Examining the Theoretical Assumption of a Six-fold Structure of Management Competency Sub-scales (MCS)

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Management Competency Sub-scales (MCS), in this current inquiry was being constructed under the theoretical assumption of a six-fold structure: self-image; leadership; skills; action; performance; and orientation. However, there is so far no empirical evidence available to support this assumption. Thus, a comprehensive measure is therefore needed to adequately gauge its validity. The aim of this present study was to assess the validity of the categorization of management competencies into the six overarching MCS. The results showed that instead of the expected six-fold structure, MCS comprised eight factors: expertise; self-image; skills; leadership; innovation; influencer, sustainability; and orientation. Looking at homogeneity and scale length in tandem, the scales were subsequently refined and the number of items reduced to 45. The inter-correlations between the derived sub-scales, as well as the mean loadings of the items on the sub-scales, were significant, indicating the validity of the construct. The Cronbach alphas for the different sub-scales were found to be of an acceptable level, above .7 suggesting relative stability of the derived scales. Comparing the inter-scale correlations of the management competencies sub-scales with their average Cronbach alpha, the values were found to be substantially different, providing support for the discriminant validity of the construct. Furthermore, conducting a second-order factor analysis, all the sub-scales loaded above .3 on the one extracted, suggesting convergent validity. The study provides a good alternative to the bounty of competency models/frameworks that have been developed in the area of management competency.

Keywords: management competency sub-scales, factor analysis, validity, cronbach alpha, inter-correlations

1. Introduction

The application of competencies is now a leading organizational strategy in all major human resource areas (Schoonover et. al., 2000). Competency is composed largely of obvious qualities, such as skill, knowledge, and attitude, and hidden qualities, such as beliefs, personality, motives, value system, characteristics, and

mission. In general, companies or institutions set goals for such obvious qualities because they are, by definition, relatively easy to evaluate.

Competency reflects differences in skill sets necessary for the relevant tasks. In general, performing a given job effectively can require a number of different competencies. Competencies are the building blocks of work performance, and performance consists of many features of practice, cognitive, affective and psychomotor skills (Donaher, 2004). Competency models or frameworks enable people in an organization or profession to understand, discuss, and apply the competencies to workforce performance (Marrelli et al., 2005). Dubois & Rothwell (2004) acknowledged two types of competency modeling: (1) the outputs-driven methodology which is about knowledge or skills, and is usually based on a job analysis and the focus is on the job responsibilities and tasks; (2) the process-driven methodology, which focuses on the unique qualities held by individuals that lead to successful work results. Accordingly, a competency model/framework needs to specify all the competencies essential for a job or a task and lay out each competency in a readily applicable form for various human resource management activities. The literature reveals many models or frameworks of competencies, (Honore and Costich, 2009; Moohd-Shamsudin and Chuttiattana, 2012; MacKinnon et. al, 2004; Hudak et al., 1999; Wenzel et al., 1994; Boyatzis, 2008). While these competencies may have face validity on the development process, few have been subject to further tests of validity and reliability (Howard et al., 2018).

The sub-scales of management competency in this current inquiry were being constructed under the theoretical assumption of a six-fold structure: self-image; leadership; skills; action; performance; and orientation through synthesis of research literature. However, there is so far no empirical evidence available to support this assumption. Thus, a comprehensive measure is therefore needed to adequately gauge its validity. The aim of the present study was to assess the validity of the categorization of management competencies into the six overarching MCS. In the course of the study the following hypotheses were to be tested: (1) The sub-scales of management competency fall into six factors that can be labelled as self-image, leadership, skills, action, performance, and orientation; and (2) The sub-scales of management competency correlate positively with each other. In light of the hypotheses and the expected structure of management competency, a multi-factorial approach to the development of the sub-scales was required. Factor analysis and item analysis were used in combination in the development process, the former to establish the factor structure underlying the items and the latter to ensure homogeneity. It was also an objective to provisionally analyze the convergent and divergent validity of the encountered scales and to explore the sub-scales in some details.

2. Methodology

The sub-scales of management competency were developed following a multi-stage approach. Figure 1 shows the different stages employed to identify and operationalize MCS to ensure reliability and validity.

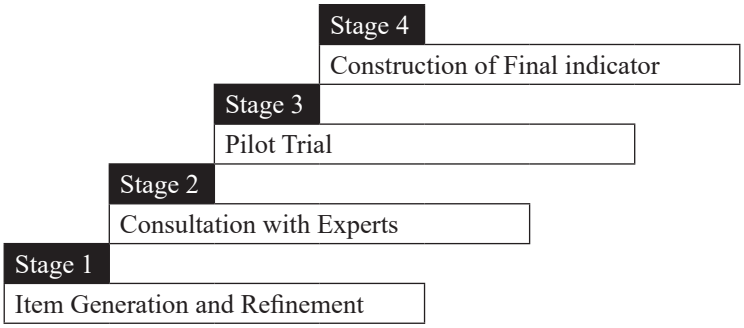

Figure 1. Research Approach

In this current inquiry, the MCS was developed in four stages: (1) initial item generation and refinement; (2) refinement of initial items through consultation with experts; (3) refinement of initial items through a small pilot trial; and (4) construction of final indicator using a factor analytic and item analytic approach on a large sample testing of hypotheses.

2.1. Stage 1: Initial Item Generation and Refinement

The conceptualization of the sub-scales of management competency focused primarily on the six-fold structure suggested by the author based on the readings about management competencies. Accordingly, management competencies involve a systematic evaluation and analysis of the different aspects of management and leadership behavior called competencies in organizations. The combination pattern of the competencies will help shape one's management style that ultimately contributes to job performance. To operationalize the six sub-scales of management competency, a theory-driven approach was chosen, since many of the other methods of competency development have been criticized with regard to their reliability and validity. First, a review of the literature was conducted, and following suggestions by DeVellis (1991) and Kline (1993), an extensive list of concepts that related to the six sub-scales was formulated. In addition, the results from previous studies were examined, especially the factors that had been placed under one of the six sub-scales of management competency in the template analysis. This information was also used to inform the search and selection of concepts.

In this study, each competency was seen as a collection of related indicators representing skills, knowledge or activities. It was considered neither possible nor necessary to provide examples of all indicators that can be observed within a competency.

Above all, concepts were chosen on the grounds of their correspondence to one of the sub-scales of management competency: self-image, leadership, skills, action, performance and orientation. They also had to conform to the definition of management competency as behavioral repertoires and knowledge instrumental in the delivery of desired management-related outcomes. This not only required that concepts were phrased in behavioral or knowledge terms, but also that they had an established relationship with management success. However, it was

accepted that due to the definition of management competencies, not all concepts considered for inclusion. Initial item generation and refinement may represent directly observable behaviors. Therefore, it was decided that the minimum criteria for consideration of concepts was that they had the potential to be converted into observable measures. The measurability of competencies represents one of the main goals of this study. In summary, in order to be selected, concepts had to: (1) to reflect one of the sub-scales of management competency, (2) be formulated as behavioral repertoires, skills, knowledge or activities, (3) be important significantly related to career outcomes, (4) be defined in terms that are easy to understand, (5) be trainable or influence by conscious behavior, and (6) have the potential to be observable.

After an in-depth literature analysis, concepts were chosen to operate the sub-scales of management competency. Most of the concepts had been mentioned, either directly or indirectly in the related literature. However, some concepts had not previously been included in the sub-scales of management competency. This is due to differences in the understanding of some of the models/frameworks of management competency.

Table 1. Template for Item Selection

Management Competency Sub-scale: Self-image	
Sub-scale number	**Concept**
1	Knowledge
2	Awareness
3	Responsibility
Management Competency Sub-scale: Leadership	
Sub-scale number	**Concept**
1	Abilities
2	People
Management Competency Sub-scale: Skills	
Sub-scale number	**Concept**
1	Interpersonal
2	Communication
3	Entrepreneurial
Management Competency Sub-scale: Action	
Sub-scale number	**Concept**
1	Change
2	Differences
3	Innovation
Management Competency Sub-scale: Performance	
Sub-scale number	**Concept**
1	Self
2	Others
Management Competency Sub-scale: Orientation	
Sub-scale number	**Concept**
1	Focus
2	Orientation

The structure in Table 1 served as a model for the selection of items for the indicator. Existing scales were consulted in the search for items which described each concept. Following DeVellis (1991), an over-inclusive approach was taken with regard to item selection. Using multiple and seemingly redundant items, the content that is common to the items will summate across items while the irrelevant one will cancel out. Therefore, redundancy of items was tolerated at this stage. In addition, new items were developed to represent aspects that were considered important, but had not been included in any of the existing scales. The design was based on already existing items, definitions found in the literature.

Items were refined using the following procedures: (1) Items addressing multiple issues were changed to present only one issue, to avoid ambiguity and to ensure clarity for participants; (2) Items worded in a passive voice or in the third person were changed to the first person, so that participants would be more likely to relate to them; (3) Where items were not only similar but identical in content, the least ambiguous item was selected; (4) All items were written into positive statements, to avoid confusion for participants and stress the positive approach to development taken by this study; (5) Items were rewritten to be consistent in tense, using the present tense to make them more salient for participants; (6) General statements regarding feelings or attitudes were changed, where possible, into expressions of behaviors, skills or knowledge; (7) Items relating to intra-organizational contexts were either subsumed by an identical item relating to extra-organizational contexts, or transformed into an organization neutral version; and (8) Phrasing items in as balanced, clear and unambiguous way as possible.

The goal of the item refinement was to create approximately the same number of items for each of the six areas of management competency. However, a greater number initial item generation and refinement of suitable items were available for some areas, leading to some deviation in the number of items.

Determining the format of measurement is an important part of the scale development and should occur simultaneously with the item generation (DeVellis, 1991). Most scale items consist of two parts: the stem, generally a declarative statement expressing an opinion, and a series of response options, descriptors indicating the strength of agreement with the statement (DeVellis, 1991).

In the present study, all questions were formatted as statements, as were the items selected for inclusion. With regard to the response format, there are various options available when using self-response scales. Some provide the respondent with a range of options, while others limit the options to simple yes/no responses. A desirable quality of a measurement scale is variability, because this allows for discrimination between subjects and facilitates the assessment of correlations with other measures (DeVellis,1991). There are two ways to increase opportunities for variability inclusion of a large number of scale items, or numerous response options. If a large number of items are included, binary answers may yield sufficient variability when the items are aggregated to obtain a scale score. However, the more items included in a measure, the higher the risk of participant fatigue. In addition, some items do not lend themselves to the use of binary responses.

If only a limited number of items are included, more useful information will be gained from a response format which allows participants to make gradations of response. However, participants' ability to discriminate meaningfully between

the options must be taken into consideration. Using numerous response options will not offer benefit if it does not reflect actual differences in the phenomenon being measured.

Another issue which should be considered is the question of whether the number of responses should be even or uneven. In the case of bipolar scales, an odd number of response options generally allows for equivocation, while an uneven number usually forces respondents to make at least a weak commitment to one direction of the scale (DeVellis, 1991).

Since management competencies were thought to develop through experience, it was expected that different individuals would engage in them to different degrees. Therefore, binary yes/no response options were considered too simple to adequately represent the concept, or to effectively serve the idea of self-development. Instead, it was decided to employ a gradual response option format. It was deemed inappropriate to force participants' choices, considering that the MCS was to be used for self-development. In addition to that, it was important not to overstretch participants' ability to discriminate between response options. Consequently, it was decided to use a 5-point Likert scale.

The Likert scale is the most frequently used scale format (DeVellis, 1991). It usually presents items in a declarative sentence, followed by response options that indicate, at roughly equal intervals, the extent to which subjects agree or disagree with the statement. Wording the response options using vague quantity descriptors such as 'few' or 'many' may create problems, because individuals may interpret them in different ways. Presenting the response options with an obvious continuum can reduce some of this ambiguity (DeVellis, 1991). Therefore, the 5-level response option was employed in this study: Strongly Agree (5), Agree (4), Neither Agree nor Disagree (3), Disagree (2), Strongly Disagree (1). Table 2 presents, a sample of selected response format applied in this current inquiry.

Table 2. Example of Response Format

	5	4	3	2	1
Has practical, technical and professional skills required for the job					

2.2. Stage 2: Refinement of Initial Items Through Consultation with Experts

A review of the initial item pool by experts is an important part of scale development. The review serves multiple purposes related to maximizing the content validity of the scale (DeVellis, 1991). Therefore, the initial item set was presented to four experts, together with the definition of management competencies as proposed by this study. These four experts coming from different industries have solid track records and deep competence in terms of knowledge, skills and experience in managing people as well as the company.

In order to be able to make informed judgments on the items, experts not only had to have knowledge of the subject matter, but also the analytical skills to consider connections between the items and the competency areas.

The experts were invited to comment on the relevance of each item to the respective concept and the respective management competency area. Second, the

experts' interpretation of the items was assessed. If they understood an item in a way that did not agree with the intention, the respective item was rephrased or removed. Third, experts were asked to evaluate the items' clarity and conciseness. They were invited to point out awkward or confusing items and to suggest alternative wordings. Finally, the experts were asked to point out other concepts that they considered important, that were not already represented in the selected sub-scales.

2.3. Stage 3: Refinement of Initial Items Through a Pilot Study

A pilot study was carried out to 42 company managers in different industries to refine the items further and to assess the suitability of the chosen survey design. This trial aimed to check the readability and unambiguity of the items, as well as the accurate recording of the data (Oppenheim, 1992). It also sought to highlight and eliminate any potential problems which subjects may encounter when answering the questions. Furthermore, piloting the questionnaire allowed for an initial assessment of the content validity of the questions and the likely reliability of the items. Each sub-scale of management competency contained at least 10 items. This was considered a satisfactory number because, as Kline (1994) pointed out: (1) there should not be so many items in a questionnaire that they result in fatigue or boredom on the part of the participant; (2) reliable scales should ideally include at least 10 items (considering there are six sub-scales of management competency, there should be at least 60 items); (3) the final number of items is likely to be half the number in the pilot study.

2.4. Stage 4: Construction of Final Measure Using a Factor Analytic and Item Analytic Approach on a Large Sample

Participants in the construction of final measure using factor analytic and item analytic approach on a large sample consisted of 310 company managers in different industries. The participants were guaranteed anonymity and assured that no individual data would be published, only aggregated data. It was stressed that the data would be treated confidentially and would only be used for the purposes of this study. It was also pointed out that this study focused on self-development and participants were encouraged to be as honest in their answers as possible. They were asked to answer the questions in respect to their current or latest position only.

There are two main approaches to identify the underlying dimensions of a data set: principal component analysis, and factor analysis. Principal component analysis focuses on data reduction. It aims to obtain a relatively small number of dimensions that account for the variability between the items and maximize the amount of the total variance (Bryant & Yarnold, 1995). In factor analysis, the variance associated with scores on a variable is decomposed into common variance and unique variance"(Briggs & Cheek, 1986). Factor analysis assumes that responses are based on underlying factors and seeks the least number of factors that maximize the amount of common variance. It is recommended to use factor analysis when one is interested in identifying dimensions that are responsible for a set of observed responses. Since this reflects the aims of the present study, factor analysis was applied.

Before using factor analysis, it needs to be established if the data lends itself to factor analysis. Factor analysis is based on correlation analysis and correlation coefficients fluctuate depending on sample size (Field, 2005). That is, sample size is very important if reliable factors are to be obtained. Generally, it can be said that larger samples are better than smaller samples, because they tend to minimize the probability of errors, maximize the accuracy of population estimates and increase generalization of results (Osborne & Costello, 2004). Osborne & Costello (2004) argue that 300 represents a good sample size, 500 a very good sample size, and 1000 or more an excellent sample size.

One point that leading authorities in the field agree upon is the necessity of having more subjects than variables (Osborne & Costello, 2004). However, there are no generally agreed exact guidelines on subject item ratios for factor analysis. Moreover, there is a widely-cited rule of thumb, that the subject-to-item ratio for factor analysis should be at least 10 to 1. This is a very conservative approach. Barrett and Kline (1981) found that at a ratio of 2 to 1 the main factors were clear and that a ratio of 3 to 1 did not yield an improvement.

Guadagnoli and Velicer (1988), in Stevens (1992) found that the component saturation and absolute sample size were most important, and not the subject-item-ratio. They stated that components with four or more loadings over .60 in absolute value would be reliable, regardless of sample size.

Osborne and Costello (2004) showed that there is an interaction between sample sizes and subject-to-item ratio and that both concepts influence the "goodness" of factor analysis or principal component analysis. However, it is not only sample size and subject-item ratio which are important when deciding if the data is suitable for factor analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is also important (Field, 2005). The KMO indicates the degree of common variance among the variables. The value of KMO varies between 0 and 1. A value of 1 indicates that patterns of correlations are relatively compact and therefore, factor analysis should yield distinct and reliable factors (Field, 2005).

Another statistical measure to assess the factorability of the data is Bartlett's test of sphericity, which has to be significant ($p<.05$) for factor analysis to be appropriate. For factor analysis to work, it is important that the original correlation matrix is not an identity matrix, that is, there are some relationships between the variables included in the analysis. This is guaranteed by a significant result of the Bartlett's test of sphericity.

Another method that was demonstrated to provide a reliable criterion for factor selection, especially in samples $N>200$ (Stevens, 1992), is the scree test ((Kline, 1993). The scree test plots a graph of each eigenvalue against the factor with which it is associated. The point of inflexion on this curve should be used as the cut-off point for the selection of factors, i.e. eigenvalues in the sharp descent before the levelling off should be retained. Identification of the cut-off point requires subjective judgement.

Generally, researchers consider loadings of .3 and above to be important. Therefore, in the present study loadings of more than .3 were considered significant. Taking into consideration the fact that oblique rotation was conducted, the maximum iterations for convergence (specifying the number of times that the computer will search for an optimal solution) was set to 30, to allow for the large data set (Field, 2005).

Since, the sub-scales of management competency were claimed to be theoretically correlated, oblique rotation was chosen as the rotation method. The factors were extracted using direct oblimin rotation and the factor solutions were examined. The pattern matrix that contains information about the unique contribution of a variable to a factor was used as the basis for the interpretation of the sub-scales. In addition, the structure matrix that takes the relationships between the factors into consideration was consulted, to cross-check if the same factors emerged.

While the term factor refers to all the items that load on it, the term scale refers to the items retained in the analysis with loadings of .3 and above on the respective factor. In the context of this study, scales consist of items that indicate the level of the construct. Item analysis uses two indices to determine item-selection: the p-value for each item and the item-total correlation.

The p-value is concerned with the discriminatory value of an item. It is the proportion of participants passing the item. Items are rejected if they are poor discriminators between good and poor performers. In situations such as this one, where there are no right and wrong answers, and where responses are expected to be normally distributed, using the p-value for item selection would not be appropriate. However, the discriminatory value of an item can also be inferred from its degree of variance. A relatively high degree of variance indicates a good spread of responses from participants on the item. Low variance, on the other hand, suggests that the item will not discriminate well among individuals and, therefore, would not be of much value (DeVellis, 1991).

The item-total correlation is concerned with the homogeneity of an item set and can be calculated using the Pearson Product Moment Correlation Coefficient. However, it has been pointed out that a larger range than the commonly used five-point scale is a requirement for this method to yield meaningful results (Kline, 1993).

Another index that provides valuable information about the item homogeneity of a scale is internal consistency. Internal consistency answers the question of whether the scale consistently reflects the construct it is measuring. Internal consistency is usually measured using Cronbach's alpha (α). This assesses within-scale item inter-correlation. It is generally agreed that for a psychometric measure to be considered reliable, Cronbach's α should be above .7 (Tabachnick & Fidell, 2001).

The internal consistency reliability of a scale is influenced by the number of items in the scale. While shorter scales are usually recommended, because they place less of a burden on the respondents (DeVellis, 1991), longer scales are generally more reliable. Therefore, an optimal balance between brevity and reliability must be achieved. If the item-scale correlations are about equal to the average inter-item correlation, adding more items will increase coefficient alpha while removing them will lower it.

The discriminatory value of each item was assessed and items were deleted if they exhibited little variance (SD below .50). Then, the final sub-scales were developed, using the above-introduced criteria regarding scale length and consistency in an iterative procedure. The homogeneity indexes were computed in tandem with item removal, until an acceptable trade-off between coefficient alpha and scale length was achieved.

3. Results and Discussion

3.1. Pilot Testing

To get an initial idea regarding the reliability of the measure, despite the small sample size, the internal consistency of each of the six sub-scales of management competencies was assessed (Table 3). The results indicated acceptable levels of internal consistency, above the recommended level of .70 (Tabachnick & Fidell, 2001), for all six areas: self-image (α=.81), leadership (α=.82), skills (α=.81), action (α=.80), performance (α=.83), and orientation (α=.78). The impact that the deletion of any of the items would have had on the value of the Cronbach alpha was assessed. It could be seen that only a couple of items would have increased Cronbach alpha by their removal, and then only negligibly. This suggested that reliability of the measure could be expected.

Table 3. Reliability Test of the MCS (Pilot Study)

MCS	Cronbach Alpha
Self-image	0.81
Leadership	0.82
Skills	0.81
Action	0.80
Performance	0.83
Orientation	0.78

Participants were asked whether any topics, which they considered important with regard to the sub-scales of management competency had been overlooked. No input was received, indicating that all the major issues had been covered in the questionnaire. In total, all of the 75 items were retained.

3.2. Final Testing

The data from the large sample was subjected to principal axis factoring using SPSS. The result of Bartlett test of sphericity was significant ($p<.001$) and the KMO measure of sampling adequacy was .84, suggesting that the data was suitable for factor analysis. The eigenvalue distribution of the scree plot (Figure 1) suggested that 8 factors should be extracted.

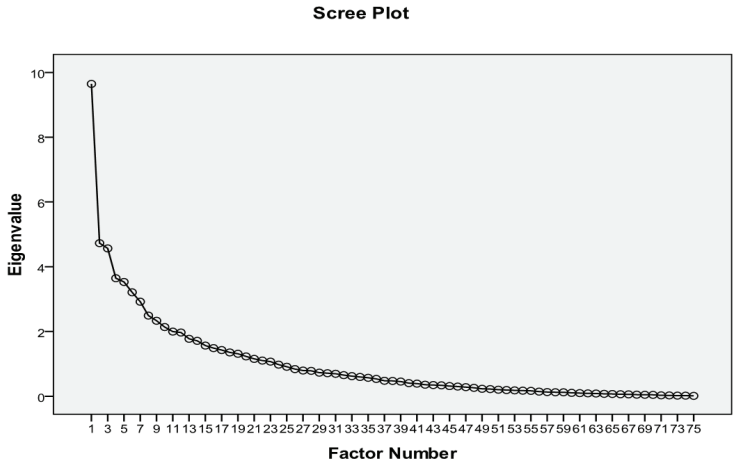

Figure 2. Eigenvalue Distribution of the Scree Plot

Table 4 indicates the variance explained by each factor and Table 5 presents the loadings of the items on the respective factors. The first five factors had at least four variable loadings of above .6 which, according to Guadagnoli and Velicer's (1988, in Stevens, 1992), indicates their reliability. Overall, the hypothesis that MCS falls into six factors that can be labelled as self-image, leadership, skills, action, performance, and orientation was not supported. Instead of the expected six-factor structure, an eight-factor structure emerged.

Looking at the items that loaded on each factor, the factors were described as follows: (1) expertise, (2) self-image (3) skills, (4) leadership, (5) innovation, (6) influencer, (7) sustainability, and (8) orientation.

Table 4. Total Variance Explained by Factors

Factor	Initial Eigenvalues			Extraction Sum of Squared Loading		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	24.12	27.41	27.41	23.64	26.86	26.86
2	6.62	7.52	34.93	6.14	6.98	33.84
3	4.40	5.00	39.93	3.98	4.52	38.36
4	3.31	3.76	43.69	2.78	3.16	41.52
5	2.55	2.90	46.59	2.04	2.32	43.84
6	2.20	2.50	49.09	1.74	1.97	45.81
7	2.14	2.43	51.52	1.61	1.83	47.64
8	1.99	2.07	53.59	1.49	1.77	49.41

Note: *Extraction Method: Principal Axis Factoring*

Table 5. Pattern Matrix Principal Axis Factoring

	Factor							
	1	2	3	4	5	6	7	8
A3.1C1	.87							
A2.4C1	.85							
A3.5C1	.77							
A2.2C1	.70							
A2.1C1	.53							
A2.5C1	.46							
A3.2C1	.45							
A3.3C1	.39							
A2.3C1		.81						
A1.3C1		.80						
A1.1C1		.79						
A1.2C1		.75						
A1.4C1		.47						
A4.5C1			.78					
A5.3C1			.77					
A4.1C1			.75					
A5.2C1			.74					
A4.3C1			.54					
A4.2C1			.42					
A7.4C1				.72				
A8.4C1				.69				
A6.3C1				.65				
A6.4C1				.64				
A6.5C1				.57				
A8.3C1				.48				
A7.1C1				.39				
A10.4C1					.78			
A9.5C1					.59			
A9.2C1					.55			
A10.2C1					.52			
A9.3C1					.56			
A10.3C1					.44			
A11.3C1						.65		
A11.5C1						.63		
A11.2C1						.54		
A11.4C1						.45		
A11.1C1						.42		
A13.2C1							.68	
A13.4C1							.57	
A12.3C1							.48	
A12.4C1							.42	
A13.1C1							.37	
A12.1C1							.35	
A14.5C1								.77
A15.5C1								.73
A15.3C1								.69
A14.4C1								.55
A14.2C1								.47

The coefficient alpha of each sub-scale was initially calculated based on the total number of items loading above .3 on each factor. Then, items were removed following the procedure described: (1) the number of items in each sub-scale was scrutinized; (2) the item-scale correlation was assessed; (3) the alpha coefficient was computed; (4) the weakest item was identified; and (5) step 1 to 4 were repeated until an acceptable trade-off between length and reliability was achieved. The final alpha levels of the sub-scales can be found in Table 6. They show acceptable levels.

Table 6. Cronbach Alpha of Reliabilities of the Final Sub-Scales

Sub-Scale	Cronbach α
Expertise	0.91
Self-image	0.82
Skills	0.87
Leadership	0.88
Innovation	0.83
Influencer	0.85
Sustainability	0.89
Orientation	0.93

Factor analysis was performed again after the removal of the items to determine whether the deletion of the items had not affected the factor structure (Field, 2005). The final construct of management competency contained 45 items.

Convergent and discriminant validity are both aspects of construct validity. The management competency sub-scales measure similar concepts and are, therefore, expected to share an amount of co-variation as stated in Hypothesis 2. If this proved to be the case, this could be seen as evidence for the construct validity of the sub-scales of management competency. The correlations would provide evidence of similarity between the sub-scales as measures of theoretically related constructs and, therefore, be indicative of convergent validity.

A comparison of the inter-correlations between the factored scales was carried out to test the covariance (Cohen and Swerdlik, 2005). The values of items within a sub-scale were summed and divided by the number of items in the sub-scale. This gave an overall sub-scale score on a common range between 1 and 5. Table 7 shows the correlations between the sub-scales. All the sub-scales were significantly correlated. The inter-correlations between the subscales were similar, with a mean scale inter-correlation. These findings were in accordance with the underlying theory of inter-dependence between the management competencies and supported the hypothesis that MCS correlate positively with each other.

Table 7. Correlation Between the Sub-Scales

	2	3	4	5	6	7	8
1	.33**	.41**	.47**	.55**	.38**	.69**	.78**
2		.57**	.44**	.45**	.33**	.37**	.48**
3			.58**	.67**	.77**	.38**	.72**
4				.37**	.44**	.28**	.35**
5					.65**	.47**	.38**
6						.65**	.47**
7							.71**

***Correlation is significant at .01 level*

If sub-scales measured one overarching concept of management competency, they could be expected to converge conceptually and statistically into a higher order construct. One way to assess this is through conducting a second order factor analysis (Briggs & Cheek, 1986). This procedure assesses the common variance shared by the first order factors, obtained in the initial factor analysis using oblique rotation.

It is hypothesized that all eight management competency sub-scales will have substantial loadings on a single second-order factor, representing the general management competency construct. Initial principal axis factoring of the sub-scales revealed the presence of two factors with eigenvalues exceeding 1. However, an inspection of the factor matrix showed that all sub-scales loaded highly (above .4) on the first factor, suggesting that they measure one overarching concept. Therefore, in a second step only this factor was extracted. The loadings of the sub-scales on the extracted single factor are presented in Table 8.

Table 8. Second-Order Factor Loading for MCS

Sub-scale	Loading
Expertise	.65
Self-image	.54
Skills	.48
Leadership	.88
Innovation	.69
Influencer	.93
Sustainability	.76
Orientation	.81

If sub-scales are measuring different aspects of management competency, they would also be expected to show a degree of discrimination between them. Discriminant validity of the sub-scales can be assumed if the individual scale reliabilities are meaningfully higher than the average inter-scale correlations. Discriminant validity was analyzed, assessing the respective values of the original sample data. The average inter-scale correlation of .31 differs substantially from the average Cronbach α of .88, indicating good discriminant validity between the sub-scales.

To explore the sub-scales of management competency further, the overall score was calculated as a sum of all the sub-scales divided by the number of sub-scales. The relationship between the sub-scale scores and the overall calculated score was investigated using Pearson Product-Moment Correlation Coefficient. There was a strong positive correlation ($p < .001$) between the variables and the overall score (Table 9).

Table 9. Correlation Between the Sub-Scales and the Overall Score

Sub-Scale	Correlation with Overall SMCT Score
Expertise	.78**
Self-image	.61**
Skills	.56**
Leadership	.88**
Innovation	.75**
Influencer	.82**
Sustainability	.85**
Orientation	.79**

** *significant at .01 level*

The study presented resulted in the development of the MCS. The attempt to provide support for the proposed six-factor structure of MCS failed. Instead, the following 8-factor structure emerged: (1) expertise, (2) self-image, (3) skills, (4) leadership, (5) innovation, (6) influencer, (7) sustainability, and (8) orientation.

Some of the concepts expected to load onto one of the sub-scales of management competency remained as single factors. This suggested that the items representing these concepts were not similar enough, with regard to what they measured, to load onto one factor. Instead, they appeared to belong to different clusters of variables. For instance, items measuring personal values and self-awareness and knowledge and expertise, while conceptually similar, were not similar enough to load onto one factor. Conversely, some items expected to measure different concepts loaded onto one factor and were subsumed accordingly. A possible explanation may be found in the choice of concepts to represent the sub-scales of management competency. On the other hand, some concepts may have been too dissimilar, or may not have fitted their proposed competency area.

However, this is unlikely, since the selection was based on the conceptual definition of management competencies and confirmed by subject matter experts. On the other hand, the loading of items from different concepts onto the same factor suggested some concepts to be very similar. This would explain the loading of the respective items onto one factor. The activities underlying these concepts are different which would explain why they do not emerge as one factor.

Some of the concepts chosen did not feature at all in the sub-scales developed on the basis of the factor analysis. Concept and/or item selection might be responsible for this. The items chosen to represent action, for instance, might not have been clear cut enough to emerge as one factor. Furthermore, the fact that action did not cluster together with other concepts suggested conceptual

differences. This is not to say that action is not of importance for management development, but that its items do not correlate as a concept with any of the other elected concepts. As such, it does not appear to measure aspects of management competency as conceptualized in this study. Following the advice by Whiddett and Hollyforde (2003) that it was not necessary to include all aspects of competency, these concepts were, therefore, excluded from further use.

Overall, the emergent 8-factor structure may suggest that the concept of management competencies is too complex to be grouped into six broad areas. There are some issues related to the use of a factor analytic approach that must be taken into consideration when interpreting the results of this study. The main potential problem is more an issue of interpretation than statistical artefact. Factor analysis does not provide unequivocal results, but is subject to interpretation (Kline, 1990). The researcher's judgement regarding factor extraction and subsequent explanation of the factors has a direct impact on the outcomes of the analysis. This can be compounded by tautologous factors. If some items are essentially paraphrases of other items, a factor analysis will produce a set of related factors that are simply repeats of the same factor. With only paraphrases and no other items loading on them, the factors are merely 'bloated specifics' (Kline, 1990). In the present study, factor analysis and subsequent scale development resulted in some sub-scales containing only five items, all similar in content. To rule out the possibility of bloated specifics and to cross-validate and confirm the factor-structure as emerged here, further replication studies, possibly involving a larger set of items, representing all eight identified competency areas are necessary.

The theoretical assumption of inter-relatedness of the sub-scales of management competency has been supported by the results of this study. In line with Hypothesis 2, the sub-scales of management competency have been found to be positively correlated with each other. In factor analysis, factors attempt to account for correlations between items. Even oblique rotation, which allows for the factors to be interrelated, forces the data into a certain format. Constructing the sub-scales of management competency using a factor analytical approach does not make allowances for the fact that the relationship between factors may change over time. Instead, it is assumed that the multi-collinearity between the sub-scales is lasting. All this suggests that the findings of this study and the factor analysis should not be interpreted strictly. As mentioned, sub-scales of management competency that were rejected on the basis of the results of the analysis are not necessarily of less importance than those which were accepted. The rejected sub-scales were simply not needed to describe the present data.

Another issue that deserves mention is the scale length. Kline (1993) suggested that a reliable scale should consist of at least ten items. The initial item generation was geared towards meeting this requirement, taking an over-inclusive and generous approach to item selection. However, the eight-factor structure which emerged from the scale development did not meet this criterion. On the other hand, several studies, consulted during the item generation stage, used scales consisting of less than ten items. These scales had been shown to be of value in the contexts in which they had been applied (Callanan & Greenhaus, 1990; Kossek et al., 1998).

Given that the scales fulfilled other criteria (internal consistency and item-scale correlation), it was considered acceptable to retain the eight-factor structure.

The study did provide initial evidence for the construct validity of the sub-scales of management competency. Furthermore, evidence for both convergent and divergent validity was presented. However, these focused mainly on the sub-scales of management competency itself. Therefore, further evidence of construct validity must be provided, using other measures like a multi-trait approach.

There is a range of limitations regarding the research design and methodology that should be considered, especially with respect to implications for future work. First, it must be considered that the creation of a new measure typically requires numerous administrations and intensive research into the measure's validity and reliability in different settings. Therefore, the current administration of MCS should be seen as the first in an iterative development process.

It has already been critically mentioned that the reliability evidence presented in this study focused exclusively on internal consistency. This does not affirm consistency of the sub-scales of management competency over time. Future research should seek to substantiate the reliability evidence further, looking at forms other than Cronbach alpha, such as test-retest or alternate form reliability.

The development of MCS followed a theory-based approach, using previously tested or hypothesized items. A related concern is the relatively low number of items in some of the sub-scales. It may have been better to have included an even larger initial number of concepts and items in order to obtain the desirable scale length of ten items. As it is, some scales only contain five items. This may give reason to question how comprehensively the respective competencies are measured. Using a research-based approach might have yielded broader categories, with different items. Although the sub-scales identified in this study were shown to accommodate most of the management competencies, it must be acknowledged that some concepts important for effective management might have been missed.

The study sought to minimize this risk of omitting concepts through consultation with subject-matter experts. The concepts and items used were mostly already validated, rather than being subjective criteria whose impact had not already been empirically evaluated. However, to substantiate the validity and the comprehensiveness of the eight factor structure, replication studies using a different approach are required.

It has already been discussed in detail that the evidence for construct validity presented in this study is somewhat limited. The sub-scales of management competency showed above-chance similarity with each other, indicating convergent validity. Replication of these findings using a multi-trait multi-method approach would add strength to this evidence.

4. Conclusion

The study did provide initial evidence for the construct validity of the MCS. Furthermore, evidence for both convergent and divergent validity was presented. However, these focused mainly on the MCS itself. Therefore, further evidence of construct validity must be provided, using other measures like a multi-trait approach. While some researchers looked at single concepts, others combined them. This study has served to integrate much of the earlier work, by including many concepts that have been shown to be related to management success and

measuring them together in one psychometrically sound instrument. This study identified reliable and valid constructs, providing a means of discriminating between the ones that are indeed different and combining those that are indeed similar. Nevertheless, the study provides a good alternative to the bounty of competency models/frameworks that have been developed in the area of management competency.

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