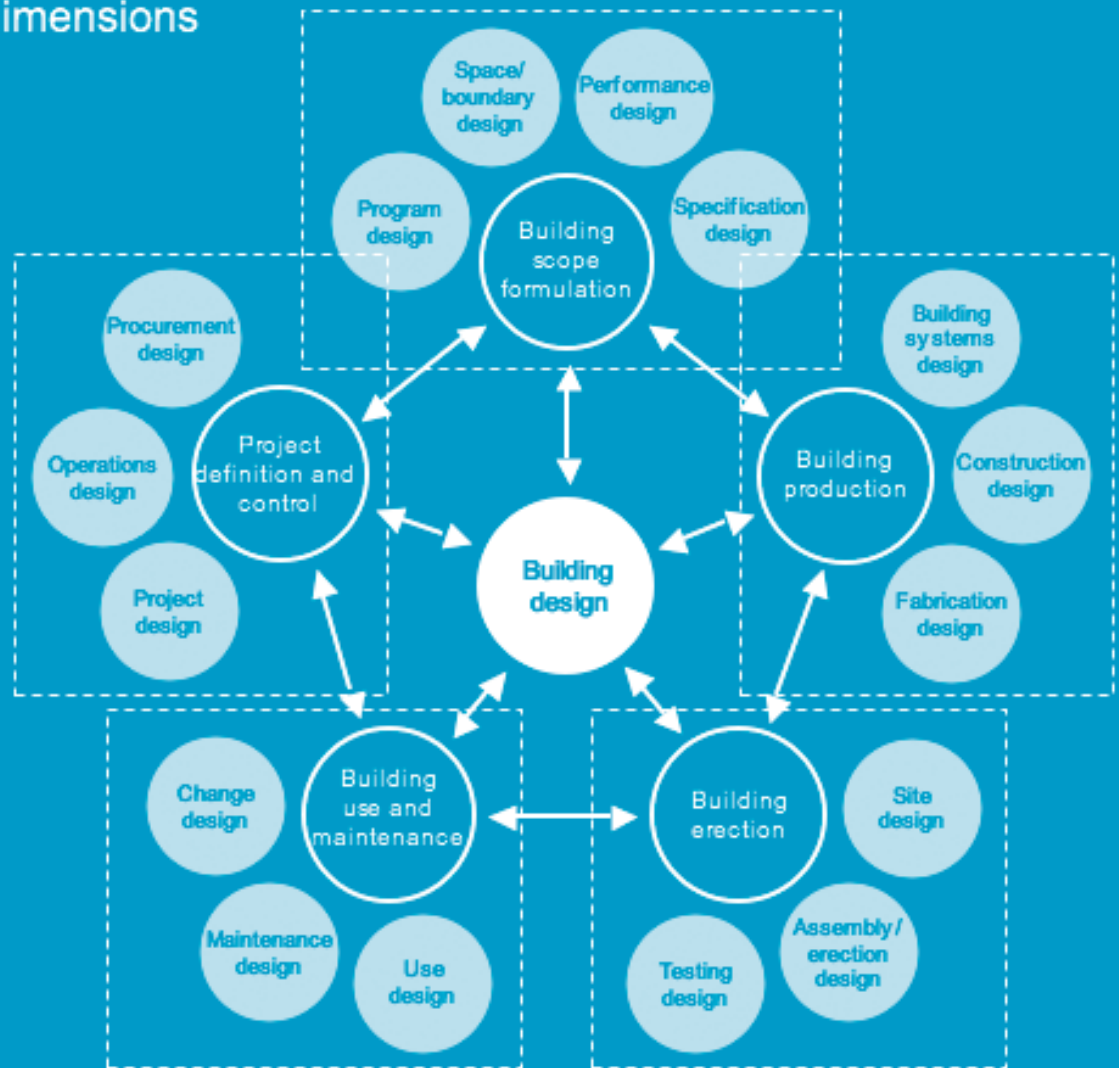


## Figure 1 – The five dimensions of building design

The idea of the building procurement process as a network of design and coordination activities.



# Clever Beyond Engines

---

Paolo Tombesi

---

For architects, reflecting on engineering has always proved difficult. No matter how good the initial intentions, more often than not the discussion ends up in some form of comparison between engineers and architects—be it about history, education, professional attitudes, cultural inclinations, agency functions, or else...

Rather than focusing on the verb, “to engineer,” we tend to concentrate either on the socio-technical implications of “being an engineer,” or on “engineering” as a noun defining areas of technical expertise conventionally understood as complementary to the architect’s.

There is no harm, of course, in taking or nurturing such a social view of the work; but it may be useful to ask, particularly in the context of this issue of *arcCA*, whether the direct, almost automatic association between agents and actions, or official knowledge and practice, can help articulate—and possibly overcome—the challenges internal to building design today. In other words, does the discussion of design (or engineering for that matter) need to retain explicit ties with identifiable professional domains and/or profiles? Should we continue to rely on conceptual categories that date back to the eighteenth century, and which reflect a vested interest in portraying and communicating a specific model of practice based more on the existence of social contracts than actual methods of work? Or should we rather try and let corporative notions go for a moment, turning ourselves into empirical diggers of design data that can help us decide whether the intellectual dynamics at work within building projects suggest changing geographies of authority, authorship, and alliances?

I am convinced that, if we are serious in scrutinizing professions to shed light on the organizing capacity of contemporary practice, we need to rethink the very description of the work carried out under its banner. In order to do this, attention must switch from social roles to design tasks or skills, from occupations to problems.

Engineering itself stands as a testimony of the flexible nature of the concepts we use. If one

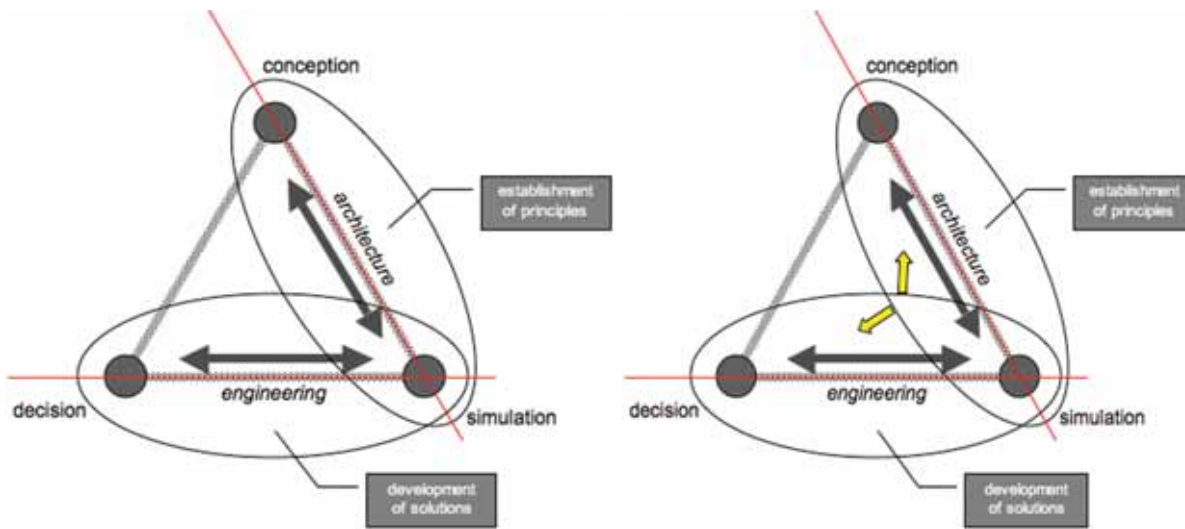


Figure 2: The relationship between architecture and engineering in the design process.

follows the dictionary, not all engineers are the same. In the English-speaking world, the term “engineer” has always sported a mechanic-like connotation, since its root derives from—and therefore denotes the ability to deal with—more or less complex machines (or “engines”). In most romance languages, by contrast, it is associated with ingenuity or “cleverness”—the innate quality that enables *ingegneri*, *ingénieurs* and *ingenieros* to be resourceful, act with originality, devise new explanations or methods, and thus invent.

The semantic slippage from *engines* to *cleverness* is an etymological oddity and should not be carried too far; yet it epitomizes the difference between defining an expert group on the basis of the devices it works on and with or in relation to the ability to devise. Depending on the framework adopted, engineering can be discussed as an occupation/discipline or as an intellectual practice—that is, a way of thinking strategically and theoretically about anything.

Now, if engineering is equivalent to “being ingenious” rather than “being an engineer,” the activity we label “engineering” can pervade the entire building process, much in the same way as design does the moment we disconnect it from the qualification “architectural.” To take a prosaic view, it becomes a problem-defining, problem-solving, information-struct-

turing activity that, on the basis of understood conditions and rules, however partial or “rationally bounded,” defines and communicates a specific course of action. According to this description, design-definable work would enter all dimensions of the building procurement process, irrespective of the architect’s engagement, from building scope formulation to building production, building erection to building use and maintenance, project definition to project control (Figure 1). By the same token, ingenuity is required—and it is indeed employed—across the entire project board.

Once we arrive at this dialectical conclusion—that design activity and ingenuity cannot possibly be limited to the areas covered by one or two professions (however broad these may be)—we have a blank slate on which to draw a truly original portrait of practice. Its defining traits can and should still be based on the generation and management of design capacity, but the social body in charge of (rather than entrusted with) it would not be determined *a priori*, but instead would require “fieldwork analysis” to be identified.

Which brings me to what should be the central question of a reflective discussion on engineering: not just “What do engineers do?” but, instead, “Who are today’s engineers? Who works, in fact, as an engineer? Who practices

the art of engineering?”

These questions are neither trivial nor without consequence. To answer them, we need to consider rigorously how design gets articulated into the specific functions related to the various aspects of the building process, then to produce taxonomies with the power to describe the work that ought to go into it. Doing so would make it plausible to turn architects’ mental image of construction around and think of the building process, with all its ramifications, as a “system of design production” (or a process of concurrent engineering) independent of the profession—a cycle, that is, within which all the information necessary for the implementation of the building is conceived, assembled, and exchanged.

To make it clearer: the moment we extend our discussion on ingenious practice to the various types of intellectual activity required to conceive a building and implement its construction, the design task is transformed from an intra-organizational to an inter-organizational set of activities and goods. How this system organizes to deliver its product, what logics it follows in doing it, what it is constrained by, and how many units of production it consists of, then become the real objects of the discussion.

It should not come as a surprise that such

	building design															
design dimensions	building scope formulation			building production			building erection			building use and maintenance		project definition and control				
sub-design tasks	program	space/boundary	performance	specifications	building systems	construction	fabrication	site	assembly/erection	testing	use	maintenance	change	project structure	operations	procurement
establishment of principles																
development of solutions																

Figure 3: The relationship between architecture and engineering in the design process.

analyses have not been carried out in force for decades, possibly as a result of the backlash caused by the use and abuse of design theory and methods in the 1970s. The consequence is that we tend to perpetuate, based on casual documentary evidence, a socially consistent view of the design professions as fiduciary agents of the client, sometimes engaged in sibling rivalry . . . at the same time that professional bodies come out with new design-assist contracts, and trade specialists increasingly sign as engineers of record.

So, what can or should be done to bring rhetoric and reality on a par?

My suggestion is as follows. Let's take the concepts of architecture and engineering at face value, for what they are supposed to mean in the field of ideas, rather than whom they are supposed to represent in the field of professions. The definition of their scope is embedded in the language, and we can assume it as appropriate: the construction of principles (or the principles of construction) for architecture, and the carrying out of an enterprise "by skillful or artful contrivance" for engineering (as per the dictionary).

The establishment of principles (architecture) thus goes hand in hand with the development of solutions (engineering) to define the intellectual component of the design process,

which, as we know, consists of three functions: envisioning, deciding, and transferring. Architecture is the process helping us envision the future by establishing organizing principles that develop in the space contained between conception and representation; engineering is the tool that brings us closer to their implementation by taking decisions based on the creation and evaluation of feasible alternatives (Figure 2). There is little doubt that, when put this way, architecture and engineering are consequent stages of the same process, connected through all the simulative activity that serves to represent ambitions, assess their potential, and translate them into action. As expected, initial conception and final decision about a design can be drawn closer together either by making the two ends of the arrow converge socially—that is, by managing the two tasks under the same roof or hat—or by expanding the area of communicative simulation, which is where design debate and adjustments take place.

Once we use "architecture" and "engineering," thus defined, to energize the tired notions of "schematic design" and "design development" internal to the building project, they become ubiquitous: every sub-design task needs architecture (the recognition of this simple truth would alone be a great step forward), and each architectural thesis, no mat-

ter its domain, demands proper engineering testing and support (Figure 3). But, since the labels we employ are tied to the function being performed rather than the party performing it, it is plausible to expect, when the situation requires it, architectural practitioners to engineer (i.e., to test, perfect, hone) their design, and engineers to work on the architecture of their system specialties. The problem may well turn out to be that, at times, architects do not do enough engineering, and that engineers don't do enough architecture.

But we might discover that, in particular areas, both architecture and engineering, in the sense put forth here, are either absent or carried out by significant "others." In this case, I play the optimist. Using the rubric of architecture and engineering to expose the existence of alternatives to the customary social division of professional labor in the design of the built environment could be both intellectually powerful and professionally cathartic. One would hardly need a more forceful depiction of practice to trigger, at last, grounded reflection on the structure of design sub-contracting, the evolution of the network firm, the alteration of the triangle of practice, and the advance of new building (and design) information models. ●