dot.com startups have emerged to offer comprehensive, on-line management and distribution of design and construction data. Whether traditional design and construction organizations end up controlling this business, or whether the task of on-line design and construction data management is taken over by the new, specialist players with large amounts of venture capital behind them, it seems clear that the future belongs to electronically interconnected, geographically distributed design and construction teams. Increasingly, designers, consultants, clients, fabricators, general contractors, construction managers, and regulatory authorities will be tightly interlinked through the Internet and the web. Rapid digital transfer of CAD and other data, and use of specialized software for managing, safeguarding, and distribution information, will become the norm.

One of the most dramatic consequences of this development will be the growing integration of CAD and electronic commerce capabilities. Instead of selecting materials and products by flipping through printed catalogs and consulting sales staff, designers will increasingly resort to on-line catalogs. Choices will be recorded by linking CAD databases to product catalog data. Prices will be quoted, and negotiation and bidding processes will efficiently be carried out in on-line environments, making use of electronic procurement technologies that are already employed extensively in other fields. Increasingly, CAD systems will look like specialized browsers that provide access, as needed, to information and resources residing on servers scattered throughout the web.

VIRTUAL STUDIOS AND CONFERENCE ROOMS

The combination

The combination of CAD capabilities with extensive web resources and on-line data management tools can be regarded as a virtual design studio–an electronic facility for supporting the work of a design team that is wholly or partially geographically distributed. Use of such a capability has many potential advantages: it facilitates the export of design services, it allows the aggregation of the best expertise for a project on a global scale, it keeps traveling participants in close touch, it provides the possibility of tapping into inexpensive labor markets for routine aspects of the process, and it can even sup-

port 24-hour operation by taking advantage of time differences between widely separated locations such as Los Angeles, London, and Hong Kong. It also, of course, removes many geographic constraints on competition among design firms.

Within such an environment, digital telecommunication adds the possibility of *remote* interaction to that of local, face-to-face interaction. Similarly, digital storage adds the possibility of *asynchronous* communication to that of synchronous. (In asynchronous communication the parties make use of recorded messages of some kind to remove the necessity of being available at the same time.) The combinations of these possibilities are illustrated in Figure 14-10.

The various options do not substitute directly for one another, since they have different strengths, weaknesses, and associated costs. Local synchronous interaction–for example, by meeting around a table in a conference room–is most intense, effective, and satisfying for many purposes, but it is also the most expensive and difficult to arrange. Remote synchronous interaction, through on-line chat, teleconferencing, or videoconferencing, removes the element of travel time and cost but limits the possibilities for effective communication. Local asynchronous interaction, for example by inspecting a large collection of drawings stored in a flat file, can provide enormous bandwidth for information transmission but lacks human directness. Remote

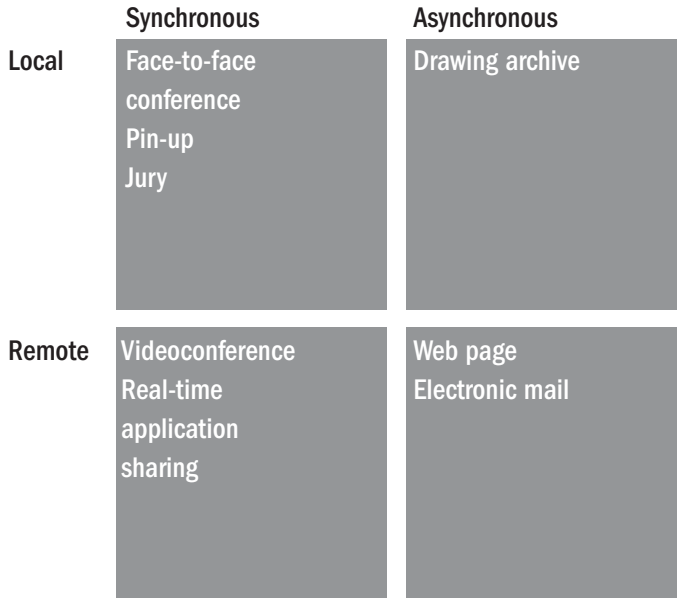

FIGURE 14-10
Modes of Design Interaction.