Chapter 4 – MODELLING CULTURAL ADAPTABILITY

4.1 BACKGROUND

Based on previous research conducted at Stabilization Force (SFOR) headquarters in Bosnia-Herzegovina, Dr. Janet Sutton (U.S. Air Force Research Laboratory) and Dr. Linda Pierce (U.S. Army Research Institute) identified several cognitive styles and culturally based behavioural dimensions to be either enablers or potential barriers to individual and team adaptability in multicultural military environments. They shared these findings with the NATO ACT CD&E / RTO HFM RTG 138 Leader and Team Adaptability in Coalition Teamwork (LTAMC) project team and a plan was developed to leverage their knowledge for the purpose of developing a conceptual model of cultural adaptability, then validating the model with empirical data. Cultural competence is a critical enabler of information sharing, situation awareness, and team performance in multicultural collaborative environment and, as such, it is imperative that nations address the need to understand what it means for officers to culturally adapt, as needed, to ensure mission success.

4.2 MODELLING CULTURAL ADAPTABILITY

To expand on the idea that statistically related cognitive styles and/or personality traits might predict cultural adaptability, survey data was collected from 150+ NATO officers participating in two Deployable Joint Task Force (DJTF) headquarters. The initial model of cultural adaptability was developed from field research at the NRF certification exercise Allied Warrior 04. The model was then validated with data collected at a second NRF certification exercise, Allied Warrior 05. A summary paper, originally presented in April 2008 at a NATO RTO Human Factors and Medicine Panel Research Symposium (HFM RSY 142), is included here in its entirety. When referencing content from this paper, the following format should be used: Svensson, E., Lindoff, J. Sutton, J.L., (2008, Apr). Predictive Modelling of Personality Traits – Implications for Selection so Operational Personnel (MP-HFM-142-06). In J. L. Sutton (Chair), *Adaptability in Coalition Teamwork.* Symposium conducted at the HFM-142/RSY, Copenhagen, Denmark.

Predictive Modelling of Personality Traits –

Implications for Selection of Operational Personnel[44]

ABSTRACT

A series of factors have impact on teamwork in coalitions. Individual differences in personality traits represent powerful factors that, in interaction with culturally based cognitive biases, influence collaboration and performance. By means of factor analyses, multidimensional scaling, and modeling ad modum LISREL, 17 personality measures have been reduced to models of three interrelated factors. From initial model analyses, we found that the co-variances between variables were explained by a sequential relation between the factors Emotional Stability, Adaptability, and Need for Structure. An interpretation of the model is that if you have a high rating in Emotional Stability, your rating in Adaptability will be high. And, if your rating is high in Adaptability, your rating in Need for Structure is low. In a second series of validation analyses the initial model was confirmed. An alternative model to the sequential was proposed. In this model Emotional

[44] The work on predictive modelling has been supported by U.S Air Force European Office of Aerospace Research and Development (EOARD).

Stability directly affects Need for Structure and Adaptability. Confirmative analyses of the alternative model showed that this model has the same fit as the sequential. We have tested the fit of the models when using two of the main markers of each factor, and we found an almost perfect fit of the sequential as well as the alternative model. Accordingly, six of the measures used can represent the models adequately. Our conclusion is that the subjects can be ordered or classified with respect to the three factors by means of six measures. Four trait dimensions of the 'Big Five' are markers of our factors Emotional Stability and Adaptability, and the interaction between two fundamental dimensions behind the 'Big five' is in accordance with these two factors of our model. Emotional Stability and Adaptability are fundamental aspects in selection of personnel working under stressful conditions with high stakes and risks. By mean of the factors found and validated, we have reliable and practicable measures of basic aspects predicting the performance and co-operative ability of personnel working in coalitions.

1.0 INTRODUCTION

A series of factors have impact on teamwork and performance in coalitions. Individual differences in personality traits represent aspects that, in interaction with culturally based cognitive biases, we believe influence collaboration and performance. Especially personality traits reflecting aspects of emotional stability have, since long, been considered important in selection of personnel working under high psychological stress, task load and risk. Selection of e.g. military pilots by means of personality traits as well as intellectual, perceptual and motor skills was introduced as early as during World War I. Similar procedures for selection were then developed and introduced in the army and naval branches. Procedures for selection with respect to operator and team performance in command and control environments are of a later date and in progress.

Selection of military operators has been extensively discussed in the scientific literature. Several meta-analyses have shown that personality traits, in spite of their considerable face validity, have a restricted predictive power on operational performance as compared to job sample tasks. In general terms, we can conclude that personality measures have a common variance of about 10 to 20 percent with different performance criteria [96]. The corresponding values for job sample tasks are about 30 to 40 percent [99]. On the other hand, personality or trait measures are easily administered and, in many situations, the most practicable and *the* remaining possibility to predict and optimize operational performance. Accordingly, an optimal combination of personality and task-related measures gives the best predictive power in selection of operators.

To cite the steering program for the task group *Leader and Team Adaptability in Multinational Coalitions,* a "*complicated assemblage of coalition partners will be required to perform as a team in complex environments that place high demands on the command and control of forces. This complex environment makes* ***adaptive performance*** *more critical than ever, yet the presence of* ***adaptable leaders*** *and* ***teams*** *continues to be elusive*" [100].

1.1 Methods, Assumptions, Procedures

1.1.1 Factor Analysis (FA)

1.1.1.1 Rationale.

Factor analysis is an analytical technique that makes possible the reduction of a larger number of interrelated manifest variables to a smaller number of latent variables or factors. The FA technique is based on the co-variation between manifest measured variables, and the goal of the technique is to achieve a parsimonious and simplified description by using the smallest number of explanatory concepts needed to explain the maximum amount of common variance in a correlation matrix (i.e., a table showing the inter-correlations among the

variables to be factored). The factors can be considered as hypothetical constructs laying behind and explaining the co-variation between their markers, and the constructs find their manifest expression in their markers.

The factor extraction procedures can be divided into *exploratory and confirmative* (hypo-thesis testing) methods. Explorative solutions cannot be generalised to populations. Generalisation requires replications in new samples. Factor solutions from confirmative methods of factor extraction, on the other hand, can be generalised from a sample to a population of subjects.

The exploratory methods as *principal factors analysis* assume populations of subjects and variables, and provide descriptive solutions. Principal FA (also called common FA) is the method preferred when analysis of common variance is desired. Principal FA is a practicable tool for generation of hypotheses about factor structures to be analysed further and confirmed in future research [101] [102] [103] [104].

From inferential and confirmatory methods as *maximum likelihood FA*, on the other hand, generalisations to other members of the population are possible. *LISREL* (analysis of linear structural relationships) is a practicable tool for confirmation and generalisation of factor structures [105] [106] [107] [108].

1.1.2 Structural Equation Modelling (LISREL)

1.1.2.1 Rationale

In the LISREL model, the linear structural relationship and the factor structure are combined into one comprehensive model applicable to observational studies. The model allows 1) multiple latent constructs indicated by observable explanatory variables, 2) recursive and non-recursive relationships between constructs, and 3) multiple latent constructs indicated by observable response variables. The connections between the latent constructs compose the structural equation model; the relationships between the latent constructs and their observable indicators or outcomes compose the factor models. All parts of the comprehensive model may be represented in a path diagram and all factor loadings and structural relationships appear as coefficients of the path. LISREL gives a series of Goodness of Fit measures of the whole model [106]. Examples of psychological models are given in [108] [109] and [110].

1.1.3 Multidimensional Scaling (MDS)

1.1.3.1 Rationale.

MultiDimensional Scaling (MDS) is a procedure for fitting a set of objects or variables in a space (or plane) such that the distances between the objects correspond as close as possible to a given set of similarities or dissimilarities between the objects. Similarities can be measured directly or derived indirectly from e.g., correlation matrices [111] [112]. Usually MDS can fit an appropriate model in fewer dimensions than can FA. Furthermore, MDS provides a dimensional model even if a linear relationship between distances and dissimilarities cannot be assumed. As compared to other multivariate techniques MDS is easy to use and the statistical assumptions are mostly easy to fulfil. In contrast to FA no statistical distribution assumptions are necessary, even if some metric conditions must be satisfied.

1.1.4 Assumptions and Data

1.1.4.1 Assumptions.

Results of research on the impact of individual and cultural factors on adaptive performance can be used to address personnel selection, modelling and simulation, and training, resulting in development of new measurement scales designed to assess the impact of culture on teamwork and new training tools designed to turn cultural diversity into mission strengths.[113]

1.1.4.2 Instruments.

Besides a demographic questionnaire a large number of questionnaires or measurement scales tapping different cognitive aspects as well as mental states and traits have been answered by the participants of NATO's Allied Warrior 2004 (AW04), and Allied Warrior 2005 (AW05) exercises.

Seven instruments comprised of seventeen distinct measures tapping different emotional and cognitive states and traits, formed the base for a series of data reduction and modelling analyses. The measures are named as follows: *Personal Need for Structure (PNS)* [114], *Personal Fear of Invalidity (PFI)* [114], *Need for Cognitive Structure (NCS)* [115]*, Ability to Achieve Cognitive Structure (AACS)* [115]*, Uncertainty Response Scale (URS)* [[116], *Intercultural Potential Adjustment Scale (ICAPS)* [117], *and the NEO-FFI Personality Inventory* [118], The URS has three subscales measuring *Emotional Uncertainty, Cognitive Uncertainty, and Desire for Change.* The ICAPS has five subscales measuring *Cultural Adjustment, Emotion Regulation, Need for Openness, Flexibility, and Critical Thinking* The NEO-FFI has five subscales measuring *Neuroticism, Extroversion, Openness Agreeableness, and Consciousness,* All instruments have been validated in other studies, and their reliabilities have been scrutinized.

2.0 ANALYSES AND RESULTS

As a first step of analyses based on data from AW04, the linear relationships between the measures by means of product moment correlations were calculated[45]. This matrix of correlations was then used as input in explorative principal factors analyses with oblique[46] rotation of factors. Rotation of factors results in a more even variance distribution, and in a more interpretable and simple factor structure.

From the analysis we found that 54 percent of the total variance[47] between the manifest variables could be explained by means of three latent variables or factors. Two practicable criteria for optimisation of number of factors, Kaiser's criterion and Cattell's scree-test were used [101] [104]. Kaiser's criterion states that, only factors with 'eigenvalues' greater than 1.0 should be retained. Cattell's scree-test identifies the number of factors that can be extracted before the amount of unique and error variance begins to dominate over the amount of common and true variance. Both criteria indicated a three factors solution as optimal.

Figure 23 presents the three tentative groupings of variables into factors. Two of the instruments used*, 'Critical Thinking', and 'Agreeableness',* had low or insignificant amount of common variance with the other measures, and were therefore excluded from further analyses.

[45] Optimal estimates of correlations were extracted by means of PRELIS, a sub-routine to LISREL.

[46] In oblique rotation factors are free to correlate.

[47] The total variance is the sum of common variance, unique variance, and error variance.

Our tentative interpretation of this first grouping is that the measures '*Neuroticism', 'Ability to Achieve Cognitive Structure', 'Fear of Invalidity', 'Openness I', 'Conscientiousness', and 'Emotional Uncertainty'* represent a factor or latent variable named ***Emotional Stability***. Multidimensional analyses show that the variables '*Neuroticism', 'Emotional Uncertainty'*, and '*Fear of Invalidity'* represent the core of the factor.

An interpretation of the second grouping is that the measures '*Emotion Regulation', 'Inter-cultural 'Adjustment Potential'', 'Openness II', 'Desire for Change'*, and '*Extraversion'* represent a factor named ***Adaptability.*** Dimensional analyses showed that '*Openness II'* was an outlier and that the other measures represent the central aspects of the factor.

The interpretation of the third grouping is that the measures '*Cognitive Uncertainty',' Need for Cognitive Structure', 'Personal Need for Structure'*, and '*Flexibility'* represent a factor named ***Need for Structure***. Multidimensional analyses indicated that '*Flexibility'* was an outlier and that the other variables represent the core of the factor.

- *Neuroticism*
- *Ability to Achieve Cognitive Structure*
- *Fear of Invalidity*
- *Openness I*
- *Conscientiousness*
- *Emotional Uncertainty*

- *Emotion Regulation*
- *Intercultural Adjustment Potential*
- *Openness II*
- *Desire for Change*
- *Extraversion*

- *Cognitive Uncertainty*
- *Need for Cognitive Structure*
- *Personal Need for Structure*
- *Flexibility*

Figure 23: Groupings of variables from explorative factor analyses of the 17 measures. Fifteen out of 17 measures (88 %) are represented in the groupings or factors. Fifty-four percent of the common variance between the measures is explained by the three factors.

The three factors structure from the exploratory analysis was used as a hypothesis in confirmative factor analyses ad modum LISREL. From the Goodness of Fit Statistics (GFI) of the confirmative analyses, we found that a three factors model significantly explains the co-variances between the manifest variables. The Weighted Least Squares Chi-Square equals 72.03 and has a p-value of 0.20[48]. The standardized Root Mean square Residual (RMR) equals 0.093, the Goodness of Fit Index (GFI) equal to = 0.84, and the Adjusted Goodness of Fit Index (AGFI) equal to 0.73.

In contrast to the explorative analyses, significant relationships were found between the three factors. These relationships were used in an attempt to build a causal structural model explaining the co-variances between the manifest variables by means of the inter-related factors.

When we scrutinized the factor structure of the confirmative analysis we found that the factors ***Emotional Stability*** and ***Adaptability*** correlated, and that factors ***Adaptability*** and ***Need for Structure*** correlated,

[48] High p-values indicate that the factor model exhaustively explains the co-variances between the markers.

respectively. This means that ***Adaptability*** relates to both ***Emotional Stability*** and ***Need for Structure***. Accordingly, ***Adaptability*** seems to be a mediator between the other two factors.

Accordingly, we tested and confirmed a three factors structural model by means of LISREL. In this model factor ***Emotional Stability*** precedes ***Adaptability***, and ***Adaptability***, in its turn, precedes ***Need for Structure***. The final model from these analyses is presented in figure 24.

As can be seen from figure 24 the three factors can be ordered in a sequence, in which ***Adaptability*** is a mediator between factors ***Stability*** and ***Need for structure***. There are no direct effects from ***Stability*** to ***Need for structure***, but a significant indirect effect. The Weighted Least Squares Chi-Square equals 80.54 and has a p-value of 0.093. The standardized Root Mean square Residual (RMR) equals 0.14, the Goodness of Fit Index (GFI) equal to = 0.82, and the Adjusted Goodness of Fit Index (AGFI) equal to 0.70. All loadings are significant ($p < .05$). The fit of the model is acceptable[49].

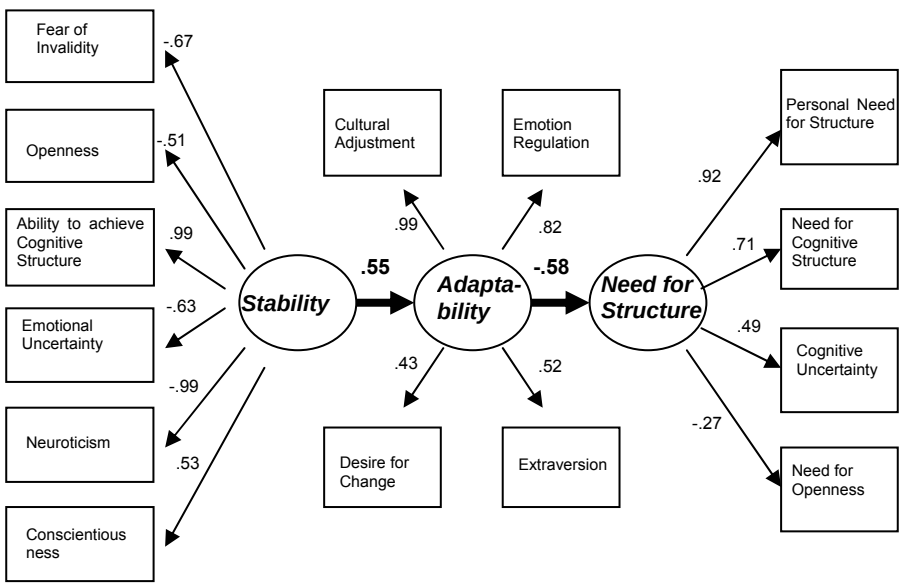

Figure 24: A structural LISREL model of the relationships between *Emotional Stability*, *Adaptability*, and *Need for Structure*. The Goodness of Fit Index (GFI) = 0.82. All effects (thick arrows) and factor loadings (thin arrows) are significant (p < .05).

Our interpretation of the model is that if you have a high rating in Emotional Stability i.e. low scores in fear of invalidity, neuroticism, openness, and emotional uncertainty as well as high scores in ability to achieve cognitive structure, and in conscientiousness, your rating in Adaptability will be high, i.e. you will have high scores in emotional regulation, cultural adjustment, desire for change, and extraversion. And, if your rating is high in Adaptability, you will have low scores on personal need for structure, cognitive need for structure as well as cognitive uncertainty, i.e., your rating in Need for Structure is low. Figure 25 summarizes the sequential relationships between the three factors.

[49] The manifest variable 'Openness II' was found insignificant and was excluded from the structural model.

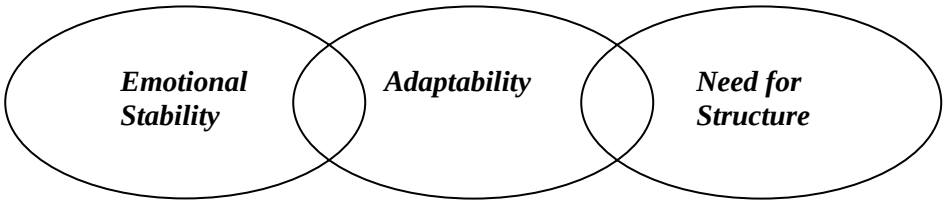

Figure 25: The sequential relationships between Emotional Stability, Adaptability, and Need for Structure.

In a second series of analyses, data from AW05 was added. In order to analyze to what extent data from AW05 was similar to the data from AW04, the correlation structures (i.e. the internal relations between the variables of the two studies, respectively) were compared. Figure 26 illustrates the correlation between the two structures.

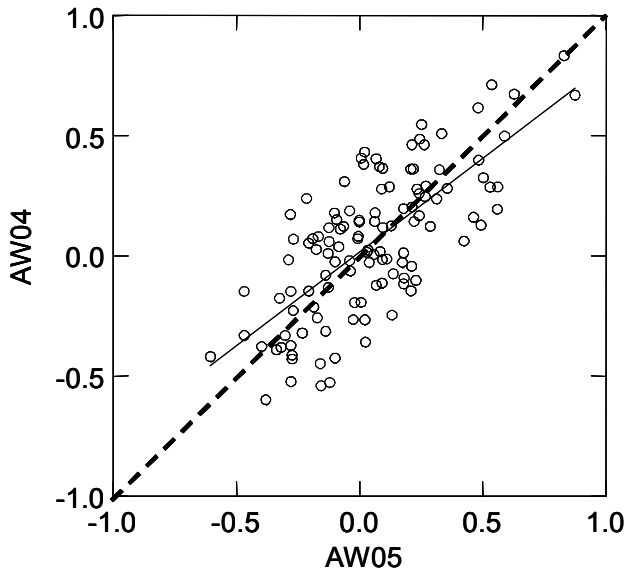

Figure 26: The relationship between the correlation structures (inter-variable correlations) from AW04 and AW05. The correlation (r) is .72, (p > .01). The common variance (R^2) is 52 percent.

The proportion of common variance between the two structures was .52. Accordingly, the similarity between the rank-orders of the correlations from AW04 and AW05 is significant (p > .01) and high. As can be seen from the figure, the variance of the AW05-distribution of correlations tends to be greater than the AW04-distribution.

Our conclusion from the finding of a close similarity between the databases from AW04 and AW05 was that the three factor model based on data from AW 04 could be tested on data aggregated from AW04 and AW05. Accordingly, the addition of the data from AW05 represents a test of the validity of the model in an extended sample. The number of subjects from the two exercises was 155.

Figure 27 presents the three factors structural model based on data from AW04 **and** AW05. The Weighted Least Squares Chi-Square equals 85.11 and has a p-value of 0.03. The standardized Root Mean square

Residual (RMR) equals 0.10, the Goodness of Fit Index (GFI) equal to = 0.85, and the Adjusted Goodness of Fit Index (AGFI) equal to 0.75. All loadings are significant (p < .05).

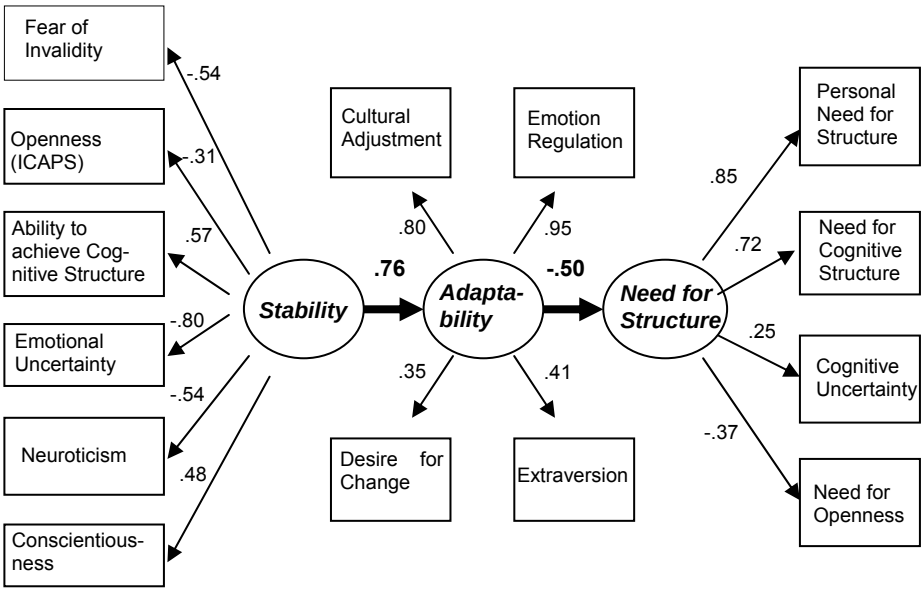

Figure 27: A structural LISREL model of the relationships between *Emotional Stability*, *Adaptability*, and *Need for Structure*. The Goodness of Fit Index (GFI) = 0.85. All effects (thick arrows) and factor loadings (thin arrows) are significant (p < .05).

Our conclusion is that the fit of the model is acceptable, and that the data from AW05 support and validate the model based on data from AW04.

From the explorative as well as from the confirmative analyses we have found a three factors model in which the factors are ordered sequentially (***Stability*** affects ***Adaptability***, and ***Adaptability***, in its turn, affects ***Need for Structure***). However, from discussions within the research group an alternative solution was suggested. In this model ***Emotional Stability*** will directly affect ***Need for Structure*** as well as ***Adaptability***.

From LISREL-analyses we found that the fit of this model was as good as the fit of the original model. The Weighted Least Squares Chi-Square equals 82.89 and has a p-value of 0.04. The standardized Root Mean square Residual (RMR) equals 0.11, the Goodness of Fit Index (GFI) equal to = 0.85, and the Adjusted Goodness of Fit Index (AGFI) equal to 0.75. All loadings are significant (p < .05). Figure 28 presents the model in which ***Emotional Stability*** directly affects ***Adaptability*** and ***Need for Structure***.

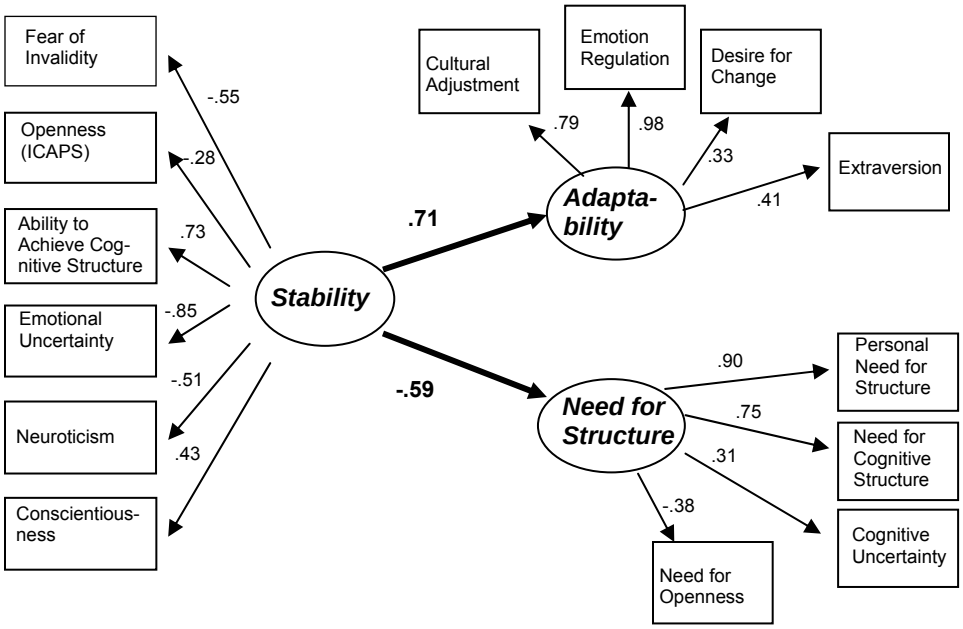

Figure 28: A structural LISREL model representing the direct effects of *Emotional Stability* on *Adaptability*, and *Need for Structure*, respectively. The Goodness of Fit Index (GFI) = 0.85. All effects (thick arrows) and factor loadings (thin arrows) are significant (p < .05).

Accordingly, we have two models of equal fit. The models explain the same amount of common variance, they confirm the structures to the same extent, and they can both be generalized to the population of subjects. To determine which of the models that is to be preferred is both a theoretical and practical matter. Obviously, both can be used as complementary models.

The models of figures 27 and 28 are based on 14 markers. We have also tested the fit of the model when using two of the main markers of each factor (i.e. altogether six measures). By using the main markers we are optimizing the relationship between the proportion of variance explained and the number of measures used. Figure 29 presents this optimized model.

The Weighted Least Squares Chi-Square of the optimized model equals 4.09 and has a p-value of 0.76. The standardized root mean square residual (RMR) equals 0.04, the Goodness of Fit Index (GFI) equal to = 0.98, and the Adjusted Goodness of Fit Index (AGFI) equal to 0.94. All loadings and weights are significant (p < .01). The fit of the model is almost perfect.

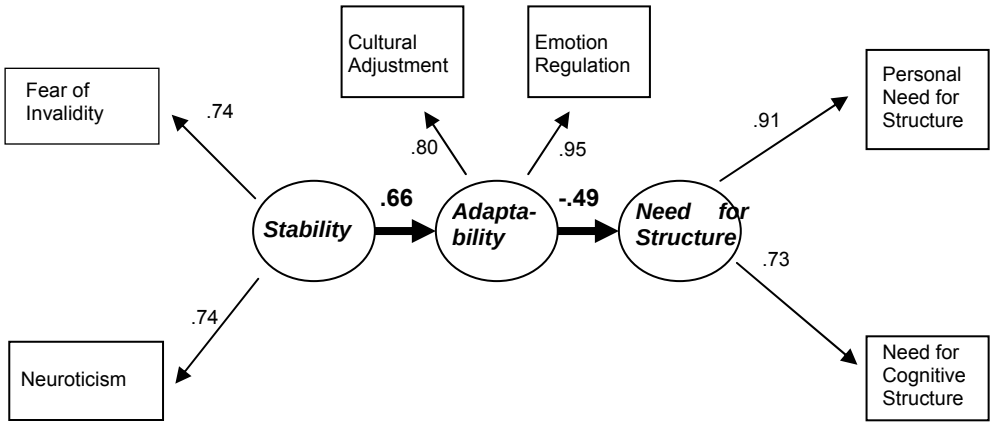

Figure 29: A structural LISREL model of the relationships between *Emotional Stability*, *Adaptability*, and *Need for Structure*. The model is based on six main manifest variables. The Goodness of Fit Index (GFI) = 0.98. All effects (thick arrows) and factor loadings (thin arrows) are significant (p < .01).

The alternative model (in which *Emotional Stability* directly affects *Need for Structure* as well as *Adaptability*) has also been analyzed by using six main markers. Figure 30 presents the alternative and optimized model.

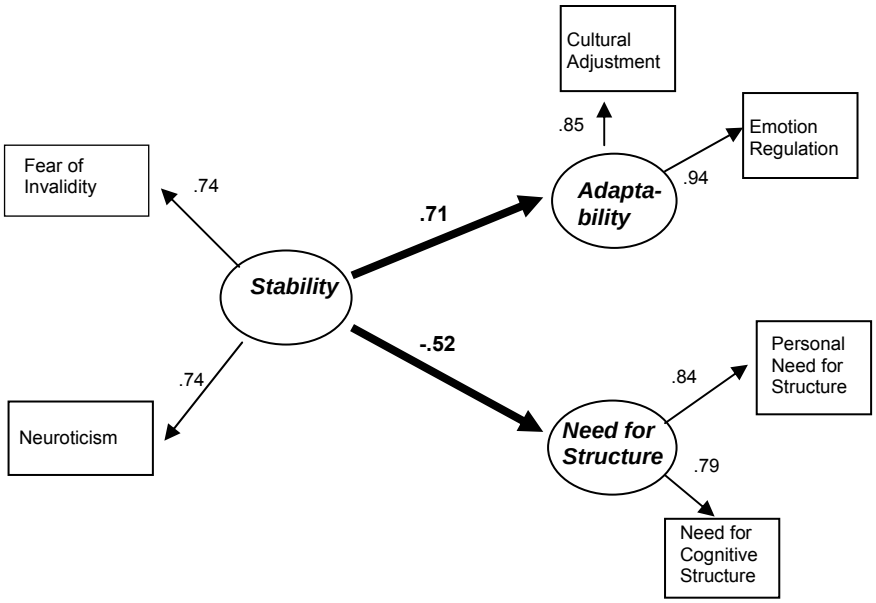

Figure 30: A structural LISREL model representing the direct effects of *Emotional Stability* on *Adaptability*, and *Need for Structure*, respectively. The model is based on six main manifest variables. The Goodness of Fit Index (GFI) = 0.97. All effects (thick arrows) and factor loadings (thin arrows) are significant (p < .01).

The Weighted Least Squares Chi-Square of the alternative and optimized model equals 7.02 and has a p-value of 0.43. The standardized root mean square residual (RMR) equals 0.05, the Goodness of Fit Index (GFI) equal to = 0.97, and the Adjusted Goodness of Fit Index (AGFI) equal to 0.90. All loadings and weights are significant ($p < .01$). The fit of the alternative optimized model is almost perfect.

When comparing the factors of the large models represented by 14 markers with the factors of the small models represented by six markers we found that the correlations between the stability factors was .89, the adaptability factors .76, and the need for structure factors .90. Accordingly, the common variances for the factors were 79, 58, and 81 percent, respectively.

As illustrated in figure 31, the structural model can be visualized in a Euclidean space, of which the three dimensions represent the factors ***Emotional Stability, Adaptability***, and ***Need for Structure***, respectively.

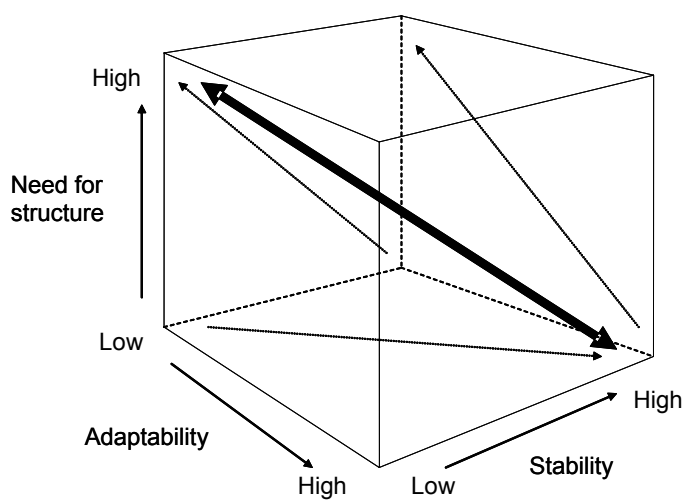

Figure 31: A representation of the structural model in a Euclidean space. The three dimensions indicate the factors *Stability*, *Adaptability*, and *Need for Structure*. The double headed arrow illustrates a goodness of fit continuum.

The vector or arrow from the lower right to the upper left corner of the cube, illustrates a continuum from high ***Stability***, high ***Adaptability***, and low ***Need for Structure*** to low ***Stability***, low ***Adaptability***, and high ***Need for Structure***. We consider the integrated continuum to indicate a 'personality goodness of fit index' of importance for prediction of operational performance.

3.0 DISCUSSION

By means of factor analyses, multidimensional scaling, and modelling ad modum LISREL, 17 personality measures have been reduced to models of three interrelated latent variables or factors.

From the explorative analyses we hypothesized a three factors model as an optimal solution. From these analyses we found that 15 of 17 measures (82 %) have an acceptable communality (i.e. significant co-variances with the other measures) for confirmative analyses. From the confirmative analyses we found that a model of three interrelated factors significantly explains the co-variances between the manifest variables.

From the initial structural model analyses (data from AW04) we confirmed that the co-variances between the variables were thoroughly explained by a sequential relation between the factors ***Emotional Stability***, ***Adaptability***, and ***Need for Structure***. We also found that the structural model can be generalized to the population.

An interpretation of the model is that if you have a high rating in ***Emotional Stability*** i.e. low scores in fear of invalidity, neuroticism, openness, and emotional uncertainty as well as high scores in ability to achieve cognitive structure, and in conscientiousness, your rating in ***Adaptability*** will be high, i.e. you will have high scores in emotional regulation, cultural adjustment, desire for change, and extraversion. And, if your rating is high in ***Adaptability***, you will have low scores on personal need for structure, cognitive need for structure as well as cognitive uncertainty, i.e., your rating in ***Need for Structure*** is low.

In a second series of analyses data from AW04 **and** AW05 were used. Our conclusion from these analyses is that the data from AW05 support and validate the model based on data from AW04.

From discussions within the research group an alternative solution was suggested. In this model ***Emotional Stability*** directly affects ***Need for Structure*** and ***Adaptability***. Confirmative analyses of the alternative model showed that this structural model has the same fit as the sequential.

Accordingly, we have two structural models of equal and acceptable fit. The structural models explain the same amount of common variance between the measures, they confirm the structures to the same extent, and they can both be generalized to the population of subjects. To determine which of the models that is to be preferred is both a theoretical and practical matter. Obviously, both can be used as complementary models.

We have tested the fit of the models when using two of the main markers of each factor (i.e. in all six measures). From these analyses we found an almost perfect fit of the sequential as well as the alternative model. Accordingly, six of the measures used can represent the models adequately.

Our conclusion is that the subjects can be reliably ordered or classified with respect to the three, factors by means of six measures. To use these six measures is an economic way of getting information representing all of the measures.

When scrutinizing the proportion of variance accounted for by the factors we found that ***Emotional Stability*** explains more variance than the other two factors. This is, of course, a reflection of the psychological content of the measures analysed, but it also reflects the prominence of the stability concept. The aspects representing emotional stability are related to operator performance and, since long, of central importance in e.g. selection of military pilots and conscripts.

Unlike many other situations of measurement, each measure has a proved reliability and validity, and most of them are, in themselves, personality factors. In fact, four trait dimensions of the 'Big Five' (Emotional Stability, Conscientiousness, Extraversion, and Openness to Experience) are represented in our analyses. This 'inborn' part of reliability and validity gives additional strength to the quality of the indices for the three factors and the structural models found. From a statistical point of view, ***Emotional Stability, Adaptability***, and ***Need for Structure*** are second order factors (i.e. factors of factors). The fact of the matter that the factors have specific and logical relations to each other in the model strengthens further their construct validity.

Digman [113] has performed as series of confirmative factor analyses of the 'Big Five' dimensions (Agreeableness, Conscientiousness, Emotional Stability, Extraversion, and Intellect or Openness to Experience). In all analyses a two factors solution was con-firmed. As can be seen from figure 32, the trait dimensions Agreeableness, Conscientiousness, and Emotional Stability were markers of the first factor, called **α**, and the dimensions Extraversion, and Intellect were markers for the second factor called **β**. As can also be seen, the factor ***Emotional Stability*** of our analyses is comparable to Digman's factor **α,** and our factor ***Adaptability*** is close to his **β**-factor. Digman considers his two factors to be orthogonal or un-correlated. However, in our re-analyses of Digman's data we found factor **α** and factor **β** to be correlated in the same way as ***Emotional Stability*** and ***Adaptability*** are in our models.

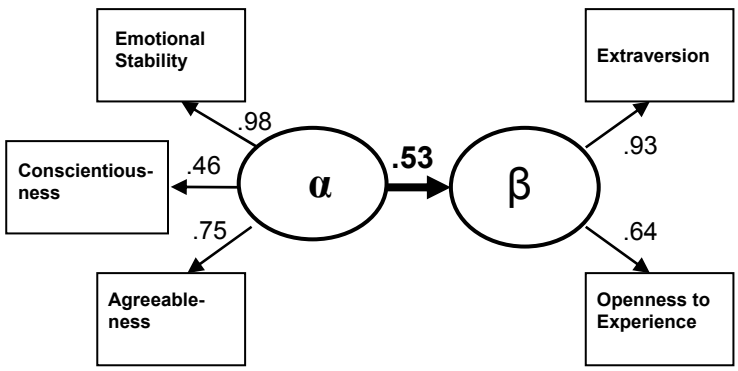

Figure 32: A structural LISREL model representing the direct effects of α (*Emotional Stability)* on β (*Adaptability)*. The model is based on six main manifest variables. The Goodness of Fit Index (GFI) = 0.97. All effects (thick arrows) and factor loadings (thin arrows) are significant (p < .01).

Accordingly, from our re-analyses of the 'Big Five' dimensions, we can conclude that, from a statistical point of view, the 'Big Five' dimensions can be thoroughly explained in terms of two factors (close to ours ***Emotional Stability*** and ***Adaptability***) and their relation.

4.0 CONCLUSIONS

What are the implications of the structural models for leader and team adaptability? ***Emotional Stability*** and ***Adaptability*** are fundamental aspects in selection of personnel working under stressful conditions with high stakes and risks. With high emotional stability your cognitive performance (information handling and decision making) can stand high stress levels longer without deterioration. With high ability to adapt you are better at handling complex and ambiguous information and situations. We have in other modelling studies [109] found that emotional cooping processes will increase and interfere with problem solving cooping processes when the challenge (the combination of risk- and complexity aspects) of a task increases. Sooner or later emotional

coping dominates with deteriorated decision making as a consequence. Emotional stability counteracts and delays emotional cooping. There are similarities between the effects of emotional stability and the effects of training – both delay emotional cooping and support problem solving cooping processes. It is not for nothing that emotional stability and intense training since long form corner stones for effective military operations.

Accordingly, there is strong evidence of relationships between stress tolerance or emotional stability and aspects of cognitive performance under high information load and psychological stress. Consequently, the factors of the models have a predictive potential in the recruitment of personnel to e.g. exposed or critical positions in C^2-systems. The reliability of the factors of the models increases the predictive power further, and, accordingly, the measures can be applied in situations where a few are accessible for a specific position.

We have mentioned that the validity and reliability of our factors are manifest and high as compared to specific and singular personality measures. However, even so, the predictive power of the measures or factors is not perfect. Furthermore, there is no one to one relationship between the personality measures and cognitive performance under stress and strain. On the other hand, from a statistical point of view, the probabilities of successful performance increase as a function of increased emotional stability and adaptability.

It is also of importance to notice that experience in and training of specific situations counteract interfering effects of personality factors. Personality traits can, partly, represent states, and, accordingly, change as a function of situation and surrounding factors. In the analyses of EW04 data we found a relationship between a demographic factor reflecting native background and experience and mental stability. However, this relationship was not found when the EW05 data was added.

In the databases analyzed, we have no data on performance aspects as mental workload, situational awareness, and operational performance, and, accordingly we were not able to directly relate performance to our stability- and adaptability measures. Information load, situational awareness as well as performance are central aspects in command and control situations. If we can relate these performance-related criterion variables to the personality traits of our models, and to states or moods as stress and activation, the map will be more complete. To that end, our next step is to use the model in C^2 – studies at the Swedish Armed Forces Joint Concept Development and Experimentation Center.