Design Culture and Acceptable Risk

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Abstract Technological design is usually considered as a process of stipulating target functions. Technological artifacts are, however, not determined entirely by the intent of the engineers who designed them: they unavoidably contain unpredictable and uncertain characters that transcend engineers' intent, and they cannot be understood purely from a functionalist perspective. In aviation, for example, the smooth implementation of a flight is ensured by a system that includes pilots interacting with each other and with a suite of technological devices. Emphasizing the human aspect of technological designs, this article presents a theoretical framework that takes socio-cultural aspects of technology as the primary for a philosophical, ethical analysis. An analysis of the acceptability of risks shows that the reliability of a technology is determined by the reliability of the technological decisions, eventually the existence of a reliable technological culture. So the task of the ethics of risks is to provide ways to reform our technology culture.

1 Introduction

Presently, the problem of how to deal with the risks posed by technology is growing in importance.

Engineering is often considered as a cultural activity, i.e., an activity that people undertake within a social context. Thus, the ethics of engineering and those concerning risks are to be found within this cultural process. However, risk is also considered as quantifiable and objective, particularly in scientific risk analysis. Moreover, since the situations with which risk analysis is concerned are complicated in nature and involve uncertainty to some extent, a complete optimization of technology cannot be expected and the rationality of risk analysis must correspond to "bounded rationality." This might remind us of the well-known conflict between cultural relativism and naïve positivism. However, in this chapter, I adopt a different path by avoiding referring to this conflict, i.e., avoiding referring to the under- or overestimation of risk analysis. Therefore, I focus on the problem of the acceptability of risks.

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As an introduction to the following discussion, let us focus on the statement made by E. S. Ferguson. In "Engineering and the Mind's Eye" (1992), while discussing computer-assisted design (CAD), he states that "numerical calculations always embody human judgment":

> The precise outcome of the [design] process cannot be deduced from its initial goal. […] Computerized illusions of certainty do not reduce the quantity or the quality of human judgment required in successful design. To accomplish a design of any considerable complexity […] requires a continuous stream of calculations, judgments, and compromises that should only be made by engineers experienced in the kind of system being designed. (Ferguson, 1992, 37)

Man tends to distinguish traditional techniques supported by human expertise and skills from modern technology supported by science. Such expertise and skills, which are usually not visually or verbally articulated, are replaced by or translated into scientific knowledge. However, in reality, they are not entirely removed from modern technology (hereafter, referred to as "technology" unless otherwise indicated). As in the case of CAD, they remain as constitutive elements, even though they are partly objectified and thoroughly modified in modern technological procedures. Ferguson calls this kind of knowledge the "mind's eye" or "intuitive sense." Initially, this "mind's eye" seems to be purely personal in nature. However, when analyzed from a reflective viewpoint, one can identify some cultural "style" that is strongly connected to it; this is because a calculation or judgment is made on the basis of the accumulation of tacit information and tacit understanding. Therefore, it is possible to state that in technology, certain cultural elements are incorporated. If technology, which is considered to exist within a social and cultural context, is characterized as "technology in culture," these cultural elements incorporated in technology can be characterized as "culture in technology." We will also refer to these cultural aspects of technology as "technical culture" in a wide and narrow sense, respectively (this distinction will be indicated clearly only if it is necessary).

From this perspective, we can discuss the problem of acceptability of risks within a cultural context, without denying the need for scientific analysis. The following are some of the issues that need to be addressed: how a particular risk is recognized as risk; how some risks are considered to be acceptable in a society; in which cases do people regard such acceptance risks as reasonable; and so on. Studying the acceptability of risk from this perspective, I seek in this chapter to consider the problem of risk within the "ethos of technology" and consequently find answers to practical and ethical debates regarding technology. In this manner, the technical culture of a society, or of an organization, will be discussed critically, thereby paving the way for an inquiry about the public nature of technology.

In section 2, I will review the Challenger space shuttle accident in order to discuss the notion of acceptability more concretely and show that it is deeply rooted in technical culture (in the narrow sense). In sections 3 and 4, I generalize this notion to technology as a whole and indicate that the reliability of technology depends on that of technical culture. In section 5, I focus on technology in culture i.e., technical culture in the wide sense. Based on the examination of the Ford Pinto case, I create a discussion where the definition and reliability of design is not only concerned with engineers but also with society at large. Finally, in section 6,