To date, the freehand sketch has no substitute in the private process of shaping design concepts. Reliance on sketching varies among design domains and is definitely dependent on the type of task and on individual propensities. But to the extent that the individual designer reasons about his or her design, sketching is how he or she carries out a dialogue with the design situation (Schön 1983).

In teamwork things happen a little differently, of course, as reasoning is carried out collectively. On top of serving the individual's needs, representations are also the basis for communication among team members who use language to explicate their design arguments and make them accessible to others. Gestures and artefacts that are used to model or simulate shapes of design components or their mode of operation also facilitate the flow of ideas and arguments concerning the proposed design's appropriateness. As a rule, cognitive economy is the overriding principle that dictates the use of the fastest, simplest, most direct and least effort-exerting mode of representation for a given task and under specific circumstances. The process of designing involves the production of sequential representations, until a "satisficing" (to use Herbert Simon's term) solution is reached. Once a candidate solution is proposed, there is no substitute for a suitable drawing or a 3-D representation that specifies what words, for example, can only approximate. The design team therefore uses representational means similar to the ones in use by individuals, but, due to an increased need for communication, verbal representation in particular plays an increased role in this type of design activity.

When inspecting the cognitive aspects of the public image of a work of design, we all but switch paradigms: here it is not the designer's cognitive mechanisms that are of interest. Instead, it is the user, or viewer, who occupies centre-stage, and it is his or her perception of the representation that we focus on. In successful cases the user infers information that facilitates proper understanding or use of the designed object. Principles of perception, such as those devised by Gestalt psychology, are therefore included in design textbooks (e.g., Quarante 1994) as a prerequisite to the understanding of issues of human factors. On a practical level this means representations that facilitate the use (or production) of a designed entity with no operational mistakes or unnecessary waste of time or energy. If that entity is a building, we are talking about easy orientation and way-finding, coherent hierarchy of spaces, and generally speaking a minimum need for signs and instructions. Bamberger and Schön (Schön 1983) have coined the term "felt-path" to describe how the viewer "experiences" a building when only its plans are available. Based on those plans, the viewer is able to follow a virtual path through the building's spaces and "feel" what it would be like to move through them. Yates (chapter 1 of this volume) gives an eloquent example of the use Le Corbusier made of photographs of houses he designed from specific angles to achieve the desired viewer's impression of the design.

But there is also a cultural level at which the representation is to convey the status of the building or product and the proper attitude towards it. This is done by employing explicit and implicit symbols and by using norms and conventions through which messages are communicated. Attributes related to the approach to a building, the height of its major spaces, the manner in which daylight is admitted into it – all speak for formality or lack thereof, for quotidian or ceremonial functions, and so on. Likewise, in typography, composition may easily help to distinguish, at first sight, an ordinary printed text

and a text of special significance, such as a religious text. We ascribe values such as "status" or "sophistication" to certain types of representation (e.g., specific fonts), and we can create alternative representations of the same product (e.g., a consumer product) to give it "leisure" or "office" looks. Designers are aware of users' perceptions and prepare their representations accordingly. For example, a frontal perspective will always yield a more formal-looking appearance than a top-down axonometric view of the same building. What is selected for presentation and how it is represented will always affect the viewer's notion of a work of design.

History and Culture

As is still the case today in indigenous architecture, traditional architecture of the past was produced by designers who worked primarily according to the dictums of convention, habit, and common sense. Innovation, creativity, and even individuality were not held in prime esteem. Alexander (1964) calls such design "unselfconscious" and he contrasts it with today's "selfconscious" design, produced by designers who have little, if any, commitment to tradition, convention, or habit. On the contrary, the contemporary designer is expected to boast originality and creativity above all else and, if successful, he or she is rewarded by peers and the general public alike. However, no designer can "reinvent the wheel" with every new design. One therefore works within a style, one "subscribes" to shared values of a design culture or microculture that is the product of historical circumstances, and one accepts rules and regulations imposed by authorities, such as safety codes. This is true for the individual designer and, even more so, for the design team, which can hardly function without some agreement on what its members aspire to achieve and how they are to proceed about it. The affiliation with a microculture also impacts representational choices, which help to solidify and communicate an individual or organizational identity. In the context of today's global economy, design is a major factor in the creation of distinct images of products or lines of products. Corporate identity, designed to enhance the competitive edge of companies, is based on the creation of a unified representational "language." The choice of such a "language" is clearly an act of positioning oneself on a socio-cultural "map," one that best fits the market niche for which the products are destined.

It is therefore not surprising that designers develop personal or communal (in a design firm, say) "trademarks" that eventually differentiate them from other designers and contribute to the ability to identify their work. We would like to suggest that architects, and to a lesser degree also industrial designers, develop personal repertoires of shapes and forms, as well as rules of assembly and composition of these forms. In teamwork, the more prominent designers usually establish these repertoires that are then shared by coworkers, who in turn are in a position to influence and develop them. A designer's repertoire is dynamic and may undergo many changes over time, although at any given period (the length of which varies) it is often quite stable and fixed. The talented designer manipulates his or her repertoire in endless ways so that each resultant design is unique, but the basic repertoire may be quite limited. Let us look at two examples. The first is Alvar Aalto with his "fan motif" (Quantrill 1983). Aalto was a keen sketcher and in many of his