as fully unified as many historians claim, nor did the architects of the 1970s, '80s and '90s swing *en mass* to limited visual concerns. Rather, a sober view of the state of architecture at the beginning of the 21st century reveals a pluralistic and diverse scene, one where some architects clearly practice as visual artists (these are the so-called "star-architects"), others practice in a corporate context much like engineers (these are technical production firms with names like SOM, RDGB, and BNIM), and a few have become more socially active and engaged than ever (these are firms that see themselves as socio-environmental activists).[9]

A deeper historical inquiry reveals even more about the current situation. Not only do architects and engineers practice in contexts that are increasingly similar, but modern architects have long admired the reductive qualities of engineering practice. For example, rather than distance architecture from engineering practice as many might expect, the early 20th century Swiss-French architect le Corbusier argued that "The Engineer's Aesthetic and Architecture are two things that march together and follow one from the other …"[10] From his perspective in 1920, le Corbusier saw engineering practice as a model of efficient production, devoid of neoclassical decoration and craft that previously denied the benefits of design-thinking to the masses. Embracing more modern and industrialized modes of production like engineers advocated would not only improve distributive justice but also result in an aesthetic that expressed such changed social values.

Although we tend to assume that building designs in general are the products of architects, they are the first to decry the fact that only two to three percent of housing (in North America) is designed by architects and many types of utilitarian buildings and infrastructure such as roads, bridges and harbors are designed by engineers. Observing the built world through the revealing statistics of the construction industry reveals that architects are far less the authors of the built world than we might think.

In sum, this counter-narrative suggests that it is a mistake to essentialize engineering or architecture. Attitudes and practices related to authorship and organizational structure within both disciplines are now, and always have been, in flux. Our argument is that across the range of practices and firms representing engineering and architecture we can see the two disciplines as increasingly more similar than distinct in relation to the societies that they serve. If one observes how contemporary engineers and architects actually work, we see that authorship and responsibility are more distributed in reality if not in the eyes of the public.

Without pushing on further with which of these two narratives is more accurate, our aim in this volume is to present a range of views on why current developments in engineering and architecture require the development of visions concerning the social responsibilities, ethical practice, and political context of both disciplines. In the past few decades more architects, engineers, and design methodologists have increasingly come to recognize what philosophers have been claiming for some

[9] For example, see Bell (2004).

[10] Le Corbusier (1990).

time now, particularly with regard to engineering, that all design shapes social relations and hence contains an inherent moral and political content. It is to a more robust understanding of this common content that we now turn.

3 Shifting Boundaries

Let us return to engineering design, and to an analysis of its gradual development towards a model more like architectural design, as we identified it in the opening section of this introduction. In the 20th century the institutionalization of a rich variety of engineering design traditions and practices emerged. During the second half of the last century design practices gradually developed that focus on the material product of design and on the broader social system in which these products are supposed to perform their function. For example, with the advent of ergonomics, and the wide dissemination of computers, engineers became systematically involved in problems related to man-machine interactions and in designing human interfaces for their products. But the broadening of the boundaries of the systems that engineers had to deal with did not stop with the inclusion of human agents. Also, with regard to the life-cycle of designed objects, the boundary between products and users has been shifting. Calls for a more environmentally sustainable society, for example, has forced architects and engineers to consider products as items with life cycles that include their production and their disassembly. More recently, with the growing awareness of the vulnerability of large infrastructural systems to cascading failures and terrorist attacks, engineers have further enlarged their professional scope, to include in the systems they study and design, the interaction and social organization of human agents that operate massive technological products. This trend in different engineering fields has led to the emergence of systems engineering as a separate branch of engineering.[11] Originally this new field of engineering focused on the design of complex, large technological systems, and on the organization of technologically complex production processes, including complex design processes. Nowadays there is a growing awareness in this field that systems engineering will have to include human agents and social infrastructures as elements of the designed system.

As we pointed out at the start, design traditions have emerged that focus their attention on technological systems and what are called, by science, technology, and society scholars (STS), and philosophers of technology, socio-technical systems: amalgams of technological objects, agents, and social objects, all of which are necessary to guarantee the functioning of these systems. The crucial role of social infrastructures for the functioning of socio-technical systems may, for example, be illustrated by what happened to civic air transportation in 2001 just after the 9/11 attack on the New York City World Trade Center. The system of civic air transportation temporarily collapsed in part

[11] E.g., Blanchard and Fabrycky (1981) and Miser and Quade (1985).