## The Measurement and Estimation Scale Unification

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The development of a new paradigm of integral utility evaluation of an object of mixed nature (OMN) is a subject activity process in the field of reproducing of the state of educational and teaching activities (ETA) of the institutes of higher education in way of cognitive images, and an active transformation of these taxons for the purpose of creating of a definite vision of the reality. For acquisition of knowledge about the status or behavior of the higher education system (HES) expressed and organized in something like a complex of cognitive forms and relations be-tween them, there is a need to establish the influence of the content and essence categories on the ETA utility evaluation. The thought reproduction of the necessary aspects and principles of real activity in their natural correlation and interdependence is the cognition of the HES essence.

The movement to the essence begins with the establishment of determining variables and relations between them in a concrete educational institution. These basic factors, relations are reproducing in the consciousness the actual correlations and other characteristics of the ETA of an institution of higher education. The expression form of the ETA essence of a concrete educational institution is the complex utility evaluation of this activity which includes values of weighted unified variables and their interactions. However, the OMN cognition doesn't stop at the ETA essence analysis, but under the impact of practice demanding perfect knowledge about the HES behavior it proceeds to the explanation of all interactions and due to changes of activities of institutes of higher education. The taking account of all internal and external interdependence of variables in the subsystem status definition causes the formation of the whole and their change into the component parts of the unified HES.

The Content as a dialectics category means a complex of all interactions and changes caused by them and relevant to the ETA of the high school. Speaking about the content of the generalized utility estimation it should be emphasized that it includes the internal interactions between the weighed indicators as well as the interdependences which exist between homogeneous factors concerning various educational institutions [1].

It becomes obvious that the preservation of all mutual interconnections between the variables makes it possible to objectify the cognition formula of OMN, and to expand the bounds of the aggregate utility estimation of the ETA of high schools in the whole HES. Then the integrated (aggregate, whole) criterion of utility estimation is based on the principle of general correlation which is not simply specific for a concrete educational institution, but as a conceptual char-acteristic is peculiar to the other educational institutions without reference to that how much better the educational space participants are aware of the importance of universal interdependences, because the correlation between the relevant indicators and the development of uniform system of higher vocational training (HVT) really don't exists separately.

Let's define the study problem of diverse connections of variables, measured and estimated in various metrological and semantic scales, as a creative problem since its solution lies outside of the reference set of diagnostic representations. In this case it is impossible to find the problem solution for result estimation of the ETA by deductive way, because such cognition method of monitoring mechanism cannot lead out of the initial reference set of educational indicators. However, the intuition can do it, one of the major preconditions of which is the simultaneous perception of variables values of reference representation, fusion of hybrid values into a single image.

As the educational reality is extremely various, so is the world of images representing it not less various too. One and the same difficult OMN can generate a set of cognitive eidetic images located on different truth degrees. The image of the ETA of high school as a subjective reflection of real activity of an educational institution is produced by people; it is represented in the character and symbolic form and acts as result of creative activity of the subject. The major characteristics of cognitive images of high schools are:

- The subjective reflexion of the initial definition of the ETA status by an eidetic image
  The ideal reflexion of the reality
- The image content is objective; it is represented as a whole OMN. The objective reference means that the eidetic image as a reflection of high school activity is in a definite relation to it, and the way of relevance of this image to the OMN is that what may be designated as a objective sense of taxon
  The image depends not only on the OMN and is attributed not only to it, but to the researcher producing the criterion for the ETA

All above mentioned indicates the complex nature of cognitive image as an ideal estimation of its relation to the OMN by an individual or joint researcher. In this respect too, within the development of paradigmatic grounds for utility reconstruction is taking place the change of cognition social nature having a determining effect on the estimation culture formation.

utility estimation too.

The ETA representation image and the basic definition of status of an educational institution in the HES as well as the form and content categories in philosophy are opposites which are in unity, unlike bands of the same thing. The degree of similarity of the OMN status and the high school image is defined by their conformity which defines the two-sided process which presupposes the movement from object to knowledge and from concept to reality. The true estimation finds its completeness only in this two-sided conformity of the real ETA of high schools and its conceptual model. The conformity establishment is activity of the subject which relies on concrete hypotheses, represents the ETA in a concrete language, is guided by some kind of motive, relies either on this or on that paradigm of utility reconstruction. The integrated utility estimation (IUE) of education is here a result of creative work of the subject and contains not only knowledge about HES, but about the observer, his purposes, intentions and responsibility.

Therefore, the variety of realities, multiplicity of images, inexhaustibility of match making ways indicate that every time is reached the true of defined type and level: the variety of the IUE types underlies the variety of practices which role is important for establishment of the greater number of correlations between relevant variables. So proceeding from the idea of sociocultural conditionality of cognition of the high schools ETA, it is necessary to develop the integrated criterion of the utility estimation based on the thesis about the variety of knowledge and practice. The image of true develops in this case on the basis of the comparative analysis of various hypotheses fixed concerning practical activities. However, before taking on the development of IUE criterion ИОП of the OMN, characterizing the content of high school ETA in the whole HES, it is necessary first of all to reduce the heterogeneous hybrid signs to the same "common denominator".

The values of the original variables are represented in two scales:

• The metrological scale, when the indicator value  $\boldsymbol{\chi}_{i}$  changes over the range

 $x_{\min j}$  to  $x_{\max j}$ ;

 The semantic scale, when the range of boundary values is worked out by experts over the range

$$x_{\min j \ ext{to}} \ x_{\max j}$$

Since the values of hybrid variables measured and estimated by cognizing subjects are determined in various scales and have different dimensionalities (for quantitative factors), wide changes spreads of qualitative characteristics, so for the subsequent generalizing it is necessary to transform the diagnosing values of the original features into their nondimensional unified analogs in result of which all symptoms will be estimated in the k-level and interval scale (fig. 1). In order that the original scale may be in conformity with the unified scales, we will use the following figure stated below.



Let's work out the equation of straight line (AB): A ( $x_{\min j}$ ; 1) and B ( $x_{\max j}$ ; k). Then

the equation of straight line passing through the points A and B will look like:

$$\frac{k_{j}-1}{k-1} = \frac{x_{j}-x_{\min j}}{x_{\max j}-x_{\min j}}.$$

It follows from (1):

$$k_{j} = \frac{x_{j} - x_{\min j}}{x_{\max j} - x_{\min j}} (k - 1) + 1.$$
<sup>(2)</sup>

This expression under  $k_{\min}=1$  coincides with

the analogous formula resulted from [1] and under A (  $\pmb{x}_{\min}$  ; 0) and B (  $\pmb{x}_{\max}$  ; k) with the

formula presented in [2]:

$$k_{j} = rac{x_{j} - x_{\min j}}{x_{\max j} - x_{\min j}} k_{i} \ 0 \leq k_{j} \leq k.$$
 (3)

The formulas (2) and (3) are correct, if under the growth of  $\mathcal{X}_i$  value increases the utility degree

 $k_i$  too. Sometimes under the increase of the

 $oldsymbol{\mathcal{X}}_{j}$  value the utility level of factor decreases. In

## this case the expression [1] is correct:

k

k

$$x_{\max j} = \frac{x_{\max j} - x_j}{x_{\max j} - x_{\min j}} (k-1) + 1$$

Let certain educational institution be characterized by six  $\mathcal{X}_i$  features. The values of these fac-

tors are given in the eighth row of the table 1.

The first three features (1, 2, and 3) are fixed as their quantitative values, but in different units of measure. The features (4, 5, and 6) have not a numerical measure and are fixed in various ordinal scales. The feature 4 is fixed as a threepoint qualitative scale; the feature 5 is fixed as a ten-level ordinal scale; the feature 6 is fixed as a hundred-level semantic scale.

It is required to convert all dissimilar intensity
 values of these features to the analog quantities which have five qualitative levels (k=5). For conversion we use the formula (1).

$$x_j = \frac{(x_j - x_{\min})(5-1)}{(x_{\max} - x_{\min})} + 1.$$

$$x_{1} = \frac{(x_{j} - x_{\min})(5 - 1)}{(x_{\max} - x_{\min})} + 1 = \frac{(470 - 20)(5 - 1)}{(50 - 20)} + 1 = 4, 6 \approx 5;$$

and un-  
h the 
$$k_6 = \frac{(x_j - x_{\min})(5-1)}{(x_{\max} - x_{\min})} + 1 = \frac{(70-1)(5-1)}{(100-1)} + 1 = 3,88 \approx 4.$$

The received fractional values of qualities we round to whole numbers, and the results we will place in the ninth (fractional qualities) and in the tenth (whole) rows of the table stated above.

The synthetic (complete) base k makes it possible to reduce the set of various scales available for the researcher to the unified estimation scale by uniting the diagnosing indicators (factors, features) on the unified principle. Thanks to

	1		Six features					
Table 1	2		1	2	3	4	5	6
	3		Quantity			Quality		
	4		Unit of measure			Quality scales		
	5		Piece	Percent %	Square meter	1-3	1-10	1-100
	6	max	50	100	30	3	10	100
	7	min	20	40	5	1	1	1
	8	$x_{j}$	47	55	25	2	8	70
	9	$k_{j}$	4,6	2	4,2	3	4,1	3,79
	10	$[k_j]$	5	2	4	3	4	4



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this fact it is possible to explain the quantitative and qualitative characteristics of original variables from the same positions, to find out the interrela-tion between them and to fix place, role and value of every essential feature. Moreover, the original factors transformed to the complete base are out of dimensions, become correlative and allow their further generalizations.

Thereby the cognizing subject having reached the base (2) acting as the base of scales, guided by it starts to explain all other sides and relations which are essence and content of the analyzed ob-ject of random nature. The established formalization allows for behavioral systems reaching the required transformation fidelity of factors of the numerical and non-numerical nature to the uni-form base.

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## Literature

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