waste. The garage would be no use without connection to a street system. Unlike the primitive dwelling considered earlier—which was essentially autonomous in its operation—the modern house is so dependent on its utility connections that it quickly becomes uninhabitable if these are disrupted.

Other modern building types—offices, manufacturing facilities, warehouses, retail facilities, schools, hospitals, laboratories, and so on—can be analyzed in similar ways. All consist of differentiated and specialized interior spaces, with furniture and equipment adapted specifically to the particular functions of those spaces. These spaces are tied together by internal mechanical and electrical networks, and these networks are linked to large-scale utilities. Throughout the nineteenth and twentieth centuries, as the mechanical and electrical systems of buildings became increasingly elaborate and sophisticated, they demanded growing shares of design attention (Figure 3-2). They also accounted for increasing proportions of construction documents, and they began to dominate construction and operating costs.

DIGITALLY NETWORKED INTERIORS

Since the late 1960s

Since the late 1960s, digital networks have emerged as an increasingly important new type of interior system. Their development began with the implementation of elementary computer networks in major business, research, and educational facilities. The adoption of Ethernet and token ring standards, together with the growing popularity of personal computers and engineering workstations, led to the proliferation of local-area networks (LANs) in workplaces during the 1980s and the 1990s. As the twenty-first century dawned, digital network connections were becoming commonplace in almost all types of interiors, and as ubiquitous as electrical outlets.

In their physical characteristics and space requirements, these networks are highly varied. Optical fiber may be used for the highest-speed links; this is bulky, cannot be bent around sharp corners, and—though fairly easily accommodated in special chases and trays in new construction—can be very difficult to retrofit gracefully into existing interiors. Coaxial and twisted-pair copper

FIGURE 3-2
Mechanical and electrical networks have become increasingly elaborate and sophisticated in modern buildings.

wiring serves for lower-speed links; this is less demanding in its requirements than fiber, but the sheer number of cables may add up to a significant space demand. Wireless networks reduce the need to run cables everywhere, but they have other limitations: they still require transceivers at closely spaced intervals, they are generally slower than the wired alternatives, and they are subject to interference problems.

Networking also creates a significant demand for space–particularly accessible closets–to accommodate switching equipment. These closets are now an increasingly important element of interior space programs.

The growing need to provide network connection anywhere, and to power digital electronic devices, creates some particular interior design challenges. In some cases it suffices to provide power supply and network access around the perimeter of spaces, and perhaps on columns. Where a higher density of access points is required it may be necessary to introduce floor or ceiling grids. Cabling can also be run through demountable partition and furniture systems, but this increases their complexity and cost, and makes them harder to take apart and reconfigure.