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On practical disciplines and their methodology

Abstract. Science studies as a pragmatic epistemology is, from the methodological perspective, a practical discipline, for which design is the characteristic feature. The Tadeusz Kotarbiński approach of the issue is reviewed in the paper.

Keywords: design, Kotarbiński, methodology of practical sciences, pragmatic epistemology, science studies

O naukach praktycznych i ich metodologii

Abstrakt. Naukoznawstwo jako epistemologia pragmatyczna, jest z metodologicznej perspektywy dyscypliną praktyczna, której wyróżnikiem jest projektowanie. W artykule przypomniano ujęcie zagadnienia przez Tadeusza Kotarbińskiego.

Słowa kluczowe: epistemologia pragmatyczna, Kotarbiński, metodologia nauk praktycznych, naukoznawstwo, projektowanie

This is a small contribution to the methodological seminar organized by the Science of Science Committee, written with the intention to briefly review the issue and its history.

Science studies, or the science of science, in Polish *naukoznawstwo*, was called a *pragmatic epistemology* by Tadeusz Kotarbiński (2003a, 2003b), for he considered it to be the study of the organization of cognitive-oriented processes, one of the practical disciplines, the methodology of which was successfully originated by Kotarbiński himself and acknowledged as his important contribution to the methodology elaborated by Polish philosophers in the period after World War II. It was why eminent professors Marian Przełęcki and Ryszard Wójcicki, editors of the anthology *Twenty-five Years of Logical Methodology in Poland* (1977, PWN – Reidel) included Kotarbiński's article "Concepts and Problems in General Methodology and Methodology of Practical Sciences" in the collection.

The history of Kotarbiński's practical sciences methodology is, however, longer than the anthology may suggest. The very first introduction to the methodology was given in a special chapter called "On the practical abilities" in his book *Elements of Epistemology, Formal Logic and Methodology of Sciences* published in Polish in 1927 (Engl. translation *Gnosiology…*, 1965). In that chapter Kotarbiński pointed to

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design activity (*design* in short) as the characteristic feature of practical sciences. The concept of *design* gave birth to the *design methodology* I started to develop under the praxiological umbrella, in the early 1970s, adapting Kazimierz Ajdukiewicz's program of science methodology (Gasparski 1972), and establishing the Design Methodology Unit at the Department of Praxiology of the Polish Academy of Sciences. From the very beginning, design studies were supported by the Science Studies Committee of the Polish Academy of Sciences under whose auspices the special 17-volume series *Design & Systems: The Methodological Issues of Practical Sciences* was published in Polish between 1978 and 2003[1].

Kotarbiński's above-quoted article on the methodology of practical sciences introduced the following sequence of relevant concepts. First, he established the meaning of the word *method*, which is – he wrote with praxiological precision – "always the method of some kind of human activity" (Kotarbiński 1977, 279). An *activity* is a *process*, he continued, which is a complex object (a whole) with a *structure*. There are two meanings of the term: "In the broader sense, structure [… is] the system of relations between the components of the whole, in the narrower sense – it is a set of components of a whole and the system of relations between them" (Kotarbiński 1977, 279). Activity as a process has a structure of component sub-processes, or stages (phases), "taking place in a sequence in time" (Kotarbiński 1977, 280). It is a *course* of a process. Thus the *method* of the activity is its "course plus its relation to the earlier preparation of some of its phases by others" (Kotarbiński 1977, 280). *Methodology* is the science of methods (Kotarbiński 1977, 281), Kotarbiński concluded.

Sciences are either theoretical or practical, according to Kotarbiński. Theoretical means "every science whose basic aim is the acquisition of truth, i.e. finding the best substantiated answers to questions, and only such sciences are called theoretical. Mathematics, physics, botany, history are examples of theoretical sciences. All other sciences are practical … e.g. making a tool, or bringing about the recovery of a patient, or increasing a fortune, is practical" (Kotarbiński 1977, 281). Kotarbiński pointed out that "the peculiarity of the method of practical science [is that, WWG]: it relies on remodeling the subject matter according to the planned pattern thus equipping it with the features relevant for the intended product. And the success of this remodeling is conditioned by the method peculiar to this type of operation, and which we shall call *designing* [italics WWG]" (Kotarbiński 1977, 282–283). The great philosopher analyzed a variety of methods relevant to different types of practical sciences. He also noted that there exist "restrictions imposed upon the use of certain methods resulting from moral or legal principles" (Kotarbiński 1977, 282–283). He also referred to the General Systems Theory developed by Herbert A. Simon.

[1] A few articles from earlier volumes of the series were translated and published in (Collen, Gasparski, 1995).

Simon, a Nobel Prize winner for the concept of *bounded rationality*, published the book *The Sciences of the Artificial* (1969, 2nd edition 1981[2]) in which he introduced an idea similar to Kotarbiński's distinction of practical science. Simon called practical disciplines the *sciences of the artificial* and suggested they are busy with design as a preparatory action of manmade artifacts. He wrote:

> "Engineering, medicine, business, architecture, and painting are concerned not with the necessary but with the contingent – not with how things are but how they might be – in short, with design. The possibility of creating a science or sciences of design is exactly as great as the possibility of creating any science of the artificial." (Simon 1981, xi)

Practical sciences or applied sciences or sciences of the artificial are disciplines that serve as a source of knowledge needed as cognitive preparation of any professional practical activity. Simon suggested the Science of Design should be taught at schools of engineering, architecture, business, education, law, medicine, for design distinguishes the professions from the sciences, and the task of schools is to educate specialists concerned with the process of design.

During the first World Congress of Design, held in Boston in 1987, I invited Herbert Simon to attend the international conference on *Praxiologies and the Philosophy of Economics* planned to be held in Warsaw in 1988. He accepted the invitation and contributed to the event with the paper "Methodological Foundations of Economics" (1992, 25–42). In the paper he pointed out that:

> "1. Economics has both a descriptive (positive) and normative aspect. It describes how people behave in their economic decisions and action, and it prescribes rational behavior.
> 2. Economics is a 'science of the artificial' for it deals with systems that seek to adapt to their environments in order to reach goals, including survival goals. They may be subject to natural selection.
> 3. If we place no limits on the adaptive capacity of a system, then its behavior can be predicted completely from (1) its goals, and (2) the shape of the environment to which it is adapting.
> 4. The properties of the system itself influence behavior only to the extent that they limit the perfection of its adaptation to the environment. There may be limits both on its ability to compute what is the rational behavior and its ability to carry out the behavior computed.
> 5. It is convenient to draw the boundary of the system so that all limits on ability to carry out actions are outside the skin, while all limits on ability to calculate correct actions are inside the skin. Then only the latter limits (which define 'bounded rationality') need be viewed as causes for departure from rationality." (Simon 1992)

Once economics is a science of the artificial it has to be, like other practical disciplines, oriented toward the design of relevant artifacts. What kind of design should it be? – That is the question. Traditional or modern, i.e. systemic, context-oriented and multidisciplinary? To answer the question let me refer to my earlier

[2] Cited in this paper.

paper (Gasparski 2012) republished recently and discussed at the 5th World ISBEE Congress held in Warsaw in 2012. I wrote as follows:

"Traditional design is concerned with particular situations which are fractional parts isolated from the conglomeration of the practical situations, to form 'design objects' given to the designer in advance for developing. The 'design objects' are objects-desires specified by real customers, or objects-attractions for inciting designers in potential buyers. Traditional design is solution-oriented and regards a solution as better if it is more innovative. This approach follows from neglecting realizability, conceived as a holistic concept, and has its origins in the assumption, here put into doubt, of the limitlessness of resources.

Modern design, on the contrary, would be concerned with the 'object of design' regarded as if it were linking together a given practical situation of a concrete subject (the core) with the remaining world (the complement) (therefore multi-stakeholder, WWG). This kind of design is situation-oriented and is meant to cope with the pair (core—complement) of practical situations. In design conceived in this way what belongs to the core part in one particular case is a fraction of the complement in other cases, and vice versa. And this is the reason why a synthesis is necessary, a synthesis which forms a basis for the postulated 'unity of divided design' and for introducing the multi-dimensional relevance criterion[3].

The reason for regarding design as a way of solving practical problems is the growing importance of meta-actions under conditions characterized by the complexity of the conglomeration of practical situations. If it is desired to cope with practical situations genuinely, basing ourselves on the best knowledge and acting according to the best will, then it must be preceded by design solving the problems arising from these situations. The term 'practical problem' is understood here as a description of a practical situation, as its mapping in a language which serves to formulate designs coping with these situations. This is the task of practical disciplines.

Design as a way of solving practical problems creates possibilities for overcoming our human inclination toward unreasonable or simply irrational behavior. This way necessitates an externalization of the problem-solving process which, in effect is becoming transparent. Design as such a way enforces explicit presentation of all pros and cons of particular candidate solutions thus providing evidence to support the selected solution. Design carried on in such a way ensures that actions thus conceptually prepared will be more relevant than actions not preceded by such preparation." (Gasparski 2012, 175–176)

The importance of science for the preparation of actions was underlined by Tadeusz Kotarbiński, who wrote as follows:

"Science is important not because it satisfies the curiosity and shapes sophisticated and interesting minds, or because of its relation to art in developing elegance, thus its being mentioned together with it not without harm to its own standing, but because of its being an indispensable *preparation*, indispensable preparation of a strong economy and technology serving this economy, preparing defense against diseases and premature death, defense against social disasters, especially against the disaster of being defeated in the struggle to exist in a way worthy of it.

[3] "The quality of the change, its *relevance*, is defined as a change which is: real *(efficiency)*, rational *(cognitive substantiation)*, positive as regards its utility *(effectiveness)*, positive as regards its ethics *(morality)*, *and* positive as regards its aesthetics *(beauty)* as much as possible. In solving practical problems the criterion of a change relevance plays the role that should be compared with the criterion of authenticity in solving cognitive problems, i.e. the criterion of truth. As scientists and as designers we do what is possible to fulfil these criteria." (Gasparski 1987).

And if science is, thanks to that, extremely important, then also teaching is extremely important. Science is the preparation for struggle against the threatening forces and teaching is the *preparation of preparators*: Our society, in theory, feels the role and consequences of science; in practice, it hardly cares whenever it should be devoutly looked after... But there can be no physics without physicists or no general intellectual skill without teachers of comprehensively developing subjects." (Kotarbiński 1958, 337) [my italics WG]

It is a message worth considering seriously by scholars involved in science studies considered as pragmatic epistemology, being a practical discipline whose aim is to organize cognitive-oriented processes designing relevant solutions for the successful development of all other disciplines, whether theoretical or practical, and relevant institutions. For: "Epistemologists' interests are historiosophical, sociological, socio-technical, and finally become increasingly directly economical in the face of rational mutual interdependencies between scientific research and the work of an economic nature. In the area of epistemology meets therefore philosophy with social practice in co-operation necessary and co-productive" (Kotarbiński 2003b, 543), as Kotarbiński concluded his review of science-of-science problems delivered at the first science studies conference organized by our Committee in 1964.

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