

**The Dual Nature of Technical Artifacts**  
– presentation of a new research programme  
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### **Introduction**

In our thinking, speaking and doing we employ two basic conceptualizations of the world. On the one hand, we see the world as consisting of physical objects interacting through causal connections. On the other hand, we see it as consisting of agents (primarily human beings), who intentionally represent the world and act in it. The great successes of natural science have suggested to many that the physical or material conceptualization fits every part of the empirically accessible universe, including humans. This idea, however, has created serious problems for the intentional conceptualization. It suggests that mental states are causally inefficacious in human actions, or conversely, that human action is causally overdetermined by mental states as well as brain states. Nowadays a large part of the philosophy of mind is devoted to analyzing these types of problems.

Our research program, “The dual nature of technical artifacts”, will address a set of problems that originate in the existence of these two conceptualizations. The intentional conceptualization applies not only to mental states of individual persons, but also to social entities, i.e., entities involving several persons, such as gangs, armies, banks, governments, countries, etc. And it stretches out in another direction, so to speak, to include (technical) artifacts, such as screwdrivers, spectrographs and skyscrapers. It is this category of technical artifacts on which the research program focuses. Its subject matter is the applicability of the two conceptualizations and their interrelatedness when human beings connect to the physical world in the creation of technical artifacts (artifacts designed by engineers). The problems encountered here are different from the ones in the philosophy of mind. In that discipline one problem among others is the existence of two alternative conceptualizations of mental states, where one seems to be superfluous in the explanation of human action. As will be explained below, the problem addressed here is the indispensability of *both* conceptualizations for understanding and explaining the nature of technical artifacts. This calls for an integrated account.

**The dual nature of technical artifacts**

Technical artifacts are, at least *prima facie*, always physical objects, but they are also objects that have a certain *function*. Looked upon merely as physical objects, they fit into the physical or material conception of the world. Looked upon as functional objects, however, they do not. The concept of function never appears in physical descriptions of the world; it rather belongs to the intentional conceptualization. This is shown, for one thing, by the fact that attributions of function lend themselves to normative judgments – artifacts can perform their function well or badly – and normative statements make sense only within the intentional conceptualization. Technical artifacts thus have a dual nature: They cannot exhaustively be described within the physical conceptualization, since this has no place for their functional features, nor can they be described exhaustively within the intentional conceptualization, since their functionality must be realized in a physical structure that is adequate to it.

The category of technical artifacts is a neglected topic in philosophy [One of the exceptions is R.R.Dipert (1993, 1995)]. This is shown particularly in the philosophical treatment of the notion of function. Philosophical analysis of this concept virtually always centers on its use in biology, although such analyses admit that the concept was imported from the functionality of designed artifacts. One expects, then, a clear analysis of the functionality of artifacts to be available. Such an analysis, however, is missing to such an extent that even occasional attempts to remedy this lack take their departure from biology and are consequently laden with biological terminology (natural selection, survival), the relevance of which to an understanding of artifacts is doubtful. It is still a problem exactly how the intentional and the physical description of artifacts hang together. If functions are primarily seen as ‘added to’ the physical substrate, or as realized in physical objects, then the question remains how these functions are related to the mental states of human individuals, which, after all, form the core of the intentional conceptualization. If functions are primarily seen as patterns of mental states, on the other hand, and exist, so to speak, in the heads of the designers and users of artifacts only, then it becomes somewhat mysterious how a function relates to the physical substrate in a particular artifact. But relating them is exactly what happens in the design of artifacts. So how well does the rather metaphorical idea that structure and function ‘come together’ in the making of an artifact fit the engineering practice of designing? Does this imply that on the route toward the physical realization of a function we are speaking two languages – the intentional and the physical – at the same time and in a coherent way?

On the one hand, the problem is thus how physical structure and function are related to each other in artifacts and what the precise role of intentions is in relating them. On the other hand, it is equally a matter for further inquiry how technical artifacts are related to *social* objects and what the role of physical realizations is in distinguishing them. There are numerous social objects of which we also say that they are made by humans, e.g., codes of law or universities. Prima facie it seems that artifacts are always 'kickable', whereas such 'social artifacts' are not. But does this mean that for social artifacts the point of their physical realization is irrelevant? Moreover, there is also a category of artifacts, such as computer programs, that seem to share some features with technical artifacts and others with social artifacts. We have, so to speak, two 'triangles' of basic concepts: The first is *structure–function–intention*, and the second is *technical artifact–physical object–social artifact*. The relations between these triads and among the elements making up each triad are to be further analyzed and clarified.

### **Research aim**

The preceding considerations led us to formulate our research aim as follows:

*The general aim of the research program is to develop a coherent conceptualization of technical artifacts, taking into account their dual nature as (i) designed physical structures which realize (ii) intentionality-bearing functions.*

The following list of activities gives an initial idea of how this general aim will be achieved in the present program: It will be necessary to give an in-depth conceptual analysis of the notion of technical function; to compare this account with the accounts of function given in other areas, especially biology and the social sciences; to develop an account of the relation between technical function and physical structure, particularly the sense in which the physical structure constrains the technical function; to develop an account of the intentional aspects of technical functions and of their relation to the intentionality and actions of designers and users; to examine the epistemological consequences of these intentional aspects of functions; to investigate the normative judgments that apply to the functioning of artifacts and the origin of this normativity; to clarify the ontological commitments that are involved in describing and using artifacts; to develop an account of the process of designing technical artifacts and of the way the structural description of the artifact-as-physical-object and the functional description of the object-as-intentionally-formed-artifact are combined during this process; and to examine how technical explanations in design are related to the

various types of explanation that are traditionally distinguished in the philosophy of science.

### **The four projects and the coherence of the program**

The program consists of two complementary research lines. The first will address the relation between technical function and physical structure, the second the relation between technical function and the intentionality of designers and users. Each line consists of two projects – one postdoc project and one Ph.D. project – which will address several of the issues raised above. Project 1 (postdoc) will investigate the various conceptual and ontological relations between technical function and physical structure. Project 2 (Ph.D.) aims at a rational reconstruction of technical design as a process of establishing basic relations between technical function, physical structure and intended use. Project 3 (postdoc) will focus on the intentionality of technical functions and its consequences for the epistemology of function attributions. Project 4 (Ph.D.) will analyze the necessary social conditions of technical functions, in order to further clarify their intentional nature. Together these projects aim at a coherent conceptualization of technical artifacts, taking into account their dual nature as (i) designed physical structures which realize (ii) intentionality-bearing functions.

In addition to these research lines, there are common *themes*. These common themes cannot be investigated fully in the individual projects, given their wide-ranging scope, and the fact that they will arise from integrating and synthesizing the results of the projects (see below). ‘Function’ is an obvious common theme in the program, as is ‘design’. Other themes are the resulting metaphysics of artifacts, more specifically the ontological commitments involved in the descriptions of artifacts and their use and the normativity of technical functions. These themes will be jointly examined by the researchers involved in the various projects.

The aim of the program can only be realized by combining the expertise of several disciplines, both inside and outside philosophy. In philosophy it requires the combination of, among other things, the philosophy of science, philosophy of mind, philosophy of biology, epistemology, ontology, theory of action, and philosophy of the social sciences. Outside of philosophy, engineering (especially design methodology) and the anthropology/sociology of technology are the main relevant disciplines. Since the proposed program aims at developing conceptualizations based on empirically adequate

### References

- Dipert, R.R. "Some Issues in the Theory of Artifacts: Defining 'Artifact' and Related Notions." *The Monist* 78 (1995): 119-135.
- Dipert, R.R. *Artifacts, Art Works and Agency*. Philadelphia: Temple University Press, 1993.
- Kroes, P.A. and A.W.M. Meijers (eds.), *The Empirical Turn in the Philosophy of Technology, Research in Philosophy and Technology* 20 (series editor Carl Mitcham), JAI / Elseviers Science 2000.
- Kroes, P.A., Meijers, A.W.M., Franssen, M.P.M., Houkes, W.N., Vermaas, P.E., "The Dual Nature of Technical Artifacts", Netherlands Organization for Scientific Research, The Hague 1999.

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<sup>1</sup> For more information on the Dual Nature Program: <http://www.dualnature.tudelft.nl>. The program is financed by the Netherlands Organization for Scientific Research. It is one of the activities of the international Tèchne Group, a group of researchers working on the philosophical foundations of modern technology. The participants and their manifesto can be found at: <http://www.dualnature.tudelft.nl/manifesto.htm>.