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Information is the Raw Material of a New Architecture

The brief of this 2010 Acadia conference is Life in Formation: On Responsive Information and Variations in Architecture, and it will discuss "on the influence of computing and its impact on the changing nature of information." But at this point an interesting question should be answered. What is information? What is its specific significance in the area of information technology? How could information be considered the "raw material" in the most advanced architectural experimentation over the past few years? This essay wants to demonstrate the effectiveness of the affirmation: Information is the Raw material of a New architecture. To further expand the thesis and to access bibliography and notes, see the many books of the "IT revolution in Architecture Book Series" Birkhäuser (Basel, Boston) and EdilStampa (Rome) and the last book of the author "The IT Revolution In Architecture, Thoughts on a Paradigm Shift" Carocci,(Rome) 2007 translated in English in ITool and distributed by Lulu.com.

Our relationship with information technology (IT) is structural, cultural, and formal at the same time; *structural* because all of society rotates around the value of information; *cultural* because orienting one's self in this new scenario is fundamental; and *formal* because the procedures put into effect by this IT way of thinking can also influence the way of conceiving architectural form.

Spaces tend to be ever more multi-functional and designed using complex geometry. Construction utilizes special pieces created by cutters guided by digital models. But information, above all, becomes the essential component of a new architecture and a new urban environment.

Information technology is imposing itself as the central paradigm for a new phase in all of architecture; the dynamic interconnections at the heart of IT are being transferred from the world of digital models to the reality of a reactive, sensitive, interactive architecture.

The world of information technology is made of bricks; for clarity let's call them "informational atoms." The basic characteristic of electronics is that the support containing the information (numerical, alphabetical, pictorial, vectorial, three dimensional, etc.) is not rigid (stone, papyrus, parchment, paper, etc.) but is made up of an electric impulse. It changes at the speed of light.

The advantages to this are well known. Information varies continuously, the word is constantly refined, one number always replaces another, pillars thicken, plants lengthen, etc. Seated at our desk, we can have a teleconference over the computer that brilliantly accomplishes everything, or at least almost everything. With the Internet, we are part of the whole world. But on closer examination, this series of practical advantages derives only from the difference between an electrical support and one that is immaterial or rigid. In reality, these advantages have almost nothing to do with the truly central aspect of information technology. The world of information technology is in fact essentially a mobile web. We can reassemble informational nuclei with each other, hierarchize them into innumerable relationships, and create models. By changing one atom, we can create a change in the entire system or form different worlds by changing the sense, order, or network of the connections.

The word "model" becomes key in this way of thinking. A computerized model of a building is potentially not just a three dimensional construction that, like a real building, gives us infinite points of view, but is actually a model in the scientific sense (e.g., a mathematical, financial, physical, or statistical). The information is interrelated and a change in one varies the other.

But at this point an important question should be answered. What is information? What is its specific significance in the area of information technology? This essay illustrates a series of concepts, provides arguments, suggests experiments, and most importantly formulates some definitions.

Working on a Definition

Take a white sheet of paper and a pencil with a sharp point. Place the pencil on the paper until it leaves a point, the smallest possible.

Now ask yourself "How big is it?" There will be no lack of ideas about how to measure it (magnifying glasses, microscope, etc.). The only thing you obviously will not say is: "it is not possible to measure it; it has no dimensions." Why? Because it is inside the field created by the question "measure." However, to measure it, we need a basic assumption, a fundamental postulate or, in other words, that the point (let us say "that" point) has no dimensions, or better yet, as Euclid wrote, "has no parts." So here is a nice contradiction. In order to measure that point on the paper (a point clearly measurable), we must use the postulate of its immeasurability.

To resolve this contradiction, let's proceed with an initial formulation: 1) *a datum is the minimum element that modifies a previous situation* (the paper "was" white and now has a point). Now I can proceed to the second formulation: 2) *a datum is the objects of multiple conventions*. This means a datum must be associated with a well-defined convention in order to have any meaning. The basis of the convention may not necessarily be logical, but can be simply utilitarian. This is why by saying the point is "a surface," if needed I can calculate the area, but if the point is assumed conventionally "without parts," then we arrive at Euclid's first postulate which has developed into one of humanity's most powerful (and useful) constructions. Remember the second postulate—a "line (curve) is length with no width"—and the third—"the extremes of a line are two points". Another convention I can apply to the point is related to its state of standing still or in being in motion. (This system can be adopted to help understand *vectorially* the creation of the computerized three-dimensional world).

But we are still stuck at the crux of the problem. Applying convention to a datum begins the "formation" of a world. This word "formation" is important and leads us to the center of the problem and the third formulation: 3) *information is the application of a convention to a datum*.

Let's see if this definition functions in the common as well as electronic contexts. In the common meaning, information is a collection of data that comes to us substantially and objectively like a package, divided by critical opinion.

Our definition functions very well (perhaps better than others) in the common context. Now we come closer to the center of the problem, i.e., the profound difference between the world of paper and pencil (for clarity we will call it "traditional") and the electronic world.

Let's go back to the sheet of paper, and instead of a point, draw a small oval. Now let's change the question. Instead of "How big is it?" let's ask "What is it?"

As we stated in our third formulation, in order for it to be something, a convention must be applied to that datum. Only through this process will the datum become an atom of information, albeit the smallest.

Depending on the convention we choose to adopt, that oval could be: a group of smaller points; a letter of the alphabet; the number 0; an oval (mathematically defined); the two-dimensional projection of a volume; a whole note; a "sprite" in a montage; or even a symbol for something else. All this "depends" on the convention. Our definition functions excellently in this second meaning.

Now we come to the fundamental passage regarding the difference between the traditional world and the world of information technology.

The fundamental passage is that the world of information technology *is a world already formalized from the start*! In other words, the earlier question, "What is it?" (referring to the small drawing of the oval) is inconceivable because in information technology "we know right from the start the conventional system within which we are moving."

So here is the fourth formulation: 4) *in information technology, data do not exist, but instead only and always information*. Information technology has a well-known, close relationship with the electrical data of the computer that are in fact "data": either they are there, (*On* = 0), or they are not there, (*Off* = 1). Based on the presence or not of this electrical datum, a series of codification systems have been constructed since the Morse code.

We are slowly approaching the thought behind the statement "information is the raw material of architecture" but we still have a few more steps to take. Here is the fifth formulation, a crucial tautology: 5) *if in information technology, data do not exist but only information, then in information technology everything is information.* This formulation touches on the crux of the problem and takes into account that information is truly "in formation," in constant, dynamic, inexhaustibly moving and becoming! It also defines the territory where this occurs as precisely the electronic territory.

Thus information is, by definition, a *fluid* mass that must "still" take form.

At this point, it is useful to refer to the Oxford English Dictionary: "inform" means "put into form" and information is the "action" of this putting into form.

From this definition comes a new decisive proposition. If, in information technology, everything is "in formation," then 6) *the taking shape of information is defined as modeling and finds its expression in the creation of models*, a term we will discuss shortly.

Thus, the model is *the form assumed by information*, the form into which information becomes "modeled."

Raw Material

Many families of models exist in information technology. The simplest is represented by the spreadsheet that links pieces of information to one another via mathematical formulas, allowing constant updating of all values based on variations in only one piece of information. This invention has had consequences in a broad field of activities, from financial to construction. Above all, it represents the advent of a generalized way of thinking: "What … if" or rather "What" happens in my model "if"? For some time, "spatial and architectural" models have existed that dynamically link the geometric, spatial, constructive, and even performance information of a project so that varying one datum makes it possible to verify "in a cascade" what will happen in all the interconnected areas of information in the project system.

In this context, as we will see more clearly, a design project tends to function like a group of equations representing specific sub-areas of the project. Defined forms are not designed, but instead "families of possible forms" that can vary within several parameters, substituting the geometry of Euclidean absolutes with topological families. Architectural design and thought thus moves within a network of these fluctuating, moldable bits of information like a system of interconnected equations that pass data back and forth between each other. Today, more and more architects work with scripting first and visual programming after to produce a representation that is geometrical and mathematical at once. The infos resulting at the end of the process can be sent to computerized machines to electronically produce concrete components of construction. This process tends to reverse the type of thinking that was usual for the architects of the past. A script generated form can be interrogated to understand what constructive, functional, and bioclimatic characteristics it can effectively support. A cyclical process of hypotheses-test is generated in which the manipulation of the mathematical information is indeed the "raw material" of a radical new conception of architecture.

The new generation of architects is working to understand how these mutable, interconnected, dynamic models, representing the heart of the IT Revolution, could transmigrate into an architecture that would be their reification. If this research constitutes the horizon of a new phase of architecture, its raw material, the wellspring that feeds the research and moves in waves, whirlpools, eddies, and waterfalls, is called information, the raw material of a new phase in architecture.