Modeling and Assessment of a Building Intellectual Grade in the Community of Full Participant in Construction Activities

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Abstract. The study contributes to a concept of "an intellectual building" which is a common term in the construction and reconstruction of housing and social purpose nowadays. The object of study is value oppositions which have been revealed during investigations of collaboration process in construction activities. The task of the study was to describe four main values of the opposition (dichotomy of values of activity), regarding the intelligent building modeling with the notice of its efficiency and reliability in two modes of implementation of activities in intelligent building – operation and development. An analysis of functioning when collaborating in the community of full participant in construction activities has been used as a method in the study. Conclusions of the study show that all the considered value oppositions are aimed at improving the quality of functioning, development and change of activity. The set of criteria for the activity quality, in general case, can be divided into three groups of suitability, optimality and superiority. At the same time, "an intellectual building" is proposed to be considered not only as a socio-technical, but also as a cyber-physiological system in the process of its infographic modeling.

1. Introduction

The new object of activity - "an intellectual building" - has appeared in professional investigations as the development of intention to quantify the actual human consumption of different resources in the environment and control the process of such consumption at the market economy. This object requires permanent diagnosis, monitoring and analysis. Builders traditionally understand a building or a structure as a technical object only. It has a known set of features, the values of which should not go beyond the range of the Regulation norms.

However, the mentioned technical objects have been building in order to enable individuals or communities to carry out a variety of types of productive work or life activity there. The functional specific of an individual or group of people is so, that the physiology of each person and the team sociology dictate the need to work in accordance with a completely different type of rationing- the adaptive norm of a particular individual.

The building "intellectualization" framework, as a process, generates a stationary mechatronic environment of a building which is a subject of diagnosing, discrete or continuous monitoring within
the process of its "intellectualization". This environment plays role of a common "Human - Technics - Environment" system which unifies the building Regulation norms and adaptive norms of an individual or a group. Construction anthropotechnics considers value oppositions (pair interrelations of distinct positions of individual figures in the management of "an intellectual building") as the basis of the modes of operation, development and change of professional activity and human activity of the consumer of "an intellectual building".

The article outlines four main value oppositions (dichotomies of activity values), revealed during the research. The value oppositions allow to model and evaluate the properties of operating and development of activity in "an intellectual building". At the same time, "an intellectual building" is proposed to be considered not only as a socio-technical and cyber-physical, but also as a cyber-physiological system in the process of its infographic modeling.

2. Methods
Domestic [1-4, etc.] and foreign [5-8, etc.] researchers distinguish different modes of management and technologies of human intellectual and creative activity in a building.

Functioning, along with organizational and technological design (modeling the capability of tools, methods and resources to achieve the desired result the obtaining of "an intelligent building"), is the first possible mode of implementation of activities which do not require its development (or it is not expected for the next foreseeable period). This activity is based on the existing Regulations and methodological framework and it is implemented by trained and certified personnel to achieve a pre-known and strictly formalized result. This understanding of the term and the process of "functioning" is applicable to purely technical systems of activity, when an operator controls the programmable technological processes executed by machines and mechanisms. With this approach, along with the technical means of mechanization and automation of technological processes of activity, the human operator is also considered a biological robot with all the ensuing consequences. Human operator in the process of functional labour activity provides the commercial and personal necessary economic benefits, which could be monetary expressed in the framework of business. Socio-economic benefits of the final results of large technical investment projects in housing and transport construction, unlike the benefits of commercial and personal, can only be determined by the state, this is the task of the government. Technical systems are subject to be directly regulated. A human is a biological being and one works according to the adaptive norms of his organism, manifesting himself as a unique object of management. Therefore, the implementation of a certain activity, normalized in the technical system, contributes to anthropotechnics management or anthropotechnical management.

The second mode of implementation of activities is development. It is activity when changing the main task and also intermediate and/or final results. In the course of development, the activity qualitatively changes its infrastructure, which is affiliated to the conflict of order state and disorganization in activities, with the accumulation and complication of information, changes in organizational forms of activity, the value of its processes and results.

A number of authors believe that there is no more subtle and complex subject of consideration than value. Being extremely general, it contains the whole range of possible manifestations in reality. The values themselves sound trivial, which provokes the primitiveness of their understanding, but people pay the most for neglecting the banal truths [12]. Entering a complex and harmonious system, values mutually determine and mutually define each other. Consideration of each of the values as an element of the whole panorama of integrity significantly complicates their adequate understanding and, consequently, its correct implementation. Ontological and system approach in the analysis of values requires taking into account the dialectics of the relationship between general values and local ones (which have a subject orientation). In this article, it is important to fix the dichotomy (a set of dyads) of the values of activity in "an intellectual building".

3. Results
The study identified four main dyads of values of activity.
Dyad 1. Individual needs - Values of activity.

The five aspects discussed below are highlighted in this dyad.

**Dichotomy 1.1** Keeping of individuality and its needs - keeping of agreed standards of activity (Figure 1). The "cycle" of effects, its results and relations formed on their basis, as part of the considered interaction of \( K_1 \) and \( K_2 \), as shown in Figure 1 is the meaning of dichotomy 1.1. The essence of any activity is laid down in the rules, which contain tasks objectives and methods for the actor. Activities can only be discussed if there is a process of implementation of the norms. If the activity is carried out in violation of the prescribed rules, the practice is approaching chaos: "loss of purpose - a loss of connection with life" [13]. Keeping of the agreed norms of activity is the value protecting activity from its transition to a state of chaos.

![Figure 1. The model of interaction in the dyad No.1.](image)

The symbols in Figure 1:

- \( K_1 \) - the process of preserving the individuality and its needs; \( VD_1 \) - the \( K_1 \) influence on \( K_2 \); \( K_2 \) - the process of agreed standards of activity; \( K_1 \) keeping; \( VD_2 \) - the \( K_2 \) response to \( K_1 \); \( PB1_1 \) is the result of the \( K_1 \) influence on \( K_2 \), which forms the \( O_1 \) ratio inside \( K_2 \) to this influence; the result of mentioned ratio \( O_1 \) is a new influence \( VD_2 \); \( PB1_2 \) is the result of the \( K_2 \) influence on \( K_1 \), which forms the ratio of \( O_2 \) inside \( K_1 \) to this influence; the result of mentioned ratio \( O_2 \) is a new influence \( VD_2 \).

Adequate implementation of the norm requires a high concentration of attention and efforts of an actor, the ultimate distraction from own needs and motives. This can lead to extreme psychological stress, unacceptable physical stress and loss of human meaningfulness of the work. All this should be compensated economically and morally: "if you demand from someone that he gives his time and energy for the business, then make sure that he does not face financial difficulties" [14]. In any bundle of opposite values, it is necessary to establish an optimal ratio between the rigidity of prescriptions and the value of psychological comfort of an actor, adjusting it depending on the situation. The problem of ratio and definitions of the dominant "here and now" value arises in any value analysis.

**Dichotomy 1.2. Communicative interacting within activities - the implementation of functional duties within activities**

Here and further, when considering the diversity of dichotomies, an infographic model is used (Figure 1). Team activity, if it pretends to be professional one, should include the distribution of labor and duties. Cross-functional interaction of employees defines the position-functional character of "production relationship" scheme. The optimum of the scheme predetermines the activity efficiency as a whole. The activity is carried out by people with the help of mechanization and automation of their labor and not machines and mechanisms itself. Therefore, a full human relationship is extremely important in the activities, without which it is impossible to solve complex tasks and problems together (especially those that go beyond a hierarchy organization scheme).

To avoid disharmony, the development of employees professional skills should be carried out in parallel with the identification and improvement of their personal qualities.

**Dichotomy 1.3. Matching to the positional norms within activities - coordination within activities.**

The relevance of compliance has already been addressed in Dichotomy 1.1. The principle of hierarchy scheme is the basis of the managed cooperation within the activity. It should be demonstrated, standardized and information supported. This principle could be put as exact fulfilment of norms within a particular position of the organizational structure.
In general, one cannot take into account everything in the norms, therefore, to solve problems and settle on conflicts in the production relations, use the coordination procedure as a condition for the formation and implementation of mutually acceptable activities.

There are two conditions are important in the implementation of the coordination procedure:

- to avoid formal approval, each party should strive not only to preserve the most significant in its position, but also fully and essentially take into account the correctness of the position of the other;
- to try to realize of the counterparty's position and review own claims about the possibility of positions convergence once again.

This is the key to any productive coordination.

**Dichotomy 1.4. Self-control and self-correction in collaboration - control and correction of collaboration partner.**

The productivity of collaboration depends not only on the full coordination of participants, but also on keeping them in their actions the position of self-control and self-correction on the basis of the accepted norms. This requires an actor to seek to identify his own shortcomings, eliminate its reasons, and keep contact with collaboration partners.

**Dichotomy 1.5. Knowledge of collaboration process - self-discovery in collaboration.**

This value opposition constitutes the key link in the development of the professional's personality, because the cognition of activity and of oneself in it allows to consolidate positive experience and protect ourselves from repeating of mistakes.

**Dyad 2. Functioning of activity - development of activity.**

The values discussed in aspects 1.1.-1.5., have concerned the person who only "enters" activity or just participates in it. It is interesting to consider the values of managed activity in the context of its reproduction and socially significant task solutions. It has been shown above there are two modes of operation possible: operation and development.

Functioning "preserves" the existing form of activity (its functional and organizational structure, functions, instructions, etc.), keeping the organizational definiteness that have been developed at the stage of activity formation.

The development of activities is predetermined by:

- the complexity of the implementation of the previous ways of activity;
- the change of social needs, legal, social, economic or any other restrictions.

The necessity to develop anything is due to the rational inability to act on the used scheme. To develop, one should first find out the boundaries of the domain area to be changed (to find the "a problem link").

If there are insuperable difficulties in the activity operation process which require a change of its purpose, the development process is the most complex one.

Development process of an activity can occur with the keeping of the activity purpose and correction of process management of the goal achieving. Development implies the keeping of all the positive from the previous experience of activity functioning, and when changing, it needs to eliminate only discovered causes of destruction.

The value opposition of dyad 2 is the expression: "the implementation of the established ways of activity - the development of the established ways of activity".

**Dyad 3. Executive activity - administrative and management activities.**

In the hierarchy structure of the positions within complex collaboration there is a position of the anthropotechnical manager should be established. The manager might be responsible for the keeping and implementation of the prescribed norms by the participants.

Anthropotechnical management is close to the well-known concept and practice of operational management. The system of operational management methods should have "antennas" for immediate and timely reception of signals about changes in aspects of psychology, sociology and market economics in order to start managing of the process to a new situation adaptation in time.
The position of the anthropotechnical Manager presumes there is a cooperation of actors solving particular tasks within the framework of the developed strategy of activity, timely tactical response to changes in the external and internal conditions of the environment.

Since the anthropological manager, as a technical initiator of the process, is responsible for the keeping and adherence to the prescribed norms of stakeholders, there are two important value oppositions (dichotomies) for the manager:

- "problematization" - problem making activity - "de-problematization" - problem removing activity;
- a conceptual and axiological validity - situational sensitivity;

**Dyad 4. Self-support of activity - fulfillment of social needs within activity.**

Every activity should have its own socio-cultural mission and contribute its share to the functioning and/or development of society. Each company ought to have certain tasks, different from profit, that justify its existence. This position can be set by the value opposition: "meeting the needs of activity - meeting the needs of society in the product of activity specialization".

The researchers have pointed out [9-11, etc.], there is a serious problem in modern Russian society concerning that, against the background of the revival of entrepreneurship, the "spirit" of professionalism, the value of professional skills development has been losing. On the other hand, the system of criteria for evaluation and growth of professionalism in various fields of activity is not sufficiently developed.

The above-mentioned "value approach" could serve as a basis for research and formulation of specific professional criteria in different subject areas (civil engineering, construction, entrepreneurship, advertising, pedagogy, management consulting, municipal management, anthropotechnical management and many others).

4. Discussion

The criteria of activity should have the properties as follows:

- representativeness - it describes the main (not secondary) activity tasks and takes into account the main aspects of its demonstration;
- critical attitude (criticality) to the investigated parameters of activity consists in significant changes in the criterion value at relatively small changes in the studied parameters
- simplicity.

When assessing the quality of activity management, several levels of quality can be considered, ranked by the increasing complexity of the properties of the studied activities.

The first level of the quality is considered as its sustainability. For relatively simple activities, stability combines such properties as resistance to external influences, balance, stability, homeostasis (the ability of the activity to return to an equilibrium state when leaving it under external influences). Complex activities produce different forms of structural stability (organizational and technological reliability, viability, etc.).

The second, more complex level of the activity quality is a noise immunity which means the ability of activity to perceive, use and generate information flows with the minimum of "noise" in the information and power communication channel. Noise immunity combines a number of properties, including the reliability of information channels, their bandwidth (including the individual bandwidth of a particular figure), the ability to effectively encode and decode information, etc.).

The third level of control is the ability of the activity to demonstrate the achievement of initially known results in a given time under the influence of control actions. Handling activities provide direct and feedback, flexibility, speed, accuracy, efficiency, coherence, visibility of intermediate results. At this level of quality for complex activities, manageability should have the ability to make decisions on the formation of management effects on the implementation of activities.

The fourth level of self-organization, self-organizing activities can make changes to its structure, parameters, algorithms and behavior of workers to improve efficiency in achieving the intended
results. Important properties of this level are the freedom of choice of decisions, adaptability, self-learning, the ability to recognize situations and images.

5. Conclusions
1. All the considered value oppositions are aimed at improving the quality of functioning, development and change of activity. Each significant (in terms of activity quality) feature of the activity (engineering, social, legal, technical, economic, physiological, etc.) is set by one or more indicators, which values describe the measure (intensity) of this feature. This measure is called a private indicator of the activity quality. Indicators can be quantitative and qualitative.
2. Quantitative indicators are measured and evaluated by a number and qualitative indicators, as many believe, do not have universally recognized units of measurement. It needs to realize that quality indicators, if it is stated as a rule, also are evaluated by the number (for example, simplisity of maintenance is measured by the time required for the detection and troubleshooting).
3. The set of criteria for the activity quality, in general case, can be divided into three groups of suitability, optimality and superiority.

Acknowledgments
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