

HANDLING UNCERTAINTY IN DECISION MAKING

From
**BIZ, BUCKS
& THE
BOTTOM LINE**

CTN Broadcast - March 9, 2006

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Handling Uncertainty in Decision Making is a streamlined version of one module of *Biz, Bucks & the Bottom Line*, a mini-MBA for technical and non-technical professionals. This presentation has been developed and tailored for the CTN Broadcast Network by

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Summary Outline

- I. Methodology Overview
- II. The Fundamental Philosophy of Decision Making
- III. Class Room Example: NASA Space Shuttle
- IV. Including Intangibles
- V. Practical Tips
- VI. The Power of Decision Trees



Robert N. Llewellyn, Sr. Biographical Information

In 1996, Bob Llewellyn formed Llewellyn Consulting, a sole proprietorship focused on building business skills in corporate settings. In addition to consulting on strategy development and implementation, he has designed and delivered the Biz Bucks series of business acumen courses to over 3100 people.

Bob's 30 years of industry experience spans a diverse set of functions. These include both leadership and professional work in engineering, marketing, budgeting, management control systems, compensation and, his passion, organizational effectiveness.

He has an electrical engineering degree from Arizona State University and an MBA from the Executive Program of the Marshall School at the University of Southern California.

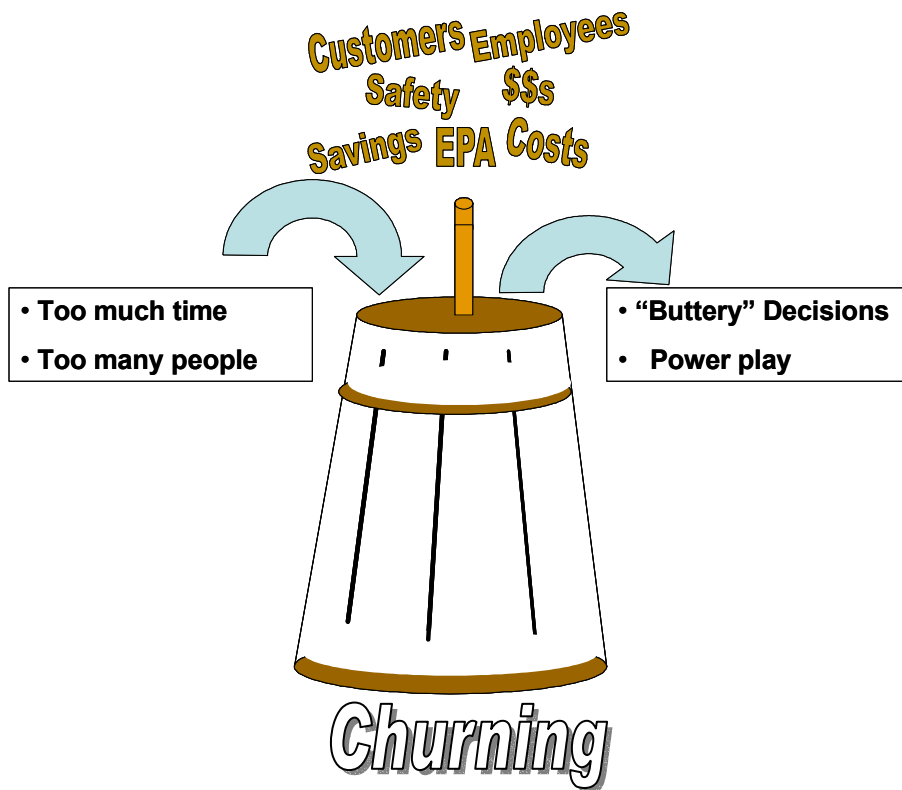
He and his wife, Marilyn, have six children and eleven grandchildren. They reside in Phoenix, Arizona. Bob enjoys sailing, golf, raising kids and spoiling his grandkids. His volunteer efforts focus on church service and the Boy Scouts of America (as a District Commissioner with 110 troops and packs).



The Fundamental Philosophy for Spending Decisions

- 1. Do financial analysis.**
- 2. Consider all intangibles.**
- 3. Weigh financial vs. intangibles using common sense. Make decision.**

-- OR --



Decision Tree Example: The NASA Decision

The following is a fictitious case study:

The space shuttle, Discovery, is near the end of a long mission. You are the head of the mission. There is growing pressure from Congress to cut the NASA budget. You need to do everything you can to minimize any additional costs for this mission. You may be requested to testify at Congressional hearings on the prudence of your decisions.

You had planned to have the shuttle land today at Kennedy Space Center in Florida. However, weather prohibits landing there today. You have two additional days of fuel and all other necessary supplies. A fuel cell has failed on the shuttle. If another one fails, the astronauts will have some increase in safety risk due to the lack of on-board power to some instruments. The other fuel cells are working within specifications with no problems.

You have a decision. You can land at Edwards Air Force Base in California today or wait until tomorrow to see if the weather clears in Florida. Your meteorologists predict a 55% chance of clearing tomorrow and a 95% chance for the next day.

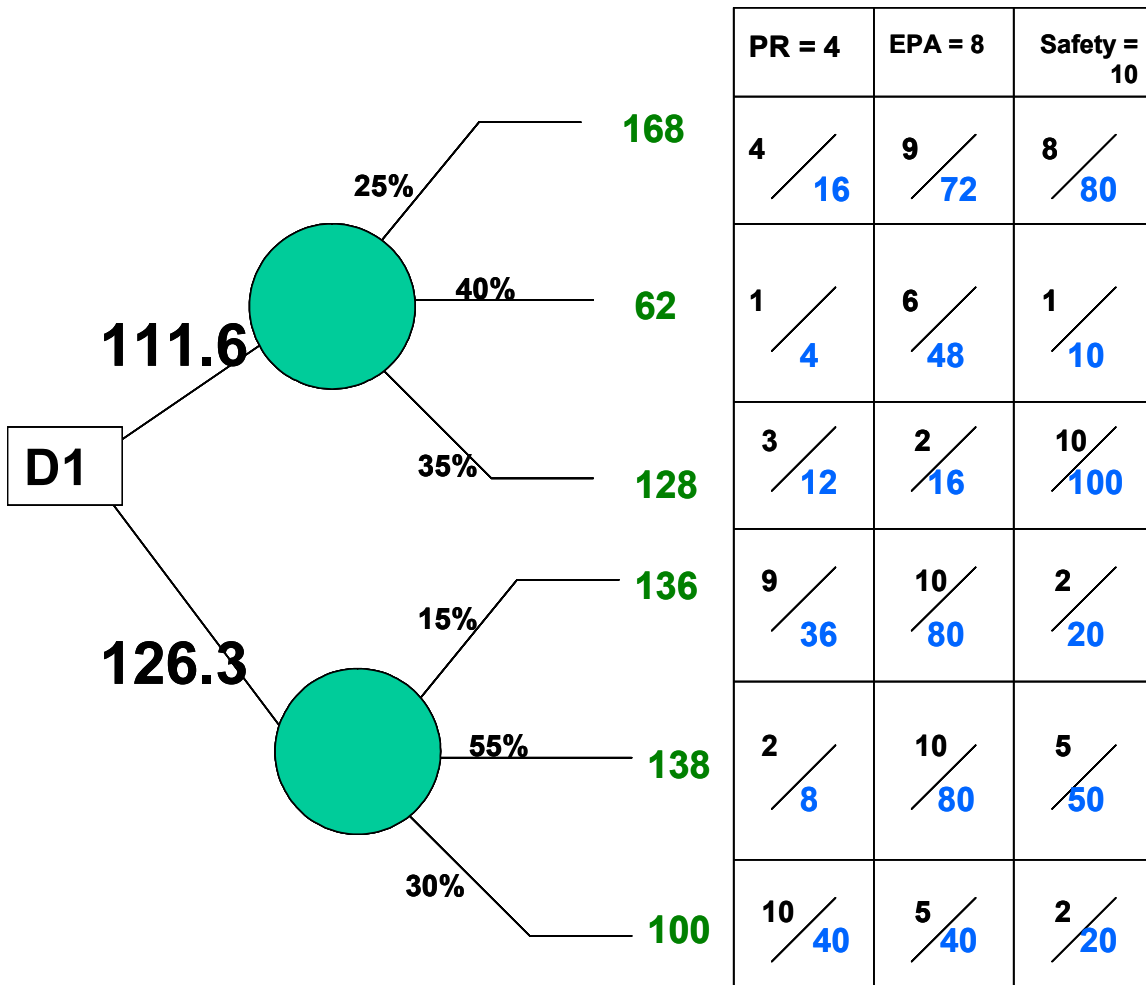
Assumptions:

- Transportation of shuttle from Edwards to Kennedy: \$5 million
- Cost of additional days in space: \$3 million per day
- No weather problems for next three days at Edwards

Do you order the shuttle to land at Edwards today or wait for tomorrow?



The NASA Decision Worksheet

Including Intangibles



The Ten-Point “Must” System has been applied four times in the above example, once for weighting the importance of each of the three intangibles and once each for the relative impact on the three intangibles. First, the group must agree on the “most important” intangible and give it 10 points. All other intangibles are weighted against that maximum score of 10. In the above example, “Safety” is considered the most important intangible (10 score). “EPA” is close with an 8. Public Relations (PR) is a relatively minor consideration with a 4. Then, each terminal path is weighted, with the “most impact” on an intangible getting a 10 for that column. The scores for each path are used just like \$s, multiplied by probabilities yielding expected values. The initial path with the highest score is weighed against the financial version.

Decision Trees in Six Easy Steps

 = Decision Node
  = Outcome Node

1. Draw the Tree Structure
2. Add Costs (or NPVs or Revenues)
3. Estimate Probabilities for Outcome Nodes
4. Work the numbers – right to left

For OUTCOME NODES, multiply cost x probabilities to get expected value.

For DECISION NODES, take the best path, “hash out” other branches.
5. If decision is not obvious, vary probabilities to gain insights
6. Weigh intangibles and make decision

Practical Tips

- Use progressive discloser (Draw it, don't “drop” it, like a bomb.)
- Use only key sources of uncertainty
- Use only with those familiar with Decision Trees

The Power of Decision Trees

- Handles uncertain assumptions
- Allows intangibles to be considered in an organized way
- Helps in group facilitation, keeps group focused
- Improves communications of recommendations
- Provides clear documentation of decisions

Notes

