components, and that the design of the machines is part of the design of the socio-technical system. This means that being type-fixed, in this case, is transitive: a type-fixed component of a type-fixed component of a system can be regarded as being type-fixed with respect to the whole system as well.

The type-fixed components of a socio-technical system, and again their components, are not only supposed to be present in a system; they have also to fulfill certain functions in the system. Only the functioning will show whether the design proves successful and therefore has to be judged when assessing a design. Again, the concept of function, like that of design, is highly controversial (cf. Allen et al., 1998; Buller, 1999). As I have pointed out, it may be linked to the concept of design. Accordingly, the concept of general design allows for a straightforward definition of the concept of function. We may simply combine a Cummins-like causal role account of functions (Cummins, 1975) with the design concept, and end up with the following explication: a function is a contribution of a type-fixed component to a capacity of a system that is the realization of a design (Krohs 2004; 2007). "Contribution" is to be taken with a dispositional meaning, as in Cummins (1975).[10]

So a function is the role that a component has according to a design, where it is not asked whether it was designed *to* have this role. As in the case of the design concept, this concept of function is applicable to functions of components of intentionally designed entities and to functions of components of naturally designed entities. Precondition is only the ascription of design in terms of type fixation.

We have seen before that type fixation is transitive in the cases under consideration. A type-fixed component of a technical artifact is likewise a type-fixed component of the socio-technical system to which the artifact belongs as a type-fixed component. Functions may also be transitive, but this does not seem to apply generally. Malinowski gives an example of how the subcomponents of components of social systems may effect a social system by referring to biologically designed components: "such processes as breathing, excretion, digestion, and the ductless glands [i.e., the hormone glands] affect culture more or less directly" (Malinowski, 1941, 68). Although we see this influence of the effects of components of higher components of a system on the embedding system, we should be careful to regard this as a transitivity of *functions*: The excretory organs of humans will not function as the excretory organs of society, nor does epinephrine make society ready to perform a flight reaction. Instead, the functional subcomponents will contribute to other capacities of the higher system, e.g., to agricultural production *via* the production of fertilizer, or to certain social dynamics. Similar considerations may hold with respect to the functions of components of technical artifacts within societies.

[10] This definition of function overcomes the two basic shortcomings of Cummins's concept: it is not applicable to purely physical entities, and it allows for a definition of malfunction since reference to design introduces some normative instance. It does not run into the definitional circle etiological accounts of function such as Millikan's (1984) must envisage when referring to design (Krohs, 2005). In addition, the concept allows for a definition of historically established functions, hence for reference to selected functions almost as Millikan's approach. Details will be given elsewhere (Krohs, 2007).

It might be more likely than in the organismic case that many functions of subcomponents really are transitive, but other type-fixed subcomponents may assume new functions in the socio-technical system.[11]

According to my account of function, components of a socio-technical system may have functions not as such, but only within the system. These are the contributions of the components to the capacities of the designed entity. For example, workers fulfill different professional tasks; machines serve different functions in a production process. These latter systemic functions of machines within the socio-technical system are functions of artifacts-as-wholes. These functions only emerge on the level of a system embedding the artifact. Though it is quite common to qualify functions with respect to an embedding system, some scholars also want to allow for the ascription of functions to context free artifacts. Achinstein, e.g., explicitly denies that an ascription of a function to an artifact refers to a system the artifact belongs to: "To understand the claim that the function of that mousetrap is to catch mice one need not identify or be able to identify … any system within which … this is its function" (Achinstein, 1970, 350). I explicitly disagree with his view and here follow Preston and others instead. Preston points out that artifact functions of one kind are directly based on their systemic role and that functions of the other kind, Millikanian proper functions, at least started off as systemic functions (Preston, 2000, 32). So Achinstein's mousetrap has its function only in a system in which somebody may use it – with or without success – for catching mice. If the device is not considered to be part of such a system, it does not have the function. One might try to evade this consequence by reference to intended functions; but if the device only *shall* have a function according to the intention of the designer and is badly designed and does not work, we may say that it does not have this function but has *only* the *intended* function to catch mice. So a merely intended function is not a function, like a forged coin is not money.[12] A statement about an intended function is a statement about a goal of a designer. He may or may not succeed in implementing the intended function as a function of a component of the designed system. The intended function of a machine could even be something such as doing work without consuming energy, despite the fact that nobody will be able to realize this function. The designer can fix only the types of the components and their relation with respect to each other, but not the functions. The functions will show up in the operating system. The function of an artifact-as-a-whole depends on what it does and how it is used in the system it is embedded in (for the use-aspect, cf. Houkes et al., 2002). Hence, just as functions of components of artifacts are defined with respect to capacities of the artifact as a system only, functions of artifacts-as-wholes refer to capacities of the embedding system.

[11] Settling this question requires further elaboration, which cannot be achieved within the limits of this chapter.

[12] Within the conceptual framework applied here, the concept of an intended function may be explicated as follows: the intended function of a type-fixed component of a complex designed entity is the role that the designer supposed it to fulfill when fixing its type. Please observe that the designer's supposition does not imply that the component actually has the capacity to fulfill its role.