and engineering, within which the architect had to work. Twentieth-century architecture is a socially-constructed balance between these two poles.

At one extreme there are architects who see themselves as artists, and want to be seen that way by the public. People such as Zaha Hadid and Rem Koolhaas are emblematic of architects for whom artistic form is dominant, and for whom the technical issues of putting a building together are of secondary consideration. These architects will do what they can to supersede or reinterpret technical issues in the service of their artistic concept. In many cases, they work with other architects who are legally responsible for the building's construction; this allows them to concentrate on "art" and to avoid liability. This kind of procedure is often what allows these architects to do extensive work internationally: the local architect of record is the one who really understands local codes, materials and construction procedures, and who deals with most issues of the building during construction.

At the other extreme are architects who are firmly entrenched within systems that are at root modern technological systems, and that seriously constrain their ability to be "artists." These systems include the contexts of building codes, zoning regulations, development finance, construction law, liability insurance, and the manufacture of building components, among others. These are all rationalized systems that took on much of their present form during the nineteenth and early twentieth centuries, as the industrial paradigm finally replaced craft production. These systems leave limited room for discretion on the part of the architect.

Most architects understand that they need to incorporate both attitudes into their work, and the curricula of architecture schools attempt to maintain the idea that architecture is both an "art" and a "science." This turns out to be an uneasy marriage, in the profession as well as in the schools. Professional firms feel caught between their desire to do good design, and the fact that schematic design – the phase of their services in which the basic form of the building is determined – represents only 20% of their fee, or even less. A good percentage of an architects' time, during and after that initial phase, is spent satisfying explicit requirements, including those imposed by the threat of litigation.

There is a strong relationship between the transformation of practice with respect to process and the increasing split between "art" and "science." Modern technological systems, including statutory legal systems such as building codes and zoning regulations, leave little room for discretion on the part of the architect. To varying degrees, the architect is a manager, coordinating these various requirements and incorporating them into the building. Of course, this varies from architect to architect, and architects are different in their degree of inventiveness even in the context of these requirements, but most will agree, when asked to account for their time over the course of a week, that their job is not nearly as creative as they might have thought it was going to be when they first entered the profession. There is room for creativity and invention, but many would argue that this is only superficial, leading to superficial differences between buildings.

Yet, the early nineteenth-century architect/builder like Isaiah Rogers was working within an intellectual framework that allowed him to make many implicit judgments. This system was also one in which design and construction were much more

intertwined than they are today, allowing for a dynamic relationship with the emerging building all through the course of construction.

The emergence of institutions of control outside architecture itself – building regulations, zoning, insurance, building finance – had the effect of taking the ability for discretionary judgment away from the architect. To the extent that the architect remained an "artist," his authority was greatly reduced, but even within this reduced authority he tended to remain unwilling to give up even the illusion of being a creative artist.

## 5 Process and the Work of Christopher Alexander

At the beginning of the twenty-first century, the challenges faced by those who are responsible for making the built environment – architects and engineers included, among many others – are considerable. Buildings and cities are responsible, one way or the other, for the bulk of fossil-fuel consumption, as production levels off and begins to decline. Cities in developing countries continue to experience enormous population growth through births and in-migrations, most of it in slums and informal settlements; there are hundreds of millions of people in the world without an adequate place to live. And many would argue that the quality of the built environment – its ability to support human life and elevate people's spirit – has not only declined but does not seem to be the goal of those who are making it.

As the contemporary paradigms of architectural and building production are focused more on product than they are on process, the major challenges we face seem intractable. Christopher Alexander argues that it is only through a fundamental transformation of process that the built world as a whole – rather than the relatively few buildings over which architects have direct control – can be adequately dealt with. The paradigm of the individual architect designing the individual building is outmoded, in a world in which the bulk of the environment is controlled by developers and migration and forces that are beyond the architect's control.

Alexander's work has three major components that help to define his attention to process: (Alexander, 2002–2004)

First is the idea of the *structure-preserving transformation*, or the notion that any act of construction must work to repair and/or reinforce the larger whole in which the project is located. This may be seen as extending some ideas of the sustainability of ecological systems into the realm of the built world, by requiring first a value judgment about the health of the larger system, and second a commitment to maintain or improve that health.

The idea of the structure-preserving transformation runs counter to the idea of so-called "object building," and by extension, to the idea of "star-architect as hero." In this way it helps to define the architect as a professional whose primary responsibility is to the built world as a whole, and not only to the particular building s/he is designing. This is perhaps the most fundamental way in which Alexander's thought bears on process and not only on form.