Using hierarchical item clustering to establish the dimensionality of the multifactor leadership questionnaire†.

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ABSTRACT

This paper illustrates some benefits of using hierarchical item clustering (ICLUST) as an alternative analytical procedure for establishing the dimensionality and homogeneity of the multifactor leadership questionnaire, a scale widely used for measuring leadership behaviours. We used ICLUST analysis to analyse data from 177 local councils’ employees. Current findings suggest that ICLUST analysis established first-order clusters of the leadership research construct that had equivalent comparisons to factors found through confirmatory factor analysis and reported in extant literature. Theoretical and practical implications for using ICLUST are discussed.

Key words: Hierarchical item clustering (ICLUST), multifactor leadership questionnaire, scale construction, scale dimensionality, internal homogeneity, whole-of-scale, subscales.

INTRODUCTION

There is a growing call for researchers that use summated scales in management and organisational behaviour to choose alternative but defensible analytical procedures for scale construction other than factor analysis (Cooksey & Soutar 2006; Revelle 1978, 1979; Revelle & Zinbarg, in press; Zinbarg et al. 2005). Choosing a good scale construction technique not only enhances a researcher’s confidence that they are validly and reliably measuring constructs as stated in original theory, it can also help a researcher make decisions on whether to use whole scales or subscales when analysing relationships between constructs. This is especially important when researchers plan to compare scale scores across cultural and/or organisational boundaries, where scale factorial homogeneity is crucial.

One construct that is often studied across multicultural and cross-cultural environments is leadership. Needless to say that a majority of positivistic studies use summated scales to measure the construct of leadership (Alimo-Metcalfe & Alban-Metcalfe 2001; Avolio & Bass 2004; Parry & Proctor-Thomson 2001; Podsakoff et al. 1996). Once data are collected, researchers then evaluate the reliability, validity, and factorial homogeneity of the scales through a series of procedures, with exploratory factor analysis or component analysis being the most pervasive scale construction techniques (Cooksey & Soutar 2006; Hinkin 1995). Occasionally, these conventional methods fail to produce optimal solutions when constructing scales, and it is then that researchers turn to other psychometrically defensible approaches. One such approach is to use hierarchical item clustering or
ICLUST (Cooksey & Soutar 2006; Revelle 1978, 1979; Zinbarg et al. 2005). This paper examines the effectiveness of using ICLUST to illustrate the factorial homogeneity and internal scale structure display of the multifactor leadership questionnaire (Avolio & Bass 2004), the most commonly used leadership survey instrument.

THEORETICAL BACKGROUND AND RESEARCH APPROACH
Proponents of hierarchical item clustering (Cooksey & Soutar 2006; Revelle 1978, 1979; Zinbarg et al. 2005) have shown that the approach is robust and efficacious when examining the factorial homogeneity of scales by looking at how items are optimally divided into ‘internally consistent and independent subsets’, thus helping researchers determine ‘the relative contributions of a general factor or specific group of factors to a particular scale of interest’ (Cooksey & Soutar 2006: 79). Furthermore, scale structure displays from hierarchical item clustering analysis open up the possibility of visually examining the internal structure of the scale, thus identifying whether there are coherent and valid subcomponents within scales. This would consequently enable a researcher make decisions on whether to use the scales at a ‘macro (whole-of-scale) level’ or at a ‘more finely grained micro level (sub-scales)’ (Cooksey & Soutar 2006: 80). In addition, factorial homogeneity of the multifactor leadership questionnaire would allow researchers to make legitimate comparisons of the MLQ scores across cultural and organisational boundaries, and would be especially useful since leadership research transcends cultural and organisational boundaries.

Conceptualising transformational and transactional leadership
Avolio and Bass (2002) conceptualise leadership as both transactional and transformational. They propose that transformational leadership offers a full range of leadership potential, claiming that each leader has a profile that includes some or all of the transformational, transactional, or nontransactional behaviours, and that better leaders do both, while the best leaders are more transformational than transactional. Furthermore, Avolio and Bass (Avolio & Bass 1988, 1991, 2002) propose that transformational leaders behave in ways which achieve superior results by emphasising one or more of four dimensions of transformational leadership. First, leadership is idealised when followers seek to identify with their leaders and emulate them. Second, leadership inspires followers with challenges
and persuasion that provide meaning and understanding. Third, leadership is intellectually stimulating, expanding the followers’ use of their abilities. Finally, leadership is individually considerate, providing the followers with support, mentoring, and coaching. Avolio and Bass (2002) also state that transactional leadership occurs when the leader rewards or disciplines a follower on the basis of adequacy of the follower’s performance. This leadership approach depends on contingent reinforcement, either positive contingent reward or the more negative or passive forms of management-by-exception (MLQ, see discussion in Avolio & Bass 2004: 21-23). Each of the nine (9) factors described above can be assessed with the Multifactor Leadership Questionnaire (MLQ, see discussion in Avolio & Bass 2004: 28-29).

The issue of the generalisability of US approaches to leadership has been raised by other researchers (Smith et al. 1989; Smith & Peterson 1988). Extant literature echoed distinctions between the management of profit and not-for-profit organisations (Robbins et al. 2006). When comparing the organisational structures of public and private sectors, it had been expected that bureaucracy, in the form of stringent rules and regulations, would dominate hierarchically-structured public organisations like local councils. Consequently, participants from local councils would have been expected to respond to more traditional transactional leadership styles while participants from the more dynamic flat-structured private sector organisations would be expected to identify more with transformational leadership styles. Besides the dearth of organisational studies on local government, local councils were chosen on the premise that they would provide a relevant public sector context for the study. The researchers were interested on whether dimensions of organisational leadership which have emerged from North American studies are similar to those found in Australian organisations, particularly those in the public sector. Regional councils were chosen as there had been little leadership research conducted on them.

**Measuring leadership using the multifactor leadership questionnaire (MLQ 5X)**
The questionnaire used to measure the transformational and transactional leadership in this study was the Multifactor Leadership Questionnaire (MLQ, Form 5x-Short) developed by Bass and Avolio
(1990; Avolio & Bass 2004). As indicated in Table 1, the leadership dimensions measured in this survey were:

a. Transformational Leadership, comprising charisma/idealised influence-attributed (4 items), idealised influence-behaviour (4 items), Inspirational motivation (4 items), intellectual stimulation (4 items), and individualised consideration (4 items).

b. Transactional leadership, comprising contingent reward (4 items) and management by exception-active (4 items), and passive (4 items).

c. Laissez-faire Leadership, which is a non leadership dimension comprising 4 items.

(Insert Table 1 here).

Data for this study were collected using thirty-six (36) items, numbered from TL1 to TL36. The employees rated their feelings about the leadership roles of those they considered to be their leaders using the MLQ. All the items were rated using a five-point Likert scale defined as: (0) not at all; (1) once in a while; (2) sometimes; (3) fairly often; (4) frequently if not always; and, (UR) for unable to rate. Past research data from all continents (N=7,324) and run on a confirmatory factor analysis yielded 9 sub-components of the MLQ 5x-Short (Avolio & Bass 2004: 46-48).

However, existing literature on the MLQ indicated that there were still high, positive correlations among the five transformational leadership scales in the MLQ 5X-Short. There were also positive and significant correlations between contingent reward and each of the five scales comprising the transformational leadership. Avolio and Bass (2004) also reported a confirmatory factor analysis for data collected from a large US sample (N = 27, 285). The same study reported the following reliability coefficients for the nine leadership factor scales: idealised influence (attributed), .75; idealised influence (behaviour), .70; inspirational motivation, .83; intellectual stimulation, .75; individualised consideration, .77; contingent reward, .69; active management-by-exception, .75; passive management-by-exception, .70; laissez faire, .71; extra effort, .83; effectiveness, .82; and satisfaction, .79. Using data analysed with confirmatory factor analyses, Avolio and Bass (2004) concluded that testing the nine factor scales across regions and by rater-level showed strong and
consistent support for the full range 9-factor model. However, previous research produced three higher-order factors of transformational, developmental/transactional and passive corrective (Avolio & Bass 2004: 60).

**USING HIERARCHICAL ITEM CLUSTERING ANALYSIS FOR SCALE CONSTRUCTION**

To judge the dimensionality and internal homogeneity of the MLQ instrument used in this study, the ICLUST item-clustering procedure (Revelle 1978, 1979) was implemented. Revelle (1978) proposed that the use of factor analysis as a way of forming sets of relatively independent and internally consistent scales has some drawbacks. First, inter-item “correlations are usually small (average interitem correlations ≤ .3) and the sample sizes are usually not much larger than the number of items” (1978: 739). Consequently, “These problems tend to lead to overfactoring (extracting too many factors), unstable rotations, and generally nonsensical solutions” (1978: 739). Moreover, when “the item pool is large (greater than 10-20 items), when the item intercorrelations are small (between 0.0 and .5), or when a sample size is small”, Revelle proposed the use of cluster analysis as an alternative to factor analysis (1978: 739).

**ICLUST: Cluster analytic approach to exploratory and confirmatory scale construction**

Although normally used to group objects (Everitt 1974; Hair et al. 1998; Hartigan 1975), Revelle (1978) noted that a weakness of many clustering procedures when used for scale construction had been that they did not include basic psychometric decision rules to evaluate either the quality or the number of clusters to extract. However, with the development of ICLUST analysis program, Revelle was able to combine psychometric principles with clustering procedures, leading to a simple but useful approach to scale construction. Consequently, Revelle (1978: 739) detailed the following hierarchical clustering algorithm steps:

1. Find the interitem proximity matrix (for items, this is the correlation matrix)

2. Find the most similar pair of variables in this matrix
3. If the internal consistency of the cluster formed by combining this pair of variables would be
greater than that of its components, then combine the two variables into a new (composite)
variable or cluster.

4. If the test at Step 3 is passed, add the new composite variable to the set of previous variables,
delete its two component variables, and calculate the proximity of the new composite with the
remaining variables.

5. Repeat Steps 2-4 until no more variables pass the increase-in-internal-consistency criterion of
Step 3.

6. Find the value of the VSS goodness-of-fit criterion. The “VSS criterion…measures how well the
cluster solution reproduces the initial correlation of matrix” (Revelle 1978: 741).

Revelle’s Coefficient Beta
Revelle (1979) defined coefficient beta “as the worst split-half reliability of a scale”, and that it “is an
estimate of the lowest or minimum value in the collection of possible split-half reliabilities that are
averaged to obtain coefficient alpha”. Consequently, he proposed that coefficient beta can be viewed
“as a more appropriate estimate of the amount of variation within a scale that is due to some general
factor or construct if the scale comprises several factors or constructs” (1979: 80).

Cooksey and Soutar (2006: 80) formally defined coefficient beta as

$$ \beta = (n + m)^2 \left( \min \sigma^2_{ij} \right) / \sigma^2_t. $$

(1.1)

where $n =$ the number of items in the first subscale, $m =$ the number of items in the second subscale,
$\min \sigma^2_{ij} =$ the minimum of all possible averages of between-half item covariances, and $\sigma^2_t =$ the
variance of the total scale.

Having noted the inherent weaknesses found in conventional factor analysis, Revelle consequently
called for a rethink on forming composite scales from batteries of items. Revelle particularly called
for an assessment of the adequacy of a scale on the basis of both the magnitude of the coefficient
alpha and the worst split-half reliability coefficient beta. Hence, Revelle concluded: “If a test has a
sizeable beta as well as a sizeable alpha, the test can be considered to be assessing one construct. A
high alpha and a low beta, on the other hand, is an indication that the test is “lumpy” and has several large group factors. Such a test should not be considered to be a measure of one construct, but rather of two or more” (1979: 71). Consequently Revelle (1979, later reinforced by Cooksey & Soutar 2006) proposed that a low value for coefficient beta (that is, beta less than 0.50) for any single set of items would signal the presence of subscales. Moreover, “the decision to combine two sets of items into a single scale should only be made if the beta for the combined scale is higher than the average beta for its subscales” Cooksey & Soutar 2006: 81).

Therefore, ICLUST Analysis was chosen as the main procedure for scale construction in this research for several reasons. First, several recent writings on alternative approaches to scale construction (Cooksey & Soutar 2006; Zinbarg et al. 2005) have shown the merits of using ICLUST analysis, especially when there are small sample sizes. ICLUST analysis was particularly suitable for the final sample size (N = 177). Second, ICLUST analysis enables researchers to use both the coefficients alpha and beta when judging the scale quality and homogeneity. Third, ICLUST analysis had the benefits of enabling us to assess the coefficient beta when making scale revision decisions. Consequently, the researchers agreed with Cooksey and Soutar’s argument that ICLUST analyses are “relevant in cross-cultural studies or in studies that use the same measures in different circumstances, where contextual variations in construct measurement may require different scale compositions” (2006: 81).

METHODS

Participants and procedure for data collection
Data used in the present study were collected as part of higher research degree study which examined the influence of leadership behaviours on several organisational outcomes. Following clearance from the Human Research Ethics Committee, a survey instrument was administered to employees drawn from nine local councils in New South Wales. With the help of Human Resource departments of the participating councils, respondents filled out the questionnaires in their work settings during normal working hours, or respondents were allowed to take the survey home to complete if they so chose. The researchers had included a prepaid self-addressed envelope, encouraging respondents to post back
their surveys directly to the researchers. All participants had been assured of anonymity and their right to withdraw from participation. The participants represented blue collar, managerial and professional positions. Respondents also represented multiple divisions, organisational levels, and from councils of varying sizes. The complete sample from the councils was 200 employees. Of these, 23 respondents failed to provide background information and were therefore deleted. Thus the final effective sample size was 177.

**ICLUST SCALE CONSTRUCTION PROCESS**

Available data were screened using a SPSS 14 software package and all missing data values were replaced with means. Data were later analysed using Revelle’s (1978) ICLUST IV software package that had been adapted for use on a PC. All coefficient beta values were computed using Equation 1.1 (explained earlier under Revelle’s Coefficient Beta). The resulting alpha and beta coefficients together with the VSS index and the hierarchical tree diagram outputs for the nine scales were assessed for emerging subscales and then compared with extant reports of original subscales. Once the final clusters had been identified, respondents were given scores on each cluster using the following process: (1) all items were converted to $z$-scores and (2) $z$-scores for all non-missing items defining a cluster were then averaged to produce a cluster score. Following on from the results of both the first-order and second-order ICLUST analyses, the researchers would then decide on whether to use one superordinate cluster (unidimensional) or multidimensional clusters for later hierarchical multiple regression analyses. Using second-order clusters (or macro level focus) would allow the testing of models with fewer and less complicated predictors.

**ICLUST ANALYSIS OF THE MULTIFACTOR LEADERSHIP QUESTIONNAIRE**

The factor analysis of the original Multifactor Leadership Questionnaire (Avolio & Bass 2004; Avolio et al. 1995; Bass & Avolio 1990) yielded 3 main factors (scales) and 9 sub-scales: transformational leadership, comprising charisma/idealised influence-attributed (4 items), idealised influence-behaviour (4 items), inspirational motivation (4 items), intellectual stimulation (4 items), and individualised consideration (4 items); transactional leadership comprising contingent reward (4 items) and management by exception-active (4 items), and passive (4 items); and, laissez-faire
leadership, which is a non leadership dimension comprising 4 items. For construct equivalence purposes, ICLUST analysis was expected to yield a similar number and composition of clusters.

First-Order ICLUST analysis for the multifactor leadership questionnaire

During the initial analysis process, items 4 (from the active management-by-exception factor: “focuses attention on irregularities, mistakes, exceptions, and deviations from standard”), 17 (from the passive management-by-exception factor: “shows that he/she is a firm believer in “if it ain’t broke, don’t fix it”), 23 (from the idealised influence-behaviour factor: “considers the moral and ethical consequences of decisions”), and 25 (from the idealised influence-attributed factor: “displays a sense of power and confidence”) were deleted as they did not substantively contribute to any cluster.

Figure 1 shows the resulting hierarchical tree diagram from the first-order ICLUST analysis. The new 32-item MLQ was not unidimensional, as there were four distinct, reliable, and homogeneous sub-scales/clusters. An inspection of the item patterns in Figure 1 suggested that the first subscale/cluster (labelled Active Management-by-Exception) comprised items 22, 24 and 27, just as originally theorised. The cluster had a Cronbach alpha of .61 and a coefficient beta of .55. The second subscale/cluster (labelled Intellectual Stimulation) comprised items 2, 8, 29 and 30. All items except 29 (from individualised consideration) were as originally theorised. The cluster had a Cronbach alpha of .67 and a coefficient beta of .60. The third subscale/cluster (labelled Laissez-Faire/Passive Management-by-Exception) comprised items 3, 5, 7, 12, 20, 28 and 33. Items 5, 7, 28 and 33 were from the laissez-faire factor, whereas the remaining items were as originally theorised. The cluster had a Cronbach alpha of .83 and a coefficient beta of .71. (Insert Figure 1 here).

Finally, the fourth subscale/cluster (labelled Transformational and Contingent Reward) comprised items 1, 6, 9, 10, 11, 13, 14, 15, 16, 18, 19, 26, 31, 32, 34, 35 and 36. Items 10 and 18 were from the idealised influence (attributed) subscale. Items 6 and 14 were from the idealised influence (behaviour) subscale. Items 9, 13, 26 and 36 were from the inspirational motivation subscale. Item 32 was from the intellectual stimulation sub-scale. Items 15, 19 and 35 were from the individualised
consideration subscale. Items 1, 11, 16 and 35 were from the contingent reward subscale. The cluster had a Cronbach alpha of .95 and a coefficient beta of .86. The overall goodness of fit was .95.

**Second-order ICLUST analysis for the multifactor leadership questionnaire**

First-order cluster scores for the Multifactor Leadership Questionnaire clusters were examined for second-order unidimensional cluster structure to be used in further model analyses. An inspection of the results of the second-order ICLUST analysis displayed in Figure 2 suggested the formation of two superordinate clusters. (Insert Figure 2 here). The first cluster, *Active Individualised Transformational Leadership* comprised transformational/ contingent reward, intellectual stimulation, and laissez faire/ passive management-by-exception. The cluster had a Cronbach alpha of .74 and a coefficient beta of .66. The second cluster, *Active Management by Exception* did not join with the other clusters and was consequently deemed a separate cluster. This cluster solution had a goodness of-fit of .96. Researchers may have chosen to use these 2 clusters for further analyses in for example, hierarchical multiple regression analyses.

**CONCLUSIONS AND IMPLICATIONS**

The present study illustrates some benefits of using hierarchical item clustering (ICLUST) as a viable scale construction technique in management and organisational behaviour research. Scale construction of the MLQ using ICLUST produced useful tree diagrams showing both coefficients beta and alpha that ultimately enhanced the confidence of the researchers when making decisions about the homogeneity and interpretability of scale structures. In the present research, the scale construction methodology of ICLUST analysis established first-order clusters of the research constructs that had largely equivalent comparisons to factors found through confirmatory factor analysis and reported in the existing literature. First-order ICLUST analysis established four MLQ dimensions: active management-by-exception, intellectual stimulation, laissez-faire and passive management-by-exception, and transformational-contingent reward. The cluster composition differed from the full range nine factor model of transactional-transformational leadership comprising idealised influence (attributed), idealised influence (behaviour), inspirational motivation, intellectual stimulation,
individualised consideration, contingent reward, management-by-exception (active), management-by-exception (passive), and laissez-faire leadership (Avolio & Bass 2004).

Nevertheless, the present study corroborates previous research showing a degree of unidimensionality with the transformational items, and multidimensionality of the transactional items in the MLQ. It should be noted that the multifactor leadership questionnaire has been criticised for its inability to accurately measure and differentiate several dimensions (for example, differentiating idealised influence from inspirational motivation) (Bycio, Allen & Hackett 1995; Judge & Piccolo 2004). Consequently, measurements of transactional-transformational leadership have ranged from a 1-factor solution to the full 9-factor model (Avolio & Bass 2004; Judge & Piccolo 2004). Leadership investigation has continued using different versions of the MLQ and ‘number of items and their specific content vary among the forms, as does the target user population…Regardless of the particular form involved, subsets of the MLQ facets have been differentially related to leader performance, organizational outcomes…’ (Bycio et al. 1995: 469).

Second-order ICLUST analysis established a two-dimensional transactional-transformational construct comprising active individualised transformational leadership (composed of intellectual stimulation, transformational-contingent reward, reverse-scored laissez-faire and passive management by-exception) and active management-by-exception. The statistical veracity of these final two clusters’ (alpha = .74, beta = .66, overall goodness-of-fit, .96) was deemed robust in comparison to that in a previous MLQ report (Avolio & Bass 2004). The construct also compared especially well to a two-factor higher order model described in previous studies (Avolio et al. 1988; Bass 1985; Bycio et al. 1995; Waldman et al. 1987). That the ICLUST analysis did not clearly support the theorised factors may also be attributed to the potential effect of national cultural differences (Ashkanasy et al. 2002). Recent research on leadership in Australia has conceptualised effective leaders as those exhibiting transformational leader behaviours, although the conceptualisation of transformational leadership in Australia somewhat differed from that of the US (Bartram & Casimir, 2007; Casimir et al. 2006; Parry & Sarros, 1996; Parry, 1996; Sarros et al. 2008; Trevor-Robberts et al. 2003). Based on the findings of the current study, it is noteworthy that dimensions such as passive management by
exception and intellectual stimulation clustered together into a single dimension. However, this is not unique since a review of past studies (Avolio & Bass 2004) shows that other well regarded studies have previously used a superordinate leadership factor, comprising of both the transactional and transformational leadership dimensions. Avolio and Bass (2004:71) attributed the high correlation between transactional and transformational dimensions to the fact that both leadership styles represented forms of leadership, and that many leaders had been shown to be both transactional and transformational.

Researchers need to understand that during scale construction and data analysis phases of a study, confirmatory factor analysis and structural equation modelling approaches may not always work. This study should therefore spur researchers in management and organisational behaviour, especially those who use the MLQ in contexts outside the US, to explore and use other defensible scale construction methods such as item-clustering (ICLUST), instead of the popular confirmatory factor analysis (whether in factor analysis or structural equation modelling) that pervade scale construction in leadership/management research. Consequently, this study proves that researchers can combine ICLUST analysis with other techniques such as hierarchical multiple regression analysis as alternative approaches. The lesson learned here was that researchers in the management discipline can successfully circumvent a failure to fit models to research data using confirmatory factor analysis and structural equation modelling. Furthermore, this shows that management researchers can use this method, one especially suitable for small sample sizes like that used for this research and for scale construction which is careful to maintain cross cultural (using US scales in an Australian context) and cross organisational (using scales developed for private sector to public sector) equivalences.

An important limitation of this study is that it studied members of only one level of local government, namely local councils/shires in regional New South Wales. It is possible that cluster compositions for the MLQ derived from a public sector sample may differ from a private sector sample. Further, this may explain why several cluster formations did not occur as theorised. For example, it was clear that, for the transformational leadership construct, our sample viewed leadership
as pairing increased active individualised transformational leadership with reduced focus on active management-by-exception. These findings demonstrated that, in order to capture the intended constructs, the MLQ needed refining when used in public sector research. However, these findings also demonstrated that the majority of the scales developed for research in the US could feasibly be used in Australian public sector contexts. To progress this research further, the next stages will involve (a) comparing the ICLUST analysis to a confirmatory factor analysis using the same data set; (b) determining the concurrent validity of the instrument, using independent, objectively measurable criteria; and, (c) investigating the discriminant as well as the convergent validity of the MLQ, with reference to supervisors at different levels, and in different organisations.

In conclusion, this study corroborates earlier studies (Cooksey & Soutar 2006; Revelle & Zinbarg, in press; Zinbarg et al. 2005) showing ICLUST analysis as a viable alternative methodology (to factor analysis). Furthermore, this paper has shown the utility of ICLUST as a scale construction technique in organisational studies and especially applicable when analysing small data samples in cross-cultural contexts.

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Zinbarg, R, W Revelle, I Yovel & W Li (2005) Cronbach’s α, Revelle’s β and McDonald’s ω_H: their relations with each other and two alternative conceptualizations of reliability. Psychometrika, 70(1), 123-133.
### Table 1 Dimensions measured by the multifactor leadership questionnaire

<table>
<thead>
<tr>
<th>Type of Questionnaire</th>
<th>Main Factor</th>
<th>First Order Factor</th>
<th>Theorised sub-dimensions</th>
<th>Item Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multifactor Leadership Questionnaire 5x</td>
<td>Transformational</td>
<td>Idealised Influence (Attributed)</td>
<td>TL10, TL18, TL21, TL25</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Idealised Influence (Behaviour)</td>
<td>TL6, TL14, TL23, TL34</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspirational Motivation</td>
<td>TL9, TL13, TL26, TL36</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intellectual Stimulation</td>
<td>TL2, TL8, TL30, TL32</td>
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<tr>
<td></td>
<td></td>
<td>Individualised Consideration</td>
<td>TL15, TL19, TL29, TL31</td>
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</tr>
<tr>
<td></td>
<td>Transactional</td>
<td>Contingent Reward</td>
<td>TL1, TL11, TL16, TL35</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Management by Exception (Active)</td>
<td>TL4, TL22, TL24, TL27</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management by Exception (Passive)</td>
<td>TL3, TL12, TL17, TL20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laissez- Faire Leadership</td>
<td>Laissez- Faire Leadership</td>
<td>TL5, TL7, TL28, TL33</td>
<td></td>
</tr>
</tbody>
</table>
**Figure 1** First-order hierarchical Tree Diagram from ICLUST Analysis of the Multifactor Leadership Questionnaire

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>ALPHA</th>
<th>BETA</th>
<th>SIZE OF FINAL CLUSTER</th>
<th>NAME OF FINAL CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention towards failures (27)</td>
<td>.612</td>
<td>.547</td>
<td>3</td>
<td>ACTIVE MANAGEMENT BY EXCEPTION</td>
</tr>
<tr>
<td>Concentrates on mistakes (22)</td>
<td>.588</td>
<td>.588</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracks mistakes (24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differing perspectives (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Re-examines critical assumptions (2)</td>
<td>.539</td>
<td>.539</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Considers my different needs (29)</td>
<td>.667</td>
<td>.599</td>
<td>4</td>
<td>INTELLECTUAL STIMULATION</td>
</tr>
<tr>
<td>Examines problems from many angles (30)</td>
<td>.605</td>
<td>.605</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fails to interfere till problems arise (3)</td>
<td>.833</td>
<td>.710</td>
<td>7</td>
<td>LAISSEZ-FAIRE / PASSIVE MANAGEMENT BY EXCEPTION</td>
</tr>
<tr>
<td>Absent when needed (7)</td>
<td>.695</td>
<td>.695</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delays responding (33)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waits for things to go wrong (12)</td>
<td>.825</td>
<td>.761</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problems chronic before action (20)</td>
<td>.746</td>
<td>.746</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoids decisions (28)</td>
<td>.781</td>
<td>.743</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoids getting involved (5)</td>
<td>.607</td>
<td>.607</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistance in exchange for efforts (1)</td>
<td>.952</td>
<td>.860</td>
<td>18</td>
<td>TRANSFORMATIONAL CONTINGENT REWARD</td>
</tr>
<tr>
<td>Treats me as an individual (19)</td>
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<td>Talks values and beliefs (6)</td>
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<td>Enthusiastic about future (9)</td>
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<tr>
<td>Importance of purpose (14)</td>
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<td>Compelling vision (26)</td>
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<tr>
<td>Importance of collective (34)</td>
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<td>.857</td>
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<td>Instills pride (10)</td>
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<tr>
<td>Discusses responsibilities</td>
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<td>Expresses satisfaction (35)</td>
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<tr>
<td>Expresses confidence (36)</td>
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<tr>
<td>Clarifies rewards after goal (16)</td>
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<td>Teaches &amp; coaches (15)</td>
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<td>Beyond self-interest (18)</td>
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<td>Builds my respect (21)</td>
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<td>Develop my strengths (31)</td>
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<td>Suggests new ways (32)</td>
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</table>

Item numbers are in parenthesis and bold. Coefficient alphas are in italics, and coefficient betas are in bold. Overall Goodness-of-fit (VSS) = .95.
**Figure 2** Second-order hierarchical Tree Diagram from ICLUST Analysis of the Multifactor Leadership Questionnaire

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>ALPHA</th>
<th>BETA</th>
<th>SIZE OF FINAL CLUSTERS</th>
<th>NAME OF CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laissez faire/ Passive Management by Exception (3)</td>
<td>.738</td>
<td>.657</td>
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<td>Active Individualised Transformational Leadership</td>
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<td>Transformational Contingent Reward (4)</td>
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<td>Intellectual Stimulation (2)</td>
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<tr>
<td>Active Management by Exception (1)</td>
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<td></td>
<td>1</td>
<td>Active Management by Exception</td>
</tr>
</tbody>
</table>

Cluster numbers are in parentheses and in bold. Cluster 1 did not join other clusters. Coefficient alphas are in italics, and coefficient betas are in bold. Overall Goodness-of-fit ($VSS$) = .96