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Why Model ?

Modeling brings the power of mathematical abstraction to domain reality to solve problems.

The **art of modeling** involves articulation of the decision problem, understanding the domain reality, and translating the abstracted solution provided by the decision model to concrete reality. **At the heart of decision modeling is the domain expertise** that lies largely with the decision-makers. Tools and technology by themselves can seldom identify the problem, key drivers, choose the right modeling approach, and discover qualitative frameworks/relationships (preferences, experience etc) from the given data.

The **science of modeling** involves converting domain reality- quantitative, and qualitative (like ethics, preferences, experience) to mathematical abstraction, using quantitative tools, and providing solutions as abstracted reality. The ultimate objective is to give quantitative expression to the decision maker's expertise.

Meaningful and relevant modeling is a product of close and continuous interaction between the decision maker and the modeling experts.

Modeling aids decision making through

1. Logical structuring of decision problem,
2. Identification of pertinent data and
3. Intelligent assessment of alternatives.

Logical structuring of decision problem:

"It isn't that they can't see the solution. It is that they can't see the problem."
- Chesterton, G. K. (1874 - 1936), *The Point of a Pin* in *The Scandal of Father Brown.*

The first step in this process is to ask "What is the Question"? Once the problem is clearly posed, the next step is to identify the key variables or parameters necessary for answering the question. With these inputs, the data that is relevant is specified, and at the same time a framework for a model emerges. One is then ready to use state-of-the-art mathematical and computational tools.

Identification of pertinent data:

"A theory has only the alternative of being right or wrong. A model has a third possibility: it may be right, but irrelevant."
- Eigen, Manfred (1927 -), The Physicist's Conception of Nature, 1973.

Domain expertise and sound knowledge of modeling tools are keys to selecting the relevant data for a problem. This is illustrated with an example. Consider modeling the evolution of inflation rates. A multivariate model is used to predict inflation rates based on relevant independent variables. Decisions involved are how many independent variables are to be chosen, and what should be the period over which the data needs to be examined. The trade-off is model complexity (too much data) versus model relevance (too little data).

Intelligent assessment of alternatives:

"Technical skill is mastery of complexity while creativity is mastery of simplicity."
Zeeman, E Christopher (1925 -) Catastrophe Theory,1977

A model would necessarily make assumptions. These have to be tested. Alternatives emerge by changing the assumptions either drastically or in a gradual manner. In either case, different scenarios get generated with different probabilities. Intelligent assessment on the part of the decision maker would involve risk vs. return policy of the organization.

Modeling is like vintage wine; it matures with time.

There is a mental model driving every decision we make. The model reflects our knowledge and perspective of the outside world. One way of viewing a model is as an interface between man and the computer. Modelers form a perspective of the problem drawn from interactions with domain experts and managers. Modeling is a channel through which modelers can communicate to the computer to view the problem the way they see it. They use mathematics and logic to teach the computer to be more sensitive to the way business requirements need to be met.

Sophisticated modeling techniques set rules and heuristics to teach the computer to learn dynamically and from past experience. There is a continuous feedback process between the modeler and the computer, in which the goal is to refine the understanding of what drives the solution, and to what extent. The thought process followed by the modelers and domain experts will gradually get encoded through mathematics into higher levels of abstraction to accommodate for various scenarios, and are then passed into the computer. This is how intelligence is built into a model. The key is then to leverage the superior processing power of the computer to consistently deliver intelligent solutions with high performance.

More Resources on Modeling:

- History of Mathematical Modeling

-Modeling Applications in Business

About DecisionCraft Analytics

DecisionCraft Analytics provides intelligent business solutions aimed at helping organizations create and sustain competitive advantage. Our competency lies in solving complex business problems with the help of **state-of-the-art mathematical models.**

Our focus areas include supply chain management, marketing, finance and manufacturing. We recognize that all organizations are unique entities at various levels of evolution and hence, our solutions are tailored to the specific needs of each organization and its business environment.

A model enables

1. Testing of hypotheses - reconciliation of intuitive understanding with mathematical formulations
2. Identification of key drivers
3. Building scenarios
4. Formalization of decision making
5. Traceable decision making
6. Replicability of decision-making and resultant scalability of operation

AND

"The purpose of models is not to fit the data but to sharpen the questions."
- Karlin, Samuel (1923 -), 11th R A Fisher Memorial Lecture, Royal Society 20, April 1983.

The first steps:

Building advanced models relies a great deal on computing power. Availability of low cost computing is a relatively recent phenomenon. In the absence of availability of low cost computing, modeling in organizations did not receive enough attention. And without any plans for formal modeling, the organization did not focus much on data collection and archival strategies. In most organizations this is the **first challenge** and the **first benefit** of formal modeling exercise. It forces organizations to identify strategies to collect and archive pertinent and clean data.

It is often useful to begin initial modeling exercises with the existing data. While this phase may not lead to major value creation, it forces one to define and identify the pertinent data, fine-tunes the existing data collection mechanisms to ensure availability of clean data. Besides, to derive the power of modeling, one cannot escape the first step.

Decision models are vital tools for robust decision-making.

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