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'The Value Map' – Graphic Analysis Proposal

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Abstract:

Purpose: *This paper presents the Rybaczuk Graphic Method (RGM), an advanced graphical approach to the visualization and analysis of multidimensional data structures. The method is applied to construct a value map based on the seven value types of Schwartz's value model, providing a framework for examining the relationships between objects and their associated features.*
Design/methodology/approach: *The RGM represents feature points uniformly along the circumference of a unit circle, while object points are positioned within the circle. Standardized feature values ((x_{ij})) for each object (i) and feature (j) are used to determine the corresponding geometrical distances ((d_{ij})) between object and feature points. An optimization algorithm minimizes discrepancies between the empirical feature values and their geometrical representations, subject to constraints that keep feature points on the circumference and object points inside the circle.*
Findings: *The method provides a graphical representation of multidimensional data that facilitates the examination of structural configurations and the identification of relationships among objects, individual features, and pairs of features. Its application to Schwartz's value model illustrates how the RGM can be used to represent and explore the structure of value-related data.*
Practical implications: *The RGM offers a potential analytical tool for researchers investigating value structures and other multidimensional phenomena. Its graphical representation may support the interpretation of complex relationships that are difficult to identify using conventional numerical presentations alone.*
Originality/value: *The paper presents an optimization-based graphical method for representing multidimensional data and demonstrates its application to value mapping based on Schwartz's value model. The approach integrates standardized empirical measurements with geometrical constraints to provide an interpretable representation of object–feature relationships.*

Keywords: *Rybaczuk Graphic Method (RGM), multidimensional data visualization, value map, Schwartz's value model, graphical data analysis, optimization.*

JEL Classification: *C38, C61, C65, D91.*

Paper type: *Research article.*

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1. Introduction: Types and Dimensions of Values in the Approach by Shalom H. Schwartz

This paper constitutes an example of searching for solutions with regard to graphic presentation of multidimensional data relating to the value system. It is aimed at compiling 'the value map' at the culture level. Seven value types – described by Schwartz (1994, 1996) – have been included (value types at the individual level, which have been described by the same author in the 10-element model, are provided in brackets):

- Conservatism – commitment to cultural and religious customs and ideas (tradition), restraint of impulses and actions which are socially unacceptable (conformity), stability and protection of the society, relationships with other people and oneself (security);
- Hierarchy – control over people and resources (power);
- Mastery – competence demonstrated according to social standards (achievement);
- Affective Autonomy – pleasure, sensuous gratification (hedonism), excitement, novelty, challenge (stimulation);
- Intellectual Autonomy – independent thought and action (self-direction);
- Egalitarian Commitment – tolerance and protection for all people and entire nature (universalism);
- Harmony – preserving and enhancing the welfare of close friends and relatives (benevolence).

Three dimensions comprising the above-mentioned value types are indicated by Schwartz (2003): 'Conservatism – Affective and Intellectual Autonomy', 'Hierarchy – Egalitarian Commitment', and 'Mastery – Harmony'. Value types belonging to a particular dimension are opposite to each other; thus, they give direction to different ways of solving important social problems.

Data from the publication by Schwartz (1994) Beyond individualism/collectivism: New cultural dimensions of values have been used in the graphic presentation below (those data were collected about 30 years ago; however, they constitute good material for illustrating the RGM graphic method). Those are average importance rates for seven value types across 39 study groups from different countries. See Table 7.3 (Schwartz, 1994, pp. 112-115) and Supporting Table S1. The source is included in this paper with the author's consent.

In some cases, additional criteria such as religious confession were taken into consideration. In such case, two or more study groups were derived from a particular country. Value types were singled out on the basis of 56 individual values measured on a 9-point scale: -1 means a value which is opposed to guiding principles in life; 0, 1 and 2 – a value which is neutral to guiding principles in life;

3 and 4 – a value which is quite important for guiding principles in life; 5 and 6 – a value which is closely-related (or very closely-related) to guiding principles in life; 7 – a value which is the most important principle in life. One value type comprises a few or a dozen or so values which form a basis for determining the rate for the particular value type.

This paper is composed of two sections: the first one – describes the method of graphic presentation of multidimensional data structure (this description has been included in previous publications, see (Rybaczuk, 2002; Rybaczuk *et al.,* 2007); this article presents its English language version), and the second one – depicts the application of this method for building the 'value map'.

2. Method of Graphic Presentation of Multidimensional Data Structure (RGM)

The RGM graphic method allows the projection resulting in the image of multidimensional data structure on the plane (Rybaczuk, 2002; Rybaczuk *et al.,* 2007). The image of data structure which is obtained using the proposed method, facilitates to:

- capture any clusters and determine their clearness;
- evaluate intercorrelations between features;
- evaluate the share of particular features in the formation of clusters;
- distinguish between the states of study objects.

3. Designations and Assumptions of the RGM Method

P_i (i=1, 2, ..., n) means the i-th study object from among a set of n objects $\{P_1, P_2, ..., P_n\}$, and $\hat{P}_i$ – means its image on the plane (i=1, 2, ..., n). X_j means the j-th feature from among a set of k features $\{X_1, X_2, ..., X_k\}$ which describe objects, and $\hat{X}_j$ means its image on the plane (j=1, 2, ..., k). Data obtained in the course of studies are generally recorded in the form of a rectangular tabular array where features constitute columns and study objects (cases) constitute rows. Data relating to n objects described with k features is recorded as follows:

$$\mathbf{X} = \begin{bmatrix} \mathbf{x_{11}} & \mathbf{x_{12}} & \cdots & \mathbf{x_{1k}} \\ \mathbf{x_{21}} & \mathbf{x_{22}} & \cdots & \mathbf{x_{2k}} \\ \vdots & \vdots & \cdots & \vdots \\ \mathbf{x_{n1}} & \mathbf{x_{n2}} & \cdots & \mathbf{x_{nk}} \end{bmatrix}$$

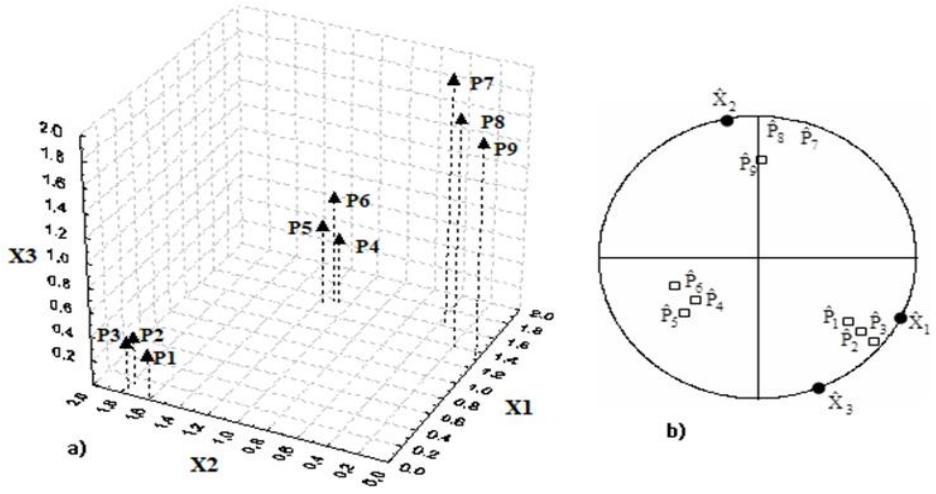
where x_{ij} – means a value of the j-th feature for the i-th object.

At the stage of study result analysis, hypothesizing and making inferences, it is essential to learn the multidimensional data structure understood as relationships:

- feature-feature (similar features – highly correlated, dissimilar features – poorly correlated);
- object-object (similarity of objects – similar objects in the space of features are located close to each other, and those not similar are distant);
- object-feature (a level of the feature for particular objects, their influence on the grouping of objects into clusters).

S means the data structure in the k-dimensional space of features (Figure 1). The method is aimed at obtaining the S^* image of the S structure on the plane in a circle with a radius of 1.

Figure 1. *Exemplary illustration of structures: a) S and b) S^* of multidimensional data.*



P1,…,P9 – objects in the space of features;

X1,…, X3 – features describing objects;

$\widehat{P}_1, \ldots, \widehat{P}_9$ – images of objects;

$\widehat{X}_1, \ldots, \widehat{X}_9$ – images of features.

Source: *Rybaczuk, 2002; Rybaczuk et al., 2007*

The images of objects are to be optimally, according to the adopted criterion, arranged as points in the interior of the circle, and the images of features – as points on the circle. With such assumption regarding the arrangement of object and feature images it can be seen that a distance between the feature image and the object image cannot exceed the circle's diameter of 2. To obtain comparability of S and S* structures, the normalization of data contained in the X tabular array is conducted so

that normalized z_{ij} values (of the j-th feature for the i-th object) are in the range [0;2]. The following method of normalization meeting this requirement can serve as an example:

$$(1) \qquad z_{ij} = \frac{x_{ij} - \bar{x_j}}{\max_i |x_{ij} - \bar{x_j}|} + 1 \qquad (i = 1,2,\dots,n; \quad j = 1,2,\dots,k)$$

Where $\bar{x}_j$ is an arithmetic mean of the j-th feature. This method of normalization transforms the minimum value of the feature into 0, and the maximum value into 2.

The post-normalization values of features are recorded in the Z tabular array, and distances between objects in the space of normalized features in the symmetrical D tabular array:

$$\mathbf{Z} = \begin{bmatrix} z_{11} & z_{12} & \dots & z_{1k} \\ z_{21} & z_{22} & \dots & z_{2k} \\ \dots & \dots & \dots & \dots \\ z_{n1} & z_{n2} & \dots & z_{nk} \end{bmatrix}, \mathbf{D} = \begin{bmatrix} d_{11} & d_{12} & \dots & d_{1n} \\ d_{21} & d_{22} & \dots & d_{2n} \\ \dots & \dots & \dots & \dots \\ d_{n1} & d_{n2} & \dots & d_{nn} \end{bmatrix}$$

Figure 1 shows the interpretation of data structure image on the plane.

Distances between images of the i-th $\hat{P}_i$ object and the j-th $\hat{X}_j$ feature are designated $\hat{z}_{ij}$ and recorded in the tabular array $\hat{\mathbf{Z}}$ $(i = 1,2,\dots,n; j = 1,2,\dots,k)$, and distances between images of the i-th $\hat{P}_i$ object and the l-th $\hat{P}_l$ object are designated $\hat{d}_{il}$ and recorded in the symmetrical tabular array $\hat{\mathbf{D}}$ $(i = 1,2,\dots,n; l = 1,2,\dots,n)$,

$$\hat{\mathbf{Z}} = \begin{bmatrix} \hat{z}_{11} & \hat{z}_{12} & \dots & \hat{z}_{1k} \\ \hat{z}_{21} & \hat{z}_{22} & \dots & \hat{z}_{2k} \\ \dots & \dots & \dots & \dots \\ \hat{z}_{n1} & \hat{z}_{n2} & \dots & \hat{z}_{nk} \end{bmatrix}, \hat{\mathbf{D}} = \begin{bmatrix} 0 & \hat{d}_{12} & \dots & \hat{d}_{1n} \\ \hat{d}_{21} & 0 & \dots & \hat{d}_{2n} \\ \dots & \dots & \dots & \dots \\ \hat{d}_{n1} & \hat{d}_{n2} & \dots & 0 \end{bmatrix}$$

Figure 2 shows the essence of constructing the S* image of the S data structure.

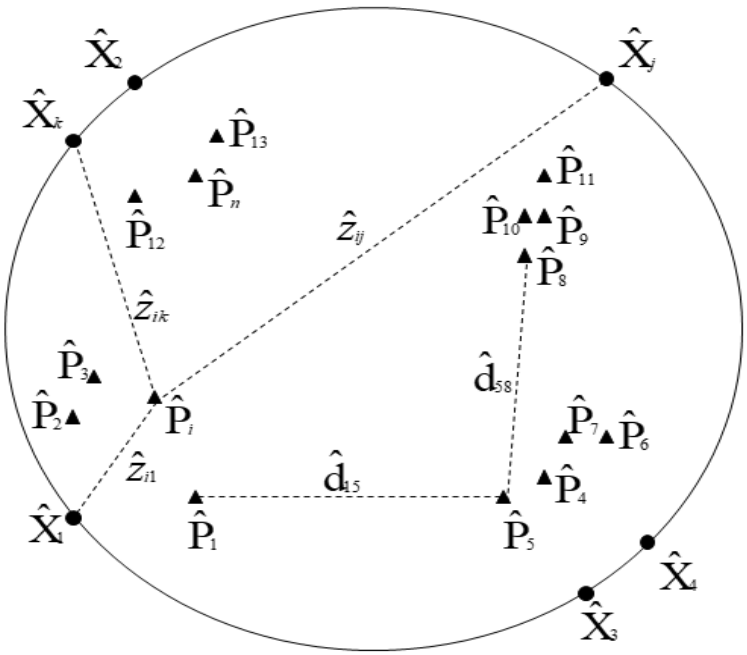
3.1 Optimization Algorithm Description

It follows from the adopted assumptions and designations that full concordance of S and S^* structures is reached, when $\mathbf{Z}$ and $\hat{\mathbf{Z}}$ tabular arrays are equal; i.e., $z_{ij} = \hat{z}_{ij}$ for $i = 1.2.\dots,n$ and $j = 1,2,\dots,k$. Due to significant reduction in the dimension of space when converting the k-dimensional feature space onto the plane, it is generally impossible to obtain such equalities.

The presented algorithm is aimed at minimizing differences between elements from $\mathbf{Z}$ and $\hat{\mathbf{Z}}$ tabular arrays, which enables to obtain possibly the most exact view of the S structure on the basis of visual assessment of its S^* image. The algorithm assumes

that the centre of circle with a radius of 1 is located in point (0,0) of the Cartesian coordinate system.

Figure 2. *Interpretation of the data structure image (object-object, feature-feature, object-feature relations).*



$\hat{X}_j$ – image of the j-th feature,
$\hat{P}_i$ – image of the i-th object,

$\hat{d}_{ij}$ – distance between images of the i-th and j-th objects,
$\hat{z}_{ij}$ – distance between images of the i-th object and the j-th feature (equivalent to the normalised value of the j-th feature for the i-th z_{ij} object).

Source: *(Rybaczuk, 2002; Rybaczuk et al., 2007).*

It has been assumed that pairs of numbers $(y_{i1}, y_{i2}), i = 1, 2, \dots, n$ constitute coordinates of the image of the i-th object, and pairs of numbers $(\hat{y}_{j1}, \hat{y}_{j2}), j = 1, 2, \dots, k$ – coordinates of the $\hat{X}_j$ image of the j-th feature. It has been assumed that $\hat{\mathbf{Z}}_{\mathbf{ij}}$ elements of the $\hat{\mathbf{Z}}$ tabular array are Euclidean distances defined as:

$$\hat{z}_{ij} = \sqrt{(\hat{y}_{j1} - y_{i1})^2 + (\hat{y}_{j2} - y_{i2})^2} \; (i = 1, 2, \dots, n; j = 1, 2, \dots, k) \tag{2}$$

The following criterion of minimizing the divergence between S and S^* structures has been adopted:

$$(3) \qquad F(Z, \hat{Z}) = \sum_{i=1}^{n} \sum_{j=1}^{k} (z_{ij} - \hat{z}_{ij})^2 = \text{minimum}$$

with restrictions:

$$(4) \qquad y_{i1}^2 + y_{i2}^2 \leq 1, i = 1,2, \dots, n,$$
$$(5) \qquad \hat{y}_{j1}^2 + \hat{y}_{j2}^2 = 1, j = 1,2, \dots, k.$$

Restrictions assure that feature images are positioned on the circle, and object images – in its interior.

3.2 Projection Quality Evaluation (Concordance of S and S^* Structures)

The reached minimum value of the F(D) function is not a good measure of the degree of structure concordance as it depends on the number of objects and features.

A. Evaluation of Feature-Feature Structure Concordance

The concordance between the feature-feature structure in the k-dimensional feature space and its image on the plane is equivalent to the concordance between linear correlation coefficients in terms of sign and absolute value for each pair of features (z_{*j}, z_{*l}) and corresponding pair of feature images $(\hat{z}_{*j}, \hat{z}_{*l})$ $(j, l = 1, 2, \dots, k)$. If the power of mutual correlation between features and their images is similar for corresponding pairs, then proper inference with regard to the correlation of features can be made on the basis of data structure image obtained on the plane.

Feature images which are located close to each other (e.g. $\hat{X}_3, \hat{X}_4$ features in Figure 2) indicate strong positive correlation. When feature images are located on the circle on the opposite sides with respect to the circle's centre (e.g., $\hat{X}_2, \hat{X}_3$ features in Figure 2), they have a strong negative correlation.

When feature images are located on the circle at a right angle with respect to the circle's centre (e.g., $\hat{X}_1, \hat{X}_4$ features in Figure 2), they are poorly correlated.

B. Evaluation of Object-Object Structure Concordance

Euclidean distances between the i-th and the j-th objects described with normalized features in the k-dimensional feature space is designated δ_{ij}:

$$(6) \qquad \delta_{ij} = \sqrt{\sum_{l=1}^{k} (z_{jl} - z_{il})^2} \quad (i = 1, 2, \dots, n; j = 1, 2, \dots, n)$$

δ_{ij}^* means a distance between images of the i-th and the j-th objects on the plane:

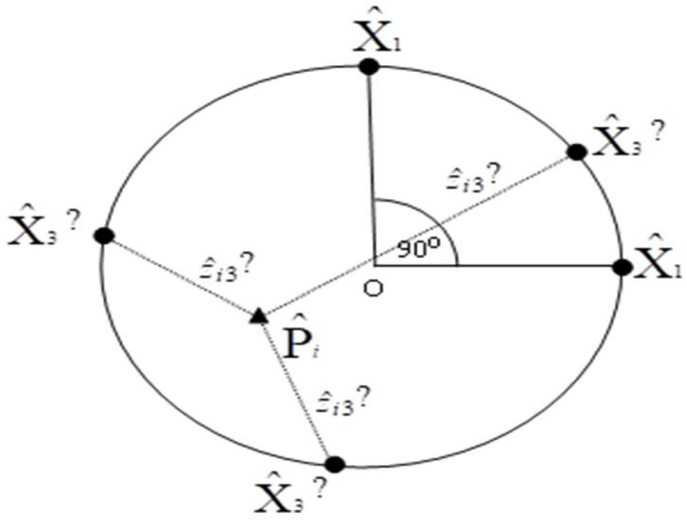
$$(7) \qquad \delta_{ij}^{*} = \sqrt{\sum_{l=1}^{2}\left(y_{jl} - y_{il}\right)^{2}} \quad (i = 1, 2, \ldots, n; j = 1, 2, \ldots, n)$$

The r_{dd} linear correlation coefficient between δ_{ij} and δ_{ij}^{*} distances can be used to evaluate the concordance of structures. The closer to one the correlation coefficient, the more concordant structures of objects and their images. This simple measure of concordance can be used for comparative analysis of results of graphic presentation of structures obtained by different methods (e.g., multidimensional scaling, principal component analysis, presented RGM method).

C. Evaluation of Object-Feature Structure Concordance

The presence of features that show poor correlation with other features in the S structure can result in quite random distribution of their images in the S* structure. For example, with orthogonal (totally uncorrelated) X_1, X_2, X_3 features, the images of two of them (e.g., X_1 and X_2) will be distributed on the circle so that there is a right angle between line segments joining the circle's centre and position points of feature images. The position of the image of the third of those features (e.g., X_3) on the circle will be quite random, and in consequence a distance between the P_i object and the X_3 feature will also be random (Figure 3).

Figure 3. *Impact of random placement of the feature object* $\hat{X}_3$ *on the distance* $\hat{z}_{i3}$ *from the* $\hat{P}_i$ *object image.*



Source: *(Rybaczuk, 2002; Rybaczuk et al., 2007).*

The indication of features whose images are located randomly on the circle will prevent from making false inferences with regard to the S^{*} structure images. The proposed RGM graphic method allows easy identification of such features. The r_{zz}

linear correlation coefficient between z_{*j} and $\hat{z}_{*j}$ for each of features (j=1, 2, ..., k) can be adopted as a quality measure of fitting of images for each of k features describing object images.

Any features for which the obtained correlation coefficients are significantly lower than +1 (e.g.; below 0,7) constitute features confounding the structure image. The elimination of selected features from the currently analysed set leads to 'viewing' the data structure at different views (which is similar to viewing the object structure in the set of various factors in the principal component analysis).

4. Application of the RGM Graphic Method for Building the 'Value Map'

When using the RGM graphic method, the following assumptions should be made:

- value types (features) are projected into their images on the circle;
- study groups – singled out by country of residence (plus other criteria in some cases) – are projected into their images in the interior of the circle.

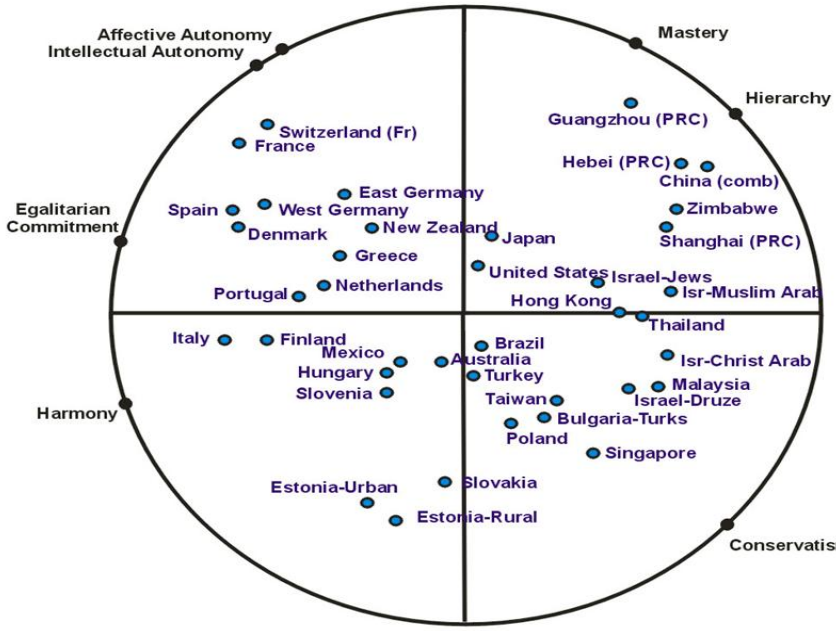
When interpreting relationships presented graphically, it should be kept in mind that:

- the smaller the distance between images of features/value types on the circle, the more similar the importance of those value types (the stronger the positive correlation between the importance rates for value types);
- features/value types of which images are located on the opposite sides in relation to the centre of the circle differ the most in the importance;
- the smaller the distance between images of objects/groups, the more similar the study groups with regard to all features/value types being analysed;
- the smaller the distance between the image of a feature/value type and the image of an object/group, the stronger the importance of this particular value type in the particular study group.

The method of normalization in relation to the arithmetic mean of obtained importance rates for seven value types has been applied (different type of normalization, see (Rybaczuk, 2002; Rybaczuk *et al.,* 2007). It allows observing value types in a relative manner; i.e., the one which enables to make a description as 'stronger importance of a particular value type' – 'weaker importance of a particular value type'.

Thus, it is easier to catch relationships between 'features', 'objects' and 'objects – features'. It should be emphasized that the statement 'value type of stronger importance' does not mean in this case 'strongly important value type', in which case the rates are close to 7 (7 is maximum importance rate for an individual value).

Figure 4. *'Value map' created using the RGM method.*



Note: *The data has been transformed (average importance rates for each value type) so that closer distance between the value type and the study group projected in the interior of the circle means stronger importance of the particular value type in the particular group.*
Source: *Own elaboration based on Schwartz (1994).*

Figure 4 presents the structure of groups and seven value types describing them: 'Conservatism', 'Hierarchy', 'Mastery', 'Affective Autonomy', 'Intellectual Autonomy', 'Egalitarian Commitment' and 'Harmony'. When analysing relationships in the 'feature – feature' ('value type – value type') dimension, it should be noted that the 'Affective Autonomy' value type is related to the 'Intellectual Autonomy' value type.

It is indicated by their location close to each other on the circle (small distance between position points of feature images shows greater positive correlation between importance rates for those value types). The correlation coefficient between those two value types is r=.49 (both this one and those correlation coefficients between value types which are provided below are taken from the publication (Schwartz, 1996, p. 102-106).

Strong relationships between 'Hierarchy' and 'Mastery' value types (r=.41) and between 'Egalitarian Commitment' and 'Harmony' value types (r=.39) (value types projected on the circle are located in a relatively small distance) have been noted. The 'Egalitarian Commitment' value type is more strongly (and positively)

correlated to ‘Affective Autonomy’ (r=.21) and ‘Intellectual Autonomy’ (r=.41) value types as compared to the ‘Mastery’ value type.

In the case of this last value type, the coefficients of correlation with the ‘Affective Autonomy’ (r=-.36) and the ‘Intellectual Autonomy’ (r=-.02, n.s.) have already negative signs (see relevant distances).

The stronger the importance of the ‘Conservatism’ value type, the weaker the importance of ‘Affective Autonomy’ (r=-.80) and ‘Intellectual Autonomy’ (r=-.74) value types (features/ value types of which images are located on the opposite sides with respect to the circle’s centre vary in the importance the most; correlation coefficients have minus signs in this case).

At the same time, the stronger the importance of the ‘Conservatism’ value type, the weaker the importance of the ‘Mastery’ (r=-.26) value type, whereas this relationship is not that strong (a distance between the ‘Conservatism’ and ‘Mastery’ value types is shorter than a distance between ‘Conservatism’ and ‘Affective and Intellectual Autonomy’ value types).

On the other hand, the location of ‘Conservatism’ and ‘Hierarchy’ (r=.34) value types on the circle (a shorter distance between ‘Conservatism’ and ‘Hierarchy’ value types than between ‘Conservatism’ and ‘Mastery’ value types on the circle is observed) indicates the positive correlation.

In turn, the higher the importance of the ‘Hierarchy’ value type, the lower the importance of ‘Affective Autonomy’ (r=-.17, n.s.) and ‘Intellectual Autonomy’ (r=-.35) value types. Such types of relationships may not be revealed in the case of the ‘Mastery’ value type. This value type is ‘closer’ to ‘Affective Autonomy’ (r=.37) and ‘Intellectual Autonomy’ (r=-.02, n.s.) value types.

The ‘Conservatism’ value type is opposite (negative correlation) in relation to ‘Egalitarian Commitment’ (r=-.54) and ‘Harmony’ (r=-.16, n.s) value types, whereas in the first case the relationship is stronger (see relevant distances between those three value types projected on the circle). If the analysis with respect to ‘Intellectual Autonomy’ and ‘Affective Autonomy’ value types is conducted, their stronger correlation with the ‘Egalitarian Commitment’ (r=.41; r=.21) than with the ‘Harmony’ (r=.34; r=-.16, n.s.) value type is observed.

The last comparison concerns four value types: on the one hand ‘Hierarchy’ and ‘Mastery’, and on the other hand – ‘Harmony’ and ‘Egalitarian Commitment’. The stronger the importance of the ‘Harmony’ value type, the weaker the importance of ‘Hierarchy’ (r=-.56) and ‘Mastery’ (r=-.52) value types, and the stronger the importance of the ‘Egalitarian Commitment’ value type, the weaker the importance of ‘Hierarchy’ and ‘Mastery’ value types (r=-.67; r=-.36) (see locations of specified value types on the circle: they are projected on the opposite sides).

The relationships in the 'object – object' dimension (location of study groups in relation to each other) have been included in further analysis. It should be noted that Western European countries such as Switzerland, France, West Germany, East Germany, Spain and Denmark differ the most with regard to analysed value types in relation to Asian countries, such as Malaysia, Singapore, Taiwan, Thailand and Israel (four research samples originated from Israel – Jews, Druze, Arab Muslims and Arab Christians – which are located in close proximity to each other).

Clear differences have also been revealed between China (four samples – China (comb), cities Guangzhou and Shanghai, Hebei province – located next to each other) and Zimbabwe compared to Estonia (two samples – town and country – located next to each other as well) and Slovakia. China and Zimbabwe differ significantly also in relation to Western European countries, in particular Finland and Italy.

That type of relationships is depicted as a large distance between locations of indicated study groups relative to each other. At the same time, it should be kept in mind that the smaller the distance between groups, the more similar the study groups with regard to analysed value types.

For example, a great similarity between Western European countries have been noted: Switzerland, France, West and East Germany, Greece, Spain, Denmark, the Netherlands, Portugal, Finland and Italy (see relevant clustering of objects), while two countries listed at the beginning are relatively more different compared to two counties listed at the end (see relevant distances between them).

A large similarity can be found between four Chinese samples (China (comb), cities Guangzhou and Shanghai, Hebei province) and Zimbabwe, between four samples from Israel (Jews, Druze, Arab Muslims and Arab Christians), Malaysia, Thailand and Hong Kong, and between Central European Countries, i.e., Estonia (two samples – town and country), Slovakia, Slovenia, Hungary, Bulgaria and Poland.

East Germany is more similar with regard to the considered aspect to Western European countries. Central European countries, such as Hungary, Slovenia, Bulgaria and Poland show greater similarity to Mexico, Australia, Brazil and some Asian countries compared to Western European Countries (it can be observed by comparing appropriate distances between objects). The analysis can be conducted from the perspective of any country.

For example, the United States vary in the axiological dimension from Western Europe, although all those countries belong to individualistic cultures. Therefore, the analysis of distance between study groups (objects) enables to describe the 'similarity' vs 'differentiation' with regard to the importance of value types which are 'fitted" on the circle (Figure 4).

The last aspect of the graphic analysis enables to describe the importance of particular value types across study groups ('object – feature' analysis). Let us remind that the smaller the distance between the image of a feature/value type and the image of an object/group, the stronger the importance of this particular value type in the particular study group. So, the 'Affective Autonomy' and 'Intellectual Autonomy' value types are of the strongest importance in Western European countries (see S1 Table 1 Mean Importance of Cultural-Level Value Dimensions in 38 Teacher Samples (corrected for differences in scale use). Source: (Schwartz, 1994).

Those countries are – as shown above (see 'object – object' analysis) – similar in terms of axiological issues, which is illustrated by close locations of objects representing study groups. However, when two autonomy-related value types are considered, it should be noted that they are of stronger importance in Switzerland, France and Germany compared to Finland and Italy (see locations of features in relation to objects and relevant distances).

In many Asian and Central European countries, those two value types are of the weakest importance (see distances between objects representing those countries and features representing both values). When the significance of the 'Conservatism' value type is considered, the reverse direction of relationship is seen: it is of the strongest importance in Asian countries, such as Israel, Malaysia, Singapore and Taiwan, but also in Central European countries, such as Bulgaria, Poland, Slovakia and Estonia. This value is of the weakest importance in Western European countries, in particular in Switzerland and France.

Therefore, the analysis of positions of objects in relation to features allows determining the relative importance of value types across study groups. The 'Affective and Intellectual Autonomy' and 'Conservatism' value types are opposite to each other (which is illustrated by the location of features on the opposite sides with respect to the circle's centre, see 'feature – feature' analysis) and demonstrate axiological specificity of countries under analysis. Let us remind that those value types are included in one of three dimensions distinguished by Schwartz; therefore, they give direction to different ways of solving important social problems.

Next, the importance of 'Egalitarian Commitment' and 'Harmony' value types is considered. First of them has obtained the highest importance rates in Western European countries, such as Portugal, Italy, Spain, Denmark, France, the Netherlands, Greece, Germany and Finland (see distances between the feature and relevant objects). That type is of the least importance in African and Asian countries, such as Zimbabwe, China (four samples), Thailand, Malaysia and Taiwan.

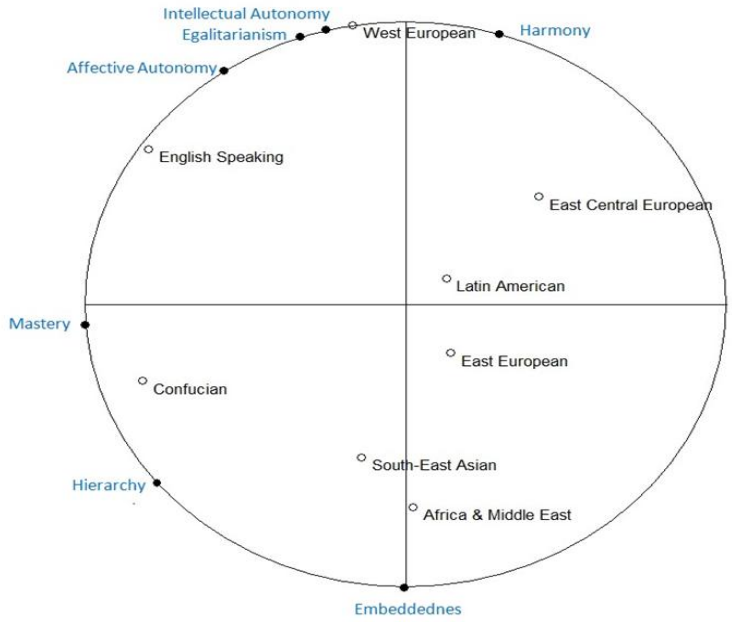
Central European countries appear to be 'between' both groups of indicated countries. In turn, the 'Harmony' value type is located relatively closer to Central European countries. It is of stronger importance in Estonia (two samples), Slovenia, Slovakia and Hungary. At the same time, it is of great importance in Western

European countries, primarily in Italy and Finland, and in North American Mexico. The lowest importance rates for the 'Harmony' value type are observed in the same countries as in the case of the 'Egalitarian Commitment' value type, i.e., in numerous Asian countries and Zimbabwe in Africa (distances between those values and the above-mentioned countries is the largest).

'Egalitarian Commitment' and 'Harmony' value types are related to each other (see 'feature – feature' analysis), but they are opposite to 'Hierarchy' and 'Mastery' value types. When examining the location of objects/study groups in relation those last two value types, the strongest importance in China (four samples) and Zimbabwe should be indicated. The farther the location of study groups, the weaker the importance of those value types. They are given the least importance in Western European countries, such as Italy or Finland, and Central European countries, such as Slovenia or Estonia.

The RGM graphic method has been used to analyse Schwartz's new data on Cultural Values Orientations of the World Cultural Regions after author's consent (Schwartz, 2014) (see S2 Table 2 Mean Scores on Cultural Value Orientations for Each of the World Cultural Regions. Source: (Schwartz, 2014).

Figure 5. *'Value map' created using the RGM method.*



Note: *The data has been transformed (average importance rates for each value type), so that closer distance between the value type and the study group projected in the interior of the circle means stronger importance of the particular value type in the particular group.*
Source: *Source: own elaboration based on (Schwartz, 2014)*

Comparing appropriate distance (object-object, object-feature, feature-feature) allows to gain a general orientation regarding:

- similarity-dissimilarity between numerous study groups in the range of all values on the circle (comparing objects inside the circle). For example, West European countries differ more with regard to value importance in relation to Africa & Middle East countries, South-West Asia countries, and Confusian than in relation to English Speaking and East Central European countries;
- the importance of value type in particular study groups (comparing objects positions to feature positions). For example, West European countries present stronger importance of a value 'Intellectual Autonomy', 'Egalitarianism', and 'Affective Autonomy', whereas Africa & Middle East countries and South-East Asia countries – value type 'Embeddednes';
- the relation between values (local features comparison). For example, positive correlation between value types: ' Intellectual Autonomy', 'Egalitarianism', 'Affective Autonomy'.

The presented graphic analysis should be contrasted with the description of Cultural Value Orientation by Schwartz (2014).

5. Conclusions

Data obtained in studies on value systems are multidimensional in nature. Numerous independent variables (e.g., cultural, national, religious or related to personality traits) determine importance rates for particular values, and they in turn interact with each other in various ways. Their 'perfect' (although impossible) graphic presentation should be given in the k-dimensional space (where k is the number of values under analysis).

However, taking into consideration the properties of human brain it should be noted that people have difficulty representing information even in the three-dimensional space (let alone in the k-dimensional space) and its description at a verbal level. The language is not too suitable to depict spatial configurations of objects.

Those cognitive properties of the human being point to the desired methods of graphic presentation of data: effective processing of visual information, its understanding and 'translation' into the verbal code to the point are more likely when data are projected onto the plane (when the k-dimensional space is reduced to the 2-dimensional space).

The RGM graphic method by Rybaczuk (2002), which is presented in this paper, features those qualities. When highlighting the qualities of this method it should be stressed that it enables the holistic view of value systems: describing relationships occurring between values (their mutual locations within the system), diagnosing

similarity between numerous study groups in the axiological dimension, determining differences in the preferences of values across particular study groups. It allows describing conditioned relationships in a multifaceted manner, whereas the interpretation can take place at different levels of detail.

The developed method may form the grounds for formulating more detailed hypotheses and selecting the variable categories which should be subjected to further empirical verification. The RGM method can also be applied to analyse data other than value systems.

In conclusion, it should be emphasized that visual methods which are available in statistical software applications and described in the literature (agglomerative methods, multidimensional scaling, cluster analysis, principal component analysis) show relationships between objects or between features only, while losing information about the impact of features on the clustering of objects. In consequence, the evaluation of strength of particular features in the differentiation of study object states is hindered.

The method by Gabriel (1971), known as biplot, is an exception. It enables graphic evaluation of the object-feature relationship, which constitutes some kind of extension of the principal component analysis. It has been described by Gordon (1999) as well. However, authors of this paper believe that the interpretation and clarity of the resultant graphic representation is unsatisfactory.

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