CORRELATIVE ANALYSIS AND OPPOSITION VARIABLES

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The article explores the correlates as the additional parameters for describing objects. At the same time,it reveals the essence of the concept of «correlative indicators», and describes three approaches to the correlative analysis – systematic, categorical, and parametric. We describe the parameters of the model at three levels: primary – not correlative, secondary – correlative, the parameters of the third level – the correlative parameters or functions. The article describes the complementary correlates and opposition correlates, as well as reveals the concept of opposition variables as a particular case of opposition correlates.

Keywords: correlative analysis, systemic analysis, modelling, parametric description, opposition variables, information models

The term «correlate» was introduced by Aristotle [1], which he uses to indicate a relative concept (the first correlative), the contents of which becomes clear when compared with some other concept (second correlate). This implies that there are at least two correlates, but their number may be greater. Therefore, there is reason to use the term correlates, bearing in mind their multiple origin. For example, the Cartesian coordinates are three related correlates describing the position of a point in space.

In the broad sense, the word correlate is used to describe factors or concepts, between which there are relationships. These factors relate to a common object, as its properties or attributes. [2] When considering models, correlates are the model parameters, between which there are relationships or connections. Correlative analysis includes three approaches: systematic, categorical and parametric.

1. System approach to correlative analysis includes the following principles.

1.1. All test events can be presented as models of systems that include elements [3], units [4, 5], communication [6], relationships [7].

1.2. The test object or phenomenon is in the microenvironment.

1.3. The test object and its microenvironment in the outer environment.

2. The categorical approach is based on the work of Aristotle's «Categories». The correlative analysis includes the following principles:

2.1. Main substantive part of the objects and phenomena can be denoted by the term «entity», which has a set of attributes that describe the basic properties of the entity and distinguish it from other entities.

2.2. An entity can be primary, which can be prepared from derivatives of secondary entity or entities (a mechanism for modelling).

2.3. What may be a comparable characteristic featureis called categories. Aristotle distinguishes the following categories [1 ch. 4] (*substance, quantity, quality, relation, place, time, position, state, action, or affection*). The concept of «relationship» is introduced by Aristotle, is different from the English term «relation». It consists of three words (Greek τοπροςτί – «is in relation to what») – «the way in which one thing can be linked to the other». This is a very important definition because it gives the difference between the «attitude» and «communication». Aristotle defines attitude as «the ability to communicate».

3. Parametric approach to correlative analysis includes the following principles:

3.1. All test objects and phenomena are natural information field from which the researcher on the basis of measurements and observations creates their parametric description.

3.2. Parametric descriptions of objects are not arbitrary, and have the form of various models.

3.3. The construction of the model is its primary identification with the help of information-determined parameters [3]. These parameters should be considered as primary attributes or parameters of the first level.

Object parameters are correlates, if relationships or connections are identified between them. These relationships or connections define the correlative dependence. A special case of such correlative dependence is correlation.

Initial model parameters typically do not include descriptions of the correlative dependence. The identification of the correlates is based on the secondary processing after the creation of the models and determination of the primary parameters. Identifying correlates is the process of finding the hidden or implicit properties, which are not included in the primary models. Correlates can be considered secondary parameters, or the parameters of the second level. Identifying correlate allows one to create additional options or parameters of the third level. These third-level parameters are referred to as correlative parameters.

Correlative parameters are the parameters, which are calculated on the basis of various mathematical equations of the initial correlates. The set of parameters of the second and third level increases the completeness of the description of the model and the object.

The number of the correlates may be two or more. There are two types of correlates: *opposition,* expressing «opposites» relationships («revenues – expenses», «advantages – disadvantages») and complementary («length – width of the land»). Correlates can express limits. For example, the category of «complexity», as a correlate, is opposed to the correlate of the category of «simplicity».

Opposition correlates allow the introduction of opposition variables [9]. The term «opposition variables» requires a fact or essence that these variables describe. Otherwise, the evaluation of complexity would be inadequate. Opposition variables of qualitatively different entities may be incomparable. Opposition variables is a rather broad concept. Therefore, they need to be specified in the framework of the correlative approach.

Opposition variables can be viewed as a couple of opposition correlates that have qualitative and quantitative values and reflect a property of an object, process, phenomenon or model.

Let us consider the requirements for the opposition variables.

Oppositional variables have to be measured in the same scale and in the same units. The opposition variables form bound pairs. Opposition variables can be expressed in quantitative values and qualitative attributes. For example, the qualitative characteristics of the «complexity – simplicity», «presence – absence» pairs. They may be indicated by faceless numerical values «0–1». If we designate one opposition variable A and the second B, the probability P is defined as

$$P(A \text{ or } B) = 1.$$

Correlates allow for comparative degrees: difficult, more difficult, the most difficult. Opposition variables exclude the comparative degree («good – better», «sure – highly-sure»). Logically they comply alternatives, which makes it possible to apply the logic of the first order.

The peculiarity of the term «opposition variables» in that it is not an independent entity, and is related to another entity. This term requires an object of relation, with respect to which these variables are introduced. Otherwise, the analysis with the opposition variables is inadequate.

Let us consider how the correlates affect the formation of the model, for example, the information model.

The *information model* [8, 10], (*IM*) – a formalized, interconnected set of identifiable and certain information parameters, which reflects not only the basic properties of the modelingobject, but also the most significant relationship between them and the environment. Thus, the information model of the object (*IMO*) is a formal description that includes: a set of parameters (*P*), connection (*C*) between the parameters, the most significant relationship (*R*).

$$IMO = F(P, C, R).$$

This approach is referred to as parametricand such information model – as parametric. Correlative approach involves additional analysis, which aims to identify correlates of (*Cr*) and relationship types (*ToR*) between the correlates. It leads to a correlative information object model (*CrIMO*).

Using a correlative relationship between the correlates enables the creation of *derivative correlative parameters* (*DCP*). As a result, the correlative information model of the object is given by:

$$CrIMO = \mathrm{F}(P, C, R, [C, ToR, DCP]).$$

In the square brackets,we put additional information that details the structure and increases the complete description of the object of analysis or research.

What does the correlative analysis give us? First, the presence of one correlate implies a search for another correlate. Only then can we analyze the object to describe these correlates. The existence of relations allows to form an additional parameter *DCP*. The *DCP* allows to generate additional parameters of the object, which remain unknown and unused in the noncorrelative parametric approach.

Consider the area of real estate. Complementary correlates «width» and «length» of land for different sections are not an element of comparison and do not allow for any assessment [11]. However, their product gives the *derived correlative indicator* «area», which is comparable for different strips of land. The quantitative value of the index multiplied by the statutory market value per unit gives an economic assessment of the value of the land. The cost of land makes it possible to compare them and engage in transactions in the market. Thus, the correlative indicators provide the opportunity to receive comparable general characteristics associated with economic categories based on the individual characteristics of objects.

Consider the application of the correlative model to the SWOT-analysis. Essentially the SWOT-analysis pairs «strengths – weaknesses», «opportunities – threats» are opposition correlates that complement each other . This makes it possible to display graphically the opposition correlates. If these figures cancel each other out, we get a balanced state for the organization – the central rectangle (the SWOT-matrix). If the opportunities and strengths outweigh, we get a competitive state – the upper right-hand rectangle. If the threats and

weaknesses outweigh, then we are in anon-competitive state – the lower rectangle.

Thus, the correlative model provides current information on the state of the object and the information to make the necessary decisions. [12]

Findings

Using the correlative approach provides the ability to create additional object characteristics that increase the completeness of its description and justification in decision-making. Using the correlative approach allows for additional comparisons of objects, their states, and thus extends the possibility of evaluation and comparison of different objects, which increases the validity of decisions.

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