

Chapter 2

Cybernetics, Control Philosophy and Control Methodology

Having reached a certain level of epistemological maturity, scientists perform “reflexion” by formulating general laws in corresponding scientific fields, i.e., create *metasciences* [149, 152]. On the other part, any “mature” science becomes the subject of philosophical research. For instance, the philosophy of physics appeared at the junction of the 19th century and the 20th century as the result of such processes.

Originated in the 1850s, research in the field of *control theory* led to the appearance of other metasciences, i.e., *cybernetics* and *systems analysis*. Moreover, cybernetics quickly became the subject of philosophical investigations (e.g., see [20, 50, 54, 87, 97, 98, 126, 176, 207, 208]) conducted by “fathers” of cybernetics and professional philosophers.

The 20th century was accompanied with the rapid progress of *management science* [38, 131, 157] as a branch of general control theory studying practical control in *organizational systems*. By the beginning of the 2000s, management science has engendered *management philosophy*. Books and papers entitled “Management Philosophy” and “Control Philosophy” appeared exactly at that times (for instance, see references in [152]); as a rule, their authors represented professional philosophers. Generally speaking, one may acknowledge the long-felt need for more precise mutual positioning of philosophy and control, methodology and control, as well as analysis of general laws and regularities of complex systems functioning and control.

2.1 Control Philosophy

Historically (and similarly to the subjects of most modern sciences), control problems analysis was first the prerogative of *philosophy*. R. Descartes was used to say, “Philosophy is like a tree whose roots are metaphysics and then the trunk is physics. The branches coming out of the trunk are all the other sciences.”

R. Mirzoyan felt rightly that, on the basis of historical and philosophical analysis, first control/management theorists were exactly philosophers [135]. Confucius, Lao-tzu, Socrates, Platon, Aristotle, N. Machiavelli, T. Hobbes, I. Kant, G. Hegel, K. Marx, M. Weber, A. Bogdanov—this is a short list of philosophers that laid down the foundations of modern control theory for the development and perfection of managerial practice.

Consider Fig. 2.1 [152] illustrating different connections between the categories of *philosophy* and *control*; they are treated in the maximal possible interpretation (philosophy includes ontology, epistemology, logic, axiology, ethics, aesthetics, etc.; control is viewed as a science and a type of practical activity). We believe that the three shaded domains in Fig. 2.1 are the major ones.

Presently, concrete control problems are no more the subject of philosophical analysis. Philosophy (as a form of social consciousness, the theory of general principles of entity and cognition, human attitude to the reality, as the science of universe laws of natural development) studies GENERAL problems and regularities separated out by experts in certain sciences.

V. Diev believed that control philosophy is “a system of generalizing philosophical judgments about the subject and methods of control, the place of control

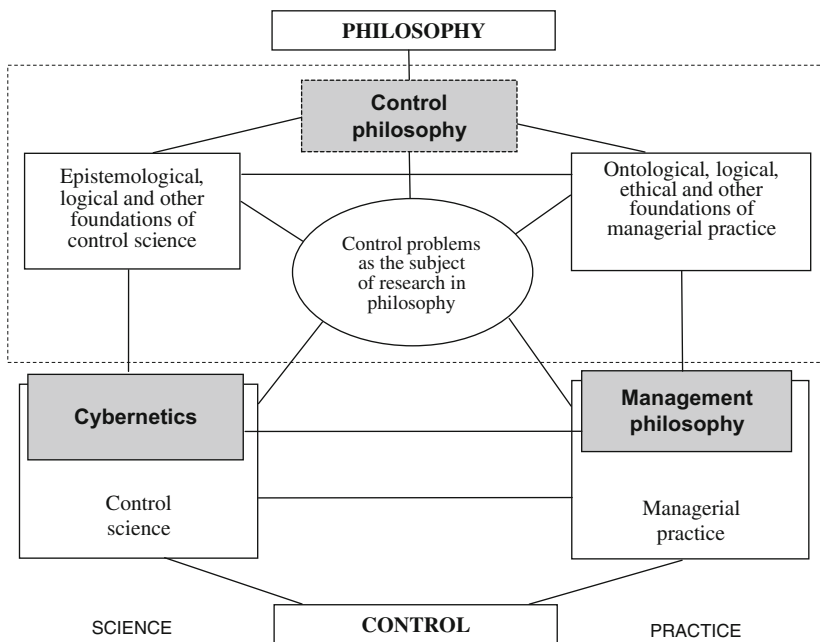


Fig. 2.1 Philosophy and control

among other sciences and in the system of scientific cognition, as well as about its cognitive and social role in a modern society.” [50, p. 36].

One can define *control philosophy* as a branch of philosophy connected with comprehension and interpretation of control processes and control cognition, studying the essence and role of control [152]. Such meaning of the term “control philosophy” (see the dashed-line contour in Fig. 2.1) has a rich internal structure and covers epistemological research of control science, the analysis of logical, ontological, ethical and other foundations (both for control science and managerial practice).

Cybernetics (with capital C, as a branch of control science, studying its most general theoretical regularities). According to V. Diev, “... for many scientific disciplines, there exists a range of problems related to their foundations and traditionally referred to as the philosophy of a corresponding science. Control science follows this tradition, as well.” [50, p. 36]. Foundations of control science also include general regularities and principles of efficient control representing the subject of Cybernetics (see Chap. 3).

In the 1970–1990s, against the background of first disillusiones of cybernetics, the only bearers of canonical cybernetic traditions were philosophers (!), whereas experts in control theory lost their confidence in ample opportunities of cybernetics.

Things can’t carry on as they are. On the one hand, philosophers vitally need knowledge of the subject (actually, the generalized knowledge). In this context, V. Il’in mentioned that “philosophy represents second-rank reflexion; it provides theoretical grounds to other ways of spiritual production. The empirical base of philosophy consists in specific reflections of different types of cognition; philosophy covers not the reality itself, but the treatment of reality in figurative and category-logical forms.” [87].

On the other hand, experts in control theory need “to see the wood for the trees.” Hence, one can hypothesize that **Cybernetics must and would play the role of control “philosophy”** (here quotation marks are crucial!) as a branch of control theory, studying its most general regularities. Here the emphasis should be made on constructive development of control philosophy, i.e., on formation of its content through obtaining concrete results (probably, first partial results and then general ones). Reflexion can be continued by considering *cybernetics philosophy*, and so on.

The book [152] briefly analyzed the correlation of control philosophy (as a branch of philosophy studying general problems of control theory and practice), Cybernetics (as a branch of control science generalizing the methods and results of solving theoretical problems of control) and management “philosophy” (as a branch of control science generalizing the experience of successful managerial practice), see Fig. 2.2.

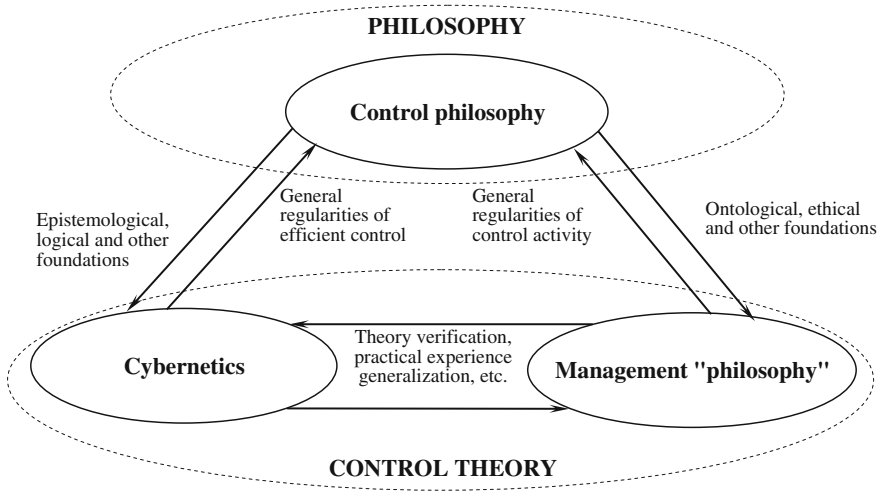


Fig. 2.2 Control philosophy, Cybernetics and management "philosophy"

2.2 Control Methodology

Methodology is the theory of activity organization [148, 149]. Accordingly, the subject of methodology is organization of an activity (an *activity* is a purposeful human action).

Control activity represents a certain type of practical activity. *Control methodology* is the theory of organization of control activity, i.e., the activity of a control subject [152]. Whenever a control system incorporates a human being, control activity becomes *activity on activity organization*. Control theory puts its emphasis on the interaction of control subject and controlled object (the latter can be another subject), see Fig. 2.3. At the same time, control methodology explores the activity of a control subject, *ergo* has-to-be-included in Cybernetics.

The development of control methodology formulated *the structure of control activity* (see Fig. 2.4) and identified the structural components of control theory [152].

A *theory* is an organizational form of scientific knowledge about a certain set of objects, representing a system of interconnected assertions and proofs and containing methods of explanation and prediction of phenomena and processes in a given *problem domain*, i.e., of all phenomena and processes described by this theory. First, any scientific theory consists of interrelated structural elements. Second, any theory includes in its initial basis a *backbone element* [148].

The backbone element of control theory (for social systems, organizational systems and other interdisciplinary systems) is the category of organization¹;

¹Note that "organism" and "organization" are paronyms.

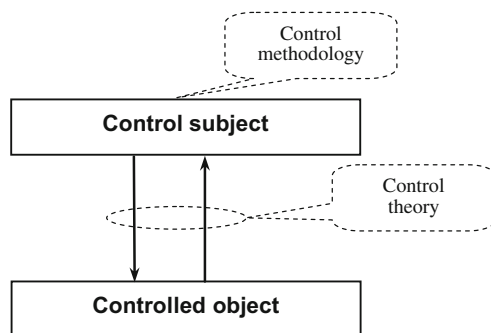


Fig. 2.3 Control methodology and control theory

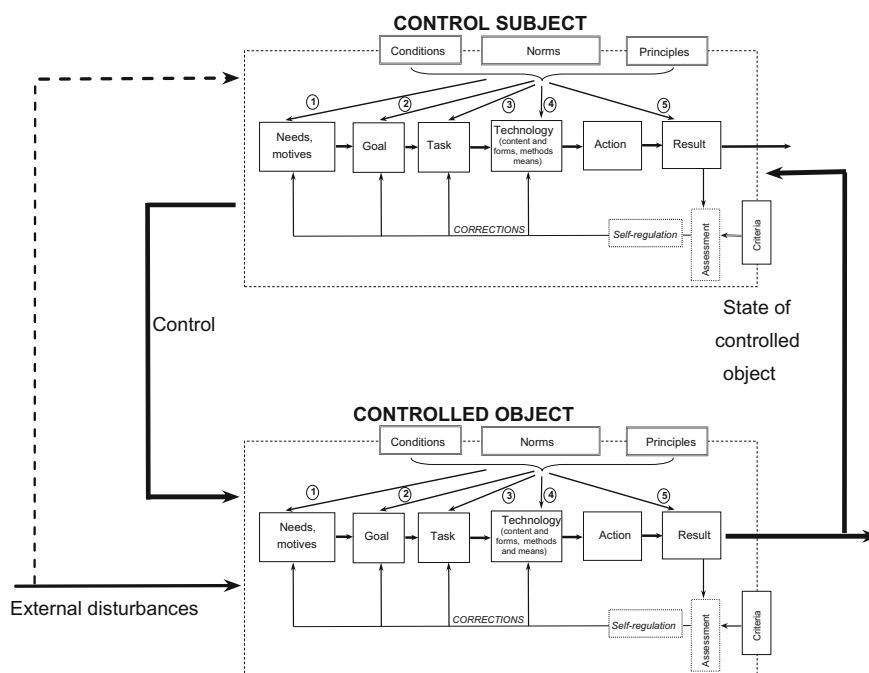


Fig. 2.4 Structural components of control activity

indeed, control is the process of organizing which leads to the property of good organization as a property in a controlled system (see the Conclusion).

The structural *components of control theory* (see Fig. 2.5) are:

- control tasks;
- scheme of control activity;
- conditions of control;

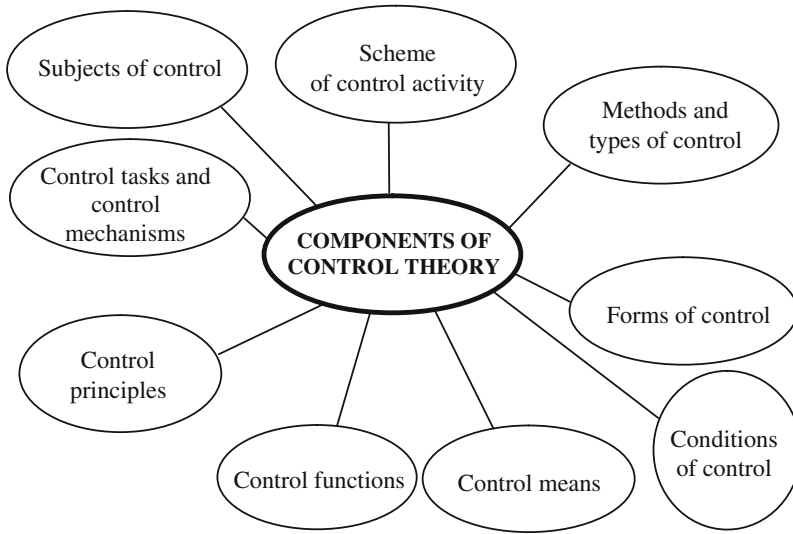


Fig. 2.5 Components of control theory

- types of control;
- subjects of control;
- methods of control;
- forms of control;
- control means;
- control functions;
- factors having an impact on control efficiency;
- control principles;
- control mechanisms.

They are considered in detail in [152].

The foundations of control methodology, the characteristics of control activity, its logical and temporal structures, as well as the *structure of control theory* (as a set of stable relations among its components) are discussed in [152, 157, 158].

Cybernetics

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