A2 and criteria C1 and C2



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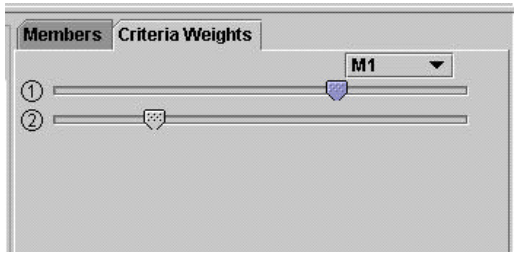
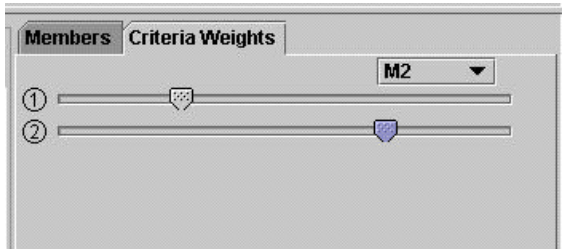
With 2 decision makers





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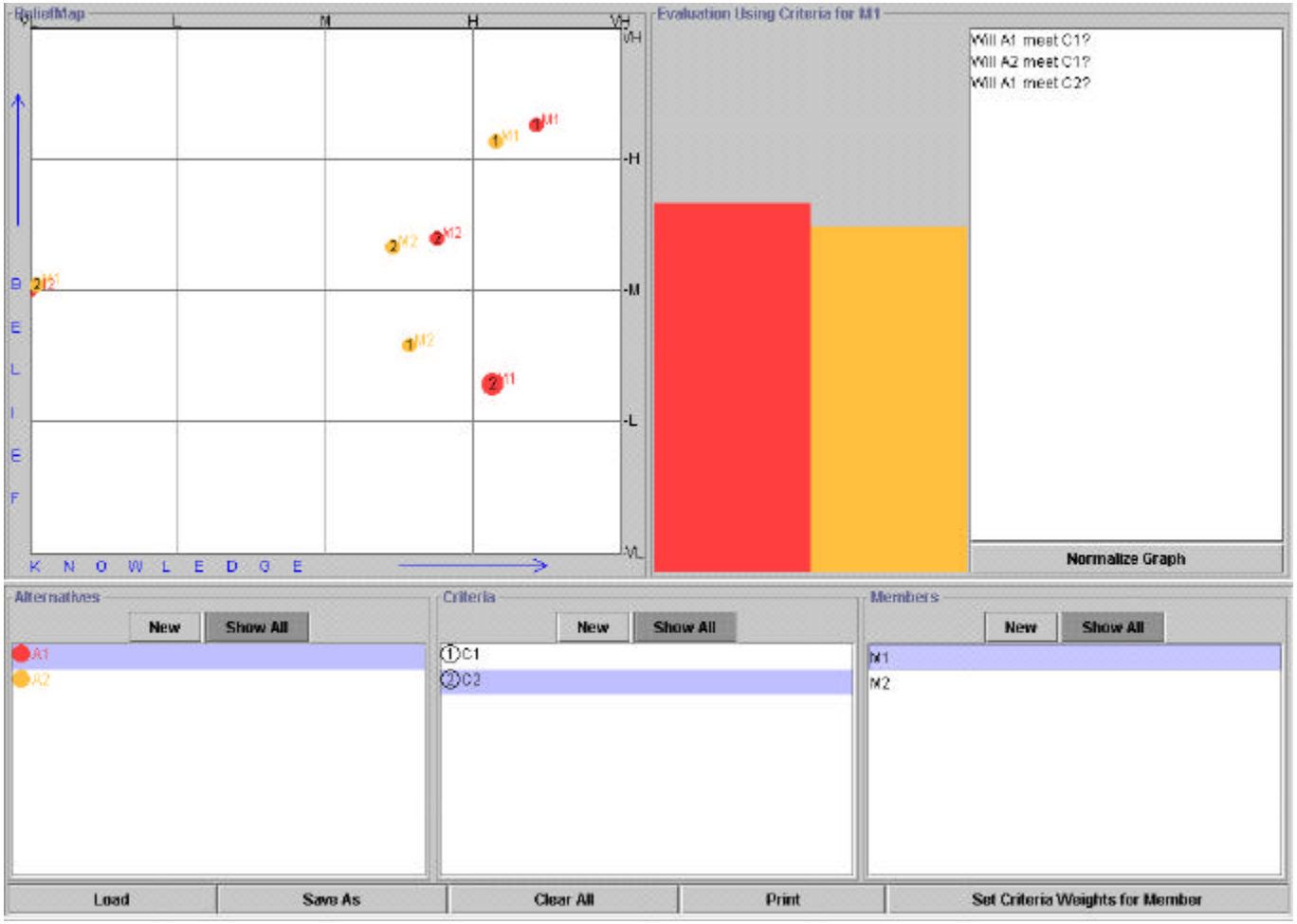
From M1's viewpoint



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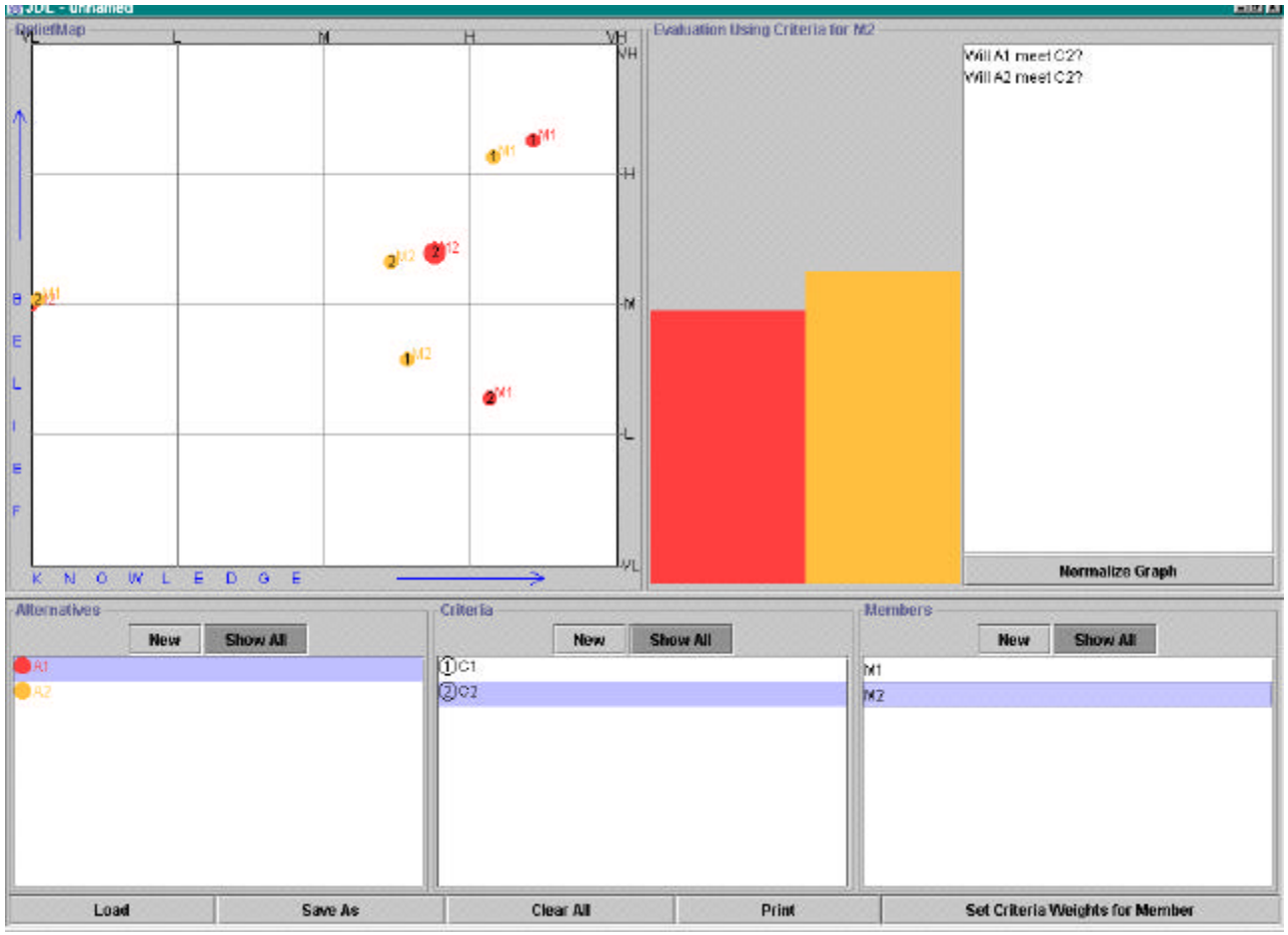
From M2's viewpoint



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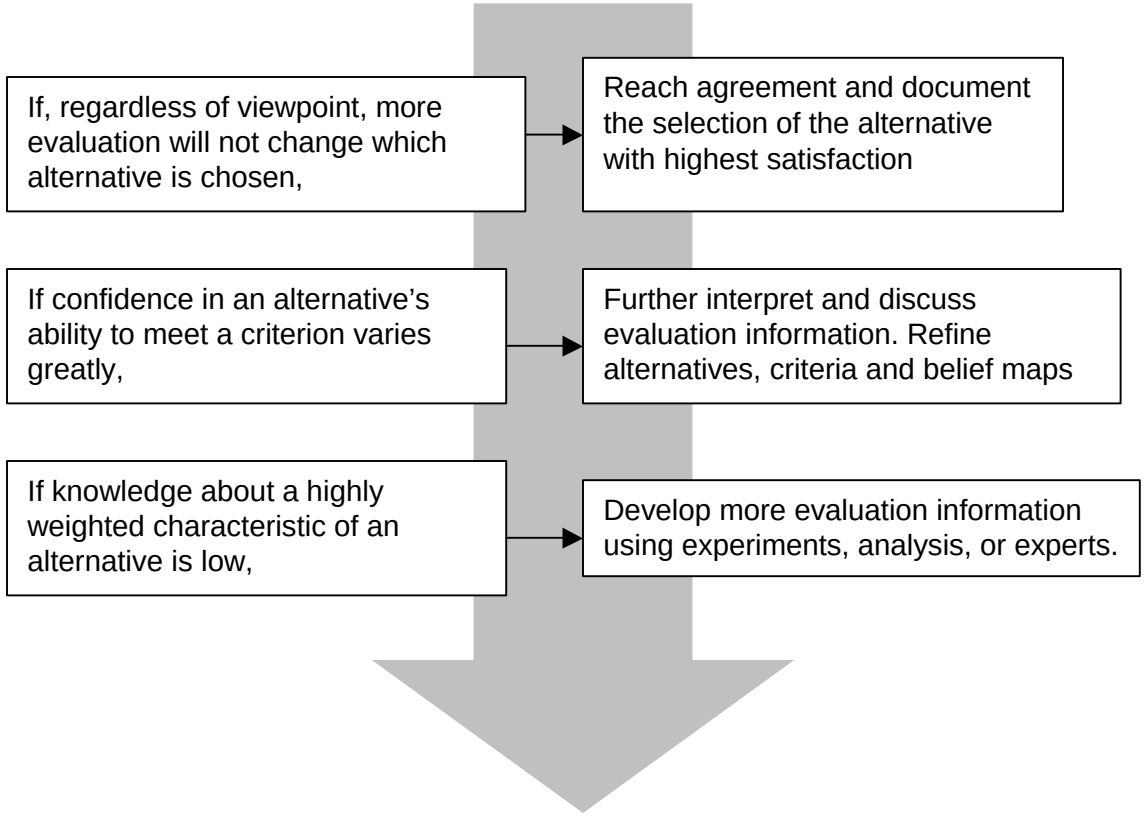
Strategy for what to do next 1/2



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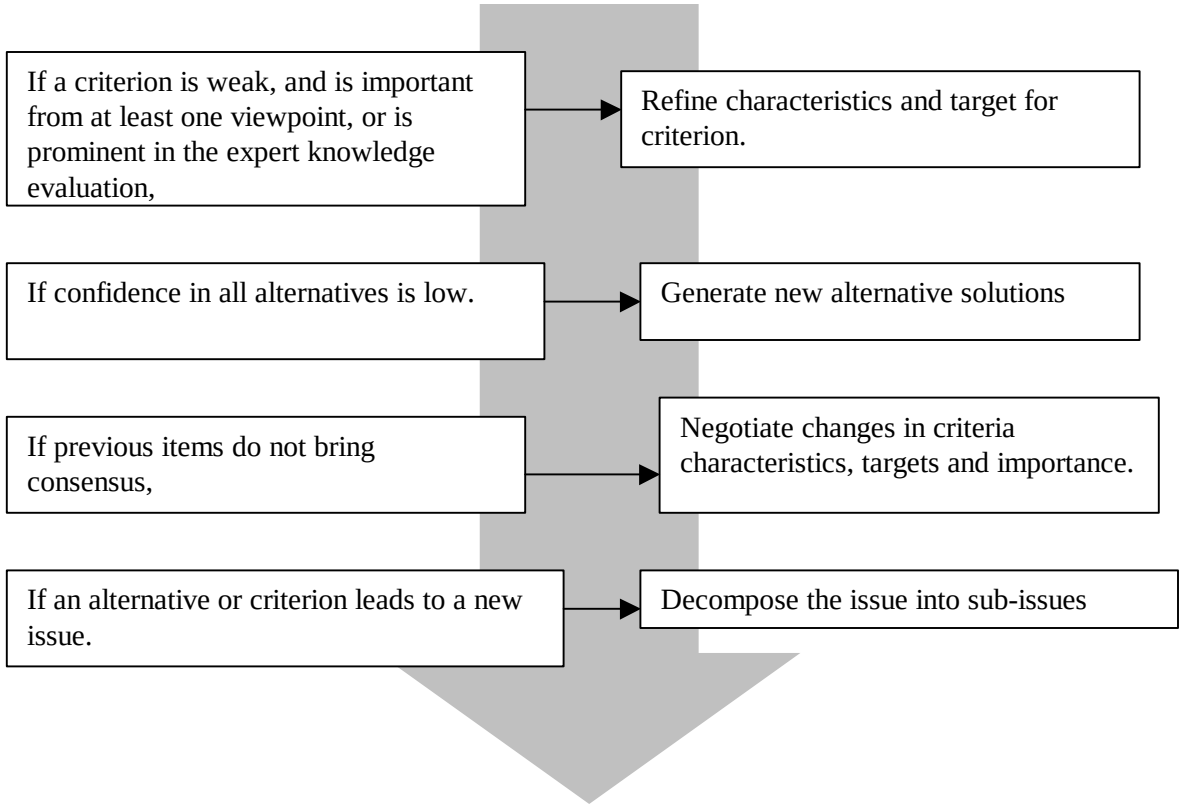
Strategy for what to do next 2/2



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End of Introduction