However, we shall also discover that design can be extremely varied and we shall see that successful designers can employ quite different processes whatever their educational background.

Design technologies

This chapter began with a brief look at some of the differences between the way fashion designers and civil engineers might design. Another very important difference between them is the technology they must understand and use to achieve their ends. Designers must not only decide what effects they wish to achieve, they must also know how to achieve them. So our civil engineer must understand the structural properties of concrete and steel, whereas our fashion designer must appreciate the characteristics of different fabrics. Again this a simple caricature since both must know far more than this, but the point is made to demonstrate that their grasp of technology has to be relevant to their design field. Traditionally we tend to use the end products of design to differentiate between designers. Thus a client may go to one kind of designer for a bridge, another for a building, yet another for a chair and so on.

Many designers dabble in fields other than those in which they were trained, such as the famous architect Mies van der Rohe who designed a chair for his German Pavilion at the Barcelona International Exhibition of 1929, which to this day appears in the lobbies of banks and hotels all over the world. Very few designers are actually trained in more than one field such as the highly acclaimed architect/engineer Santiago Calatrava. Some designers are even difficult to classify such as Philippe Starck who designs buildings, interiors, furniture and household items. It is interesting that some of the most famous inventions of modern times were made by people who had not been specifically trained to work in the field in which they made their contribution (Clegg 1969):

Invention	*Inventor*
Safety razor	Traveller in corks
Kodachrome films	Musician
Ball-point pen	Sculptor
Automatic telephone	Undertaker
Parking meter	Journalist
Pneumatic tyre	Veterinary surgeon
Long-playing record	Television engineer

Classifying design by its end product seems to be rather putting the cart before the horse, for the solution is something which is formed by the design process and has not existed in advance of it. The real reason for classifying design in this way has less to do with the design process but is instead a reflection of our increasingly specialised technologies. Engineers are different from architects not just because they may use a different design process but more importantly because they understand about different materials and requirements. Unfortunately this sort of specialisation can easily become a strait-jacket for designers, directing their mental processes towards a predefined goal. It is thus too easy for the architect to assume that the solution to a client's problem is a new building. Often it is not! If we are not careful then design education might restrict rather than enhance the ability of the students to think creatively.

The cautionary tale of the scientist, the engineer, the architect and the church tower illustrates this phenomenon. These three were standing outside the church arguing about the height of the tower when a local shopkeeper who was passing by suggested a competition. He was very proud of a new barometer which he now stocked in his shop and in order to advertise it he offered a prize to the one who could most accurately discover the height of the tower using one of his barometers. The scientist carefully measured the barometric pressure at the foot of the tower and again at the top, and from the difference he calculated the height. The engineer, scorning this technique, climbed to the top, dropped the barometer and timed the period of its fall. However, it was the architect who, to the surprise of all, was the most accurate. He simply went inside the church and offered the barometer to the verger in exchange for allowing him to examine the original drawings of the church!

Many design problems are equally amenable to such varied treatment but seldom do clients have the foresight of our shopkeeper. Let us briefly examine such a situation. Imagine that a railway company has for many years been offering catering facilities on selected trains and has now discovered that this part of the business is making a financial loss. What should be done? An advertising agency might suggest that they should design a completely new image with the food repackaged and differently advertised. An industrial designer might well suggest that the real problem is with the design of the buffet car. Perhaps if passengers were able to obtain and consume food in every coach they would buy more than if they had to walk down the train. An operations