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Chapter 2

FOUNDATIONS OF CONTROL METHODOLOGY

A *foundation* is a sufficient condition of something (entity, cognition, an idea or activity).

This chapter is organized as follows. Section 2.1 touches psychological, sociological and philosophical foundations of control methodology. Ethical and aesthetical foundations are discussed in Section 2.1.

2.1. PSYCHOLOGICAL, SOCIOLOGICAL AND PHILOSOPHICAL FOUNDATIONS

Psychology and sociology. *Psychology* considers an activity as an important component of psyche. For instance, S.L. Rubinstein believed that psychology should investigate not the activity of a subject as such, but “psyche exclusively” (as a matter of fact, by exploring its essential objective relations and mediations, including activity analysis, see [44]). On the other hand, A. Leont’ev adhered to the opinion that the activity must be the subject of psychology, so far as psyche is indissolubly connected with the moments of activity that generate and mediate it [21]. We have followed exactly the activity approach to study control in Section 1.2. Nowadays, one clearly observes active development of *psychology of management* as a branch of social psychology focused on psychological laws, conditions and features of control activity.

Sociology analyzes social phenomena connected with joint activity of people. The subject of *sociology of management* consists in subordination

relations within a society (including compatibility of social institutes, goals and forms of control, social communications, and social results of management decisions made).

One can conventionally believe that psychology deals with the levels of personality and individual communications, whereas sociology treats the levels of group, collective and mass interaction.

Nowadays, there is no clear differentiation between psychology and sociology of management. Numerous textbooks dedicated to these disciplines provide almost the same structure of material, varying merely in emphases put (some sections). A detailed study of such “uniform” material goes beyond the scope of this book; an interested reader could select any textbook on sociology and psychology of management. Here we simply present the structure of the stated material:

- 1) Some historical facts (the evolution of managerial ideas in works of philosophers, sociologists, psychologists and physiologists, as well as management (control) experts). In this context, one should mention A. Adler, E. Berne, A.A. Bogdanov, M. Weber, L.S. Vygodskii, A. Gastev, F. Herzberg, E. Durkheim, P. Kerzhentsev, R. Likert, G. le Bon, A.N. Leont'ev, A. Maslow, D. McGregor, E. Mayo, I.P. Pavlov, H. Simon, P. Sorokin, F. Taylor, A. Fayol, Z. Freud, E. Fromm, K. Horney, C. Jung, and others.
- 2) Management (control) systems and their properties. Making management decisions.
- 3) Psychological effects and phenomena in management (control); Management (control) staff as a social group. The structure of a social organization, social processes. Social partnership.
- 4) Personality. Types of personalities. Personal qualities of a manager, his/her individual features, properties (intelligent, volitional, emotional, etc.), abilities and their development. Profession diagrams, vocational fitness and adaptaion.
- 5) Needs and their satisfaction, the level of aspiration. Motivation.
- 6) Guidance and leadership. Styles of guidance. Organizational culture.
- 7) Adaptation and staff development, professional training.
- 8) Small groups. Social roles. Interpersonal communication. Conflict management. Self-management.
- 9) The socio-psychological atmosphere in a collective. Business communication culture.
- 10) Various tests.

Generally speaking, both psychology of management and sociology of management are at the initial stage of development. Still, they represent descriptive sciences endeavoring to accumulate (unfortunately, just sometimes to systematize!) the empirical material concerning their objects of research. Nevertheless, for any manager the knowledge of results obtained by these sciences is a necessary component of professional competence.

Control and management. Interestingly enough, most of textbooks on *management science* [2, 11, 12, 28, 30] have a similar structure of material as psychology and sociology of management (again, differences could be observed in emphases and detailed consideration of certain branches of management science). Notably, the structure includes the following issues:

- general management;
- marketing and sales;
- production management;
- personnel management;
- financial management;
- project management;
- strategic management;
- and so on.

Any science is determined by its subject and methods of research. On the one hand, control science studies control in systems having different nature (technical, economic, social, biological ones). On the other hand, management science focuses on control in organizations (organizational systems). Management science rests mostly upon descriptive methods, whereas control science involves empirical and theoretical methods [36]. As against control science, management science possesses narrower subject of research and employs a limited set of research methods. Hence, the latter is a branch of the former.

No doubt, the last statement would meet objections of management experts (indeed, representatives of any science tend to hyperbolizing its capabilities and place in the general system of sciences) and humanists interested in control philosophy. In corroboration of these words, we point out the incorrect usage of the terms “control” and “management” as synonyms (e.g., see references in [38]). We believe that the idea regarding “absorption” of control and cybernetics by management science is a misthought.

One of possible justifications lies in the following. The term “control science” (sometimes, “control theory” which is not totally right) often serves

to indicate the formal, i.e., mathematical theory of control. Actually, control science incorporates many such theories. Moreover, some humanists have a fear of mathematics, thus postulating the impossibility (in principle) to use mathematical methods in their investigations. Their arguments are based on complexity and versatility of the above methods.

As the result, management science and mathematical theories of control often get in a confrontation (which is a mistake!). Actually, they should supplement each other. One may identify four levels of abstraction/concretion in consideration of management activity [25], as follows.

- 1) *conceptual level* (involving the most general categories and having no claim on the operational property of management activity, especially in specific conditions);
- 2) *analysis level* (decomposing and providing a greater detail to the description of activity of organizational system members, as well as establishing system laws of their functioning);
- 3) *synthesis level* (aggregating and concretizing the description of activity of organizational system members, as well as establishing the most efficient laws of their functioning);
- 4) *implementation level* (being the most concrete and operational, as accounting for all essential aspects of activity of organizational system members in specific conditions).

Traditionally, management science focuses on the upmost and lowermost levels discussed above (the conceptual level and the implementation level, respectively—see Table 1 [25]). Contrariwise, control science mostly studies synthesis problems for optimal control mechanisms, as well as models of reaction of a controlled system to certain control actions. The corresponding levels are the intermediate ones.

Therefore, today a pressing problem lies in strengthening management science with the intermediate levels (those of analysis and synthesis), as well as in strengthening control science with the upmost (conceptual) and the lowermost (implementation) levels. In other words, in management science one may acknowledge an acute need for passing from an unsystematized and bulky combination of best practices to a certain complex of control tools [25].

Cybernetics and systems analysis are remarkable for occupying the interdisciplinary or overdisciplinary position and may be treated as applied dialectics. Within the framework of these approaches, control activity is a complex system intended for preparing, substantiating and implementing

solutions to complex problems of different character (e.g., political, social, economic, technical problems, etc.) [4, 7, 8, 27, 41, 49]. By comparing the above conceptions adopted by different scientific disciplines (*viz.*, philosophy, psychology, sociology and systems analysis or systems engineering), one would easily choose the general *structure of activity* (see Figure 3).

Table 1. Management science vs. control science

Level of abstraction / concretion	Content of management activity	Prerequisites for making efficient management decisions	Management science (a qualitative aggregated picture)	Control science (a qualitative aggregated picture)
Conceptual	Choosing general methods, types and forms of control, etc.	Terminology, best practices		
Analysis	Analyzing the controlled system	Model of the controlled system (its response to control actions)		
Synthesis	Synthesizing an optimal control (including the choice of specific methods, types and forms of control, etc.)	Solution to the control synthesis problem and/or results of simulation /scenario realization		
Implementation	Implementation of control actions	Standard schemes and techniques of control implementation, best practices		

Methodology generalizes rational forms of activity organization that have been verified in rich social and historical practice. During different epochs of civilization development, various basic types of organizational forms of activity have been popular. In modern scientific literature, they are often referred to as *organizational culture* [6, 10, 35, 45].

For instance, V. Nikitin [36] identifies the following historical types of organizational structure⁷ (see Table. 2).

⁷ Par excellence, the matter concerns European culture.

Table. 2. Characteristics of different types of organizational culture [36]

The types of organizational culture	The methods of normalization and translation of activity	The forms of social structure implementing the corresponding method
Traditional	Myths and rituals	Communities based on the kinship principle
Corporate-handicraft	Samples and recipe for their recreation	Corporations with a formal hierarchical structure (masters, apprentices, and journeymen)
Professional (scientific)	Theoretical knowledge in the form of text	Professional organizations based on the principle of ontological relations (relations of objective reality)
Project-technological	Projects, programs ⁸ and technologies	Technological society being structured by the communicative principle and professional relations
Knowledge-based	Individual and collective knowledge of activity organization	Network community of knowledge

Let us discuss them in a greater detail, making special emphasis on the level of *control centralization* in a corresponding type of organizational culture. We will understand the level of control centralization as the share of actions of a controlled system, being controlled or imposed by a control subject.

Traditional organizational culture. At early stages of mankind development, a society consisted of communities, where differentiation was based on the kinship principle. Communities are maintained by a *myth* and a *ritual*. A myth explains the origin of ancestry (e.g., from an animal or a god), the peculiarity of a given group, the rules of communal life (in particular, the primacy principle in a group and its substantiation). A myth defines the structure of the world, i.e., separates another world (“the next world,” the world of spirits, and so on). The latter resembles the real world, yet possesses supreme and perfect qualities against the real counterpart. The life in a community takes place in the both worlds simultaneously. The real mechanism, which ensures such correlation and organizes human activity, is provided by a ritual. The primary task lies in separating aliens from relatives,

⁸ In the current sense, programs represent large-scale goal-oriented projects.

helping the latter and being injurious to the former, as well as in punishing for apostasy.

Traditional organizational culture is characterized by relatively low degree of control centralization at the production level (due to poor development of production facilities) and at the individual level (“globalization” takes almost no place and an individual is a member of one’s own local social group). Figure 9b and Figure 9c illustrate the dynamics of the degree of control centralization (its conditional growth or increase). At the national level (even including autocracies of that times), the degree of control centralization appears relatively small, as well (see Figure 9a).

Corporate-handicraft culture. In the 500s AD, a new social structure with the rigid hierarchy of the Church gradually substituted communities; this process was remarkable for active impact of the Roman Empire. The Church had higher corporate organization, *viz.*, a unified control authority and a common ideology, a clear hierarchy of subordination, an internal system of education (personnel training), explicit norms of behavior and punishment for disobedience, a common language (Latin).

The Late Middle Ages were remarkable for the appearance of new centers of society organization—cities and universities. The new social hierarchy within cities was formed involving alternative (in fact, corporate-handicraft) principles. Corporations concentrated on a specific activity. Notably, some samples (e.g., of products) and recipes for their recreation were prepared and carefully protected by a corporation. The hierarchical structure of society was subject to a fixed differentiation of the members of handicraft corporations (masters, apprentices and journeymen). Transition between categories required much time and was surrounded with many conditions controlled by a corporation.

Passing from traditional organizational culture to the corporate-handicraft one was accompanied by the growing degree of control centralization at the production level (handicraft corporations) and the individual level—see Figure 9b and Figure 9c. At the same time, control centralization at the national level was reduced—see Figure 9a.

During the Renaissance, university corporations gradually substituted the application of recipe knowledge for the application of theoretical knowledge. Accordingly, there arose a definite interest in the people being able to create *theoretical knowledge* and transmit it (instead of the corresponding recipe knowledge). Transmission of theoretical knowledge became the key aspect for universities and (later) for other forms of education. Thus, the professional type of organizational culture started its formation.

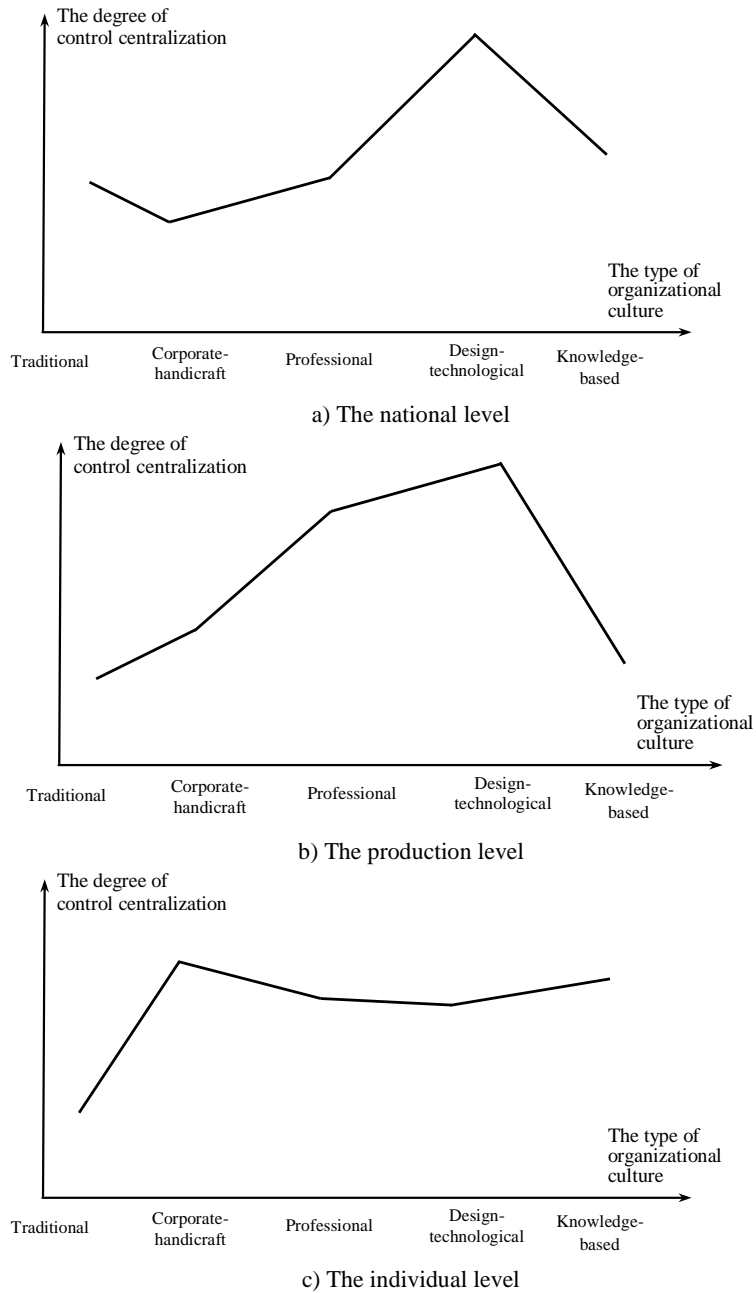


Figure 9. The dynamics of the degree of control centralization at: a) the national level, b) the production level, c) the individual level.

The professional (scientific) type of organizational structure. Here the basic activity cementing different professional fields is represented by *science*. In a professionally organized society, exactly science makes up the major institution; indeed, it serves for forming a unified structure of the world and general theories (afterwards, specific theories and corresponding problem domains of professional activity are separated with respect to the unified structure of the world). The “center” of professional culture lies in scientific knowledge, while generation of such knowledge represents the major type of production (affecting the capabilities of other types of material and immaterial production). The professional type of organizational structure was the leading one within several centuries.

Transition from corporate-handicraft organizational culture to the professional one is described by the growing degree of control centralization at the national level and production level (especially, in the conditions of mass production)—see Figure 9a and Figure 9b. Meanwhile, control centralization at the individual level decreased (at least, for some segments of the people)—see Figure 9c.

However, in the second half of the 20th century, cardinal contradictions were observed in the development of the professional form of social structure. They were:

- contradictions in the unified structure of the world suggested by science, and internal contradictions in the structure of scientific knowledge generated by science, the beliefs about shifts of scientific *paradigms* (T. Kuhn [20], K. Popper [42] and others);
- onrush development of scientific knowledge, “technologization” of the means to generate scientific knowledge resulted in diversification of the world structure (leading to fragmentation of professional fields into numerous specialities).

Therefore, there was an immediate necessity to develop another type of organizational structure, *viz.*, the project-technological one.

The project-technological type of organizational culture. As far back as in the previous century, many theories were accompanied with new structures such as *projects* and *programs*. Moreover, by the end of the 1990s the activity regarding creation and implementation of projects and programs became very popular. These structures are supported by analytical work rather than by theoretical knowledge. Due to its theoretical strength, professional culture generated certain ways of mass production of new sign forms (models,

algorithms, databases, etc.)—the “fabric” for new technologies. The above-mentioned technologies serve not only for material production, but also for sign production. Generally speaking, *technologies* (in addition to projects and programs) became the leading form of activity organization.

We have provided merely one of numerous classifications used for historical types of *organizational culture*⁹. Alternative approaches could be found in scientific literature. The most important aspect consists in the following. The professional type of organizational culture based on written texts (handbooks, manuals, instructions, procedural recommendations) had been gradually developing since the 17th century. Meanwhile, approximately in the 1950s it was replaced by a new type of organizational culture (naturally, the new one absorbed the previous types), *viz.*, by project-technological culture¹⁰; this process was induced by rapid development of social (including industrial) relations.

Passing to the project-technological type of organizational culture was marked by an appreciable increase in the degree of control centralization at the national level and production level (as an unavoidable consequence of higher complexity of projects implemented at these levels)—see Figure 9a and Figure 9b. Nevertheless, control centralization at the individual level went down—see Figure 9c.

Let us emphasize another feature. As completed cycles of the productive (creative) activity, both performing a scientific research and making a work of art fit the stated definition of a project. In science and art, the term “project” has been adopted recently (starting from the 1950s, e.g., an atomic project, a movie project, a play performance project). However, the project type of organizational culture was first mastered by painting—in the Renaissance, art was separated from handicrafts due to the formation and development of the category of an image as the artistic model of reality. This process took its final

⁹ In many sources, the notion of organizational culture is used in a narrower sense (as the culture of organizations or corporate culture). Corporate culture is the mission of an enterprise (an organization, etc.), its organizational structure, the system of norms, traditional internal relations, symbols, and so on.

¹⁰ We underline that the types of organizational culture do not simply replace each other during their development. The matter is much more complicated, since different types of organizational culture coexist. For instance, many ceremonies and rituals have been permanently in a nationality since ancient times (e.g., Russians mostly profess Orthodoxy and still have heathen feasts such as Maslenitsa). Another example is that the activity of some modern scientific schools is organized according to the corporate-handicraft type of organizational culture. Furthermore, certain kinds of human activity can be based on different types of organizational culture.

shape by the beginning of the 19th century (in particular, we refer an interested reader to *Aesthetics* by G. Hegel).

At the confine of the 19th and 20th centuries, the project type of organizational culture “penetrated” into science. In many fields of scientific knowledge, the requirement appeared concerning formation of *scientific hypotheses* as cognition models [36]. In fact, a scientific research was organized in the form of projects. One would observe the full-fledged “operation” of the project-technological type of organizational culture merely in recent decades—it has been widely demanded by the practice.

The new type of organizational culture discussed above includes the following key notions: a project, a technology, and reflexion. Yet, the first and the last ones are somewhat contrary—a project (*verbatim*, “sent forward”) and reflexion (*verbatim*, “addressing back”).

Project. An old traditional interpretation of a project (e.g., in engineering, construction) consists in the totality of documents (calculations, drawings, and so on) to design a building or a product [1]. Later on, it was substituted by the modern conception of a project as a completed cycle of the productive activity (performed by an individual, a collective, an organization, an enterprise, or by several organizations and enterprises).

A *project* is the purposeful creation or modification of a certain system, having a specific organization under constraints imposed on available time, resources and quality of the results [36]. Such terms as “*project management*,” “*program-based planning and management*” or “*management by objectives*” have become common in managerial practice.

The presence of a certain system in the above definition indicates project’s integrity, singleness and uniqueness, as well as its features of novelty.

There exist numerous projects to-be-faced in real life. They vary in the aspects of problem domain, application, scale, duration, staff, complexity, and others. For comfortable analysis of projects and project management systems, one may classify projects using different bases—see classification systems in [1, 35].

Involving the fundamental concept of a project, we may consider scientific research as the form of projects, i.e., as completed cycles of scientific activity.

Each project passes a series of development stages (starting from idea initiation to its total completion). The whole set of development stages makes up a *life cycle* of a project. Traditionally, a life cycle is decomposed into *phases*, phases are decomposed into *stages*, and stages are decomposed into *steps*.

To avoid confusion, we make a clear provision regarding the difference between the notions of a project and design. *Design* is the initial phase of any project. Indeed, any *productive activity* and any project require specific goal-setting (i.e., design). Any purposeful activity (including control activity) is designed, as well.

Now, let us proceed to the next definition (“technology”). Its modern interpretation lies in the following. A *technology* is a system of conditions, forms, methods and means to solve a posed problem. Such understanding of a technology has been recently imported from the industrial sphere. This process was initiated when in developed countries know-how engineering companies (companies designing new types of products, new materials, new processing techniques, etc.) started forming independent structures. These companies sold licenses for production of their developments to vendors; such licenses were accompanied by a detailed description of manufacturing means and techniques (i.e., technologies).

Naturally, any project is realized by a set of technologies.

An essential role in organization of the productive activity is played by *reflexion* as permanent analysis of goals, tasks, and results of the process.

Similarly to the methodology of other types of human activity, control methodology can be constructed in the logic of project category based on the triad of *project phases*:

- Design Phase;
- Technological Phase;
- Reflexive Phase.

Each phase includes particular stages and steps¹¹.

Therefore, the major difference between project-oriented activity and process-oriented activity consists in the unitary property, i.e., non-cyclicity of former. A *process* is a set of technological operations (e.g., consider an enterprise implementing a regular repetitive cyclic activity—manufacturing of same products).

Of course, some particular types of activity within a project may have cyclic character. On the other hand, violating the “regular” functioning of an enterprise or organization can be viewed as a set of projects (e.g., increasing

¹¹ For instance, design phase consists of four stages (conceptual stage, modeling stage, design stage and technological preparation stage). Next, modeling stage has the following steps: model construction, optimization, choice (see the details in [36] and Chapter 5).

production output, installing new equipment, seizing new trade areas, restructuring, and so on).

A project represents the purposeful modification of a certain system in time. Hence, a project can be described in “project notation,” which emphasizes the dynamics, and in “process notation,” which emphasizes the stable states (performing stable activities, see Figure 10). Furthermore, “joining” of processes (at instants that correspond to the beginning and termination of processes) is defined by the logic and technology of a project (e.g., by an *network schedule*). Such instants are referred to as *events* or *milestones* of a project.

At any level, managers are embarrassed or even get irritated at opposing process- and project-based approaches in management. The both aim at attaining a desired result via implementing a certain set of actions. However, generally process-based approach involves almost the same content and technology of activity (i.e., sequence of actions). In other words, activity takes place under practically invariable external conditions. Since a process presumes repetition and regularity of achieving a definite result, the probability of any changes appears minimal. Contrariwise, in project-based approach, technology and content of activity may vary (especially when a necessary result turns out unachievable or frustration of a plan seems highly probable). In addition, the results of preceding stages may be a reason for redevelopment or changes (not only in the activity network, but also in the content of subsequent activities). This feature is an inherent part of high-technology or scientific projects.

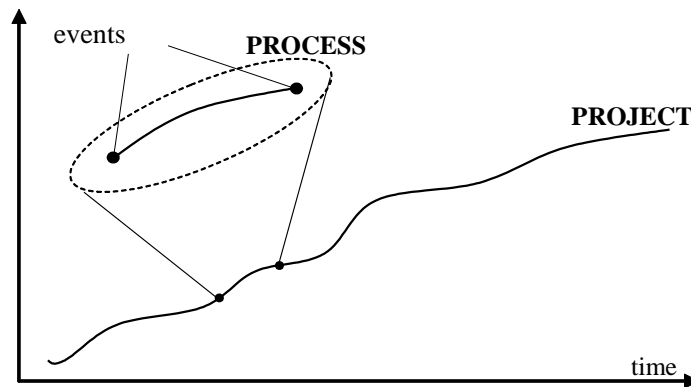


Figure 10. Project- and process-based representation of activity (the priority of a project).

Competent application of the above approaches would yield their complementarity and interconsistency (instead of mutual exclusion!). Their joint usage proceeds from that activities aim at different objects possessing non-identical nature (e.g., a project management system for process-based approach and projects themselves for project-based approach). As a matter of fact, there exist numerous ways of their joint usage (each way depends on the specifics of projects and organizations implementing the latter).

To be successful, any organization or firm sets strategic goals for ensuring competitiveness of its products, services, technologies, and business processes. Transition from a strategy to a concrete tactics and actions (adopted by project executors) may “stall” due to the absence of a regular mechanism used to assign necessary priorities. This problem is successfully treated by managing the *project portfolio* (possibly, technologically independent projects) being implemented by an organization under resource constraints and leading to strategic goals.

The modern concept of project management lies in creating organizations whose development, changes of activity and even activity itself represent a set of diverse projects guaranteeing the attainment of strategic goals exactly in the aggregate. Such organizations become more competitive than vertically integrated enterprises with their functional organization of activity, being directed towards stable specialized processes.

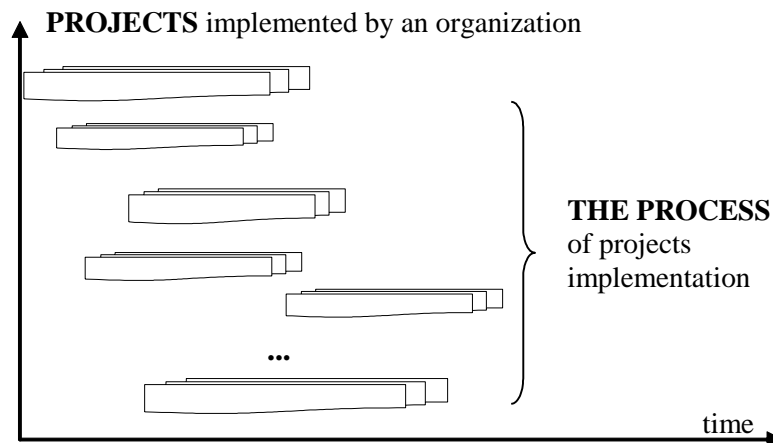


Figure 11. Project- and process-based representation of activity (the priority of a process).

Therefore, project- and process-based approaches do not contradict each other. On the one part, the framework of the modern project-technological type of organizational culture assigns higher priorities to projects as completed cycles of activity. On the other part, the conditions of dynamic requirements applied to results of an organization, its *activity acquires the form of a process representing permanent implementation of projects*—see Figure 11.

The dialectical change of emphases from projects to processes and back (at a new qualitative level) exactly characterizes an aspect of change of organizational cultures (see Table. 2 and Table. 3). According to this viewpoint, the *knowledge-based type of organizational culture* will be next (in fact, this type is gradually getting revealed today—see Table. 2 and Table. 3). Here (individual and collective) knowledge of activity organization would be the way of activity normalization and translation, whereas *network knowledge-based society* [16, 35] would appear the form of social structure (today, the term “knowledge economics” is widespread).

We do believe that the terms “the knowledge-based type of organizational culture,” “network society of knowledge,” “knowledge management” and related ones are inappropriate. Indeed, one of the preceding types of organizational culture (*viz.*, professional or scientific organizational culture) was also based on scientific knowledge. Nevertheless, the mentioned terms have been established historically. Let us elucidate the meaning of knowledge in this case. The professional (scientific) type of organizational culture involved scientific knowledge existed and transferred in the form of texts. Speaking about knowledge in the knowledge-based type of organizational culture, we imply knowledge of employees and organizations: a high level of education among employees, their scientific knowledge and skills to act in standard and nonstandard situations, a high level of creative abilities, their proficiency in handling bulky arrays of inhomogeneous information, their capacity for self-organization, self-control, team work, etc.

Table. 3. The change of organizational cultures

Types of organizational culture	Dominance of	
	project activity	process activity
Traditional		+
Corporate-handicraft	+	
Professional		+
Project-technological	+	
Knowledge-based		+

Knowledge management. During implementation of a project, certain experience is accumulated and formalized as an electronic base for corresponding *knowledge of an organization*. Later on, it can be used to implement new projects. The problems of experience generalization, as well as processing, storage and deployment of knowledge regarding the content, forms and methods of organizational control (including project management) are the subjects of *knowledge management*, a branch of modern control theory.

The issues of knowledge management have recently become relevant for efficient functioning of organizations and/or implementation of projects [16]. Indeed, dynamic external conditions of project-based management increase the role of knowledge and experience accumulated by employees of an organization. Experience systematization bases on identifying typical situations and management decisions being optimal (or rational) in such situations. Since the number of feasible situations is overwhelming, it seems impossible (and unreasonable) to remember all of them. One should separate out sets of “similar” situations and make identical decisions for situations belonging to the same set. In control theory the stated approach is called *unified control*, while corresponding management decisions are referred to as *typical decisions* [9, 37].

Transition to the knowledge-based type of organizational culture is remarkable for decreasing the degree of control centralization at the national level and production level (due to emergence and development of network organizations), see Figure 9a,b. At the same time, despite ample opportunities for growth, self-realization, etc. (being granted to an individual by network information and communication technologies), one observes increasing “dependence” of individuals on these technologies; the mass culture also starts dominating, see Figure 9c. Some scientists predict future formation of a new “slaveholding society,” where power is gradually seized by global networks and corporations. Such structures will control human beings, making them fulfill necessary requirements.

Even the new term of “netocracy” [13, 17] has appeared in literature; it denotes a new form of society control, where the basic value consists not in material resources (currency, immovable property, etc.), but in *data* and structures used to store, process and transmit it. Concerning network resources, we should mention information technologies of supporting management decision-making, as well as *online social networks*. In addition to the functions of communication, opinion exchange and information acquisition, such social networks have lately become the objects and tools of informational control and the arena of informational contagion [13].

Philosophy and control [38]. *Philosophy* studies activity as a universal way of human existence. Accordingly, humans represent active creatures. Human activity covers material-practical, intelligent and spiritual operations, external and internal processes. Activity is the behavior of mind just exactly as the behavior of arms, whereas human activity makes up cognition process similarly to human behavior. Activity enables an individual to reveal his/her particular place in the world and to assert himself/herself as a social being.

Having reached a certain level of epistemological maturity, scientists perform “reflexion” by formulating general laws in corresponding scientific fields, i.e., create *metasciences*. 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 [15].

Originated in the 1850s, research in the field of *control theory*¹² led to the appearance of other metasciences, i.e., *cybernetics* [4, 7, 49] (in the 1950s) and *systems analysis* [2, 8, 27, 41] (later). Moreover, cybernetics quickly became the subject of philosophical investigations (e.g., see [43, 46, 49]) conducted by “fathers” of cybernetics and professional philosophers.

The 20th century was accompanied with rapid progress of *management science* [2, 11, 14, 28, 30] as a branch of control theory studying practical control in *organizational systems*. By the beginning of the 2000s, management science engendered *management philosophy*. Books and papers entitled “Management philosophy” appeared exactly at that times (for instance, see [11, 18, 43]); 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 [38].

Consider Figure 12 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 domains shaded in Figure 12 are the major ones.

Control philosophy (as a branch of 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,

¹² Following the established tradition, we will occasionally call control science by control theory (yet, keeping in mind that the name is narrower than the subject).

“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.”

Historical and philosophical analysis implies that first control theorists were exactly philosophers. 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.

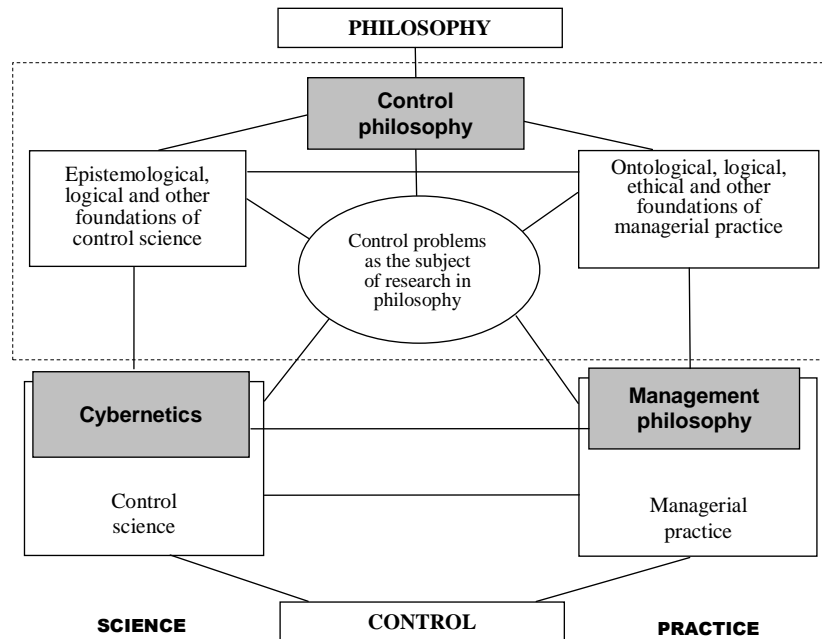


Figure 12. Philosophy and control.

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 laws separated out by experts in certain sciences.

By analogy to the notions of “historical philosophy,” “cultural philosophy,” “legal philosophy,” etc. (see philosophical encyclopedias), 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. Such meaning of the term “control

philosophy” (see the dashed-line contour in Figure 12) has rich internal structure and covers epistemological research of control science, the analysis of logical, ontological, ethical and other foundations (both for control science and management science).

The basic goals of research in control philosophy are as follows:

- 1) Identifying the content of control as a science and practical activity, analyzing their subject and place in the system of scientific knowledge;
- 2) Performing the ideological, methodological and logical-epistemological analysis of primary notions, results, techniques, functions and theories in control science;
- 3) Translating philosophical laws to enrich the content of control laws;
- 4) Involving the achievements of control theory and practice to enrich the content of philosophical categories and laws;
- 5) Substantiating the feasibility and conditions of using common approaches to control problems in systems of interdisciplinary nature, constructing uniform control theory;
- 6) Performing methodological analysis of control with application to different areas of human activity and different classes of control objects;
- 7) Substantiating philosophically the key directions in control theory and practice.
- 8) Systematizing and classifying theories of control;
- 9) Identifying and systematizing axiological dominants in control theory and practice;
- 10) Developing the integrated conceptual framework of control science (including the terminology of all embedded theories).

Let us formulate a series of “questions” determining perspective directions of research in control philosophy (according to experts in control theory, these issues lie “in the plane” of control philosophy).

- What would general laws and regularities studied by philosophy gain for control theory and practice? Which modern directions of philosophical research can find (alternatively, have already found) applications in control science (structuralism, post-structuralism, hermeneutics, etc.)? What are the manifestation and influence of

general scientific meaningfulness and interdependency of adopted terminology?

- What are the epistemological specifics of control science? Are there general approaches to the statement and solution of control problems? How does control science position itself in the general system of sciences? What is the epistemological status of a researcher in control theory and practice?
- How are basic categories of philosophy (a language, ordinary consciousness, ethics, a law, philosophy, a science, art, a religion, a political ideology, etc.) correlated with that of control science (control, an activity, an organization, decision making)? How is the latter group of categories correlated with other categories (such as a human being, nature, a society, production)?
- Which laws (features) of control science formation as a metascience can be identified in historical retrospective and at the modern stage of its development? What is the connection between control theory and practice (again, in historical retrospective and in future perspective)?
- How does philosophy (as the “quintessence of culture”) affect the formation of “organizational culture” in control theory and practice? What is the interrelation between universal principles, laws and features of development of particular organizational, social and cultural formations in control theory and practice?

Cybernetics (as a branch of control science, studying its most general theoretical laws). 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. Foundations of control science also include general laws of efficient control (representing the subject of cybernetics).

Nowadays, one often faces the opinion that cybernetics has become old-fashioned as a scientific discipline and no more pretends to the role of certain universal control science. This is true, but only in part. As a matter of fact, in the middle of the 1940s cybernetics appeared the theory of “control and communication in the animal and the machine” (see the pioneering monograph [49]). Furthermore, it originated even as the theory of GENERAL laws of control. Triumphant advancements of cybernetics during the 1950–1960s (e.g., technical cybernetics, economic cybernetics, biological cybernetics, etc., and well as their close connections to operations research, mathematical theory of control; plus intensive implementation of results in designing new and

upgrading existing technical and information systems) created the illusion of the universal character of cybernetics and inevitability of its rapid development in future. However, the evolvement of cybernetics slowed down in the early 1970s. This “integral” science branched out into a set of partial directions and “mingled with details”; indeed, the number of subbranches grew and all of them showed independent development (almost without identification and systematization of general laws). Curiously enough, 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” (see references in [38]).

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 in its second meaning (as a branch of control theory, studying its most general laws). 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).

Management “philosophy”. A detailed analysis of modern textbooks on management science, sociology and psychology of management separates out the following categories¹³ used to describe managerial practice (see Figure 13). Management “philosophy” tops the pyramid demonstrated in Figure 13. It reflects the maximally abstracted level of description and consideration of solving the problems of managerial practice.

There are intensive discussions regarding the comprehension of management “philosophy,” its subject and main content. For instance, the following opinions are quoted in [38]:

- “Possibly, management philosophy is the pragmatism, where an essential characteristic of a human being lies in actions, purposeful

¹³ Note that the corresponding terms are generally not defined explicitly and addressed somewhat inadvertently (in management science).

activity. Cognizing exactly the laws of human activity must form the object of management philosophy” (L. Bessonova);

- “Management philosophy considers axiological, epistemological, and methodological foundations of human activity in control processes” (V. Diev), and so on.

The examples of inhomogeneous definitions could be continued. Many authors of textbooks on management science adopt the term “personal management philosophy” (similarly to the existence of numerous opinions regarding necessary qualities of a good leader, there are many different management philosophies). In other words, sometimes management “philosophy” is commonly treated as analyzing the set of qualities of an efficient manager and his/her decisions leading to a success.

Almost all authors agree with the following. Management “philosophy” is a system of ideas, views and beliefs of managers about human nature and society, control problems and ethical principles of their behavior (this system forms mostly empirically). Yet, we believe such definition appears eclectic and not operational. Our approach is to understand management “philosophy” (“the top of management”) as a branch of control science dealing with generalization of laws of successful managerial practice.

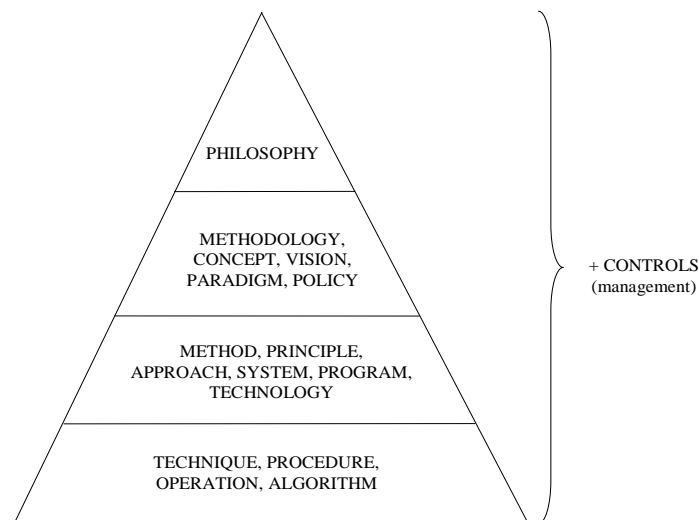


Figure 13. Levels and categories of managerial practice description.

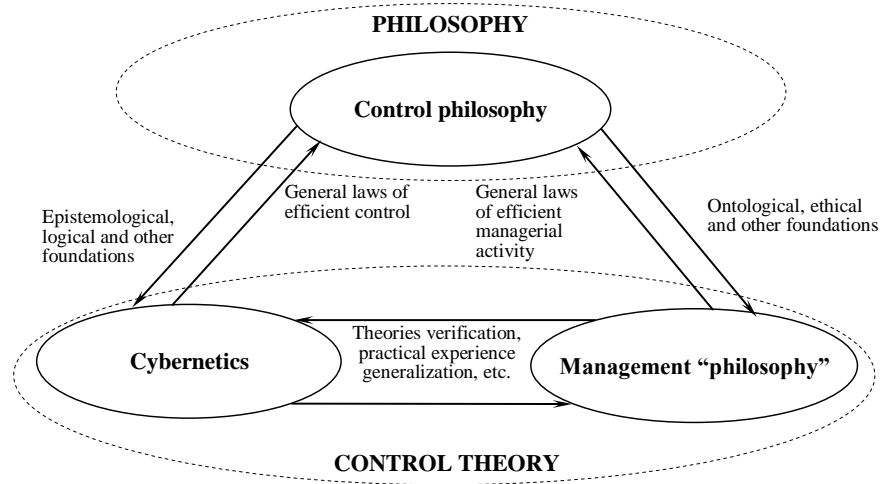


Figure 14. Control philosophy, cybernetics and management "philosophy".

We have 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 (as a branch of control science generalizing the experience of successful managerial practice), see Figure 14.

Therefore, we have discussed the basic philosophical, psychological and other notions required for further exposition of the book. Now, let us focus on ethical and aesthetical foundations of control methodology.

2.2. ETHICAL AND AESTHETICAL FOUNDATIONS

Aesthetics mostly focuses on the attitude of a human being to his/her activity; on the other hand, ethics concentrates on the attitude to activity (including the process and results) of other people.

Aesthetical foundations. Aesthetical activity—aesthetical components of activity—is inherent to an individual in any activity. Generally speaking, the specifics and functions of such activity consist in the following. Aesthetical activity is the field of free self-expression of a subject in his/her attitude towards the world. According to K. Marx, human beings (in contrast to animals) can produce using any type of measure (ideal) and can apply to an

object an appropriate measure; thus, human beings create following the laws of beauty [23, Vol. 42].

Aesthetical activity has the object- and spirit-oriented character. The subject of aesthetical activity can represent any real object, being available to direct perception or imagination. For instance, take art works containing aesthetical information; the products of rational activity, whose utilitarian purpose is accompanied with their aesthetical value; natural phenomena being separated from natural series (the ordering is subject to human activity) and entering into the context of aesthetical culture. Furthermore, the subject of aesthetical activity may include aesthetically neutral phenomena, whose value is actualized or confirmed during activity. Finally, the sphere of particular interest of aesthetical activity has always been the world of a man (the socio-historical process, social life of people, their behavior and the inner (spiritual) world).

Of special importance are the aesthetical foundations in labor as the basic form of human activity. Well-organized free labor which consists of different types of work alternating with recreation becomes the basic form of manifestation and development of creative, spiritual and physical strength of a man. The aesthetical rudiments in labor cause transformation of labor into the first vital requirement. Being directed towards satisfaction of material and spiritual needs, labor becomes really human; it forms a need whose free satisfaction provides enjoyment to a man (similarly to the delight perceived by an artist creating a painting).

The aesthetical components play essential role in control activity. For a control subject, the process and result of attaining a chosen goal (especially, the large-scale one formulated independently) bring the greatest aesthetical pleasure¹⁴ (perhaps, resembling the delight of an artist or an actor). Indeed, people are used to say that control simultaneously represents science and art. Such assertion admits dual interpretations. On the one part, it underlines that control science covers not all aspects of control activity (for the time being, control science is unable to provide full description, explanation and rationalization for control activity). On the other part, *control activity appears subjective in principle*. Under the same conditions, possessing the same awareness (even having identical education and similar experience of professional activity!), people possibly make essentially different management decisions. Thus, the personality of a manager, his/her professional (or

¹⁴ A negative situation is when a man becomes “intoxicated” by power and aspiration for power dominates the rest motives.

emotional) qualities are of crucial importance; moreover, the aspects of creativity appear relevant to control activity. In the case of man management, one of control subject's functions consists in ensuring maximal conditions for creativity and self-realization of subordinates, eliminating routine aspects of their activity, transforming the latter into creative (art) activity.

However, there is a fundamental difference between the results of control and art activities. Each art work is inalienable of the author. For instance, L. Beethoven's famous *Ninth Symphony* would have never existed if he had not composed it. Similarly, A. Pushkin's masterpiece *Evgeny Onegin* would have never existed if he had not written the poem. The situation slightly changes for control.

As a rule, the results of control activity are "unnoticeable" and alienated from a control subject. They win public recognition only in exceptional cases. Concerning control science, we mention world-famous researchers such as A. Andronov, N. Wiener, I. Vyshnegradskii, A. Lyapunov, J. von Neumann. Speaking about practical managerial activity, we should refer to glorious commanders such as Alexander III of Macedon (Alexander the Great), Napoleon Bonaparte, A. Suvorov, G. Zhukov, etc., or to well-known politicians such as A. Lincoln, W. Churchill, F. Roosevelt, etc., or to successive managers such as A. Sloan, H. Ford, L. Iacocca, and others.

Culture and control. The comprehensive treatment of *culture* as a set of all (material and spiritual) achievements of human civilization (e.g., see [34]) is by far broader and more correct than its treatment as the reflection of art achievements (used in a series of "culturological" publications). Another narrow meaning of the term "culture" applies to traditions of activity organization (a corresponding example is *organizational culture* discussed above).

Each social formation has a common "cultural platform," representing certain metacultural code of all people in society. Furthermore, all organizational and socio-economic systems include general (universal) and private cultural programs. They act as a "magnet," attracting rather inhomogeneous individuals via common interests, traditions, norms and rules, faith and persuasion that are translated by formal/informal leaders and supported by the majority of system participants. Therefore, it seems possible to distinguish among

- 1) metaculture of the whole social system (society, mankind);
- 2) national cultures of social and organizational systems (countries, states);

- 3) singular cultural programs of different organizational and socio-economic systems (corporate culture, subculture including traditions, norms and values);
- 4) individual culture.

The term “culture” (from Latin *cultura* ‘growing, cultivation’) exists in almost all languages and is used in various situations and contexts. Its semantic amount appears huge (exceeding 1000 definitions), even in comparison with such notions as “system,” “information,” and “control.”

Figure 15 illustrates the content of the term “culture” according to [38]. In the cited book, *culture* is understood as “1) a system of historically developing suprabiological programs of human activity, behavior and communication, being the prerequisites of reproduction and modification of social life; 2) programs of activity, behavior and communication are represented by diverse forms—knowledge, skills, norms and ideals, samples of activity and behavior, ideas and hypotheses, beliefs, social goals, value orientations, etc. In their aggregate and dynamics, such programs form historically accumulated social experience.

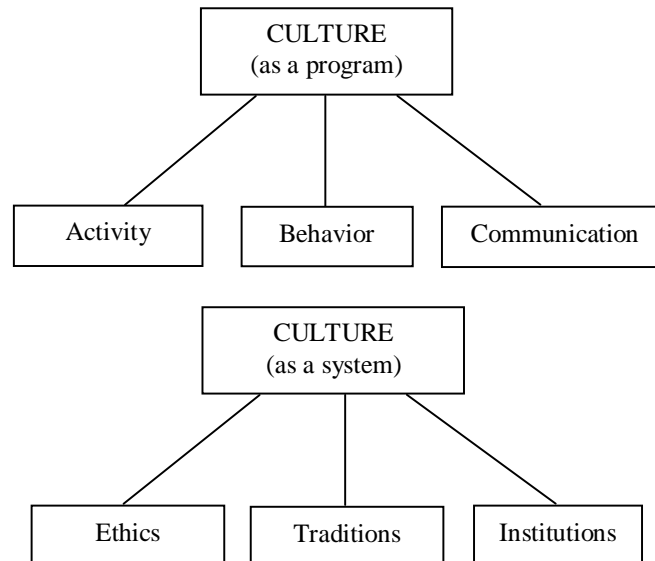


Figure 15. Culture as a program and a system.

Culture keeps, translates and generates programs of activity, behavior and communication of people. In social life they play almost the same role as hereditary information in a cell or complex organism; they support the reproduction of various forms of social life, types of activity, being so characteristic for a certain type of society.”

Within the framework of this definition, culture can be considered as 1) the system of science (ethics, philosophy) and traditions (norms, values of social and organizational systems, public institutions); 2) the program of activity performed by members of a social system, behavior and communication of people in an organization.

The correlation of the notions of culture, organization and control is demonstrated by Table 4 [38].

Table 4. The correlation of culture, organization and control

	Culture	Organization	Control
Theory	Ethics, axiology, linguistics	Control science, general theory of systems, models of control mechanisms	Control theory, cybernetics
Practice	Traditional normative behavior and language	Solving practical problems of control in organizations	Management (for organizational systems)
Object (system, program)	National culture, national language, corporate culture, slang	Social, socio-economic and/or organizational system itself, control subjects and control objects	Control as an object (an element of an organizational structure, representing the set of control subjects)

Presently, one would worldwide observe the intensive research dedicated to the humanist field of control knowledge. For instance, the problems of human self-realization, development of creative potential, harmony of interpersonal relations, self-organization, etc., have been placed in the forefront. This process is promoted by the tendency of growing complexity of controlled social systems; investigators have to find new approaches to control, study control of network systems, as well as distributed and large-scale systems.

Ethical foundations of methodology. Since any human activity takes place in a society, it is naturally based (must be based) on *morality* and must be organized according to moral *norms*¹⁵.

As is well-known, *moral culture* of a society is characterized by the level of assimilating the moral requirements (moral norms, principles, ideals, etc.) by society members, as well as by the level of their practical realization in the forms of actions and everyday behavior (exhibiting in the attitude of an individual to other people, the whole society, in his/her aims, life plan, value orientation, and so on).

In the common sense, morality makes up the comprehensive whole including moral consciousness, moral relations and moral activity. Morality has social nature; it possesses a concrete historical foundation conditioned by certain public relations.

Moral culture acts as the value adoption of the surrounding world by a man. Ethical values are a unique regulating mechanism of relations between a society and an individual; they run through the whole activity of individuals, the whole system of interaction among them. Ethical values provide a concrete expression for many categories of morality (good, a duty, honor, conscience).

Moral regulation aims to ensure the social, class and group coordination of human activity. Hence, moral values become the standards of a proper behavior. As a standard of the proper, they form the base of moral assessments for the activity of the mass, groups and individuals, facts and occurrences. In the case of collisions (the acts of a deviant behavior), moral assessments are used by the dominating public opinion to direct individuals and groups towards the standards of a proper behavior.

Note that moral guides of a society and an individual vary. The morality of a society can not be reduced to the sum of moral guides of individuals; similarly, individual morality appears nonidentical to public morality. The relations of contradictory unanimity exist between a proper behavior (the one fitting moral requirements of a society) and an actual behavior (practical morality—the acts of people reflecting their level of moral development). Such relations may lead to moral collisions.

The structural standards of moral culture as an integral system are listed below.

- the culture of ethical thinking (the ability of using ethical knowledge, applying moral norms to a specific life situation, etc.);

¹⁵ Ethics is a branch of philosophy studying morality.

- the culture of feelings;
- the culture of behavior (the ability of choosing one's own behavior, acting pursuant to moral principles and norms adopted);
- etiquette (regulating the form and patten of behavior) [34].

Thus, moral culture is an essential side of all activity of a person, a people, a class, a social group, a collective (reflecting the operation of a concrete historical system of moral values).

In the sense of its content, moral culture of a society provides a larger integral coverage for the established system of moral values and orientations than personal moral culture (here the components of the system are revealed with unique individual specifics). To a certain completeness degree and in an individual perspective, a person accumulates the achievements of moral culture of a society in his/her consciousness and behavior. This assists a person in acting in a moral way in typical situations, as well as activates creative elements of his/her moral consciousness for selecting moral decisions in untypical situations.

The above-discussed levels of moral culture are closely interconnected. In many respects, the level of moral culture development in a society is determined by the perfection of moral culture of individuals. On the other hand, the richer is moral culture of a society, the wider are the opportunities for perfecting individual moral culture.

Here we should consider two specific aspects of ethics¹⁶, the so-called corporate ethics and professional ethics.

Corporate ethics is the code of written and unwritten *norms* of relationships among employees in an enterprise, a firm, an organization, an institution, that have been established as traditions or fixed in normative documents (regulations, job descriptions). Naturally, each manager and employee must follow them.

Professional ethics. In addition to universal and public ethical norms, certain occupations have professional ethical norms (e.g., pedagogical ethics, medical ethics—recall the famous Asclepiades' (Hippocratic) Oath). Of course, here activity is organized according to these specific ethical norms.

The norms of control ethics. The norms of control ethics have no rigorous formulation as certain established codes, official requirements, etc. However, they do exist and can be considered in two aspects—as internal ethical norms

¹⁶ In principle, it is possible to study other ethical components, e.g. religio-ethnic or territorial ones.

(in a community of professional managers) and as external ethical norms (as a social responsibility of control subjects for their actions and consequences).

The notion of an institute plays the major role in control ethics in the sense of “external constraints.” According to Webster Dictionary, an *institute* is: 1) (in sociology) certain organization of public activity and social relations embodying the norms of economic, political, legal, and moral life of a society, as well as social rules of vital activity and behavior of people; 2) (in law) a set of legal norms regulating any homogeneous and separated social relations. Hence, a *norm* as a legitimate and mandatory order appears the key aspect in the above definition.

There exist *explicit norms* (e.g., a law, a contract, a job instruction, etc.) and *implicit norms* (e.g., ethical norms, an organizational or corporate culture, etc.). Generally, explicit norms are *limiting*, while the implicit ones are *stimulating*. Notably, the latter reflect the behavior of a subject, being expected by the others.

According to [26, 40], three major components of an institute can be identified as follows:

- 1) formal rules (constitutions, laws, administrative acts, statutory norms of right);
- 2) informal constraints (traditions, mores, gentleman’s agreements, verbal arrangements, voluntary norms of behavior, unwritten codes of honor, dignity, professional self-consciousness, etc.);
- 3) compulsion mechanisms ensuring abidance by the rules (courts, police, and others).

Notwithstanding rather unsystematical character of this enumeration, one would observe that formal rules reflect limiting norms, whereas their informal counterparts describe stimulating norms.

The role of institutes lies in decreasing the uncertainty via establishing a stable (not necessarily efficient) structure of interaction among people (in economics – economic agents). Furthermore, it lies in defining and limiting the set of alternatives being available to an individual. Institutional premises exert determinative impact on the following issues. Which organizations appear? How do they develop? At the same time, organizations also influence the process of modifying institutional frameworks. The resulting direction of institutional changes mostly depends on the following factors. First, the “block effect,” arising due to interpenetration of institutes and organizations based on the structure of stimulating motives (generated by these institutes). Second, the

inverse influence of changes in the set of opportunities on the perception and response of individuals [26, 40].

Efficient establishment and deployment of different (social, governmental) institutes makes up the subject of *institutional control*; the latter is defined as a purposeful impact on constraints and norms of activity performed by participants of a social and/or organizational system [37].

Let us get back to the role of ethical norms. *In managerial activity ethical norms have the dominating character*. Imagine that a conflict takes place between ethical constraints and other criteria (e.g., economic efficiency, goals of the metasystem, etc.). Then, in the first place, a management decision being made must satisfy the existing ethical norms. Only in the second place, it must be efficient according to other criteria.

Ideally, in social systems a manager should be a moral example for his/her subordinates, as well as their educator and tutor. This applies to ethical aspects of managerial activity.

It is necessary to underline the *social character of the process and result of managerial activity* (especially, in the case of man management). And so, in contrast to internal (professional) ethics, external ethics of managerial activity gets realized as the social responsibility of managers. Presently, the responsibility of managers for consequences of their (social, economic, ecological) decisions and actions gradually increases.

In this chapter we have briefly discussed philosophical, psychological, sociological, ethical and aesthetical foundations of control methodology.

Now, let us consider control activity itself. Future exposition of the book has the following structure: characteristics of control activity (Chapter 3), logical structure of control activity (Chapter 4), and temporal structure of control activity (Chapter 5).