Embedding the Organizational Culture Profile into Schwartz's Universal Value Theory using Multidimensional Scaling with Regional Restrictions

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Embedding the organizational culture profile into Schwartz's universal value theory using multidimensional scaling with regional restrictions

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Abstract.

Person-organization fit is often measured by the congruence of a person's values and the values that he or she ascribes to the organization. A popular instrument used in this context is the Organizational Culture Profile (O'Reilly, Chatman, & Caldwell, 1991). The OCP scales its 54 items on eight factors, derived by exploratory factor analysis. We investigate the extent to which the OCP can be embedded into Schwartz's Theory of Universals in Values (TUV) that is formulated in terms of a circumplex in MDS space. To address this question, we develop a non-standard MDS method that enforces a TUV-based axial regionality onto the solution space together with a permutation test that assesses the consistency of the side constraints with the MDS representation. We find that the OCP can indeed be largely embedded into the TUV. The practical implication is that P-O fit can at least be approximated by the congruence of the person's and the organization's positions on two value dimensions, risk vs. rules and results vs. relations.

Introduction

An important problem of organizational psychology is to assess how well a particular person fits into a particular organization, which is called person-organization (P-O) fit. Kristof (1996) defines P-O fit as “the compatibility between people and organizations that occurs when (a) at least one entity provides what the other needs, or (b) they share similar fundamental characteristics, or (c) both” (pp. 4-5). A high level of P-O fit is positively correlated with many important outcome variables such as job satisfaction and organizational commitment (Boxx, Odom, & Dunn, 1991; Bretz & Judge, 1994), intention to quit and turnover (Vancouver & Schmidt, 1991; McCulloch & Turban, 2007), contextual performance (Goodman & Svyantek, 1999), and organizational identification (Cable & Edwards, 2004).

The most popular approach to assess P-O fit is to assess the congruence of individual and organizational values (Sekiguchi, 2004). Values are usually defined as conditions that a person or organization finds desirable (Locke, 1976), either as end goals or as instrumental goals. Values serve as principles of orientation that transcend particular situations both in scope and time (Rokeach, 1973; Schwartz, 1992). In organizational surveys, value items are typically phrased in a form similar to “How important is [X] to you?“ (Jurgensen, 1978; Elizur, 1984; Borg, 1991; Borg & Mastrangelo, 2008). In the social sciences, one often finds more emphasis on values as ideal goals or normative guides. The corresponding value items are then phrased as “How important is [X] to you as a guiding principle in your life” (Rokeach, 1973) or, for example, as “How important is [X] for you and your future?“ (Wohlfahrtssurvey, 1998).

Probably the most prominent valued-based instrument for assessing P-O fit is the Organizational Culture Profile (OCP, see Chatman, 1991; O‘Reilly et al., 1991). The OCP consists of 54 items, each focusing on a different value such as ‘risk taking’, ‘being innovative’, ‘being precise’, ‘being aggressive’, ‘low level of conflict’, or ‘informality’. The respondent is asked to rate these values on a 9-point answer scale ranging from “most important” to “most unimportant,” with the constraint of distributing the ratings over the nine scale categories with frequencies that approximate a normal distribution (Q-sort). The OCP asks the respondent to Q-sort the items twice: once in terms of how important he or she considers the various values in an ideal organization, and once in terms of how important these values actually are in the particular organization under study.

For a sample of some 400 MBA students and new accountants, O’Reilly et al. (1991) report that eight factors emerge from the correlations of OCP items. These factors are labeled (1) innovation and risk taking, (2) attention to detail, (3) orientation toward outcomes or results, (4) aggressiveness and competitiveness, (5) supportiveness, (6) emphasis on growth and rewards, (7) a collaborative and team orientation, and (8) decisiveness. Further studies on the OCP come to similar conclusions (Chatman & Jehn, 1994; Howard, 1998). Thus, the OCP appears to measure the extent to which individuals value organizational behaviors such as “innovation and risk taking” or “attention to detail” in an organization. The resulting eight scores are the respondent’s value profile. Comparing an individual’s OCP profile for an ideal organization with his or her perception of organization X’s profile yields the individual’s P-O fit with X.

The statistical analyses of the OCP items are based on exploratory factor analysis and the interpretations remain unrelated to more general theorizing in value research. Nevertheless, an analysis of OCP ratings of an ideal company, generated by 440 full-time employees and part-time business school students (Jehn, Chatwick, & Thatcher, 1997) that leads to similar factors (principal components with varimax rotation; see Table 1) suggests that the findings are fairly robust and replicable.

Some of the observed factors are clearly bipolar. For example, one factor shows high positive loadings of the items ‘flexibility’, ‘adaptability’, ‘being easy going’, ‘being calm’, and ‘low level of conflict’ and high negative loadings of the items ‘being aggressive’, ‘being demanding’, and ‘working long hours’. The negative pole of this factor clearly matches the O’Reilly et al. (1991) factor (3). The positively loadings of the ‘flexibility’ and ‘adaptability’ value items on this bipolar factor suggest that the respondents interpret them from an employees’ perspective, not from the customer’s or the market’s point-of-view. In any case, such bipolarities indicate that the respondents felt that some of the values compete against each other. Indeed, some items such as ‘being easy going’ and ‘being demanding’ are almost logical opposites of each other, because it is hard to see how an organization can satisfy both values at the same time. Other oppositions are not necessarily logical ones (e.g. ‘being calm’ and ‘being demanding’), but depending on one’s interpretation of these notions, they may become psychologically incompatible.

The idea that relations among values are structured by their practical and psychological oppositions and compatibilities is a central feature of Schwartz’s theory of universals in the content and structure of values (Schwartz, 1992; Schwartz & Bilsky, 1987, 1990). Figure 1 shows the structure of the TUV in a diagram that represents how value items assessing different types of values are empirically related to one another in two-dimensional multidimensional scaling (MDS). The pattern established in numerous studies by Schwartz and his collaborators (e.g., Schwartz & Boehnke, 2004) is a quasi-circumplex (Figure 1). Items that express each broad value form different regions in space that are arranged like sectors of a disk. For example, the items, 'helpful', honest', and 'forgiving' fall into the sector of 'benevolence' values, and the items 'authority', 'wealth', and 'social power' fall into the sector of 'power' values.

Reflecting the incompatibility of simultaneously pursuing and highly valuing benevolence and power, the benevolence and power sectors are situated in opposing positions in the circumplex (Figure 1). Empirically, people who rate one of these values as very important tend to attribute little importance to the other. Similarly, security-related values are found to be psychologically incompatible with stimulation and change, because "to strive for success by using one's skills usually entails both causing some change in the social or physical environment and taking some risks that may be personally or socially unsettling. This contradicts the concern for preserving the status quo and for remaining psychologically and physically secure that is inherent in placing high priority on security values" (Schwartz & Bilsky, 1987, p. 554).

Data collected in many contexts and countries, using different instruments (e.g., Schwartz, 1992, 2006, 2007; Bilsky & Janik, 2008), support the circumplex theory. Yet, the data analysis method used in this context was almost always exploratory MDS. (For exceptions, see Davidov, Schmidt, & Schwartz, 2008; Schwartz & Boehnke, 2004.) This method maps the item intercorrelations optimally into distances among points in a geometric space, but it does not impose theory-generated side constraints onto the MDS configuration. Hence, such solutions are optimal in minimizing a general loss function (Stress), but they remain blind to content, because they do not incorporate particular regional predictions. Moreover, an exploratory MDS solution always leaves considerable leeway when partitioning the configuration in the sense of a circumplex pattern as in Figure 1, and so what one often finds in the literature are somewhat arbitrary curvilinear partitioning lines and/or overlapping regions (see, e.g., Elizur, 1984; Borg & Shye, 1995).

For such technical reasons and in an attempt to simplify presentation of the value theory, Schwartz (1992) also described it as postulating a two-dimensional bipolar value structure (Figure 1). The dimension ‘openness to change vs. conservation’ “arrays values in terms of the extent to which they motivate people to follow their own intellectual and emotional interests in unpredictable and uncertain directions versus to preserve the status quo and the certainty it provides in relationships with close others, institutions, and traditions” (Schwartz, 1992, p. 43). The second dimension, ‘self-enhancement vs. self-transcendence’, scales the values “in terms of the extent to which they motivate people to enhance their own personal interests … versus the extent to which they motivate people to transcend selfish concerns and promote the welfare of others … “ (p. 42ff.). Cable and Edwards (2004) recently used this two-dimensional model, with eight core values (altruism, relationships, pay, security, authority, prestige, variety, and autonomy) to identify the dimensions, and three items from existing measures of work values to measure each of the core values. Based on the characteristics of organizations, Quinn and Rohrbaugh (1983) also suggested a similar two-dimensional model of “competing values,” in their case from flexibility to control, and from an internal to an external focus.

The OCP tradition with its factor-analytic structure and specific theorizing on the one hand, and the TUV circumplex (or its two-dimensional simplification) on the other hand, represent two parallel developments. They remained unrelated to each other until Bilsky and Jehn (2002) made an attempt to analyze the OCP items within the framework of the TUV. The rationale for their study is obvious: If Schwartz’s theory indeed identifies the universals in value content and structure, it should lend itself to explaining the structure of the OCP items, at least in a coarse way. To check this hypothesis, they first classified most of the OCP items into the four types suggested by the two-dimensional bipolar theory. Table 1 shows their classification, plus additional classifications provided by Schwartz, that they based entirely on an examination of item content. Note that 11 of the 54 items remain unclassified because they appeared too vague in terms of the Schwartz dimensions.

Bilsky and Jehn (2002) then scaled the OCP items of the Jehn et al. (1997) study by using 2-dimensional ordinal MDS. They partitioned the MDS solution into regions that contain, as closely as possible, only items of one particular type. Observing the usual side constraints of such partitioning (such as, for example, using “simple” partitioning lines only; see Borg & Shye, 1995), and keeping an eye on the two-dimensional underlying model of oppositions, they generated a 2-dimensional MDS plot. They concluded that “only three of the 54 items … resulted as misfits with respect to our regional hypotheses…” (p. 219). To achieve this fit, however, they had to pay a high price: They had to draw the partition lines in a way that only roughly matches the postulated four-quadrants indicated in Figure 1. This makes it difficult to maintain, in particular, the theoretical notion of competing values. Moreover, the replicability of such a data-driven structure appears dubious. Hence, Schwartz’s value theory seems to be able to explain the OCP items only roughly.

This conclusion is not very appealing because the TUV has been shown to reliably emerge in a large variety of studies and also because most of the OCP items seem to fit conceptually into the TUV’s conceptual framework. However, the usual MDS methods for analyzing the intercorrelations of the OCP items are not an optimal method to test the scalability of these items in accord with the four-sectors theory. What one really needs is a confirmatory MDS that constrains the data representation to fit the theoretical expectations. If this would show that a strictly theory-compatible representation is possible only with a marked increase in misfit, the theory would be rejected. On the other hand, additional side constraints can sometimes be enforced onto an MDS representation with almost no additional Stress (see Borg & Groenen, 2005). If this occurred, there would be no reason to reject the theory.

Unfortunately, most MDS programs available today do not offer the possibility of enforcing such side constraints. Therefore, we undertake to show how such a confirmatory solution can be found with nonstandard methods. We analyze the effects on the overall fit of the model and on the fit of each item of enforcing the side constraints of the TUV onto the two-dimensional MDS representation of the OCP items. We also embed the OCP dimensions extracted by exploratory factor analysis into the theory-compatible MDS solution. Finally, we discuss the implications of the findings for organizational psychology.

<u>Method</u>

<u>Sample</u>

The data in this study are taken from Jehn et al. (1997). Their study was a quasi-experimental field study investigating the effects of value congruence and demographic dissimilarity for 440 participants working in 88 teams. The participants were primarily full-time employees, enrolled as part-time students at two business schools, and full-time MBA students at a third. The average age was 27.5, and 57% were male. These participants were assigned to teams of five participants each, working as consulting teams for various organizations over a fourteen-week period. The values of the team members were assessed before the teams were randomly formed. Value congruence was assessed using the OCP, and the teams were formed to be high-consensus and low-consensus on the basis of the OCP scores.

<u>Coding the OCP items in terms of the TUV</u>

To check the TUV predictions, one first has to classify the OCP items, on the basis of their content, into a typology variable with the categories openness, conservation, self-transcendence, and self-enhancement. We use the codings from Bilsky and Jehn (2002), displayed in "type" column in Table 1. Note that some items could not be coded by these authors, and so for these items no predictions can be derived from the TUV.

Enforcing an axial partitioning onto an ordinal MDS solution

We assess the structure of the 54 OCP items by first representing their intercorrelations as distances in a 2-dimensional ordinal MDS space (Figure 2). We then partition this space so that four regions emerge, each one containing only points with the same ‘type’ code in Table 1, plus possible uncoded points. Obviously, the resulting pattern does not confirm the TUV predictions with opposite quadrants. However, closer study of the configuration reveals that a more theory-compatible partitioning of the plane would be possible if some of the points were located differently. Specifically, if points 10, 35, and 36, in particular were moved upwards on the plot by about one third of the length of the vertical coordinate axis, a partitioning that represents the two-dimensional bipolar theory almost perfectly becomes possible.

Such shiftings would, of course, negatively affect the data fit. We therefore seek a solution that optimally positions all points such that the MDS solution satisfies the theoretical side constraints. To enforce such additional constraints onto the MDS configuration, we utilize an approach described in Borg and Groenen (2005). We seek an optimal mapping of the correlations into distances of an MDS space that can be partitioned by two straight lines such that the ‘openness’ region emerges opposite to the ‘conservation’ region, and the ‘self-transcendence’ region emerges opposite to the ‘self-enhancement’ region.

To impose the theory-based regional side constraints onto the MDS solution, we combine the theory of constrained MDS through majorization by De Leeuw and Heiser (1980) (see also Borg & Groenen, 2005) and that of optimal scaling (see, for example, Gifi, 1990). To be precise, our criterion for performing MDS is to minimize normalized raw Stress $\sigma_n^2(\mathbf{X})$ over the $n\times2$ coordinate matrix $\mathbf{X}$, with

$$\sigma_n^2(\mathbf{X}) = \frac{\sum_{i<j}\left(\delta_{ij} - d_{ij}(\mathbf{X})\right)^2}{\sum_{i<j}\delta_{ij}^2} ,$$

where δ_{ij} is the dissimilarity between objects i and j and $d_{ij}(\mathbf{X})$ is the Euclidean distance between rows i and j of the coordinate matrix $\mathbf{X}$. The basic idea is to do MDS but locate the points such that they are separated by two lines into an O-vs.-C region and an E-vs.-T region, respectively, resulting in four quadrants. These two separation lines span the 2D MDS space. They do not necessarily have to be orthogonal, nor do they have to go through the origin, although the latter might also be imposed as distances do not change under translation. To explain how this quadrant structure is imposed in the context of MDS, we first discuss the restriction that enforces points to lie in the same quadrant and then show how this is implemented in the Stress function.

For each of the (TUV-coded) points, we know the quadrant in which it should be located. This enables us to code two new variables, y_1 and y_2, that indicate the point's quadrant in 2D (see Table 2 for the four combinations of y_1 and y_2 and the respective columns in Table 3 for this coding per variable). Instead of using y_1 and y_2 directly as MDS coordinates, we use optimal scaling and estimate the $n\times1$ vectors $\hat{\mathbf{y}}_1$ and $\hat{\mathbf{y}}_2$. Let us focus on $\hat{\mathbf{y}}_1$. We restrict $\hat{\mathbf{y}}_1$ such that all points i with $y_{i1} = 1$ have a smaller $\hat{y}_{i1}$ value than those that have $y_{i1} = 2$. Thus,

$$\hat{y}_{i1} \leq \hat{y}_{i'1} \text{ with } i \text{ those points having } y_{i1} = 1 \text{ and } i' \text{ those points having } y_{i'1} = 2. \qquad (1)$$

Note that every (TUV-coded) point i has to satisfy restriction (1) with every (TUV-coded) point i', yielding a total of $n_{11}n_{12}/2$ inequality constraints, where n_{11} and n_{12} are the numbers of points having $y_{i1} = 1$ and $y_{i'1} = 2$, respectively. Usually, only some of these constraints are active. That is, for some combinations of i and i', we have $\hat{y}_{i1} = \hat{y}_{i'1}$, and the value at which this occurs is the same for all these active constraints. The restrictions on $\hat{\mathbf{y}}_2$ are defined analogously. In the optimal scaling literature, these restrictions are the same as doing an ordinal transformation with the primary approach to ties, that is, to untie the ties, albeit that in this case we have an (external) variable with only two ties each.

Note that in Table 3 there are also points i'' that are not allocated to any of the quadrants. These are the points that could not be coded into the four TUV types. For these points i'', no side restriction is imposed onto their location.

The second step is to make sure that the MDS solution satisfies the four-quadrant constraints. This objective is imposed easily by the restriction that **X** has to be a linear combination of $\hat{\mathbf{y}}_1$ and $\hat{\mathbf{y}}_2$. Let $\mathbf{Y} = [\hat{\mathbf{y}}_1\ \hat{\mathbf{y}}_2]$, then we restrict **X** = **YC**. If **C** would be the identity matrix, then **X** = **Y** and the points clearly satisfy restriction (1) and this still holds for **X** = **YC** with **C** any 2×2 matrix. This combination of restrictions implies that there is a direction in the MDS space that represents $\hat{\mathbf{y}}_1$, and all projections of the points onto this line satisfy Schwartz's first dimension restriction. Hence, there exists a straight line separating the space into two half spaces, each with equal values of y_{i1}. The same holds for $\hat{\mathbf{y}}_2$ and thus for Schwartz's second dimension. Because **C** is generally not orthogonal, it is not necessary for the directions of $\hat{\mathbf{y}}_1$ and $\hat{\mathbf{y}}_2$ to be orthogonal. Thus the corresponding separation lines can also be nonorthogonal.

Now, the optimization problem to be solved is minimizing

$$\sigma_n^2(\mathbf{Y},\mathbf{C}) = \frac{\sum_{i<j}\left(\delta_{ij} - d_{ij}(\mathbf{YC})\right)^2}{\sum_{i<j}\delta_{ij}^2} \ ,$$

subject to the inequality constraints in (1). For minimization, we use the iterative majorization (SMACOF) approach that allows for linear constraints (see, for example, De Leeuw & Heiser, 1980). An important feature of majorization is that $\sigma_n^2(\mathbf{Y},\mathbf{C})$ is reduced in each iteration until convergence is reached, yielding in almost all practical cases a local minimum (that may be the global minimum). A second advantage is that it can handle restrictions that have an easy solution when applied to a quadratic function loss function such as ours. We implemented this algorithm in a prototype in the MatLab language, but in principle, it should also be possible to compute such a solution in SPSS Proxscal. We tried this advanced feature, but the program crashed.

The overall Stress of the theory-compatible solution, σ_n^2, can be decomposed into two parts (Borg & Groenen, 2005). One part is due to mismatching between the distances and the *d*-hats (Stress: lack of model fit). The other part is due to the constraints imposed on the configuration (Stress: lack of confirmation fit). This allows a more fine-grained analysis of the reasons for the Stress increment expected as a consequence of imposing additional theoretical side constraints.

Embedding the OCP scales into the MDS solution

Another question is how the OCP scales (i.e., the factors F_i in Table 1) fit into a TUV-compatible MDS representation of the OCP items. We address this question by embedding these scales, one by one, as straight directed lines into the MDS space. Each such line is a linear combination of the coordinate vectors. Hence, the desired optimal embedding of the external scales can be accomplished by multiple regression, where the MDS dimensions (D_1 and D_2 of Table 3) are the predictors of each dependent variable F_i. That is, in general, $\hat{F}_i \approx a + b_1 \cdot D_1 + b_2 \cdot D_2$, for $i = 1, \ldots, 8$, where "$\approx$" indicates that the unknown should solve the fitting in a least-squares sense. As shown in Borg and Groenen (2005), the embedded scales are most easily found by running these lines through the origin and through a second point that has as its coordinates the raw weights obtained from regressing the external scales onto D_1 and D_2, b_1 and b_2. The fit of the embedded scale $\hat{F}_i$ and the scale shown in Table 4, F_i (i = 1, ... ,8) can be assessed by correlating the corresponding scale values.

Results

The intercorrelations of the 54 items can be scaled using ordinal MDS (Figure 2). An acceptable fit can be accomplished in two dimensions with σ_n^2 = .0543 (Stress-1 = $\sqrt{\sigma_n^2}$ = 0.233). Enforcing a strictly TUV-compatible MDS solution by imposing additional side constraints leads to Figure 3. This figure satisfies the requirement that the type assignments shown in Table 1 induce regions in MDS space that contain only points of one particular TUV type—or points not coded in terms of the TUV. Moreover, the solution also satisfies the regional oppositions required by the TUV, i.e., that the self-transcendence region lies opposite the self-enhancement region, and conservation lies opposite openness.

The Stress values of both the normal MDS solution in Figure 2 and the confirmatory solution in Figure 3 are quite high. However, the number of points, n, is also quite large and the correlations can be assumed to contain a certain amount of noise. This drives up the Stress values. The Shepard plot (Figure 5) provides a better sense of the fit of the confirmatory solution. It shows the ordinal transformation (the line) and the residuals (vertical distances from gray points to the line). We see that the transformation is almost linear and that most residuals are not far away from the line. Overall, this Shepard plot shows a reasonable fit.

Table 5 presents the decomposition of the overall Stress into model-related Stress and Stress due to the TUV side constraints. It reveals that almost the entire overall Stress is generated by the usual MDS representation of mapping correlations into distances (99.199%). Hardly any of the overall Stress is due to the regional side constraints imposed onto the configuration (0.801%). Thus, imposing these theory-based regional side constraints has almost no influence on the fit of the solution, even though the unconstrained configuration (Figure 1) differs somewhat from the theory-consistent configuration (Figure 3).

To see how well the individual points are represented in the theory-consistent solution (Figure 3), we consider the average Stress per point in the 'Fit' columns of Table 3. Points with a Stress-per-point of .08 or higher are shown in bold. There are two sorts of points that do not fit well: those points whose fit is worse due to the theory-based regional constraints (points 10, 15, 43, and 44) and those points that simply do not fit well in this MDS solution (points 12, 35, 46, 46, 48, 49, 52, and 54). These points can be identified by comparing their fit (Stress-per-point, see Table 3) and their position in the regionally constrained solution: Points with high Stress-per-point in the constrained solution and that lie on a boundary most likely suffer from high Stress due to the constraints. Comparing the unconstrained solution Figure 2 with the theory-consistent solution in Figure 3 shows indeed that points 10, 43, 44, and 48 are in different locations. Apparently, these are the points that are most affected by the regional constraints, albeit with a little influence on overall Stress. In summary, however, the difference in Stress of the constrained (0.258) and the unconstrained (0.233) solutions is rather small, so that the theory-consistent solution seems acceptable.

Figure 4 portrays the OCP scales embedded into the confirmatory MDS solution. It shows that seven of eight factors fit quite well into the TUV framework. The fit of the embedded scale $\hat{F}_i$ and the scale shown in Table 4, F_i (i = 1, ..., 8), is assessed by correlating the corresponding scale values. Figure 4 shows the results graphically. Substantively, we notice two bundles of scales — F_1, F_2, and F_7 on the one hand and F_3, F_4, and F_6 on the other — that approximate the partitioning lines separating the regions induced by Schwartz's theory.

Finally, we test the statistical significance of the TUV quadrant assignment of the items. If the organization of the items according the TUV is to promote deeper and more theoretically insightful understanding of the OCP and of work values in general, the theory-based restrictions it imposes on the MDS solution must not be trivial. That is, they must not be so loose and unspecific that various arrays of data would satisfy them. To test the significance of the restrictive side constraints, we apply a permutation test on the quadrant assignments, i.e. y_1 and y_2 in Table 3. Specifically, the permutation test compares the Stress value of the theory-consistent solution (Figure 3) with the Stress values obtained from solutions where the quadrant assignments are randomly permuted over the items. This permutation test evaluates the following hypothesis:

H_0: The MDS representation is either *not* consistent *or trivially* consistent with the theory-based side constraints, y_1 and y_2;

H_a: The MDS representation is strongly consistent with the theory-based side constraints, y_1 and y_2.

The permutation test first computes the distribution of, say, 1000 Stress values of solutions where the y_1 and y_2 is randomly permuted over the items. If H_0 is true, then the confirmatory ("unpermuted") Stress value will lie somewhere in the distribution of the permuted Stress values. If H_0 is not true (hence H_a is more plausible), then the unpermuted Stress value is lower than the permuted Stress values. Thus, this permutation test is a one-sided test (left-sided). Figure 6 presents the histogram of these Stress values for the present data. To test the hypothesis at a significance level of 1%, the 1st percentile of this permutation distribution is established (the dotted line in Figure 6) for one-sided hypothesis testing. The test statistic (*p*-value) is the percentile of the confirmatory MDS Stress value (the solid line in Figure 6). As can be seen, this statistic is smaller than .001; there are no permuted Stress values smaller than this value. As a consequence, we conclude that the H_0 can be rejected and that the TUV quadrant constraints are non-trivial indeed.

Discussion

Our analyses have demonstrated that structural hypotheses formulated in terms of certain axial regions in an MDS space can be tested more rigorously than previously described in the literature. The test requires one to optimally construct an MDS solution that enforces the theoretically predicted regional pattern onto the point configuration and then to compare how these side constraints affect the Stress of the solution. What we found here is not so uncommon in confirmatory scaling (see examples in Borg & Groenen, 2005): The theory-compatible solution explains the data almost as precisely as the MDS solution without any theory-specific side constraints. That is, if one accepts the normal MDS solution as an acceptable representation of the data, there is no reason to reject the structural theory that leads to the confirmatory MDS solution. Thus, in this sense, the theory is supported.

Enforcing regional constraints onto MDS solutions can be quite difficult (Groenen & van der Lans, 2006). The problem is not that there are so many different types of regional constraints. In practice, they are usually either axial, modular or polar, or some combination of two of these. However, regional predictions typically specify only the type of expected pattern (e.g., a circumplex or a radex) but not the relations of the various regions to one another (e.g., neighborhood relations such as the sequence of the particular regions in a circumplex). Moreover, most researchers only expect the partitioning lines (or surfaces) to be “simple” and "smooth", but not necessarily linear, circular, or elliptic (Borg & Shye, 1995). Nonetheless, the type of regional hypothesis that we studied in this paper is not an uncommon one. Therefore, the solution proposed here should be of interest for a variety of other studies based on simple dimensional typologies.

From a content perspective, our analyses show that Schwartz's theory (TUV) can indeed be used to structure the OCP items, at least in the sense of a coarse two-dimensional typology. Enforcing a perfect theory-compatible structure onto the MDS representation of the items pushed the Stress up from 0.233 to 0.256, a quite small increment. Moreover, the solution is not only much more pleasing theoretically; it also promises to be more robust over replications because it relates to a stable law of formation rather than fitting (or overfitting) the given data in a purely formal sense (i.e., minimizing Stress). Note too that the OCP items were constructed without reference in any way to the TUV. Hence, being able to explain the structure of these items to a substantial extent by the TUV shows the generalizability of this value theory and thereby strengthens the claim that it may identify a universal structure of values.

As noted, Bilsky and Jehn (2002) could not relate each OCP item unambiguously to the dimensions of the TUV. Table 1 shows that 12 items were unclassified. The MDS solutions can be used as an empirical foundation for speculating how the respondents perceived these items. For example, item #1 asks individuals to assess the importance of 'flexibility' in an ideal organization. This item emerged in the 'self-transcendence' region. This suggests that these respondents understood flexibility as referring primarily to promoting positive social interaction.

Other items of particular interest are those that do not fit well into the exploratory MDS plane in Figure 2 (items 15, 46, 49, 52, and 54). Bilsky and Jehn (2002) classified them either into different categories of the TUV typology (15=T, 46=O, 52=C) or could not classify them (49, 54). The classified items do indeed come out in the predicted neighborhoods, but they may address issues additional to those captured by the TUV dimensions. Different respondents may also understand them as expressing different poles of the TUV dimensions.

For example, some respondents may have understood ‘having a clear guiding philosophy’ as signifying knowing what they want for themselves in the organization (related to E), whereas others may have understood it as signifying trying to place what goes on in a meaningful broad context (related to T). Another example is ‘having a good reputation’ that is located near the border of C and E implying that it expresses elements of both. One may value a good reputation both because it serves to avoid or reduce social sources of threat (C) and because it facilitates gaining or maintaining control over resources one wants (E). Like this item, the most similar item in the Schwartz instrument, ‘social recognition’, typically emerges on the border of ‘power’ (E) and ‘security’ (C) values. By studying the items that did not fit well into the exploratory MDS plane with methods such as cognitive pretesting (Willis, 2005), it will be possible to check the validity of the classifications and the usefulness of the particular items for measurement purposes.

Other items that deserve additional attention are those that most resist being forced into the TUV constraints by generating the largest Stress-per-point values in the confirmatory MDS configuration (items 10, 43, 44, and 48). The first three of these load highly on factor F_8, the one factor that is poorly explained by the TUV dimensions (see Figure 4, r = .31). One possibility is that this factor picks up a value dimension that the Schwartz value theory does not include, perhaps one that is specifically work-related. Another possibility is that the factor is not particularly reliable. Factor 8 is the only one that does not correspond to any of the O'Reilly et al. (1991) factors and it includes items whose shared components are especially unclear (e.g., positive loadings of autonomy as well as of being careful and rule oriented).

The value scales obtained from exploratory factor analysis fit reasonably well into the confirmatory MDS structure, given that we drop the orthogonality constraint under which they were computed in the first place. These scales are purely descriptive and not generated by a theoretical rule with a psychological rationale. Indeed, factor analyzing OCP items is somewhat arbitrary because, for example, there is no clear-cut decision rule for the number of factors. Factor analyses reveal that such traditional formal criteria as the eigenvalue-greater-1 rule or the scree test do not clearly suggest extracting only eight factors. According to these rules, even more factors should be extracted, but it remains unclear exactly how many.

Having shown that the TUV is useful for understanding the structure of the OCP data, it is nevertheless desirable to reconsider its labels. For organizational psychology at least, self-transcendence vs. self-enhancement and openness vs. conservation need some explication. These labels are therefore less than optimal for the field. In the context of organizational culture, it is desirable to relate these notions to a more gripping terminology. We suggest the labels *results vs. relations* and *risk vs. rules* as a terminology that will be more accessible to HR practitioners. The person-organization fit problem then presents itself, in a nutshell, as a two-fold dichotomy: Does the organization emphasize results or relations and does it Stress risk or rules? And then, what are the individual's personal preferences in this regard? This could potentially lead to a simple organization-person fit assessment that is useful and economical for a first screening of job applicants, for example. The extent to which the 54 items of the OCP will yield a more differentiated and valid assessment of an applicant when conceptualized in terms of the *results vs. relations* and *risk vs. rules* dimensions has to be studied in further research.

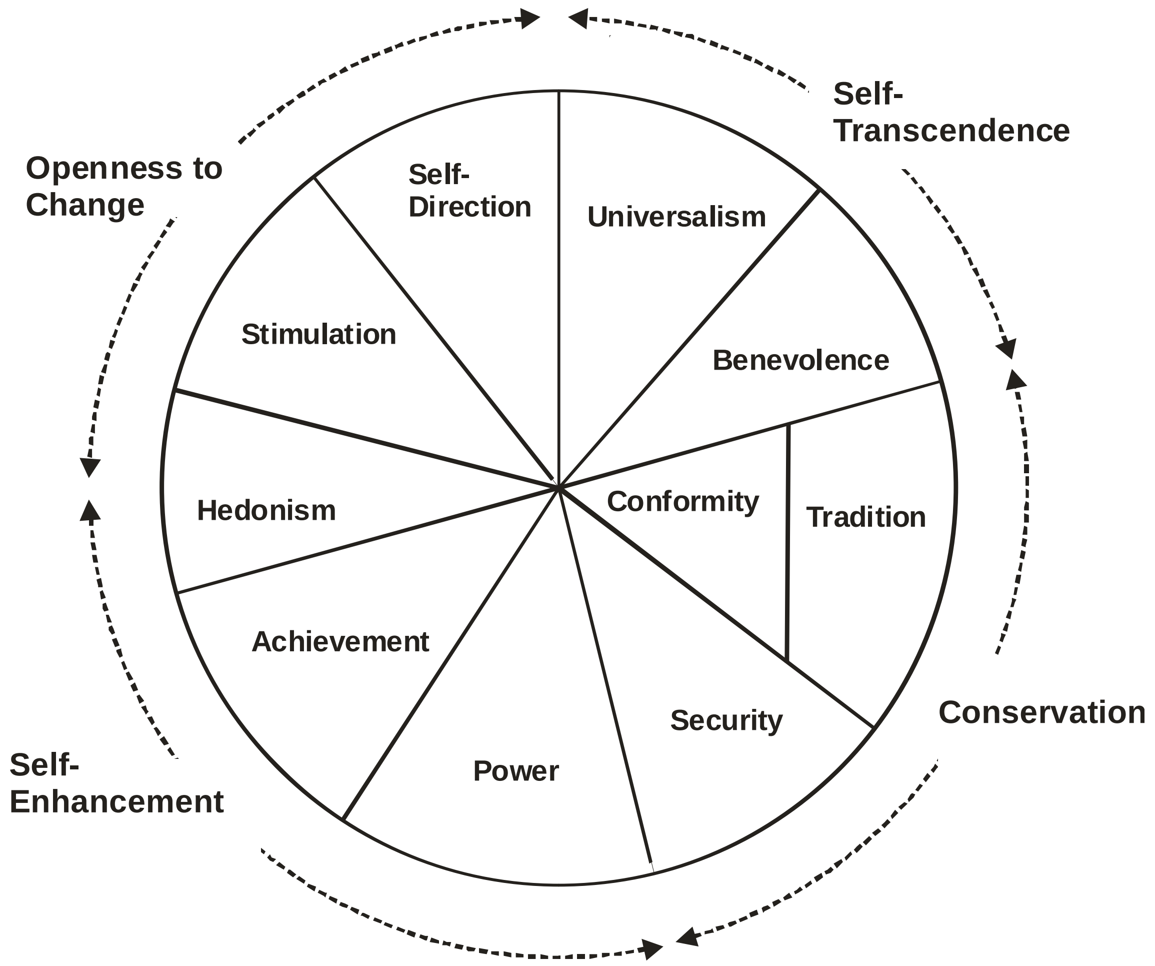

Figure 1. The Schwartz value circumplex.

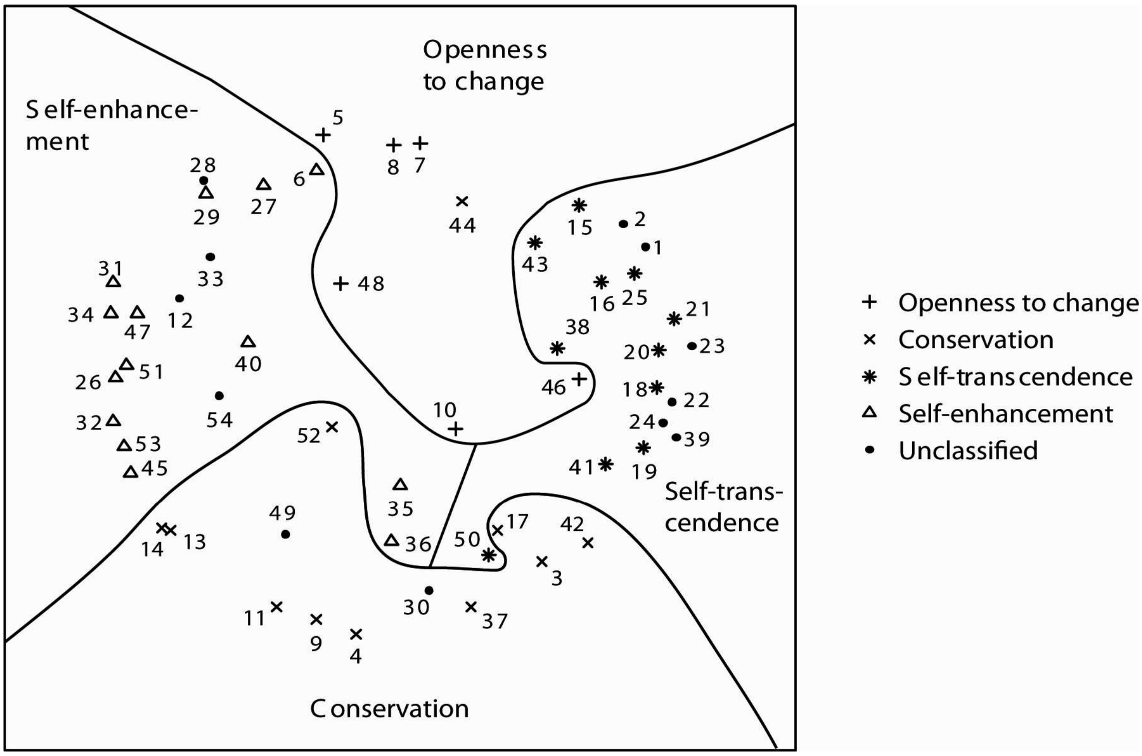

Figure 2. An MDS representation of the 54 OCP items of Table 1 (Stress=0.23) similar to the one reported by Bilsky & Jehn (2002, p. 220).

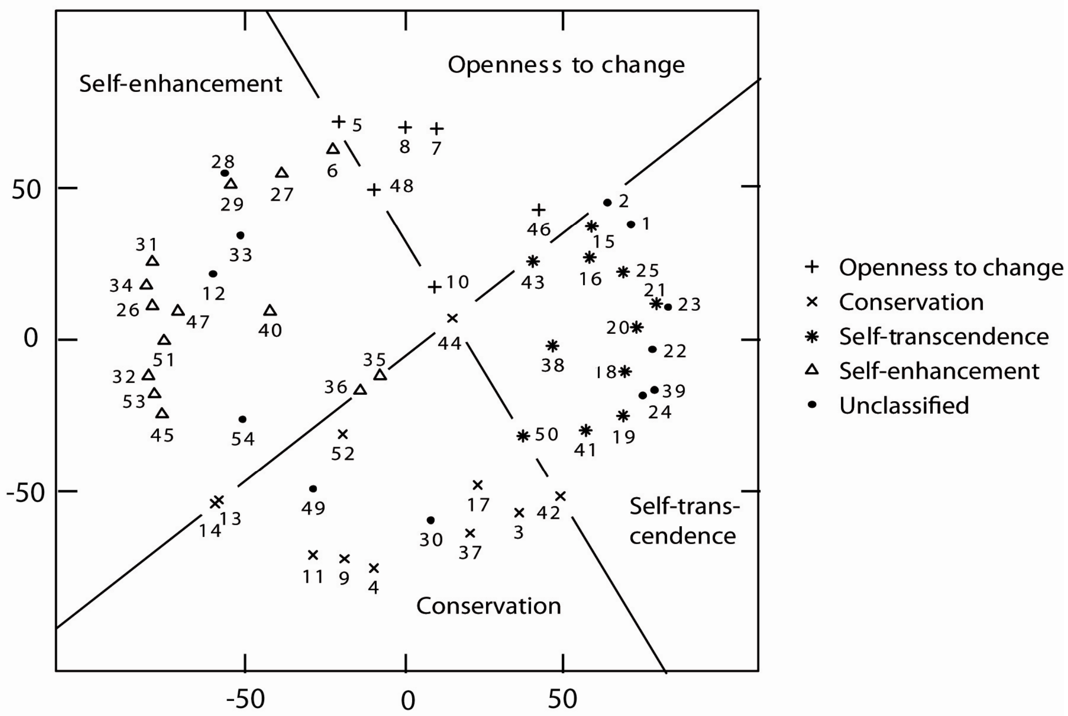

Figure 3. MDS representation for the OCP items of Jehn et al. (1997) enforcing partitionability of the configuration in the sense of Schwartz's theory.

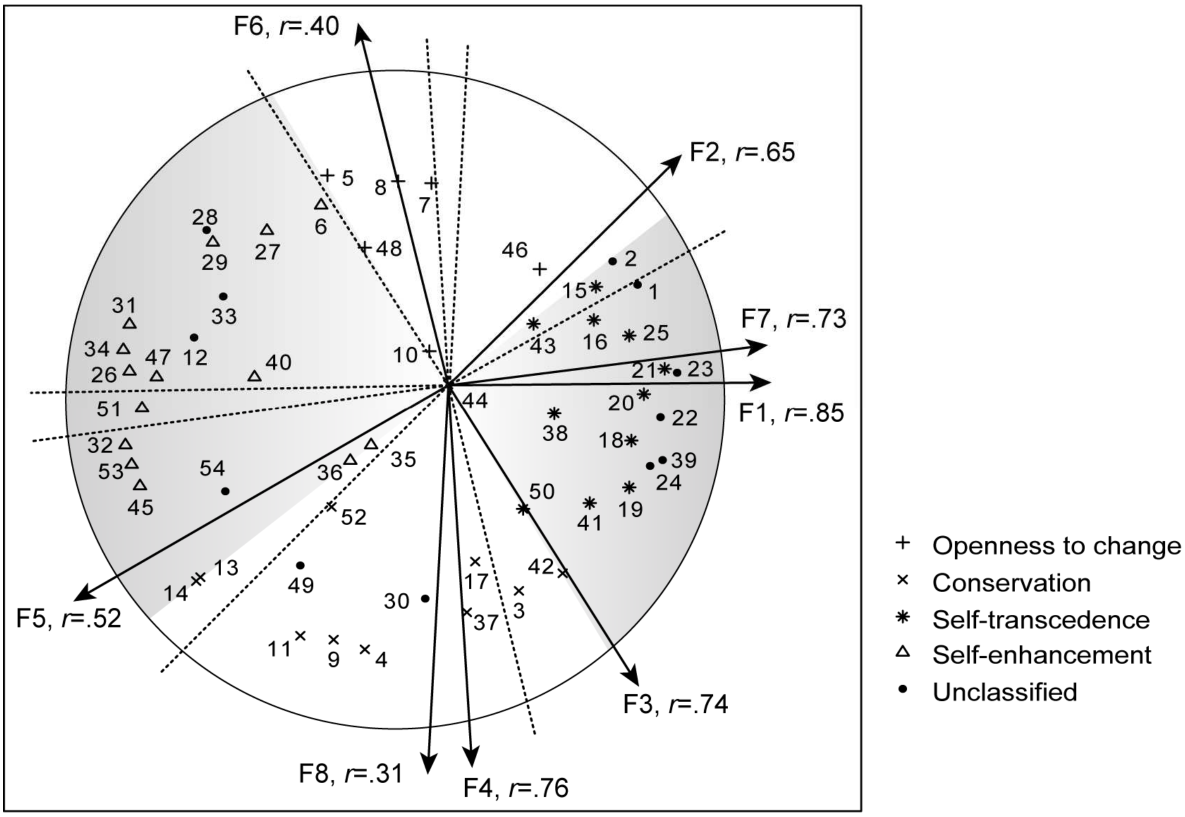

Figure 4. The MDS solution of Figure 3 with optimally embedded values scales F_1, …, F_8 of Table 1

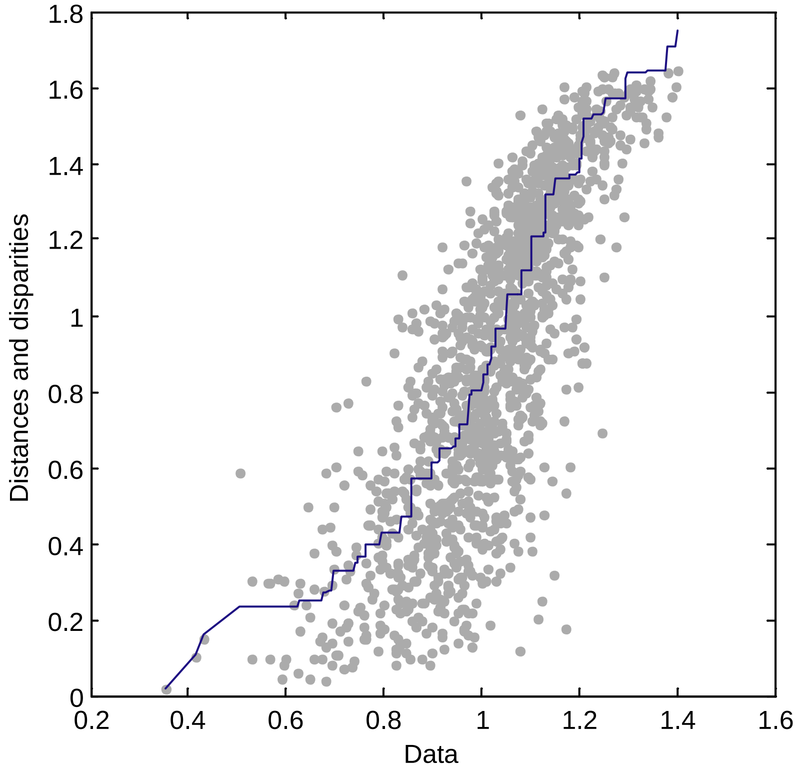

Figure 5. Shepard plot with residuals and ordinal transformation of the theory-consistent solution in Figures 3 and 4.

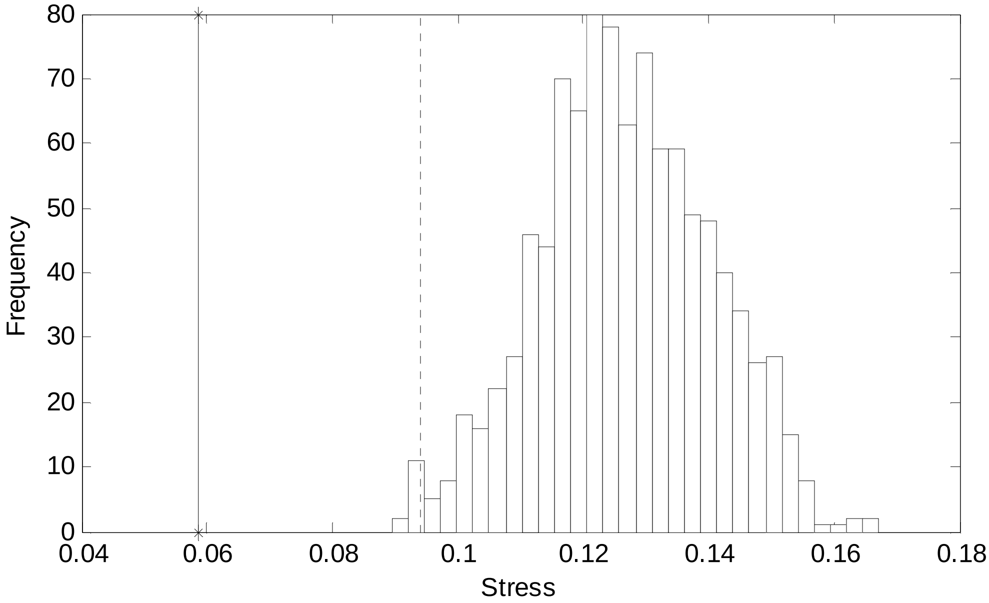

Figure 6 Distribution of Stress under random permutation of the quadrant assignments of the points. The dotted line gives the first percentile and the solid line shows the Stress value of the theory-based ("unpermuted") quadrant assignment.

Table 1 The 54 OCP items, classified as C (conservation), O (openness), T (self-transcendence), and E (self-enhancement) (Bilsky & Jehn, 2002), with the loadings (decimal points omitted) of the Jehn et al. (1997) data on eight varimax-rotated factors (F_1, …, F_8)

	Item	Type	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8
1	Flexibility	-	**54**	10	01	-17	-23	19	12	-04
2	Adaptability	-	**51**	11	01	-20	-28	23	05	-06
3	Stability	C	35	-24	22	13	03	-05	-06	02
4	Predictability	C	13	-24	26	31	24	-11	-21	38
5	Being innovative	O	-08	-08	-06	**-71**	-04	18	-05	-20
6	Being quick to take advantage of opportunities	E	08	-12	-09	**-56**	08	-02	-21	-00
7	A willingness to experiment	O	01	09	01	**-70**	00	10	10	11
8	Risk taking	O	-04	15	-09	**-72**	-09	-02	-00	07
9	Being careful	C	-04	-37	28	33	01	-02	-09	36
10	Autonomy	O	02	12	-05	01	04	09	12	**54**
11	Being rule oriented	C	-15	-35	22	37	-05	04	-07	37
12	Being analytical	-	-20	**-46**	-11	-24	07	22	10	10
13	Paying attention to detail	C	-15	**-72**	09	06	06	05	-06	08
14	Being precise	C	-11	**-72**	09	05	12	02	-18	10
15	Being team oriented	T	29	-09	-08	02	**-60**	04	09	-39
16	Sharing information freely	T	08	04	01	-01	**-47**	-00	31	-00
17	Emphasizing a single culture throughout the organization	C	17	-06	12	-03	-11	**-51**	-13	04
18	Being people oriented	T	26	09	15	12	**-58**	-13	07	-04
19	Fairness	T	13	03	14	05	-14	-06	**52**	10
20	Respect for the individual's right	T	14	10	08	08	-06	11	**66**	08
21	Tolerance	T	38	12	12	-03	-11	13	**49**	00
22	Informality	-	38	47	07	11	-14	03	09	33
23	Being easy going	-	**62**	37	10	03	-14	07	07	11
24	Being calm	-	**65**	10	-01	13	05	06	06	17
25	Being supportive	T	16	08	06	-05	-19	-04	**50**	-34
26	Being aggressive	E	**-52**	07	-14	-17	07	-13	**-41**	22
27	Decisiveness	E	07	12	**-63**	-02	21	04	-14	-04
28	Action orientation	-	-15	07	**-67**	-09	-05	09	-17	-13
29	Taking initiative	E	-22	01	**-52**	-15	-11	12	-10	-07
30	Being reflective	-	03	-19	23	12	33	05	28	04
31	Achievement orientation	E	-33	00	-31	08	-08	19	-38	-14
32	Being demanding	E	**-55**	-08	-02	01	25	04	-27	06
33	Taking individual responsibility	-	-30	-01	-42	12	-11	20	07	13
34	Having high expectations for performance	E	-37	-17	-20	-11	11	04	-31	-28
35	Opportunities for profess. Growth	E	-20	04	-02	08	00	**-55**	21	-10
36	High pay for good performance	E	-09	12	03	06	03	**-73**	-07	-06
37	Security of employment	C	-05	07	19	11	03	**-69**	04	23
38	Offers praise for good performance	T	05	20	-03	14	14	-20	**44**	-23
39	Low level of conflict	-	**56**	09	17	10	06	00	14	-09
40	Confronting conflict directly	E	-19	04	-25	01	19	-06	07	13
41	Developing friends at work	T	-06	31	34	19	-19	03	20	-18
42	Fitting in	C	09	34	**47**	32	-03	-01	-13	-02
43	Working in collaboration with others	T	-05	17	14	17	-16	10	23	**-49**
44	Enthusiasm for the job	O	06	16	-11	-02	-01	04	05	**-42**
45	Working long hours	E	**-53**	-09	16	06	-08	15	-21	08
46	Not being constrained by many rules	O	24	**47**	12	-16	28	-14	03	06
47	An emphasis on quality	E	-36	-08	-08	07	17	23	-17	**-45**
48	Being distinctive-different from others	O	-18	34	30	-28	29	17	-15	05
49	Having a good reputation	-	-10	08	25	09	-10	-04	-39	04
50	Being socially responsible	T	-05	14	22	16	01	-18	11	05
51	Being results oriented	E	-35	-03	-24	19	00	08	-31	-14
52	Having a clear guiding philosophy	C	14	-13	-11	17	**47**	-07	03	-31
53	Being competitive	E	-39	-01	02	05	32	05	**-44**	15
54	Being highly organized	-	10	-37	-38	30	26	10	-01	-24

Table 2 Coding of external variables needed for enforcing points to be regionally separated into quadrants.

Quadrant		y_1	y_2
1	Openness to change	1	1
2	Self-enhancement	1	2
3	Conservation	2	1
4	Self-transcendence	2	2

Table 3 The 54 OCP items, classified as C (conservation), O (openness), T (self-transcendence), and E (self-enhancement) (Bilsky & Jehn, 2002), with the coordinates of these data in the unconstrained 2D MDS solutions shown in Figure 2 (X_1, X_2) and Figure 4 (D_1, D_2), respectively. The quadrant constraints are also given (y_1, y_2). The column Fit contains the average Stress per point.

			Unconstrained MDS			Constrained MDS					
	Item	Value Type	X_1	X_2	Fit	Quad-rant	y_1	y_2	D_1	D_2	Fit
1	Flexibility	-	68	39	.030	-	-	-	70	39	.034
2	Adaptability	-	62	46	.037	-	-	-	63	46	.039
3	Stability	C	40	-54	.070	3	2	1	35	-57	.058
4	Predictability	C	-12	-76	.050	3	2	1	-11	-76	.054
5	Being innovative	O	-22	72	.039	1	1	1	-21	73	.047
6	Being quick to take advtg. of opport'ies	E	-24	62	.062	2	1	2	-23	64	.064
7	A willingness to experiment	O	6	70	.048	1	1	1	9	71	.034
8	Risk taking	O	-2	69	.054	1	1	1	0	71	.042
9	Being careful	C	-23	-72	.039	3	2	1	-20	-73	.044
10	Autonomy	O	15	-15	**.113**	1	1	1	9	18	**.133**
11	Being rule oriented	C	-34	-68	.044	3	2	1	-30	-72	.043
12	Being analytical	-	-61	24	**.082**	-	-	-	-61	23	**.092**
13	Paying attention to detail	C	-64	-45	.044	3	2	1	-59	-54	.045
14	Being precise	C	-66	-45	.036	3	2	1	-60	-55	.040
15	Being team oriented	T	50	51	.073	4	2	2	58	38	**.097**
16	Sharing information freely	T	56	29	.046	4	2	2	57	28	.051
17	Emphasizing a single culture throughout the organization	C	27	-45	.067	3	2	1	22	-48	.068
18	Being people oriented	T	71	-3	.051	4	2	2	68	-10	.042
19	Fairness	T	67	-21	.041	4	2	2	68	-25	.039
20	Respect for the individual's right	T	72	8	.030	4	2	2	72	4	.029
21	Tolerance	T	76	17	.022	4	2	2	78	13	.022
22	Informality	-	76	-7	.037	-	-	-	77	-3	.045
23	Being easy going	-	81	10	.019	-	-	-	82	11	.021
24	Being calm	-	73	-13	.053	-	-	-	74	-18	.055
25	Being supportive	T	65	31	.035	4	2	2	68	23	.040
26	Being aggressive	E	-79	0	.071	2	1	2	-80	12	.065
27	Decisiveness	E	-38	58	.044	2	1	2	-40	56	.052
28	Action orientation	-	-54	59	.024	-	-	-	-57	56	.033
29	Taking initiative	E	-54	55	.023	2	1	2	-55	52	.034
30	Being reflective	-	8	-63	.075	-	-	-	8	-60	.068
31	Achievement orientation	E	-80	28	.030	2	1	2	-80	27	.032
32	Being demanding	E	-80	-13	.025	2	1	2	-81	-11	.026
33	Taking individual responsibility	-	-53	36	.053	-	-	-	-52	36	.056
34	Having high expect. for performance	E	-81	19	.022	2	1	2	-82	19	.023
35	Opportunities for profess. Growth	E	0	-32	**.085**	2	1	2	-8	-11	**.088**
36	High pay for good performance	E	-2	-48	.078	2	1	2	-15	-16	**.101**
37	Security of employment	C	19	-68	.042	3	2	1	19	-64	.067
38	Offers praise for good performance	T	43	9	.056	4	2	2	45	-1	.059
39	Low level of conflict	-	77	-18	.030	-	-	-	78	-17	.034
40	Confronting conflict directly	E	-42	11	.068	2	1	2	-43	10	.067
41	Developing friends at work	T	57	-26	.059	4	2	2	56	-30	.050
42	Fitting in	C	52	-49	.048	3	2	1	48	-52	.050
43	Working in collaboration with others	T	37	40	.078	4	2	2	39	26	**.091**
44	Enthusiasm for the job	O	17	52	.051	1	1	1	14	8	**.103**
45	Working long hours	E	-75	-28	.051	2	1	2	-77	-24	.058
46	Not being constrained by many rules	O	50	0	**.086**	1	1	1	41	44	**.088**
47	An emphasis on quality	E	-73	19	.044	2	1	2	-72	10	.048
48	Being distinctive-different from others	O	-17	28	**.122**	1	1	1	-10	51	**.111**
49	Having a good reputation	-	-32	-47	.077	-	-	-	-29	-49	**.091**
50	Being socially responsible	T	24	-52	.047	4	2	2	36	-31	.054
51	Being results oriented	E	-76	4	.027	2	1	2	-76	0	.025
52	Having a clear guiding philosophy	C	-19	-14	**.106**	3	2	1	-20	-31	**.102**
53	Being competitive	E	-77	-20	.027	2	1	2	-79	-17	.035
54	Being highly organized	-	-50	-5	**.117**	-	-	-	-52	-26	**.111**

Table 4 Summary of the external fitting of the eight factors (F_1, …, F_8) of the Jehn et al. (1997) in the regionally constraint MDS solution shown in Figure 4 (D_1, D_2), respectively; b_1 and b_2 indicate the regression weights to predict the component F_i as a linear combination of D_1 and $D_{2;}$ r is multiple correlation of F_i with MDS dimensions.

	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8
Variance explained	8.1	5.7	5.3	5.5	4.2	4.1	5.7	4.5
Regression weight b_1	.45	.23	.20	.03	-.18	-.05	.32	-.01
Regression weight b_2	.01	.23	-.32	-.43	-.10	.19	.04	-.16
r (fit of F_i in confirmatory MDS space)	.85	.65	.74	.76	.52	.40	.73	.31

Table 5 Stress decomposition of theory-consistent model.

Source of Stress	Stress	Percentage
Stress Lack of model fit	.05804625	99.199%
Lack of confirmation fit	.00046888	0.801%
Normalized raw Stress σ_n^2	.05851513	100.000%

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