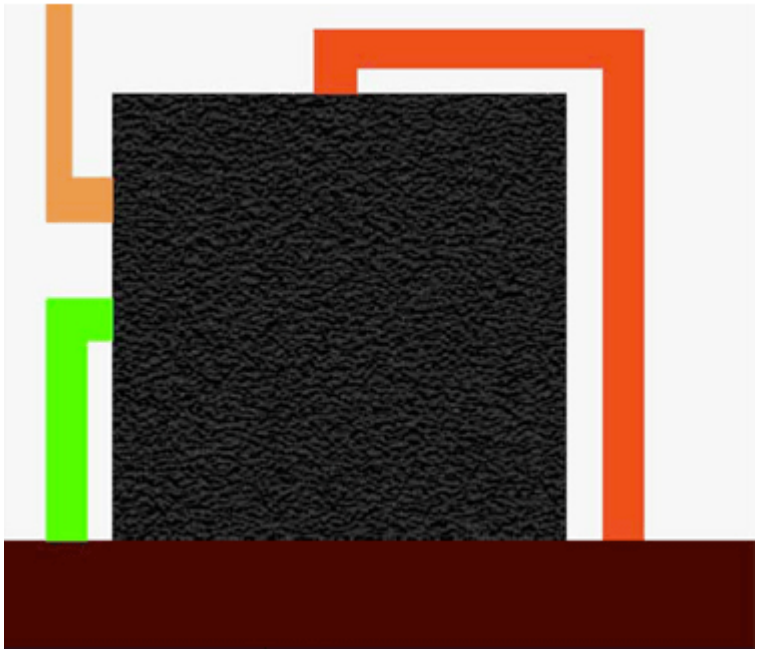
Model.

Par Zachary Patterson



Social scientists appear to be divided into two camps: those who use models and those who do not. In order to understand this phenomenon, a clear understanding of what a model is is required. Unfortunately, this is more complicated than one might think. To be sure, few social scientists would have trouble identifying what they consider to be a model: defining what a model is, however, is more difficult. To echo Associate Justice Potter Stewart's famous quote about pornography, most social scientists would agree with the statement "models are hard to define, but I know one when I see one."

Finding a definition for model is made more complicated by the fact that the word is used in so many different ways in common parlance as well as in academia. The Merriam-Webster on-line dictionary alone refers to 23 definitions of the word. Etymologically, like many other words, it has its origins in Latin and eventually meandered its way to English through Low Latin, Old Italian and Middle French. The original Latin root *modulus* is actually the diminutive of the word *modus* which meant a measure, bound or method of doing something.

Common uses in English include model: as a good example (a model student), as someone who displays clothing (e.g. Kate Moss) or poses for pictures or paintings, as an example of the adoption of a particular approach to an issue (e.g. the Swedish model of education), as a design of a product (the Toyota Prius), or as a miniature replica.

Model is used in still other ways in academia, indeed, in as many ways as there are disciplines it seems. This is not to suggest that there is one definition by discipline. Model is even used differently across the same discipline. Two definitions of model in academia overlap with those in spoken English – an example of the adoption of a particular approach to an issue, and a model as a good example. This is where the overlap ends.

In academia, the use of *model* can be divided into four main categories. The most obvious category of models, the one that social scientists are most likely to identify with the word *model*, are those that are used routinely in the economic and environmental sciences, in the engineering and natural sciences, as well as in quantitative sociology. The main defining feature of these models is the explicit use of mathematics. The complexity of these models can vary dramatically. In its simplest form such a model might simply be a mathematical relationship (e.g. a statistical *model* that quantifies the effect that different factors have on land-price). A more involved model might include the mathematical optimization of a consumer's choice of how much of a particular good to buy, given a set of preferences and a budget constraint. This model is referred to variously as the model of *utility maximization* or of *homo oeconomicus* and is an example of a quantitative behavioral model. An even more involved model (the model of general equilibrium) includes additional mathematical formulations of the behavior and interaction of consumers and producers in an economy. With the advent of powerful computing, the complexity of these models continues to grow with *models* that are comprised of many *submodels* and that try to explain the behavior of millions of agents. Integrated transportation land-use models are an example of the latter.

Also, in the Social Sciences diagrams are referred to as models. Such models take many forms. They can be graphical representations of relationships

between dependent and explanatory variables, sometimes related to explicit mathematical models (e.g. neo-classical land-rent model – distance from the central business district on the x-axis and land rent on the y-axis) and sometimes not. They can also take the form of a series of figures (maps, boxes, triangles) related to each other either explicitly through the inclusion of arrows that structure the relations between the elements, or without arrows. Interestingly, it appears that the notion of what constitutes a model is fluid. When speaking with a colleague (sociologist) about the question of models, he referred to a doctoral student (in sociology with a background in engineering) as being 'more of a modeler' than he was. The reason? In a diagrammatic model that my colleague had elaborated, the doctoral student in question had added arrows that structured the relationships between the various elements of the model. In other words, it seems that models can vary in their degree of 'modelness' according to the amount of structure attributed to them.

Another common type of model in the Social Sciences is the categorical model. In these models, often encountered in sociology, the focus of study (e.g. people, families, land-uses, etc.) is grouped based on its characteristics. Common examples of such models have been developed in the sociology of the family. In this sub-discipline there are many *models* of families: one typical categorization[1] is based on the degree of autonomy of the partners in a family. With this notion, the author distinguishes between three *models* of families: alliances (least autonomous), fusions and associations (most autonomous).

The characteristics used for grouping are not necessarily categorical, but can also be continuous. For example a family might be found on a continuum between no autonomy and complete autonomy and not necessarily placed into a categorical grouping as in the previous example.

A final category is non-mathematical behavioral models. These are models that endeavor to explain individual, family, group or indeed, societal behavior without the explicit use of formal mathematical or diagrammatic structures. The Social Science literature is filled with examples of such models and they are found in two forms. First, there are models that have been formalized mathematically in other contexts (e.g. the model of rational choice or utility maximization), but are

used or described verbally, without referring to their explicit mathematical architecture. It is interesting to recognize that these are *non-mathematical* in that they do not explicitly make use of mathematics, yet the fact that they do not use formulae does not remove their mathematical (model) underpinnings. Second, there are models that have never been mathematically formalized such as Bourdieu's tremendously influential theory of the habitus.

The most striking feature of a survey of how the word model is used in the Social Sciences is that the key difference between the various objects called models is how they are represented, but not fundamentally what they are, what they do or for what purpose they are used. Some models take the form of mathematical formulations, others the form of diagrams and flow charts, still others are described and elaborated verbally. All of them, however, endeavor to do the same thing. Each of the different categories of models are used to reduce the infinite complexity of the 'real-world' into a finite and tractable collection of information and principles that serve to explain human (be it at the level of individual, group, society, economy, etc.) behavior or other social phenomena (e.g. the existence, development and form of cities). Moreover, models try to explain human behavior in two ways. The first approach is to use models to describe or explain a given outcome. The outcome can be contemporary or historical (e.g. the size of an economy in a given year, the articulation between the proletariat and capitalist classes in a given country, etc.). In this sense they can be thought of as descriptive. Often (and almost always implicitly) models are used to forecast or project from a particular context or point in time (i.e. the outcome referred to above) to the future or a changed context. For example, models might be used to predict growth in the world economy in 2009, or they might be used to analyze the effect on class relations of a new law aimed at inhibiting the formation of employee unions. In this sense, models are predictive. This is what all social scientists do: explain and (implicitly or explicitly) use their explanation to predict what it would imply for different contexts, historical or otherwise. Even those social scientists with the most historicist tendencies, opposed to notions of all-explaining principles, at some point, undertake a triage of relevant information, events, people, etc. and consider how things might have turned out differently. This is what is required for any form of serious analysis. This should not be surprising given that this is indeed the purpose of the Social

Sciences themselves. What is surprising is the fact that social scientists are adamant about whether they use models or not.

Unfortunately, the categorical definition of models and modelers creates divisions within the social sciences and between social scientists. We seem to be obsessed with whether or not people use models and tend to dismiss the possibility of communication with researchers on the other side of the model divide. “She couldn’t possibly understand, *she* is (isn’t) a modeler…” In fact, since we all model, placing people (or ourselves) into the category of modeler or non-modeler is a false dichotomy: tragically, it is one that creates unnecessary confusion and inhibits interdisciplinary understanding and collaboration. A much more fruitful approach is to come to terms with the fact that we are all modelers and to avoid the reflex to ask each other “Do you use a model’” Instead, we should be asking each other “How does *your* model work’”

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Résumé

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Notes

1 L. Roussel. 1980. Mariages et divorces: contribution à une analyse systématique des modèles matrimoniaux. Population, No. 6, 1025-1040.