Definitions for terms used in the OOM Software

Cases. Usually refers to the persons, organisms, or objects being studied, or the number of such entities in the study. An individual case may be comprised of multiple orderings.

Chance-value (*c*-value). A proportion (thus ranging from 0 to 1) generated by a randomization test in the OOM software. It can be used to choose against *physical chance* as an explanation of an observed pattern within the data. A value close to zero (e.g., < .001) indicates that randomized versions of the observations (or their deep structures) yielded a small proportion of PCCs equal to or great than the observed PCC; consequently, the observed PCC is not plausibly due to *physical chance* in this instance. The *c*-value is *not* to be considered as a probability (*p*-value) from a traditional null hypothesis significance test, although in both cases small values near zero are typically judged as desirable.

Deep Structure. A simple binary representation of the observations based on their units. By using this method of representation, methods and procedures in the OOM software are unified and streamlined (e.g., a generic method of randomizing data is used for all of the procedures in the software, despite their variety). As an example of deep structure, consider one left-handed, two right-handed, and one ambidextrous persons. The deep structure for these four people on this 3-unit ordering appear as follows:

Deep Structure

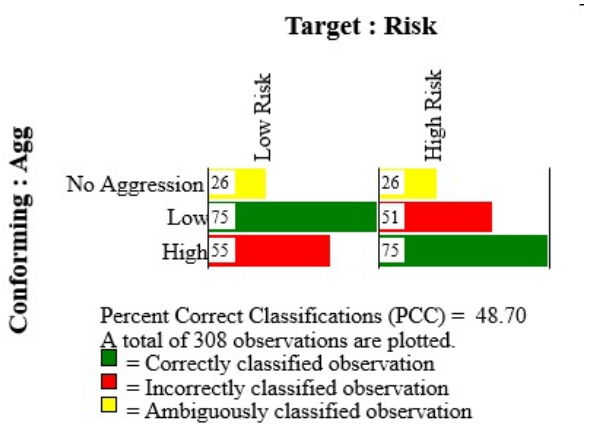
	Left	Right	Ambi
$Person_1$	1	0	0
$Person_2$	0	1	0
$Person_3$	0	1	0
$Person_4$	0	0	1

Notice how a “1" in the matrix indicates where the observation is made in the 3-unit structure. Finally, deep structures are similar to, but certainly not identical to, dummy and effect coding.

Define Orderings. The researcher defines the *units of observation* that comprise a given *ordering* in the OOM software. For example, political affiliation may be defined as “democrat”, “independent”, “republican”, and “other.” As another example, grip strength may be defined in pounds.

Integrated Model. An integrated model can be considered as an “iconic model” because it is an image that represents the causal structure of the natural system under investigation. An integrated model is *not* a variable-based path or structural equation model comprised of boxes, ellipses, and arrows such as is found in the vast majority of modern social science publications. Instead, an integrated model is comprised of different geometric figures and connecting links that represent the various causes and effects of a natural system. As a causal model, an integrated model is explanatory; that is, it explicates the what, how, and why of a natural system. Finally, as causes and effects occur at the level of the individual (or individuals in a group), it can be considered as a person-centered model rather than a variable-centered model.

Multigram or Multi-Unit Frequency Histogram. A graph produced by *Build/Test Model* procedure in the OOM software that is comprised of multiple (multi) frequency histograms (gram) aligned next to one another. The purpose of the graph is to examine how observations are patterned across units of observation for two orderings. For example, the multigram below shows a majority of High Risk persons were also High in aggression, whereas a majority of Low Risk persons were also Low in aggression. The numbers in the bars are the observed frequencies, although row, column, or total proportions can also be displayed. The bars of the histograms are colored as green, red, or yellow by default. Observations for the "Conforming" (row) ordering are classified to units of observation for the "Target" (column) ordering using a Bayesian-like algorithm. Green bars represent correctly classified observations, red represent incorrectly classified observations, and yellow represents ambiguously classified observations.



The default colors can be changed by the user, and other options are available to enhance the appearance of the figure.

Ordering. Observations or measurements ordered in a particular way by the researcher; for example, values read (observed) from a metric ruler, particular human behaviors observed and recorded on a data sheet, or observed responses to a self-report questionnaire. "Ordering" replaces "variable" in the common parlance of research. The word "ordering" connotes order and pattern while the word "variable" connotes variability and variance. Observation oriented modeling is a matter of orienting oneself to the order of nature rather than to the artificial partitioning of variance (e.g., as in analysis of variance).

Percent Correct Classifications (PCC). This value, often referred to as the "PCC index", can range from 0 to 100%. It indicates the number of observations that were classified correctly according to a pattern that was constructed a priori by the researcher or post hoc by an algorithm in the OOM software. The PCC can be considered as the primary indicator of "effect size" in observation oriented modeling research.

Units of Observation. The specific observations that comprise an ordering. For example, an ordering for handedness might be comprised of "left", "ambidextrous", and "right" units. As another example, an ordering for height might be comprised of centimeter units recorded to two decimals of precision. Finally, an ordering for relative, subjective perceptions of temperature might be comprised of "colder", "equal", and "warmer" units.

Terms used in Observation Oriented Modeling

Abduction. A type of inference that is neither deductive nor inductive. It follows the general form:

A has been observed
If B had been the case, A would have been observed

Therefore, B was the case

It can be considered as an explanatory inference. A researcher choosing between competing abductive inferences is seeking an *inference to best explanation*.

Accidental. Not formally or causally connected with one another.[2] Nonessential; not necessary; not invariably connected with one another.[5]

Accidental Cause. Something incidental or coincidental to the cause or effect but not involved in the activity-dependency relationship; the cause involved in a chance result.[5]

Causal Theory. The theory that explicates the causes and effects of the natural system under investigation. Less formally it can be thought of as the theory that explicates the structures and processes of the natural system under investigation. Ideally, in the context of using the OOM software, the model will present the material, efficient, formal, and final causes in visual form as an *integrated model*.

Causality. In the broadest sense, a relationship in which one being (the "cause") is in some *real* way responsible for a feature (the "effect") in another – the latter's existence, its essence or substantial nature, or one of its accidents.[2] A cause is generally defined as that from which something else proceeds with a dependence in being.[4]. Causality is distinguished from causation in that the former acknowledges a real dependency between the cause and effect whereas the latter implies only temporal succession. See also, *Accidental Cause*, *Efficient Cause*, *Final Cause*, *Formal Cause*, and *Material Cause*.

Efficient Cause. That from which there is a beginning of motion or rest. The efficient cause is the mover or agent that is responsible for a given change. So, a moving billiard ball is an efficient cause when it produces motion in another billiard ball, as is a sound wave when it causes the motion of the ear drum, and an atom when it produces motion in another atom.[3] This is the kind of causality most scientists think of when considering "cause."

Explanation. A clear, understandable statement about some truth, theory, process, or the manner in which an event occurred.

Final Cause. That for the sake of which a thing is done. The study of the final cause is called "teleology" from the Greek work *telos*, meaning "end". The final cause provides the ultimate explanation of motion since each thing movies to achieve some end (whether it's the early bird trying to catch the worm or the electron moving to a different energy state)...Of course, final causality cannot be operative in inanimate substances or even in plants and animals in the same way it is in human beings who have proper knowledge of the ends they are seeking. The term "end," as William Wallace points out, has various meanings. It may mean simply the point at which some action ends, as the fall of a stone ends when it hits the groud. It may also indicate the good that is achieved by a particular action. Finally, it may imply the achievemement of some conscious goal or aim. Although only humans and higher animals consciously pursue goals or ends, final causality may still be operative throughout nature as a good to be attained.[3]

Formal Cause. The principle of act which makes something to be the sort of thing it is. Thus the substantial form of bronze makes the bronze to be bronze and the accidental form (shape) of the statue makes it to be "Zeus" or "The Thinker."[4] Logical patterns, shape, organization, and order may serve as formal cause explanations as well.

Inference. An act of the mind moving from the content of one or more judgments to a new judgment connected with the prior one or ones. (In this context, a conclusion about a theory or hypothesis drawn from one's examination of data).

Inference to Best Explanation. A type of inference that is neither deductive nor inductive and was held by C. S. Peirce to embody scientific reasoning. Inference to best explanation builds on abduction in that two competing inferences are compared. For example,

> The ground rumbled beneath my feet
> If there was an earthquake nearby, then the ground would have rumbled beneath my feet
> ---
> Therefore, an earthquake was nearby
>
> The ground rumbled beneath my feet
> If an explosion happened nearby, then the ground would have rumbled beneath my feet
> ---
> Therefore, an explosion happened nearby

The goal is to determine, through investigation, which of these two inferences is most *plausible*. Note also how both inferences are causal in nature, seeking to explain a particular effect (the rumbling earth) via competing causes.

Material Cause. That out of which a thing comes to be and which persists in the result. Thus iron is the material cause of the iron statue since the statue is produced from iron and iron persists in the finished work.[3]

Nature. In many contexts within research, "nature" refers to the essence of a natural being (or power or act); i.e., the set of intrinsic intelligible features that mark the being as one of a certain type. Or, the principle of a being's operations, due to which the being itself, as well as its proper powers and acts are intrinsically ordered to respective ends. More generally "nature" refers to the whole order of physical being, or being that is changing and observable, including powers and activities of a, and relationships among, beings within this order.[2]

Physical Chance. Chance in nature or in events caused by nature's activities; an accidental combination of natural causes and events.[5] In other words, the result of the intersection of two or more lines of natural causality, whereby the outcome is not the necessary result of any type of force or act. Therefore, the outcome has "accidental" causes but no "proper" or "essential" cause.[2] "Physical Chance" is distinguished from "chance" in that the latter can be considered as a fortuitous event (per Aristotle) or as an unpredictable event (per modern physics).

Plausible or **Plausibility.** Plausibility is a qualitative and relational property of propositions (in particular hypotheses), beliefs, and inferences (Notably, plausibility is *not* equivalent to, nor necessarily related to, probability).[1] In OOM the goal is to demonstrate or argue for the plausibility of an integrated model. One an also argue against the plausibility of a competing model or against physical chance.

Note. Definitions with superscripts were taken from the source either directly or with slight modification.

References

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