Chapter 4
Objects and Processes

*Objects in the mirror appear closer than they really are.*
Oldsmobile Royale 88, left mirror (bottom)

*Do not throw diapers, sanitary napkins and objects into the toilette.* Boeing 747, lavatory cover (when raised)

Immanuel Kant said, “objects are our way of knowing.” While this is the truth, it is not the whole truth. Objects are our way of knowing the structure of systems. To understand systems’ behavior, processes are required. We know of the existence of an object if we can name it and refer to its unconditional, relatively stable existence, but without processes we cannot tell how this object changes over time.

Objects and processes, collectively referred to as “things,” are the two types of OPM’s universal building blocks.¹ OPM views objects and processes as being on equal footing, so processes are not modeled as “second class citizens” that are subordinate to objects, as is the case with the object-oriented (OO) approach. Major system-level processes can be as important, or even more important than objects in the system model. Hence, they can be modeled independently of a particular object class. This paradigm enables OPM to model real world systems in a single simple model that is faithful to reality and specifies it in graphics and text.²

Being able to tell them apart and use them properly is key to mastering OPM. To define these fundamental concepts and to communicate their semantics, we shall first discuss “existence” and “change,” laying the foundation for defining objects and processes and distinguishing between them. We will then introduce the “essence of things” and examine the difference between “physical” and “informatical” things. The word “informatical” refers to a generalization of data, information, knowledge, expertise and ingenuity without any reference to their physical manifestation.

4.1 Existence, Things, and Transformations

Webster’s New Dictionary (1997) defines *existence* as the noun derived from exist, which is *be, have being, continue to be*. To exist means to stand out, to show itself, and have an identifiable, distinct uniqueness within the physical or mental realm. A

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¹ Objects, processes, and states are OPM *entities*. States, which are discussed throughout the book, are considered secondary entities, below objects.
² This paradigm seems to violate the OO encapsulation principle, thus rendering OPM a “non-pure” object oriented approach. OPM does not present itself as an OO method, but rather as a holistic approach to modeling systems. We elaborate on this issue in Chapter 15.
thing that exists in physical reality has “tangible being” at a particular place and time. Because it stands out and shows itself, we can point to it and say: “Now, there it is.”

To stand out means to present a stable form against a background of something else that exists (with which, for the time being, we are not concerned). The notion of “background” is essential, for if there were nothing else that existed, there could not be the contrast of one thing standing out and distinguishing itself from a background of things that exist along with it. The stable form that the existing thing must exhibit is “substantially unchanging” long enough (relative to the typical rate of change of the background) for it to be recognized as “standing out”. That which we can never identify, or have its identity be inferred in some way, can have no existence for us. In other words, “to stand out” requires a continuous identifiability over an appropriate duration of time. When we consider existence along the time dimension, there are two modes of “standing out,” or existence of things. In the first mode, the “standing out” takes place throughout a positive, relatively substantial time period that occurs in such a way that it is basically unchanging, stable, or persistent. We call that which stands out in this mode object.

**4.1.1 Objects**

Webster’s Dictionary (1984) provides the following two relevant definitions for the word object:

1. anything that is visible or tangible and is stable in form.
2. anything that may be apprehended intellectually.

These two definitions correspond to our notion of physical and informatical objects. The first definition is the one we normally think of when using the term object in daily usage. The second definition pertains to the informatical, intangible facet of objects. Informatical objects are different from their physical counterparts in that informatical objects have no physical existence and, being intangible, they do not obey the basic laws of physics. However, the existence of informatical objects does depend on their being symbolically recorded, inscribed, impressed or engraved on some tangible medium. The medium can be the human brain, paper, some electromagnetic medium, stone, etc.

Qualifying the human brain as a tangible medium that can store intangible things may perhaps seem to some readers cynical or inappropriate. It therefore deserves special discussion. The central nervous system, of which the brain is the major part, is the informatical system in humans and other organisms that controls and regulates the entire organism. The human recollection or the mental record of a thing is a mostly mysterious way that a thing is inscribed in one’s mind. Among many other, more elated capabilities of intelligence and emotions, the magnificent capability of the human brain to remember things qualifies it as a superb recording medium. This by no means belittles humans (or maybe other organisms or, in the