3.2 Instrumentalization Theory

We now turn to a more detailed exposition of the instrumentalization theory. The starting point is the notion of *technical element*. By this we mean the most elementary technical ideas and corresponding simple implementations that go into building devices and performing technical operations. Anthropologists conjecture that the ability to think of objects as means, the upright stance and opposable thumb together form a constellation that predisposes human beings to engage technically with the environment. In this humans achieve an exorbitant development of potentials exhibited in small ways by other higher mammals. The starting point of this basic technical orientation is imaginative and perceptual: humans can see and formulate technical possibilities where other animals cannot. These most basic technical insights consist in the identification of "technical elements," affordances or useful properties of things.

What is involved in perceiving a technical element? Two things are necessary: first, the world must be understood in terms of the possibilities it offers to goal oriented action; second, the subject of that action must conceive itself as such, that is, as a detached manipulator of things. The technical disposition of such a subject and the manner in which it conceives its objects constitutes the "primary instrumentalization." *Primary instrumentalization* proceeds by decontextualizing objects and simplifying them to highlight those qualities by which they are assigned a function.[8] There appears to be very little of a social character about such technical insight and elements can be employed in a very wide variety of social contexts. In this sense they are relatively neutral with respect to different social values. Nevertheless, a detailed study would reveal in each case some sort of minimal social contingency controlling selection and implementation even in the simplest form. Where technical elements emerge in the context of complex technical traditions, they presuppose the results of past social and cultural shaping of technical practice and so may carry with them quite a bit of social content.

Technical elements are at first notional but achieve realization in transformations of objects. In the process, social constraints of a more complex nature than simple goals shape the elements. This is the "secondary instrumentalization" in which the elements are given socially acceptable form and combined to make a technical device. *Secondary instrumentalization* proceeds by reorienting and integrating the simplified objects into a given natural and social environment. Design is the process in which relatively neutral technical elements are arranged to form a strongly biased concrete device, one that fits a specific social context. The relationship between technical elements and devices is depicted in figure 1.

An example will help to make the distinction clear. Consider the design of an everyday object such as the refrigerator. To make a refrigerator, engineers work with basic components such as electric circuits and motors, insulation, gases of a special

[8] For a more detailed account of instrumentalization theory see Feenberg (1999), especially pp. 202–208.

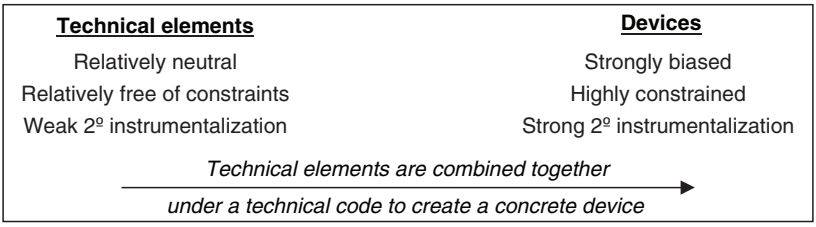

Fig. 1 Relationship between technical elements and concrete devices

type, and so on, combining them in complex ways for generating and storing cold. Each of these technologies can be broken down into even simpler decontextualized and simplified elements drawn from nature. This the level at which the primary instrumentalization is preponderant, taking the form of sheer technical insight.

However, even though these technical issues have been so thoroughly simplified and extracted from all contexts, knowledge of the components is still insufficient to completely determine design. There remain important questions such as what size to build the refrigerator, which are settled not on technical terms but rather on the basis of social principles (e.g., in terms of the likely needs of a standard family). Even the consideration of family size is not fully determining: in countries where shopping is done daily, on foot, refrigerators tend to be smaller than in those where shopping is done weekly by automobile. Thus, on essential matters, the technical design of this artifact depends on the social design of society. The refrigerator seamlessly combines these two entirely different registers of phenomena.

The two aspects of technique have a complex relationship. No implementation of a technical element is possible without some minimum secondary instrumentalization contextualizing it. Very little is required at first, perhaps no more than a socially sanctioned goal of a very general sort. Once the technical actor begins to combine these elements, more and more constraints weigh on design decisions. Some of these constraints have to do with compatibility between the various components of the new device and between the new device and other features of the technical environment. Some have to do with natural hazards or requirements that will affect the device. Others have to do with ethical-legal or aesthetic dimensions of the surrounding social world. The role of the secondary instrumentalization grows constantly as we follow an invention from its earliest beginnings through the successive stages in which it is developed and concretized in a device that circulates socially. Indeed, even after the release of a new device to the public, it is still subject to further secondary instrumentalizations through user initiative and regulation.

The iterative character of secondary instrumentalizations explains why we have a tendency to view technology in abstraction from society. It is true that technical elements are not much affected by social constraints, but we must not interpret fully developed technologies in terms of the stripped down primary instrumentalization of the initial technical elements from which they are made.