

Patterns.

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There are patterns in this world, like sunlight on water, or the ebb and flow of traffic on the nation's highways, or the differential propensities of demographic groups to purchase million dollar condominiums on a lakeshore in the upper midwest.

And always, there are always patterns beneath the patterns. Although Plato would prefer the metaphorical "above" to my "below", he would certainly agree. So would mathematicians, such as Plato's hero Pythagoras, for whom a triangle drawn on a sandy beach on the Aegean shore was but a clumsy and ephemeral reminder of *Triangle*, that perfect and eternal thing of which it would always and exactly be true that the square of its hypotenuse would be, in length, equal to the sum of the square of its other two sides. Physicists would also agree, who dream of eleven- (or ten-) dimensional strings as the single reality behind the multiple appearances that make up our physical selves and the physical world we live in.

So too would philosophers, a bemused group who have wandered through two and a half millennia of European history looking for, among other things, this ultimate reality behind the myriad of appearances that so bedazzle us. Some of those other things philosophers look for include the nature of knowledge--what knowledge is, more than beliefs which happen to be correct. Those philosophers, known as epistemologists, we need not concern ourselves with. But philosophers who look for the patterns beneath the sunlight and the freight carriers and the condominium owners are known as metaphysicians—an exalted-sounding title, but one which has been used this way for so long that I have no choice but to continue with it. A particular branch of metaphysics is ontology, the study of the fundamental categories of existence.

I am by training a data modeler, by education a philosopher. Having wandered farther afield than most members of that peripatetic group, I design databases for a living. I alternately sit at a computer screen, and chat

with experts in various fields of commercial endeavor. At the computer screen, I design logical data models—a representation of a business which focusses on *what kinds of things* are important to that business, and what information about those things is needed to facilitate the processes by which the business makes its money. “What kinds of things are there?” is the defining question of ontology, a paraphrase of Aristotle’s question “Ti esti?” Asked from the perspective of a specific business, operating in a specific industry, rather than the perspective of a philosopher in an ivory tower, the question is no less truly a question of ontology.

The *science* of building data models was created by Dr. Ted Codd. It requires that we represent our conclusions about what kinds of things there are in constructs based on set theory, the theory of relations, and the theory of functions.

But science will never replace art. The *art* of building data models is to discern the deep patterns of a subject area, its true ontology, and then map those patterns onto rigorous mathematical constructs. Practitioners of data modeling in general show little awareness of how difficult it is to discover these deep patterns--the true ontology for any subject area. Most methodologies recommend taking the nouns used by subject matter experts to describe what they manipulate and keep track of, and create an “entity” for each of them. A description of what these experts do with these entities will use such phrases as “categorize by means of” or “is subdivided into”, or “belongs to”, and such phrases are used to create the relationships between these entities.

Such methodologies lead to a representation of surface patterns. But there is always a surface and a depth, how something appears and the underlying reality of the thing. And as in all of life, appearances often mislead us, often beguile us with their surface patterns.

Databases are usually populated based on the superficial patterns, and systems are then built around them. But because the true nature of the reality we are concerned with was never discerned, our databases and information systems never feel fully in focus, never feel exactly right. There are always exceptions, instances that just don’t fit into the database and its supporting

systems. There are always work-arounds. There is always knowledge which “old pro” expert users have, about how to compensate for the systems’ limitations. Such knowledge is almost never documented, and could never be derived from a study of the systems themselves, no matter how extensive. This “not quite in focus” feeling, and the existence of work-arounds for the many exceptions the system doesn’t handle well—these are the hallmarks of systems whose databases reflect only a surface understanding of the subject matter.

However, we data modelers have at least a term for the patterns beneath, no matter how seldom we discern them. We call it an “architecture”. A model’s basic constructs are entities, attributes and relationships – or, in ontological terms, things, properties of things and relationships among things.

Given that we understand the functional dependencies among these elements, we can always construct a fully normalized model, one that is as correct as mathematics can make it. But there are usually very many fully normalized data models that can be created for any subject matter. Most, if implemented, leave us with systems that have that slightly out-of-focus feeling. But unless we believe that God has created a world too complex for us to understand, we can operate on the belief that there is a fully-in-focus data model of any subject area. And, with effort and God’s blessings, we can often come pretty close to capturing it in the lines and boxes we draw on the sandy beach of our computer screens.

Data modeling, then, is the construction of an ontology for a business. Thanks to Dr. Tedd Codd, the constructs of the model have a strict mathematical rigor to them, one based firmly on set theory and the theory of relations and functions. When given an interpretation, these mathematical constructs become the basic ontological categories of the subject matter being studied. Thus data modeling brings a rigor to ontology that, to my knowledge, it has not had before.