# OVERVIEW OF DECISION ADVISOR VERSION 7.0

# Welcome to Decision Advisor®

We have all used economic models to answer business questions. There is always a moment when we face a blank Excel spreadsheet and wonder how to approach it. Or where we open someone else's spreadsheet and wonder how we are possibly going to make modifications.

It is easy to become lost in the details of model mechanics and lose sight of the objective of the model. What questions are we trying to answer? How will this model address them? How can we obtain good information to support the model?

Frequently, models take on lives of their own as we add new features, argue about assumptions, and debug our work.

Decision Advisor provides a better way to develop economic models. The software accelerates the process of designing, building and analyzing models. This acceleration dramatically improves modeling efficiency, but more importantly, it encourages a more productive interaction between analysts and their constituents, enabling analysts to move from being spreadsheet technicians to performing a more valuable decision support role.

This overview goes through the basic steps in using Decision Advisor: designing models, building models and analyzing models. It concludes with an overview of the coach, which further accelerates these steps.

## A. A Unique Approach to Designing Models

Decision Advisor enables development of business models based on a unique graphic user interface called "value maps[1]" that represent the major variables and relationships in the model. Value maps mediate the social dimension of model construction, e.g., what inputs are required, who provides them, and how are they used; and the technical dimension, e.g., functional relationships, ranges of uncertainty and time series.

Developing the value map with stakeholders during the modeling process provides a comfortable approach to creating a model that addresses the questions that the stakeholders really care about. Because the value map completely specifies the analysis, you can be sure that the resulting Excel model responds to the needs of the stakeholders. If required, the value map can be edited and modified, with the changes accurately reflected in the spreadsheet model.

### EXAMPLE

You are considering the impact of a change in your business, e.g. a new competitor, or a new product launch. It is not clear exactly when this change will occur, how long it will take to unfold, or how the business will perform following the change. But you want to have an initial discussion about the issue to determine the potential range of impact so you can take appropriate actions.

In the traditional modeling approach, you might create a spreadsheet and enter a cash flow figure for each of the next ten years. You would argue with your colleagues about the reasonableness of each entry and eventually negotiate a cash flow. Then you would

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[1] Value maps are also referred to as *influence diagrams* or *knowledge maps.*

compute a Net Present Value (NPV).  There typically would be little discussion or recognition of the structure of the problem—the focus would be on the "exact" numbers.

With Decision Advisor, you would focus first on the business issues and uncertainties, constructing a value map like the one shown in Figure 1.  The map contains "nodes" (squares, ovals and an octagon). The overall value is represented by the octagon, and is determined from the cash flow node.  The cash flow node is determined by parameters around the timing of the start of the change and the duration of the change, as well as initial value and final value of the cash flow, each represented as ovals.
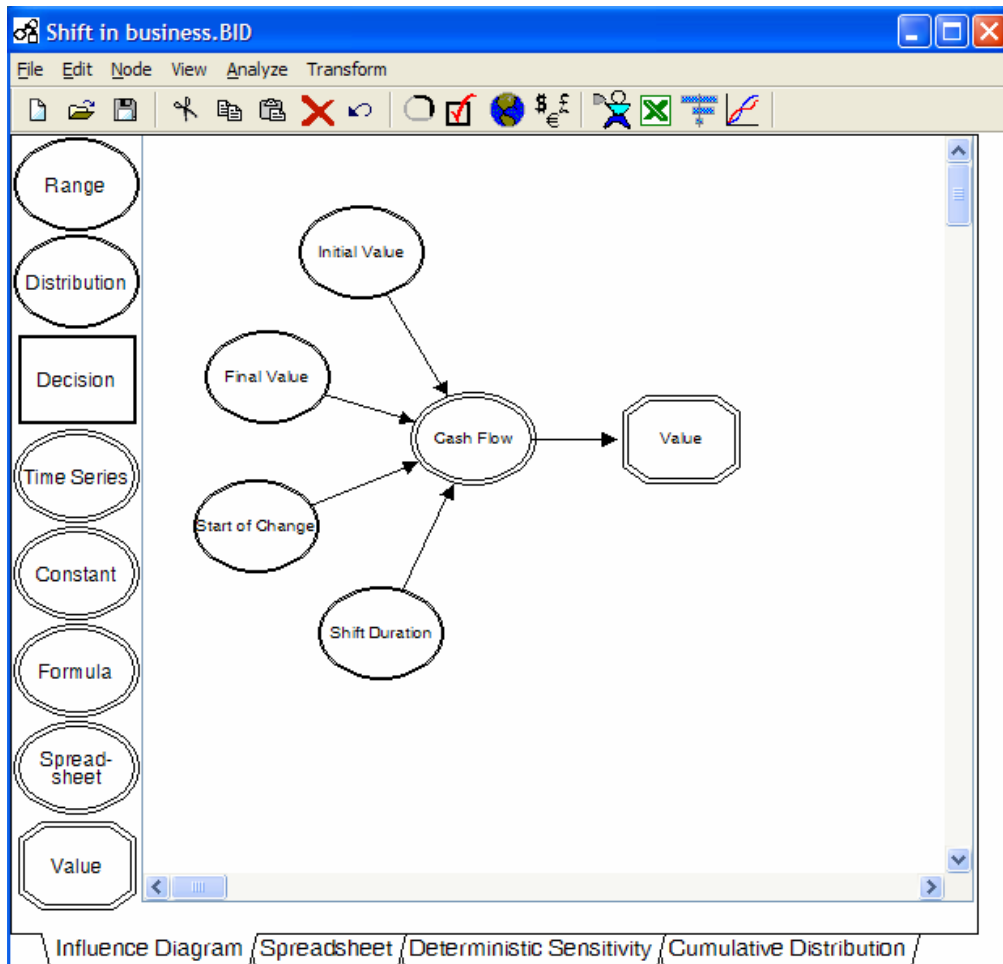


**Figure 1: A basic Decision Advisor value map**

The Cash Flow node contains a time series that represents changes in cash flow over time, as shown in

Figure 2.  Analysts can select an appropriate time series curve from a palette of time series curves or create a custom shape. In the example, the analyst has modeled Cash Flow as a gradual shift.

The model design discussion focuses on the overall shape of the cash flow curve rather than on explicit numbers and assumptions.
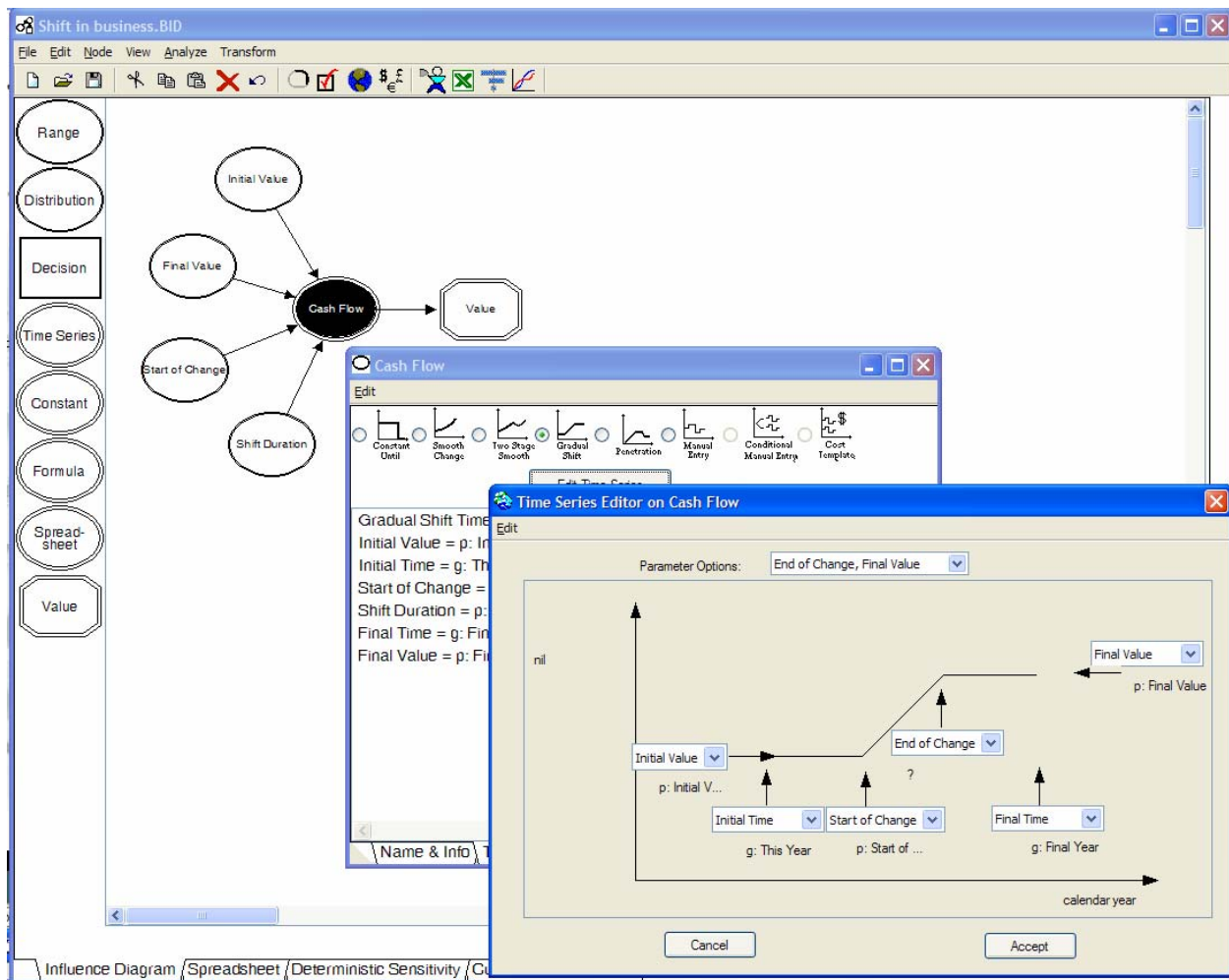
**Figure 2: The "Gradual Shift" time series for the Cash Flow Node**

Of course, the numbers do matter. Figure 3 shows what is inside the Final Value node. Although you could make an assumption about the final value, it is much better to consider the impact of risk and uncertainty and use this information to calculate the value. To accomplish this, Decision Advisor allows you to design models that explicitly address uncertainty and its affect on value. In this case for instance, Final Value has been specified as an uncertain range. The base value is $12M per year, with a high of $15M and a low of $10M. (The initial value, which is not shown, has a narrower range from $9M to $10M to $11M because it is less uncertain). Later in this Introduction, we will show how Decision Advisor uses ranges of uncertainty in calculations.

Figure 3 also shows how functions can be specified, using the Value node as an example. Decision Advisor translates these equations across the time series so you don't have to enter them manually into each cell. Once again, again, Decision Advisor frees you to focus on model design—the relationship among variables--without bogging you down with spreadsheet mechanics.
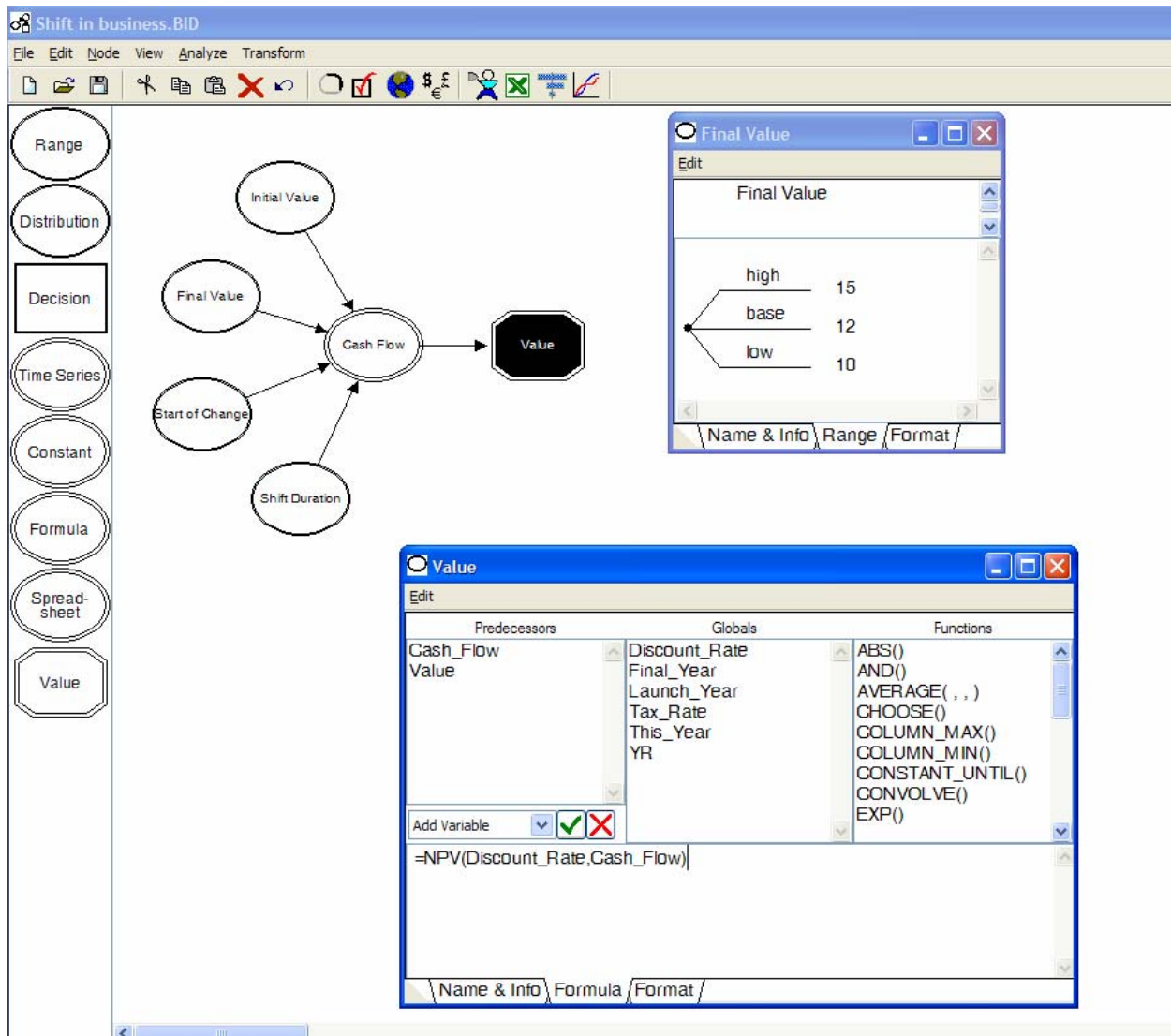
**Figure 3: Inside the Final Value and Value nodes**

As you have seen, Decision Advisor "knows a lot about the design of models" and provides many useful ways to make your life easier. For instance you can:

- Specify relationships as formulas, time series shapes, or through links to external spreadsheets.

- Specify variables as constants, globals, uncertain ranges or uncertain distributions.

- Specify decision variables for optimization relative to an objective.

- Cut and paste model elements and rewire them, allowing you to focus on higher level relationships (e.g. copy and paste one market model to create a second market segment).

- Manage units and automatically check for likely errors.

## B. Building Spreadsheet Models

Once you have designed the model structure, you can use Decision Advisor to build a spreadsheet model.[2]  Decision Advisor automatically generates the spreadsheet formulas and lays out sections of the spreadsheet for inputs, outputs and time series.  At the click of a button, the software produces an error-free spreadsheet and you can immediately see the results of your model design.  This helps you focus your time on answering questions and helping your stakeholders see the implications of their mental models.

Decision Advisor builds spreadsheets so rapidly that spreadsheets become disposable. You can often design a model, create a spreadsheet, and respond to questions before people leave the room.  When questions arise, you can easily refine the value map and create a new spreadsheet in seconds.  There is little need to maintain the spreadsheet, so you can focus on model structure and design and let Decision Advisor build spreadsheets for you.

Decision Advisor produces spreadsheets in a standard format, as shown in Figure 4.

- Globals—typically things like tax rates and depreciation schedules—are in the top section.

- The next section contains input nodes, laid out in a table.  The first column is the value the spreadsheet is currently using to calculate results; the other columns show the range of inputs (uncertainty).

- The next section contains outputs, such as NPV.

- The final section contains the time series, showing how the model is laid out year-to-year and addressing issues like working capital and tax rates.

The Decision Advisor spreadsheet is parametric: if you change one of the input values, the entire spreadsheet recalculates, so you can quickly perform "what if" analyses on any input and instantly see the impact on results.

These parametric equations can be very difficult to program by hand.  Notice the equation for the gradual shift in the selected cell—it fills two lines in the equation box at the top!  Decision Advisor dramatically reduces the errors that plague spreadsheets by creating equations automatically.

The example spreadsheet is running the base case—where each uncertainty is at its middle value. So Final Value is $12M, Initial Value is $10M, etc.  This results in an overall NPV of $104M

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[2] Decision Advisor can also analyze models without creating a spreadsheet.

**Microsoft Excel - Shift in business.XLS**

File  Edit  View  Insert  Format  Tools  Data  Window  Help  Adobe PDF

M41  =IF(Yr<This_Year,0,IF(Yr<Start_of_Change,Initial_Value,IF(Yr<Start_of_Change+Shift_Duration,Initial_Value+(Final_Value-Initial_Value)/(Shift_Duration+1)*(Yr-Start_of_Change+1),IF(Yr<Final_Year,Final_Value,0))))

Shift in business.BID - Business Model

| Input Parameter | Cell Name | Value | Low | Base Case | High | Units |
|---|---|---|---|---|---|---|
| Globals | | | | | | |
| This Year | This_Year | 2006 | | | | calendar year |
| Discount Rate | Discount_Rate | 0 | | | | decimal fraction |
| Tax Rate | Tax_Rate | 0 | | | | decimal fraction |
| Final Year | Final_Year | 2015 | | | | calendar year |
| Model Variables | | | | | | |
| ssNode_6_30_063:22:46_pm | | | | | | |
| Final Value | Final_Value | 12 | 10 | 12 | 15 | |
| Shift Duration | Shift_Duration | 2 | 1 | 2 | 4 | years |
| Start of Change | Start_of_Change | 2007 | 2006 | 2007 | 2009 | calendar year |
| Initial Value | Initial_Value | 10 | 9 | 10 | 11 | |
| Calculations | | | | | | |
| ssNode_6_30_063:22:46_pm | | | | | | |
| Outputs | | | | | | |
| ssNode_6_30_063:22:46_pm | ssNode_6_30_063_22_4 | $104.00 | | | | |

| | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

ssNode_6_30_063:22:46_pm

Cash Flow

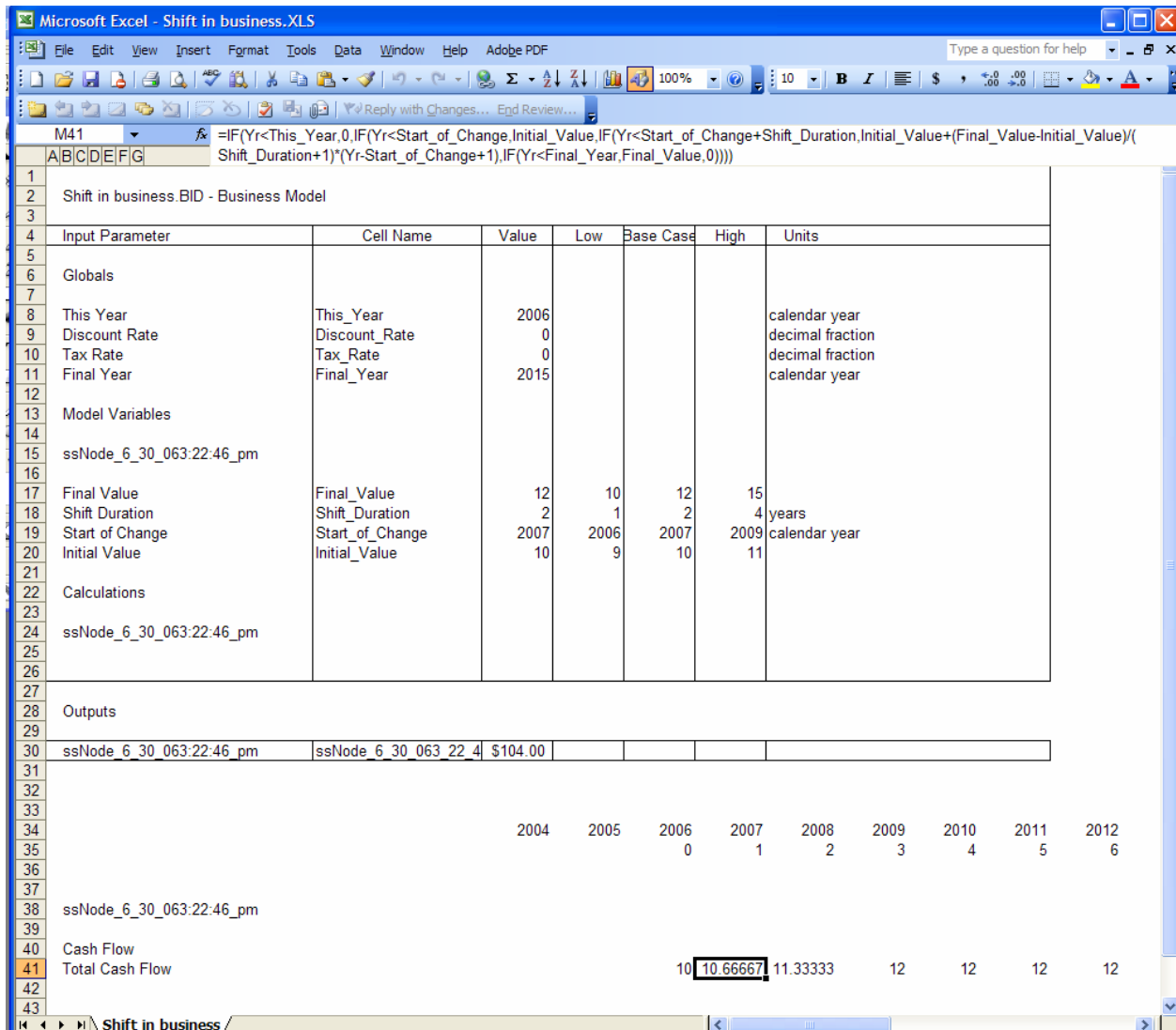Total Cash Flow   10  10.66667  11.33333  12  12  12  12

**Figure 4: An excel spreadsheet created by Decision Advisor**

You can use this spreadsheet as you would with any spreadsheet. You can distribute it to others for discussion; make graphic displays, or incorporate it into other models. The spreadsheet can also be converted into templates for use by our web-based Project Navigator™ and Portfolio Navigator™ systems.

## C. Analyze Models

Traditional analysis of spreadsheet models involves a lot of "staring at numbers." Decision Advisor goes beyond the numbers to help you answer such questions as: Which uncertainties are most critical? What is the best course of action? How much risk and return do I face?

For example, a type of analysis called a tornado diagrams help answer the question: which uncertainties are most critical?  Decision Advisor runs the spreadsheet through many scenarios, recording how the value changes, and presents the results in a graphical form.

The tornado diagram has a scale of Value (NPV) at the top and a list of variables down the side. In the diagram shown in Figure 5, the base case NPV is $104M, which is shown as the vertical

line.  If you do the "what if" by moving the Final Value to its low value of 10, then the NPV goes to $90M.  On the other hand, moving Final Value to its high value of 15 makes the NPV go to $125M.  This range, from $90M to $125M is shown on the bar.

The analysis runs similar cases for every variable, and then sorts them according to the size of the swing.  In Figure 5, the most critical uncertainty in the model is Final Value, while uncertainty in the timing of the start of change, the Initial Value, or the Shift Duration are relatively unimportant in terms of its impact on NPV.  This means that further time and attention may productively be spent on the size of the impact the change will have in the business—either by gathering more information or modeling it more carefully.  On the other hand, the timing issues do not warrant additional attention because they does not have a significant impact on value.

Many project and management teams redirect their projects to focus on the issues at the top of the tornado diagram and avoid wasting time and effort on issues of less importance to creating value. Tornado diagrams also help arguments about assumptions by demonstrating that some hot topics are not important enough to warrant further discussion.
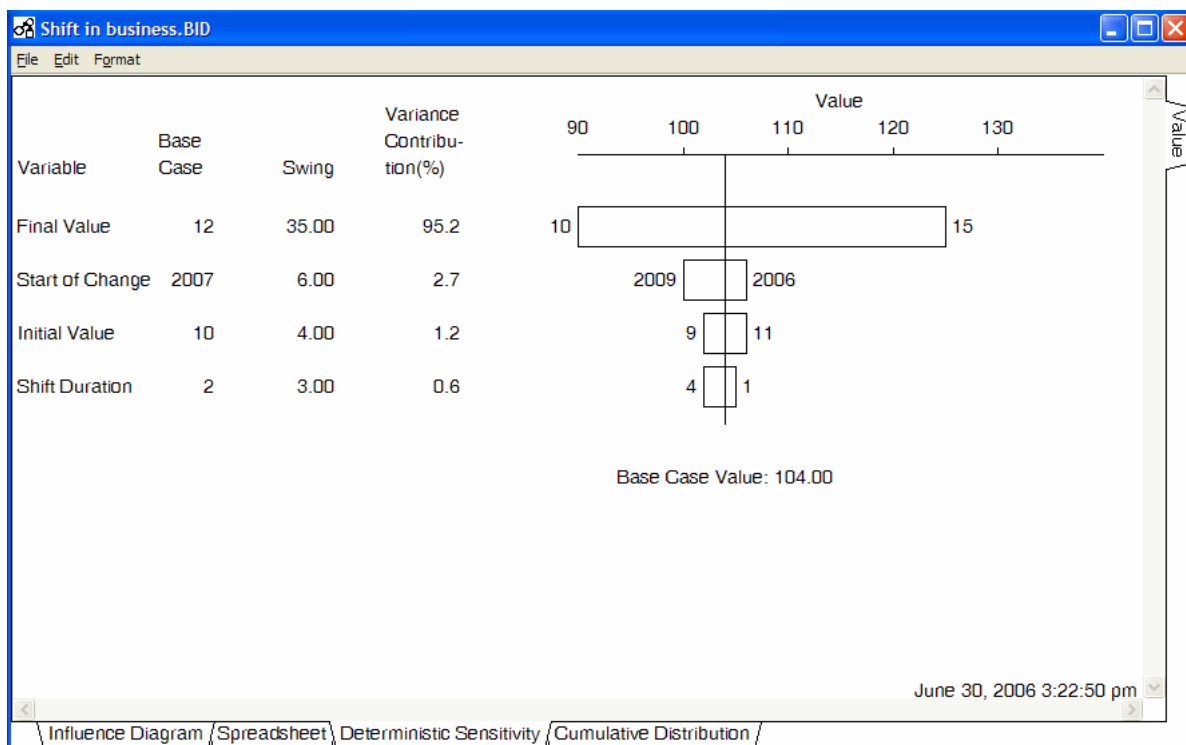


**Figure 5: The Tornado Diagram is a form of sensitivity analysis**

Decision Advisor provides various ways to analyze models, including computing probability distributions[3], decision tree analysis, probabilistic inference, and optimization.

### D. The Coach

As shown, Decision Advisor is a powerful tool for designing, building and analyzing models. The coach accelerates the process of designing, building and analyzing models through an

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[3] Also referred to as "Monte Carlo Analysis", "Risk analysis", or "Uncertainty analysis"

interactive interview process. If you need to rapidly assemble model components, the coach helps you piece together a model in blocks and analyze it. If you want to keep track of what needs to be worked on next, the coach can remind you what needs attention.

When you click on the coach icon a basic model such as that shown in Figure 6 will appear. This example is for evaluating an R&D project, showing the most basic model structure: Net Present Value, R&D Investment, Technical Achievement and Contribution Given Technical Success. The coach knows that Technical Achievement will be used to analyze the probability of success of the project and that Commercial Contribution will be used to analyze the value of the project if the project is technically successful.

The coach contains a "big bag of tricks" to aid in designing good models. It knows about new product launches, line extensions, process improvements, synergy, cannibalization, success hurdles, phased projects and uncertain results to name a few. It also knows how to analyze the models, calculate the probability of success, develop tornado diagrams and provide a summary of the project.
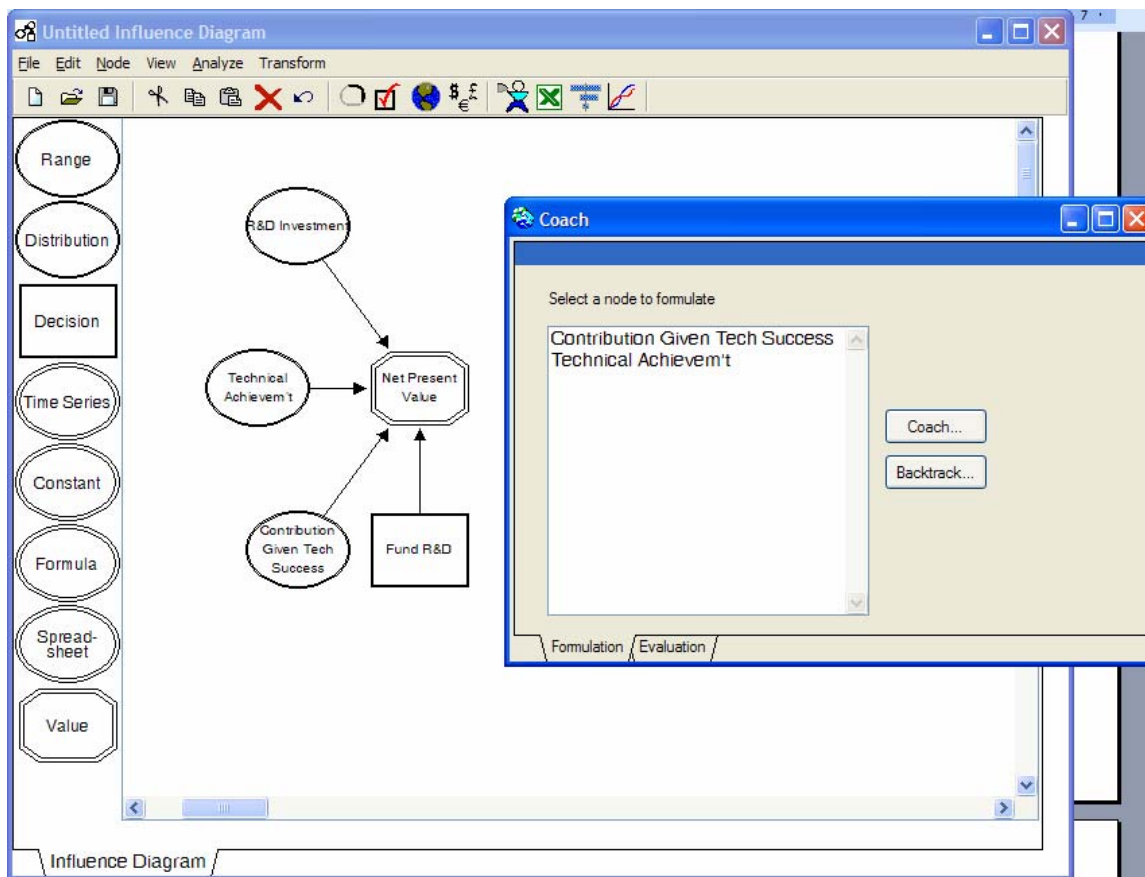


**Figure 6: Coaching a model for R&D**

Now that you've seen an overview of what Decision Advisor does, you might try getting your fingers on the keyboard by reviewing the "quickstart" guide.