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SET AND DEVELOPMENT

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ABSTRACT: THE PURPOSE OF THE ARTICLE IS TO PRESENT A THEORETICAL MODEL OF THE PROCESS OF DEVELOPMENT OF THE SET OF A SYSTEM. USING ANALYTICAL AND TOPOLOGICAL MEANS, WE FOUND THAT:

- THE DEVELOPMENT OF A SYSTEM BEYOND THE NATURAL ORDER OF ITS ELEMENTS (FIXED → VARIABLE → NEUTRAL SETS) CAUSES DEGRADATION OF THE STRUCTURE OF THE SYSTEM.
- THE VALUE OF THE VARIABLE SET OF A SYSTEM DECREASES IN HIERARCHICAL ASPECT.
- THE DOMAIN OF THE FUNCTIONAL SPACE OF A SYSTEM NARROWS IN HIERARCHICAL ASPECT.

KEYWORDS: PSYCHOLOGY, SET, DEVELOPMENT, THEORETICAL MODEL.

Introduction

The set of a system is made up by fixed, neutral and variable set.

The control factors of the fixed set form adaptive behavior to the backstory of the system.

The control factors of the variable set form adaptive behavior to the outside of the system.

The control factors of the neutral set formed adaptive behavior between the present and the backstory of the system.

It is necessary for the system to adapt its past to its present in order to be sustainable. This process is realized through mutual complementarity of the fixed, neutral and variabile set of the system:

(1) $$\mathbf{Z = Zf\,.\,Zo.\,Zv\,,}$$
$$\mathbf{1 \le Z < e\,,\ 1\quad Zf < e\,,\ 1 \le Z\,o < e\,,\ 1 \le Zv < e,\ e \approx 2{,}72\,,}$$

where **Z** - set of the system,
Zf , Zo, Zv - fixed (f), neutral (o) and variable (v) set of the system.

Each system has background. That is why it has a fixed set $Zf > 1$.

At the starting point ($t \ge 0$) of the formation of a system its variable set Zv has a starting value, i. e. $Zv(t \ge 0) \approx 1$. The value of the set increases in the process of the individual development of the system.

The new system has no life experience. The behavior of the new system depends on its background, i. e. from its fixed set. There is no exchange of information between variable and fixed sets. Therefore the neutral set has a starting value of $Zo \approx 1$.

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The behavior of the fixed set Zf , of the variable set Zv and of the neutral set Zo is a function of various factors. These factors are associated with information from the past (Zf), the present (Zv) and the relationship between them (Zo).

The behavior of the system changes depending on the stage of its individual development. The behavior is determined by the direction of development of the fixed, neutral and variable sets. They have different orientation.

The following options are possible:

- Zf = var, Zo ≈ const, Zv ≈ const: the system reacts on instinct through its fixed set; the variable set practically does not participate in behavior.
- Zv = var, Zo ≈ const, Zf ≈ const: the system forms principally new behavior through its variable set; the fixed set practically does not participate in behavior.
- Zo = var, Zv ≈ const, Zf ≈ const: the system forms internal synchronization; the external behavior of the system is practically unchanged.

The behavior of Zf , Zo and Zv is relatively independent. The directions of Zf , Zo and Zv may be presented as a mutually perpendicular vectors (fig.1). They restrict the topological space of the set of a system.

Topological model

The vector product of the fixed Zf, the neutral Zo and the variable Zv set forms the vector of the set of the system:

(2) $$\vec{Z} = \vec{Zf} \times \vec{Zo} \times \vec{Zv},$$

where **Z -** vector of the set of the system in topological space,

$\vec{Zf}$, $\vec{Zo}$, $\vec{Zv}$ — a vector of fixed Zf , neutral Zo and variable Zv set.

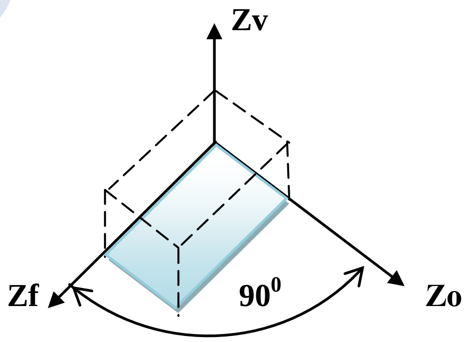

Fig.1. Rectangular coordinate system for representation of fixed Zf, neutral Zo and variable Zv sets of system in topological space

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The fixed set of a system was formed first. It includes information about the history of the system. The conditions under which the system exists, are other than its background.

A part of the fixed set is gradually transformed into a neutral set. The neutral set is a primary means for interaction of the system with the external environment.

The behavior of Zo is radical change (negative) of the behavior of Zf.

The purpose of the behavior can be represented by a vector. It is tangent to the trajectory of a continuous process.

Every point of the graph of a function is a fixed moment of the development. The point is a position of the perpendicular development on the basic direction.

It follows that the vectors of the fixed and of the neutral sets lie in perpendicular planes (fig.1).

From the vector product of the fixed and of the neutral sets it follows that:

(3) $$\vec{Zf} \times \vec{Zo} = Zf \,.\, Zo.\ \sin 90^0 = Zf \,.\, Z\,o.$$

The vector product of Zf and Zo forms the direction of Zv. The direction of Zv is a negation of the direction of Zo. Respectively the direction of Zv is a perpendicular to the direction of Zo.

Zv is the result of a double negation of Zf. The double negation is an expression of a development. The development has a certain direction.

If you change the sequence of the vector product (3), the result has a negative sign.

If you change the sequence of the vector product (2), the result has a negative sign.

The negative focus of progressive (normal) development is a retrogression.

Therefore the set of the system degrades beyond the natural sequence of evolution: Zf $\longrightarrow$ Zo $\longrightarrow$ Zv.

From (2) and (3) it follows that:

(4) $$\vec{Z} = Zf \times Zo \times \vec{Zv}\,.$$

It follows that the direction of Z is function of the direction of Zv.

If the behavior of the system is directed to this system, then:

(5) $$\vec{Z} = Zv \times Zo \times \vec{Zf}\,.$$

If the behavior of the system is directed to synchronization of Zv and Zf, then:

(6) $$\vec{Z} = Zv \times Zf \times \vec{Zo}\,.$$

Analytical model

The behavior of the system depends on the relative involvement of Zf and Zv in set Z on this system. Zf forms conservatism and Zv forms innovation in the behavior of the system.

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The ratio between Zv and Zf at a certain point by the individual development of the system can be represented as:

(7) $$Zv = b.\ Zf\ ,$$

where **Zv, Zf -** variable and fixed set of the system,
b - ratio between variable and fixed set at a certain point in the individual development of the system.

The external disturbing effects on the set of the system increases the proportion of Zv in the behavior of the system. Respectively the value of the coefficient b is growing.

The value of the coefficient b is reduced, if the system is:

- isolated from the environment,
- with reduced energy,
- with significant internal problems.

The value of the coefficient b is increased if the system is:

- energy and information open to the environment,
- with high energy,
- with minimal internal problems.

The interaction of the system with the environment can be illustrated with the electrolysis law of Michael Faraday:

(8) $$M.\ q^{-1} = c.\ A\ .\ n^{-1}\ ,$$

where **M** - quantity of substance, which is given to the electrodes as a result of the electrolysis,
q - quantity of electricity, flowed between the electrodes,
c - universal constant,
A - atomic weight of a chemical element, which is separated in the electrodes,
n - valence of the same chemical element.

The atomic weight expresses the essence of the chemical element, involved in the electrolysis. The valency characterizes its relationships with the environment. The ratio between A and n characterizes the fixed set of the chemical element, which participates in the process of the electrolysis.

The quantity of substance M characterizes the running state of the chemical element. The quantity of electricity q, which carries this substance, characterizes the running relation of the chemical element to the environment in which the electrolysis takes place.

The ratio between M and q expresses the variable set of the element involved in this process.

Therefore the constant c characterizes the relative share of the variable set in respect of the fixed set of the object.

A minor part of the variable set in respect of the fixed set is manifested in the following:

- many scientists are working on the clarifying of known concepts and a few of them aspire to achieve fundamentally new knowledge;

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- the majority of the population is engaged in self-handling and a small part of the people devotes to the science;
- the person's behavior is oriented primarily towards self-preservation and in lesser extent to self-development.

If Zo = 1, then (1) is transformed in the form:

(9) $$\mathbf{Z = Zf \,.\, Zv \,.}$$

It follows from (7) and (9), that:

(10) $$\mathbf{Z = b^{-1} .\, Zv^{2} \,.}$$

The equality (10) characterizes the set of system at a time of rapid change (e.g. stress). Then Zv has a little participation in the behavior of the system.

In the general case Zf cannot be sharply defined. The equality (10) presents Zf by Zv.

The evolutionary development of a system is a result of information opening of its set to the environment. This process increases the importance of Zv in the behavior of the system. Respectively coefficient b increases:

(11) $$\mathbf{b_{i} < b_{i+1} \,,}$$

where $\mathbf{b_i}$, $\mathbf{b_{i+1}}$ - average statistic ratios between sets Zv and Zf of a system of level of organization i and i+1.

The coefficient b expresses the current harmony in a specific system.

The specific value of the coefficient b of the concept depends on its content.

For example:

- The content of the concept "culture" has a relatively higher degree of resistance from the content of the concept "fashion". That's why the concept "culture" has a smaller value of coefficient b then the concept "fashion".
- The concept "national culture" has a higher level of resistance of it content than the concept "culture of behavior of an individuum." Accordingly the concept "national culture" has smaller coefficient b than the concept "culture of behavior of an individuum".

The systems have less variability compared to its subsystems. Every system possess smaller coefficient b compared to its subsystems.

The intensiv development of a system retards the individual development of its subsystems. That means that the accelerated increase of coefficient b of the system is a result of reducing of coefficient b for the subsystems that make up this system.

It follows from (10) and (11) that by Zv = const the set of system decreases in a hierarchical aspect:

(12) $$\mathbf{Z_{i} > Z_{i+1} \,,}$$

where $\mathbf{Z_i}$, $\mathbf{Z_{i+1}}$ - sets of a system of level of organization i and i+1.

The entropy of a system is logarithm of Z. Accordingly the inequality (12) expresses the decrease of the entropy of the set in hierarchical aspect. This means that the hierarchical development of a system increases its activity to its environment.

Functional space

The functional space of a system is an area of topological space, in which the set of the system functions normally.

The inequality (12) can be represented as a hierarchical process i of increase of the size of the vector $\overrightarrow{Zv}$ compared to the size of the vectors $\overrightarrow{Zf}$ and $\overrightarrow{Zo}$ (fig. 2). As a result the functional space of the system narrows gradually. The relative participation of Zv increases in the functional space and reduces the relative involvement of Zf. As a result of that the dynamic characteristic of the system is increased.

It follows from (4) that Zv forms the functional space of the set, i. e. the external factors modulate the set of a system.

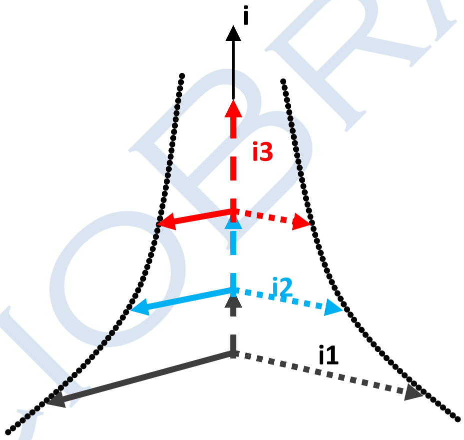

Fig.2. Diagram of variation of relative size of the vector of the variable set compared to the vectors of the neutral and fixed sets according to the organization levels i of the system: i1, i2, i3

Vector of the fixed set

Vector of the neutral set

Vector of the variable set

Sheath of the functional area (the area of behavior) of the systems which have consistently formed, i. e. evolutional levels of organization

Conclusions

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1. **The development of a system causes degradation of the structure of the system beyond the natural order of its elements (fixed → variable → neutral set).**
2. **The value of the variable set of a system decreases in a hierarchical aspect.**
3. **The domain of the functional space of a system narrows in hierarchical aspect.**