

**DISSERTATION FOR THE PH. D. DEGREE**

**CAREER MATURITY**

**Contributions to its construct validity**

**Tom-Erik Dybwad**

**Faculty of Social Sciences**

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## List of papers

### Paper 1

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*Scandinavian Journal of Educational Research*, 52, 135-152.

### Paper 2

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*Scandinavian Journal of Psychology*, *In press*.

### Paper 3

Dybwad, T. E. (2008). A MACS approach to the study of work values. *Submitted for*

*publication*.

### Paper 4

Dybwad, T. E. (2008). Dropout intentions and career uncertainty: A latent variable modelling

approach to their prediction, *Submitted for publication*.

## **Career maturity:**

### **Contributions to its construct validity**

#### **Introduction**

In recent years, the Norwegian educational system has come under heavy attack. There are several reasons for this. First, the performance of educational institutions in Norway, as measured by international achievement tests such as Programme for International Student Assessment (PISA), is clearly suboptimal when compared to other nations in the industrialized countries, given the amount of money that is allocated to the educational sector. Second, the percentage of kids who drop out or who do not complete high school is extremely high. On the average, 12 to 15% drop out of high school (Markussen & Sandberg, 2005), however, among those who have chosen a vocational course track, one out of three do not complete high school. Viewed isolated, this may not sound dramatic. A generation ago, these kids would be absorbed by a lenient labour market with few demands to formal education. Unfortunately, the labour market has undergone severe changes during the last 25 years, with serious implications for the kids. Increased internationalization and globalization of the markets has led to an influx of highly competent personnel into Norway, making Norwegian employers reluctant to hire persons less than 18 years of age and without a high school diploma. Additionally, technological changes, permeating virtually the entire labour market, have drastically constrained the range of job openings available to these kids. The service sector apparently seems to be the only segment of the labour market which can provide the kids with a job. But at the same time, it is also a sector characterized by low pay, insecure employment, and few opportunities for improving ones competency. The result being that a relatively large proportion of adolescents run the risk of ending up as recipients of social

welfare support. And a third reason for the attack on the educational system has been the relatively large proportion of adolescents who does not complete high school within the three year norm. Instead, a substantial number of kids are taking first grade over and over again, just switching course track from one year to another. This lack of adequate progression through high school may not have such deleterious effects on the kids as dropping out, but it is definitely a waste of human resources and quite expensive to the society as a whole.

The ensuing political debate over these issues has been rather hot-tempered among political adversaries, with the mass media driving up the temperature. Unfortunately, much of it has been rather uninformed as it has been driven primarily by political ideologies. Few disagree that the primary objective of the educational system is to develop the human capital of the nation (Heckman, 2000). And one way to assess the fulfilment of this objective is in terms of grades or scores on national or international achievement tests. Teaching basic intellectual skills to adolescents do have highly beneficial effects on their career development (Gottfredson, 2004; Ishikawa & Ryan, 2002). And it also turns out that the school context do matter in this connection, and possibly the class context even more so (Hill & Rowe, 1996; Lee, 2000; Mortimore, Sammons, Stoll, Lewis & Ecob, 1988; Perry, Turner & Meyer, 2006). However, focusing exclusively on intellective criteria for assessing the performance of the educational system represents an unduly and unwarranted restrictive view of the purpose of the system. That is, the human capital should not be equated with the intellectual capital, since it encompasses much more than this. Rutter (1983) and Rutter and Maughan (2002) mention several other important supplementary performance dimensions; absenteeism, attitudes toward learning and possibly continuation in education, social functioning, and employment. Data on the last mentioned dimension might be hard to obtain, but attitudes towards work is easier to assess. Smyth (1999) used dropout intentions and absenteeism as additional criteria for assessing school performance, and Rumberger and Palardy (2005) argue for the use of

dropout rates and transfer rates as alternative indicators of high school performance. We also know that “softer variables” such as motivational and personality traits, partially developed in schools, have a significant effect on people’s earnings and career success (Bowles, Gintis & Osborne, 2001; Duncan & Dunifon, 1998).

## **Background**

One important consequence of the attack on the Norwegian educational system has been an increased focus on career counselling. Initiated by the previous government, colleges/universities in Norway has been encouraged to develop educational programs for school counsellors so as to make them more competent at handling the career challenges facing kids in junior high and high school. The ambition being that a heightened focus on career counselling might alleviate most problems in this part of the educational sector. It is of course debatable whether career counselling can fulfil all its intended aspirations, but it remains a fact that such interventions can and do work well in given circumstances. In vocational psychology, the construct of career readiness or career maturity, as a multidimensional construct, has formed the cornerstone and starting point for various career counselling interventions for nearly 50 years (Chartrand & Camp, 1991). Kelly and Lee (2002) claim that career indecision or career immaturity is the most single concept in this field. As such, an appropriate assessment of the students’ standing on various dimensions of career maturity will enable counsellors to develop and better target various career counselling interventions.

## **Career maturity**

The construct of career maturity or vocational maturity as he called it, was introduced by Super (1957). He claimed that career maturity represented “the place reached on the

continuum of vocational development from exploration to decline “Super, 1957, p.186). He also gave birth to the “vocational maturity quotient” which was defined as the ration of vocational to chronological age. His operationalization of career maturity was implemented and made commercially available in the Career Development Inventory (CDI) (Super, Thompson, Lindeman, Jordaan & Myers, 1981). The inventory was designed to tap the first four dimensions in his model, and is divided into two parts: Part one includes four scales which measure Career Planning, Career Exploration, Career Decision Making, and World-of-Work Information. Part two is comprised of a scale measuring Knowledge of Preferred Occupational Group. Crites (1965) theorized that career maturity consists of two major dimensions: carer choice content and career choice process. In 1978 he published his Career Maturity Inventory (CMI) (Crites, 1978). The CMI consists of two parts, a set of competence tests and a set attitudinal scales. The competency tests assess a person’s knowledge of his or her resources, occupational knowledge, the person’s ability to match personal resources to attributes of the job, and planning ability. The attitudinal scales measure decisiveness in career decision making, involvement in career decision making, independence in career decision making, orientation to career decision making, and compromise in career decision making. It should be mentioned that both these conceptualizations of career maturity are based on the assumption that career readiness is related to one’s stage in vocational development. Recent attempts at defining career maturity have left this assumption, because age is not strongly correlated with indices of career maturity (Patton & Creed, 2001). Additionally, both of these inventories have criticized for being too undifferentiated.

The Career Decision Scale (CDS) (Osipow, Carney & Barak, 1976) is representative of this new way of defining career maturity. CDS pretends to tap four dimensions of career maturity: indecision, decidedness, approach-approach conflict, and barriers. The Career Factors Inventory (CFI) (Chartrand, Robbins, Morrill & Boggs, 1990) measures four

dimensions that might promote or impede upon successful career decision making: career choice anxiety, generalised indecisiveness, need for career information, and need for self-knowledge. The final inventory belonging to this category is the Career Decision-Making Difficulties Questionnaire (CDDQ) (Gati, Krausz & Osipow, 1996; Osipow, 1999). The CDDQ is based on the authors' theoretical hierarchical taxonomy of decision making difficulties. They distinguish between difficulties experienced prior to the decision making process, and those that are encountered during the decision making process. There are potentially five kinds of difficulties which can be encountered prior to the process and seven during the process. Unfortunately, Albion and Fogarty (2002) found that a model consisting of five factors provided the best fit to the data. The five factors are as follows: Lack of motivation, indecisiveness, lack of information, internal conflicts, and conflict with others.

This short synopsis of existing measures of career maturity reveals a rather bewildering array of dimensions that might possibly hinder or promote successful career decision making. Several attempts have been made to reduce this diversity of dimensions, primarily through exploratory factor analysis of existing measures (Dickinson & Tokar, 2004; Fucqua & Newman, 1989; Kelly & Lee, 2002; Stead & Watson, 1993; Tinsley, Bowman & York, 1989). The consensus emerging from these analysis appears to be that a need for information factor, in particular need for world of work information, should be included in the conceptualization of career maturity. Career choice indecisiveness or career choice anxiety emerges as a second common theme in the existing measures. Trait indecisiveness, or actually self-esteem, given the content of the items tapping this dimension, is a good third candidate. Finally, choice inhibitors, which really is lack of parental or familial support for career plans, is a final common theme. Neither of the existing measures have chosen to include constructs that measure attitudes towards education and learning, or attitudes towards work. This is unfortunate because both of these have potential implications for the career development of

the kids. Attitudes towards education can function as a proxy for dropout, it says something about the extent to which the school has fulfilled its objectives, and which career options are available to the student in question. Attitudes towards work have potentially even more severe carer implications. Adolescents with negative attitudes toward work will in all likelihood not engulf in career exploration activities, such attitudes might also reveal that the student in question has more profound personal problems.

However, it must be said that there exists several methodological shortcomings associated with the structural analysis of measures of career maturity. The work on CDS and CDDQ has relied exclusively on exploratory data analytic strategies; exploratory factor analysis and cluster analysis, the shortcomings of which are familiar. Chartrand *et al* (1990) and Simon & Tovar (2004) applied covariance structure analysis to the CFI, and found support for a four factor solution, but gender differences were not explored. Dickinson & Tokar (2004) proclaimed that the factor covariances of the CFI were invariant across men and women, but no proper test of invariance was presented. It is also disappointing that the sample sizes are so small, which might undermine the stability of the results. Additionally, most of the research has been conducted on college students, which may not be appropriate for the present research with its focus on junior high and high school students.

Given the centrality of the construct of career maturity, one might expect that a substantial amount of research had been performed to elucidate its nomological net; that is, exploring the antecedents and consequences of career maturity. Unfortunately, this is not so. Hartung (1997) reports some minor correlations between the various CDI scales and vocational interests, and Savickas and Hartung (1996) find some small correlations between intelligence and CDI. Albion & Fogarty (2002) found that Neuroticism was positively correlated with the CDDQ Indecisiveness and Lack of motivation scales, whereas Conscientiousness was negatively correlated with the same scales. These are potentially

interesting findings since they point to important antecedents of aspects of career maturity. One study sought to ascertain the long term consequences of career immaturity. Savickas & Hartung (1996) found that the CDI was able to identify students which would encounter academic difficulties two years into medical school. But by and large, no systematic and high quality research efforts have been put into the investigation of the antecedents and consequences of career maturity.

### **Work values**

One category of possible antecedents, which has been under-researched in recent years, is motivational constructs in the form of work values (Zytowski, 1994). Motivational constructs are usually given a prominent role in understanding human learning and development, as well as human performance and satisfaction. Scarr (1996) posited that people select environmental opportunities on the basis of relatively enduring motivational characteristics, which in turn increases the probability of reinforcing experiences and reduces the probability of negative experiences. In the field of vocational psychology, vocational interests have by far received the bulk of the attention (Dawis, 1991 & 2001). However, work values represent an equally appealing set of constructs as they have been shown to be highly predictive of job satisfaction (Rounds, 1990), even more so than vocational interests. And it is not unreasonable to hypothesize that work values are related to the same outcome variables as vocational interests: occupational choice or choice of course track in the educational context, person-environment fit which might impact turnover/turnover intentions or dropout/dropout intentions, and work or scholastic performance.

A distinction is usually drawn between values in general and work values (Dawis, 1991). Allport, Vernon and Lindzey (1970), Rokeach (1973) and Schwartz & Boehnke (2003) have studied values in general. But work values is the topic that has been studied in vocational

psychology. They play a prominent role in the Theory of Work Adjustment (Dawis, 1996, 2001; Dawis & Lofquist), in Brown's values-based holistic model (Brown, 1996), and in Super's life-span life's space approach to careers (Super, 1957, 1995; Super, Savickas & Super, 1996; Sverko, 1996). The two most known work values inventories today are The Minnesota Importance Questionnaire (MIQ) (Dawis & Lofquist, 1984) and Super's (1995) Work Values Inventory (WVI).

The MIC taps six factors, whereas the WVI measures 5 + 1 higher order themes. However, much work remains to be done in order to draw any definite conclusions concerning the structure of these inventories, since they all have relied on exploratory analysis. The Schwartz and Boehnke (2003) taxonomy has been studied extensively around the world, and the authors report an impressive N in their paper. The ten factor solution they come up with yielded an RMSEA and an SRMR of .060 and .079 respectively, which in itself suggests that their inventory is still short of perfection. More serious though, is the lack of an appropriate cross-group comparison both in terms of gender and culture (Byrne, 2006).

### **Methodological considerations**

The development of psychometrically sound measures of the constructs we want to study is an essential precondition to good substantive research. Unfortunately, it is also a rather time consuming affair. In educational and psychological research one has relied primarily on exploratory data reduction techniques for unravelling structural aspects of the measures. Principal Component Analysis (PCA) and Principal Factor Analysis (PFA) have been the preferred data analytic strategies in this respect. Additionally, one has sought to achieve satisfactory levels of Cronbach's *alpha*. There are several well-known limitations associated with this strategy. Apart from the differences in statistical objectives of PCA and

PFA, they both capitalize on chance factors. This is particularly troublesome since they are usually applied on small sample sizes, rendering results highly unstable. Additionally, these techniques provide us with no statistical indication as to the adequacy of the obtained results, or its potential rivals. And finally, Cronbach's *alpha* is a highly fallible guide for assessing the homogeneity of scales since satisfactory levels can be achieved either by having a few highly correlated items or a dozen items with small correlations.

Gradually, there has been a growing realization that the traditional strategy is inappropriate for the development of good measures. Confirmatory factor analysis has emerged as a superior strategy, providing us with statistical indications of the fit of the hypothesized model to the observed variance-covariance matrix, as well as enabling us to test for the fit of competing models. Multi-sample confirmatory factor analysis or covariance structure analysis is an important extension of this strategy, allowing us to compare the construct equivalence across groups, with groups being defined by various criteria such as gender, educational level, nationality etc.. Means structure analysis is an even further extension permitting us to draw conclusions concerning differences in latent means across the groups. Jointly, these approaches are referred to as latent means and covariance structure analysis (MACS) (Byrne, 2006).

MACS was introduced by Jøreskog (1971) and further developed by Sörbom (1974) to take into account the means of the latent constructs. The first step in testing for invariance consists of constructing baseline models for the two groups, which is equivalent to a traditional confirmatory factor analysis. Baseline models are rarely completely identical across groups (Bentler, 2006; Byrne, Shavelson & Muthen, 1989). The best-fitting model for one group may include an error-covariance as shown by the LM-test in EQS (2006), and for the other group a cross-loading (Byrne, 1988; Reise, Widaman & Pugh, 1993). Error-covariances may reflect item-characteristics implying a small unmeasured factor, or

respondent characteristics representing a tendency to yea/nay-saying or social desirability (Aisk & Jøreskog, 1990). In connection with this part of the job, one is frequently forced to engage in specification searches. Unfortunately, as is well documented, such searches entail substantial capitalization on chance factors (Chou & Bentler, 2002; MacCallum, Roznowski & Necowitz, 1992; Silvia & MacCallum, 1988). However, research on this topic has concluded that in the presence of theoretical justification, the results from specification searches may turn out to be robust. Regrettably, this cannot be done in this context, since the topics of career maturity and work values have not spawned much research to substantiate any cross-loadings or error-covariances. It is therefore imperative that the findings of this study be empirically cross-validated. Nevertheless, it is still important that these parameters are specified (Bentler & Chou, 1987).

However, it is still possible to proceed with the analysis of invariance by introducing the notion of partial measurement invariance (Byrne *et al.*, 1989) whereby some but not all measurement parameters are constrained equal across groups. In testing for global goodness of fit for the models, the Likelihood ratio test of chi-square has been the preferred choice (Hu & Bentler, 1995 & 1999; Raykov & Widaman, 1995). Its sensitivity to sample size, rendering virtually any discrepancy between the model-implied and observed covariance-variance matrix significant, at least for large sample sizes, has rendered it somewhat dubious (Jøreskog & Sørbom, 1993; Raykov and Widaman, 1995). Therefore, supplementary ways of assessing fit have been developed. One option is the Comparative Fit Index (CFI) developed by Bentler (1990). Hu & Bentler (1999) recommend that its value should be close to .95. Another option is the Root Mean Square Error of Approximation (RMSEA) for which there are several arguments in favour of: it is sensitive to model misspecification, there are adequate guidelines for its interpretation, and it is possible to construct confidence intervals around the RMSEA values (MacCallum & Austin, 2000; Steiger, 1990). RMSEA values smaller than .05 indicate

good fit, while values between .08 and 1.0 suggest mediocre fit, and values larger than 1.0 indicate poor fit. (Browne & Cudeck, 1993). RMSEA is also easily extended to the multi-group context (Steiger, 1998). The third option is the Standardized Root Mean Square Residual (SRMR) which represents the discrepancy between the observed sample and hypothetical correlation matrices. In a well-fitting model this value should be equal to or smaller than .05 (Hu & Bentler, 1995). In addition to measures of overall fit, it is important to check the standardized residuals (Browne, MacCallum, Kim, Anderson & Glaser, 2002). Standardized residuals  $>2.58$  are considered large and suggest misfit (Jöreskog & Sörbom, 1988). When dealing with data that are multivariate non-normally distributed, EQS applies the Satorra-Bentler corrected chi-square test with robust Maximum Likelihood (ML). Arguments for the use of the Satorra-Bentler correction can be found in Hu, Bentler & Satorra (1991), Curran, West and Finch (1996), and in Chou, Bentler and Kano (1992). In EQS, a normalized Mardia  $>5$  suggests multivariate non-normally distributed data (Bentler, 2006).

The next step in testing for measurement invariance is testing for configural invariance. This step only checks if we have the same number of factors in each group and the same pattern of fixed and free factor loadings. Configural invariance can be regarded as the “baseline” of invariance testing - meaning that the fit of this model provide the values against which subsequent invariance models are compared (Byrne, 2006). Without configural invariance, the remaining tests can be dropped, and the hypothesis of an invariant measurement structure is abandoned.

In the third step we test for invariance of factor loadings, or measurement invariance. This is established when both groups have equal factor loadings regarding their respective manifest variables and error variances-covariances. According to Bollen (1989), factor loadings can be interpreted as validity coefficients, where the latent variable has a causal impact on its manifest indicators. The factor loading linking both of them shows the strength

of the causal relation. Significant differences in the factor loadings across groups raise the question of whether the same construct is being measured. Equality of error variances-covariances, however, is usually considered too stringent a criterion (Bentler, 2006). But additionally specified parameters, such as common cross loadings and error covariances should be tested for invariance (Byrne, 2006).

In the fourth step we test for the invariance of the factor covariances. We are now moving onto the structural part of the model studying the equality of the associations between the latent variables across groups. The test of equal factor covariances has implications for the construct validity, and thus the construct comparability between the groups. We could of course also investigate the equality of the factor variances, but it has little bearing on the construct validity of the measures (Little, 1997).

The fifth step of invariance testing involves testing for the equality of item intercepts in the regression equation linking manifest indicators and their latent variables. According to Hayduk (1989) item intercepts can be interpreted as systematic biases in a particular group in their responses to an item. As a result, the manifest mean can be systematically higher or lower than one would expect due to the group's latent mean and factor loading. In the terminology of item response theory, item intercept refers to the item difficulty parameter, whilst the IRT equivalent of factor loading is the item discrimination parameter (Chan, 2000; Ferrando, 1996; Widaman & Reise, 1997). Cooke, Kosson and Michie (2001) argue that the problem of non-invariance of item intercepts is less serious than non-invariance of factor loadings, and that is still possible to move ahead in analyzing their underlying constructs.

The sixth, and final step in testing for invariance, is testing for invariance of the latent mean differences, which is crucially important for answering the challenges raised by Hyde (2005). This is can be accomplished in either of two ways: We can follow Byrne's (2006) recommendations and estimate the latent means for one group and set them to 0 for the

second group. This strategy only conveys information on the latent means in a relative sense. Alternatively, we can estimate the means of the latent factors for both groups, constrain them to be equal across groups, and let the Lagrange-Multiplier test decide which of these constraints should be released (Bentler, 2006).

As we progress through the stages of invariance testing, whatever parameters are found to be non-invariant at the lower level are freed, while equality constraints are set for the relevant parameters at the next level (Muthen & Christoffersen, 1981). The notion of partial invariance has invoked some controversy recently (Kaplan & George, 1995; Marsh & Grayson, 1994; Millsap & Kwok, 2004; Widaman & Reise, 1997). But as pointed out by Steenkamp and Baumgartner (1988), as long as we have two invariant items per factor, one of which can be the marker item, we can still compare the latent means across groups.

The final issue to be dealt with in this section is the issue of how to test for fit in invariance testing. For the most part, evidence in support of multigroup invariance has been based on the delta chi-square test; that is the difference in the chi-square of the baseline model and the other models (Yuan & Bentler, 2004). In the case of non-normally distributed data, delta Satorra-Bentler chi-square is used. However, Yuan and Bentler (2004) point out that this test is unreliable in case of misspecification. And recently, other researchers (Cheung & Rensvold, 2002; Marsh, Hey & Roche, 1997; Little, 1997) have argued that this value is as sensitive to sample size as the chi-square test itself. Consequently, the tendency more and more emerges to argue for the use of a more practical approach, based on two alternative criteria: 1. The multigroup model should show an adequate fit in terms of the previously mentioned fit statistics, and 2. delta CFI values should be trivial. Little (1997) originally stated that this difference should be smaller or equal to .05. Cheung and Rensvold (2002), on the other hand, argue that this criterion has no firm substantive or empirical basis, and argue instead that this value should not exceed .01.

There has been some discussion in the research literature about whether one should use total scale scores or parcels of items as manifest variables in regression based SEM, or if we should adopt a latent variable approach in which items are used as indicators of latent constructs. There are strong arguments in favour of the last mentioned strategy whereby we will obtain a reduction in the biasing effect of measurement error, and more valid and often substantially higher estimates of the relations among the latent constructs (Coffman, & MacCallum, 2005; Little, Cunningham, Shahar & Widaman, 2002).

In regression analysis, there is also the question of which variables should be included in the final equation. When doing regression analysis, the utility of predictors is usually assessed in terms of the significance of their regression weights. This can of course also be done in EQS. However, whether or not to add an independent variable is more appropriately assessed by analyzing  $\Delta \chi^2$ , or in the case of non-normally distributed data,  $\Delta$  S-B  $\chi^2$  with or without an additional independent variable included. There will be instances where an independent variable emerges as a significant predictor, but only marginally so. By analyzing the model as a whole, with and without the path of a predictor set to zero, one can compute  $\Delta \chi^2$  or  $\Delta$  S-B  $\chi^2$  for these models. A non-significant change in the chi square values indicates that adding an independent variable is inappropriate (Bentler, 2006).

## **Research Questions**

The purpose of this project was to develop measure of career maturity and start exploring it's nomological net, that is the antecedents and, at a later point in time, the consequences of various aspects of career maturity. Given the problems with existing measures along with the fact that existing measures of career maturity primarily focuses on

college students, the intention of the first paper was to develop a new measure of career maturity, coined Daidalos, primarily intended for use with junior high and high school students, and to explore its structural aspects (Paper 1). However, due to several methodological shortcomings such as suboptimal fit for boys, no direct comparison across gender, an exclusive reliance on global assessment of fit, and, in retrospect, a theoretically unjustified higher-order analysis, a second round of data collection and analysis was undertaken. The second paper presents the results of a full MACS analysis across boys and girls of Daidalos (Paper 2), the results of which turned out to be quite satisfactory.

Good measures are a precondition for substantive research. However, this also implies that we need good measures of the constructs which figure as independent variables of the topics we want to study. Values, and work values in particular, have been lying in the doldrums for years. Paper 3 thus presents the results of a MACS analysis of a recently developed work values inventory. The inventory was designed for use in career counselling with the adolescent population.

Attitudes toward school and Career uncertainty are two important aspects of career maturity, since they may, at least theoretically, function as proxies for two “illnesses” permeating the high school system; dropout and inadequate progression through high school. In Paper 4 these constructs are treated as dependent variables, and work values, Social support for career plans, Self esteem and need for World-of-Work information are used as independent variables. Regression diagnostics demonstrate a rather strong prediction of the dependent variables.

## Summary of the studies

### Paper 1

Dybwad, T. E. (2008). The Structural Validity of Daidalos: A measure of career maturity.

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Career maturity is usually conceived of as a multidimensional construct. Hence, Daidalos was designed with the intent to assess seven dimensions: Attitudes towards work, Attitudes towards education and learning, Self-esteem, Career choice uncertainty, Need for world-of-work information, Need for self-knowledge, and Social support for career plans. However, two of these dimensions failed to materialize in the subsequent exploratory analysis, primarily Principal Component Analysis and Maximum Likelihood Factor Analysis. Items tapping Need for self-knowledge loaded unambiguously on Self-esteem. Apparently, for this age cohort, the need for self-knowledge in terms of a thorough assessment of one's intellectual and personal resources is given scant attention. The items measuring Attitudes towards work had several small secondary loadings, and the inter item correlations between them were generally small even after they were normalized. This age group thus appears to have a very fine grained and context dependent approach to life.

A Confirmatory Factor Analysis was performed on the remaining items with  $N = 776$  high school students, 367 boys and 409 girls. In terms of global assessment of fit, a five factor first-order model came out with a CFI and RMSEA of .93 & .05, and .88 & .06 for girls and boys respectively. A two factor higher-order model yielded a trivial improvement in these values; .94 & .04 and .89 & .06 respectively. The fit indices were clearly suboptimal for boys,

but it should be born in mind that no specification search was performed in order to remedy this deficiency.

## Paper 2

Dybwad, T. E. (2008). Career Maturity: A latent means and covariance structure analysis  
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The intention of Paper 2 was to improve upon the analysis in Paper 1. Several objections can be levelled against the first analysis. First, no in-depth analysis of the measurement model was conducted; only global assessment of fit was assessed. Second, no specification search was conducted in order to identify the causes of the suboptimal fit for boys. Third, the idea of a two factor higher-order model lacks theoretical justification even though it might turn out to be statistically reasonable. And fourth, no across-group comparison was carried through. The establishment of across-group equivalence is also an important precondition to substantive research. Now, groups can of course be defined in various ways, depending upon the purpose of the project and available information on the sample. The use of across-group analysis in cross-cultural research is an obvious example, where groups are defined by nationality or ethnicity. However, ethnicity is not a problem in this project since the amount ethnic minorities present is marginal. Groups can also be defined by age. It is quite likely that the results for the present age group do not generalize to college students or working adults. It is the suspicion of the author that the present age group has a much more fine grained and context dependent approach to life than the other age groups, which is also likely to turn up in an analysis. Another tenable hypothesis is that intellectual resources might have an impact on the structural analysis, with brighter kids having an even

further differentiated set of responses to assessment resources. Unfortunately, neither grades nor IQ scores were available to test this hypothesis. As always though, gender is an important and interesting variable, not only in the context of scientific research, but in all realms of life. Additionally, information on gender is also easily available in most projects. It was therefore decided to run a MACS analysis across boys and girls.

The steps involved in a MACS analysis have already been reported, and will not be reiterated here. In connection with the development of the baseline models for the two groups it was realized that two more items had to be discarded. Further analysis was therefore performed on 18 items. The baseline models for girls and boys, with no error-covariances and cross-loadings came out with robust CFI and RMSEA of .934 & .044 and .896 & .056 respectively, not unlike the results in Paper 1. A specification search was conducted to identify the causes of the suboptimal fit, and the LM-test indicated that two error-covariances and one cross-loading should be freely estimated for girls, and two error-covariances and two cross-loadings for boys. This resulted in a model with robust CFI and RMSEA of .956 & .037 and .930 & .046 for girls and boys respectively. The testing of the configural model across gender yielded a robust CFI of .942 and RMSEA of .042, and the testing of the measurement model yielded a  $\Delta^*CFI$  of .002, well below the limits set by Cheung and Rensvold (2002).  $\Delta$  S-B  $\chi^2$  additionally turned out non-significant. The value of  $\Delta^*CFI$  was .004 for the testing of the equality of the factor covariances. The testing of the invariance of the item intercepts resulted in a  $\Delta^*CFI$  of .001, most acceptable. In connection with the testing of the equality of the latent means, the LM-test suggested three were non-invariant, with girls scoring higher on Career uncertainty and Need for World-of-Work information, and boys scoring higher on negative Attitudes towards school and learning.

### Paper 3

Dybwad, T. E. (2008). A MACS approach to the study of work values. *Submitted for publication.*

Work values represent an unexplored set of predictors of career maturity, despite the suggestions made by Zytowski (1994). And whatever research has been done on the role of work values has been limited to working adults. Additionally, analysis of the few existing measures in use has been rather inadequate. It was therefore considered necessary to develop a new measure of work values, to be baptized Proteus 1, where 1 signifies that there is a sequel inventory measuring vocational interests, Proteus 2. Paper 3 presents the results of a MACS analysis of this inventory.

The baseline model for girls with no error covariances came out with a robust CFI of .918 and RMSEA of .054 for girls. The corresponding values for boys were .924 and .052. For both groups these values are rather suboptimal. A specification was conducted, and the LM-test suggested four error covariances, one of which was common, should be released for both groups. With these parameters freed, robust CFI and RMSEA turned out quite satisfactory with values of .943 & .046 and .948 & .043 for girls and boys respectively.

The testing of the configural model across groups gave a robust CFI of .938 and RMSEA of .047. Moving on to the testing of the invariance of the measurement model,  $\Delta^*CFI$  was .002, and the other fit indices remained within acceptable levels. Factor covariances across gender also turned out to be invariant as indicated by a  $\Delta^*CFI$  and RMSEA of .046.  $\Delta^*CFI$  for the test of invariance of item intercepts was .001 with an RMSEA of .045. The LM-test suggested that the latent means of four work values were non-invariant

across groups. For the work values Power and Money there were significant differences in favour of boys, and for the values Personal Challenge and Family there were significant differences in favour of girls. However, in terms of Cohen's  $d$ , only the Power value reached a medium value of .41.

#### Paper 4

Dybwad, T. E. (2008). Dropout intentions and career uncertainty: A latent variable modelling approach to their prediction, *Submitted for publication*.

Dropout and inadequate progression through high school are two important themes plaguing the educational system. However, collecting good data on these variables along with information on potential predictors is a difficult and time consuming affair. Paper 4 presents the results of an attempt to predict dropout intentions and career uncertainty, which at least theoretically can function as proxies for these politically debated phenomena, along with an exploration of the invariance of the structural paths.

A latent variable modelling approach was chosen for this job. This means that the items are used as indicators of the latent constructs, rather than total scales scores. Thus we will obtain a reduction in the biasing effect of measurement error and more valid and higher estimates of the relations among the latent constructs.

Four predictors accounted for 54% of the variance in dropout intentions for boys and 32% for girls. The variables were lack of social support for career plans, low self-esteem, no desire for a personally challenging job and the power motive. For career uncertainty, five predictors accounted for 59% of the variance for boys. These predictors were need for world-of-work information, low self-esteem, the opportunity to make lots of money, a job that is not too structured, and a job that allows one to spend much time with the family. Four girls, four

predictors accounted for 45% of the variance in career uncertainty. They were need for world-of-work information, low self-esteem, lack of interest in a personally challenging job, and the money motive. As for the structural paths, they were invariant across gender for the prediction of dropout intentions. And the three common paths related to the prediction of career uncertainty, were also invariant. However, three paths were unique across the two groups.

## **Discussion**

Summarizing the results obtained in these papers, the covariance structure part of the analysis indicated that three cross-loadings were non-invariant across the two groups. Future research should attempt developing new items so as to render these unnecessary. The item correlation matrix also revealed that items measuring Need for world-of-work information did not demonstrate satisfactory discriminant validity from the items tapping Career uncertainty. The reason for this is unclear, since these groups of items are theoretically distinct. Maybe the kids are drawing causal inferences when they respond to these items in the sense that they perceive that amount of Career uncertainty is “caused” by their lack of world-of-work information. If this is the case, then the possibility of achieving a higher degree of discriminant validity will run into problems. As for the invariance of the measurement model and the factor covariances across groups, it turned out quite acceptable. The covariance structure analysis of Proteus suggested no cross-loadings were needed to achieve satisfactory fit for the baseline models. The measurement model and the factor covariances were also invariant across groups to a satisfactory degree. However, one word of caution is worth mentioning. The disattenuated correlation between Affiliation and Personal Challenge is quite high. One way to reduce this correlation might be to have the respondents rate the relative importance they attaché to the various work values. In real life, one usually can’t have it all. One usually have to make a trade-off between various preferences depending on the choice at

hand. And asking the respondents to rate the relative importance of various work values might have an impact on the intercorrelations among them.

Concerning the means structure part of the analysis, boys have a more negative Attitude towards schooling and education than girls, while girls express a higher degree of Career uncertainty and Need for world-of-work information as measured by Daidalos. It is of course tempting to think that these differences are located within the school since there has been a lot of debate about gender issues in the educational system. In policy debates it has frequently been said that the school curriculum is too little hands-on for boys. Unfortunately, in a study of student satisfaction among junior high school students, perceived difficulty level of the curriculum, whether the curriculum is too theoretical, and satisfaction with teachers demonstrate no gender differences (Dybwad, 2008). There is a small difference favouring girls when it comes to satisfaction with peer relationships, however, in terms of Cohen's *d* the difference is only .29. There is thus the suspicion of the present researcher that the answer has to be sought elsewhere. Background factors, other individual differences variables and differences in gender roles in general are prominent candidates. As for the differences in latent means favouring girls in Daidalos, it is hard to pinpoint the exact cause of them. An increased opportunity set might be responsible for these differences, but on the other hand, there might be some underlying gender differences with girls having a more cautious outlook on the world and boys having a tendency to jump to conclusions, based on the assumption that whatever goes, goes.

As for the latent means analysis of the work values, only the Power motive showed a medium effect, Cohen's *d* of .41, favouring boys. No empirical evidence exists to substantiate this difference, so we are free to speculate on its causes. Adopting a "nurture" perspective, this difference can possibly be related to gender specific differences in child rearing practices with boys being encouraged to take initiative and control to a larger extent than girls.

However, there is also a “nature” view that is equally possible. From a reproductive point of view it is of course essential that males have control over their reproductive partners so as to avoid running the risk of securing for the offspring of other males. – In addition to this difference, there were two small differences on the Money motive, favouring boys, and the Family orientation motive favouring girls.

Dropout and dropout intentions is a topic with which most politicians and educational workers are concerned. Some research has attempted to get an understanding of the causes of this problem (Barclay & Doll, 2001; Markussen & Sandberg, 2005; Rosenthal, 1988). Self-esteem frequently emerges as an important predictor of this phenomenon. This is also the case in the present research, for both boys and girls. In addition, lack of Social support for career plans is a significant predictor, but this is quite understandable given that dropout is not the optimal career choice. What is new in this project is the role of work values in the prediction of dropout intentions. The search for Power and control over one’s life might be considered a highly rational strategy for compensating for low self-esteem. However, coupled with a lack of interest in a Personally challenging job and non-Affiliative needs the image of a solitary Hopalong Cassidy or a lonesome cowboy riding into the sunset without any purpose and searching for vengeance is being conveyed. It is as if the person says: ”Someday I’ll show you, but I don’t know how”.

Career uncertainty is also predicted by self-esteem. But Need for world-of-work information emerges as a much stronger predictor, especially for girls. Providing the kids with this kind of information, preferably in the form of a computer-based information and decision support system, since most of them obtain are already highly acquainted with this way of obtaining information, should do much to alleviate the problem of career uncertainty. For both boys and girls, the Money motive adds to the prediction of this variable. Why the Money motive takes on this role is, though, unclear. It is of course possible that this motive coupled

with lack of knowledge about how to realize the desire creates a certain amount of career uncertainty. But it could also be the case that the person in question does not know what he or she wants to become, and that it does not matter as long as he/she makes a lot of money.

These three predictors carry the bulk of the prediction. For girls, lack of interest in a Personally challenging job is significant, and so is a preference for an Unstructured permitting one to spend a lot of time with the Family for boys.

Taking a broader view of career maturity, several issues need to be touched upon. First, career maturity as measured by career maturity inventories such as Daidalos does not fathom all the conditions relevant to successful career decision making. In a sense, it attempts to capture constructs which usually is not measured by test of personality, interests and intellectual resources, which are all relevant to a favourable career development, and which determine the degree to which the kids cope with the demands of work and higher education. This also implies that there is a vast array of other potential predictors of aspects of career maturity as measured by Daidalos.

Second, it is being said that many roads lead to Rome, and this also applies to Self-esteem. Low Self-esteem can be caused by the students inability to master the curriculum, that they qualify for various psychiatric diagnoses, that they have been exposed to physical and sexual abuse, bullying, as well as more “normal” age-conditioned psychological distress. The point is that the various causes of low Self-esteem require a unique approach in order to be dealt with effectively. And given the study by Westhamer-Larson, Kellam & Wheeler (1991), there is at least some support for a classroom effect on related behaviours such as shyness, aggression and concentration problems, indicating that educational personnel have a significant role to play to alleviate some of the causes of low Self-esteem. For the more severe causes of low Self-esteem, more professional assistance is of course required.

As for Attitudes towards school or dropout intentions, SES has consistently been shown to be an important predictor. However, SES in itself cannot be a direct cause of dropout since it lies 16 years back in time. The effect of SES must be mediated by some other variables. And the question arises does it operate as a substitute for genetically determined differences in IQ, or does it work through so-called “softer variables” such as personality and motivational traits? Additionally, are there school or classroom effects on dropout beyond the mediational variables mentioned? Rutter & Maughan (2002) claim that school effects on most educational performance dimensions are very small compared to SES and/or variables from differential psychology. However, other researchers claim that school climate (Rumberger, 1995), Social relations at school (Lee & Burkam, 2003), and school disconnectedness (Bonny, Britto, Klostermann, Hornung & Slap, 2000) contribute to an increased probability of dropping out.

Need for Self-knowledge did not emerge as a separate dimension in Daidalos. Rather, Need for world-of-work knowledge is the only information dimension recognized by these kids as having an impact on their degree of career (un)certainty. This does not, unfortunately for them, preclude the possibility that provision of a high quality and comprehensive assessment of personal and intellectual resources might alleviate some part of the experienced career uncertainty. From a parental and teacher point of view, kids in this age group have a tendency to conceive of themselves as world champions, a view that is of course completely lacking in substance. And in a similar vein, their conception of what they really want to do in life, and what resources they bring with them in order to realize these wishes, is usually faulty. Feedback from comprehensive and well-designed assessment tools frequently give test-takers new insights into themselves, and it might also reduce some of the uncertainty surrounding career choices.

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