# “Factorial invariance of the South African culture instrument”


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| **AUTHORS** | Nico Martins |



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# SECTION 1. Macroeconomic processes and regional economies management

Nico Martins (South Africa)

# Factorial invariance of the South African culture instrument

## Abstract

The purpose of the study is to confirm the validity of the South African Culture Questionnaire (SACI) and to assess the questionnaire's degree of factorial invariance across race groups. The questionnaire has been used for a number of years for organizational culture assessments, but no factorial invariance has been tested. It is essential for the cultural applicability of the measuring instrument (e.g. whether the measurements represent identical constructs on identical scales) and equivalence to be determined. A quantitative research study was conducted in a South African information communications and technology (ICT) company. A total of 455 employees completed the SACI. Structural equation modelling was used to determine if there was any invariance between the various race groups. The results confirmed the validity and reliability of the SACI and the fact that no factorial invariance existes between the measured groups. The original eight-factor structure of the SACI fits the data well – as evidenced by the overall goodness-of-fit statistics. The reliability associated with organizational culture for both the pathways and dimensions is acceptable across the various groups, as indicated by the overall and race goodness-of-fit statistics. No significant differences are found in the factorial patterns for the SACI for the four race groups. The conclusion drawn is that the questionnaire can thus be used with confidence for organizational assessments across race groups.

**Keywords:** factorial invariance, structural equation modelling, organizational culture assessment, goodness-of-fit statistics.
**JEL Classification:** L2.

## Introduction

Nowadays, organizational assessments by means of employee surveys are commonplace, with millions of employees being surveyed around the world (Borg and Mastrangelo, 2008; Church and Waclawski, 2001). According to Brown (2014), the identification of problems and areas of improvement is a significant element in developing a high-performance organization. He also explains the importance of employee surveys or questionnaires to provide vital information on past, present and future improvement efforts. The need to measure organzational culture is still relevant in the business world today (in South Africa too) and should not be underestimated. A recent review of research published in three leading South African business management journals shows that the most influential and cited article in the *South African Journal of Business Management* was that by Van der Post, De Coning, and Smit (1997), which provided a measurement instrument for organizational culture (Botha, Lilford and Pitt, 2011). It is customary to validate and test the reliability of employee satisfaction surveys (Brown, 2014; Moerdyk, 2009; Van Tonder and Roodt, 2008) to ensure that these instruments are constructed to meet specific scientific criteria for the measurement of the constructs. It is interesting to note that most of the validity and reliability studies on employee surveys generally refer to the validity and reliability of the instrument for the total population participating in the particular survey(s). In a multicultural country such as South Africa, with its numerous language and ethnic groups, it is necessary to take differences into account in order to conduct fair assessments (Moerdyk, 2009). In substantive research focusing on multigroup comparisons, it is typically assumed that the instrument of measurement operates in exactly the same way and that the underlying construct being measured has the same theoretical structure for each group under investigation. As evidenced in reviews of the literature, however, these two critical assumptions are rarely if ever tested statistically (Byrne, 2004).

The purpose of this study was thus to determine if the SACI can be applied fairly across race groups.

## 1. Organizational culture

In 1979, Pettigrew introduced concepts such as beliefs, ideology, language, rituals and myths which were widely used in organizational culture of sociology and anthropology and illustrated the

applicability of these constructs to organizational behavior. He believed that these concepts were useful in understanding how organizational cultures are created. This sparked the interest of many academics and practitioners, and the ensuing interest and dominant status that the "concept of culture" gained over the next few years was seen as a fad that would pass among managers, consultants and academics (Beyer and Trice, 1987; Hofstede, Neuijen, Ohayv and Sanders, 1990). Interest did not wane, however, and led instead to the development of a plethora of different theories, models and frameworks aimed at explaining organizational culture as well as its impact on and relevance for organizations (Dauber, Fink and Yolles, 2012). According to Robbins, Judge, Odendaal and Roodt (2009), each organization has its own unique feeling and character beyond its structural characteristics. According to Robbins et al. (2009), the origin of organizational culture as an independent variable affecting an employee's attitudes and behavior can be traced back more than 50 years to the notion of institutionalization, which involves an organization taking on a life of its own, disparate from its founders or any of its members.

There are enormous variations in the definitions of organizational culture, especially since the concept lends itself to a broad variation of disciplines and research orientations such as anthropology, sociology, management studies, political science and industrial psychology (Alvesson, 2013). According to Moss (2014), a sense of shared values and norms is a common thread in many definitions of organizational culture, but she admits that this is not a particularly rich conceptualization of culture. Other researchers have expanded the concept to include a common instrumental set of attitudes towards the activities and the settings people are engaged in, which serve as a foundation for an organization's management system as well as the set of management practices and behaviors that both exemplify and reinforce those basic principles.

Martins' (1989, 2006, p. 92) definition, which is based on Schein's (1990, p. 111) work, draws attention more clearly to the relationship between behavior and the creation of organizational culture. Martins (2006) defined organizational culture as "an integrated pattern of human behavior which is unique to a particular organization and which originated as a result of the organization's survival processes and interaction with its environment. Culture directs the organization to goal attainment. Newly appointed employees must be taught what is regarded as the correct way of behaving."

Hence in this study, organizational culture is regarded as encompassing a system, or many systems, of deeply rooted values and norms that are shared by employees and that direct their behavior (Kinicki and Kreitner, 2009; Martins and Martins, 2004; Odendaal and Roodt, 1998).

Based on various authors' definitions of organizational culture, a number of models have been developed and include elements such as beliefs, ideology, language, ritual and myth (Pettigrew, 1970); symbols, heroes, rituals and values (Hofstede et al., 1990); artefacts, values and underlying assumptions (Schein, 1990); artefacts, values, assumptions, symbols linked by symbolization, interpretation, manifestation and realization (Hatch, 1993); history, values and beliefs, rituals and ceremonies, stories, heroic figures, the cultural network and corporate tribes (Deal and Kennedy, 1982); and the organizational system, survival functions and dimensions of culture (Martins, 1989).

There thus seems to be a wealth of organizational culture models that attempt to explain the relationships between organizational culture and related constructs. Martins (1989) developed a model based on the work of Schein (1990) to describe organizational culture. The model is based on the interaction between three key elements, namely the organization's subsystems, survival functions and the dimensions of culture (Martins, 1989). It is a comprehensive model because it encompasses all the aspects of an organization upon which organizational culture could have an influence and vice versa (Martins et al., 2004). For the purposes of this study, the model is used to portray organizational culture and is also used as the theoretical framework to test invariance between the four race groups. Martins' model, depicted in Figure 1 below, is based on the interaction between organizational subsystems, the two survival functions comprising the external environment and the internal system and the dimensions of culture (Martins, 1989).

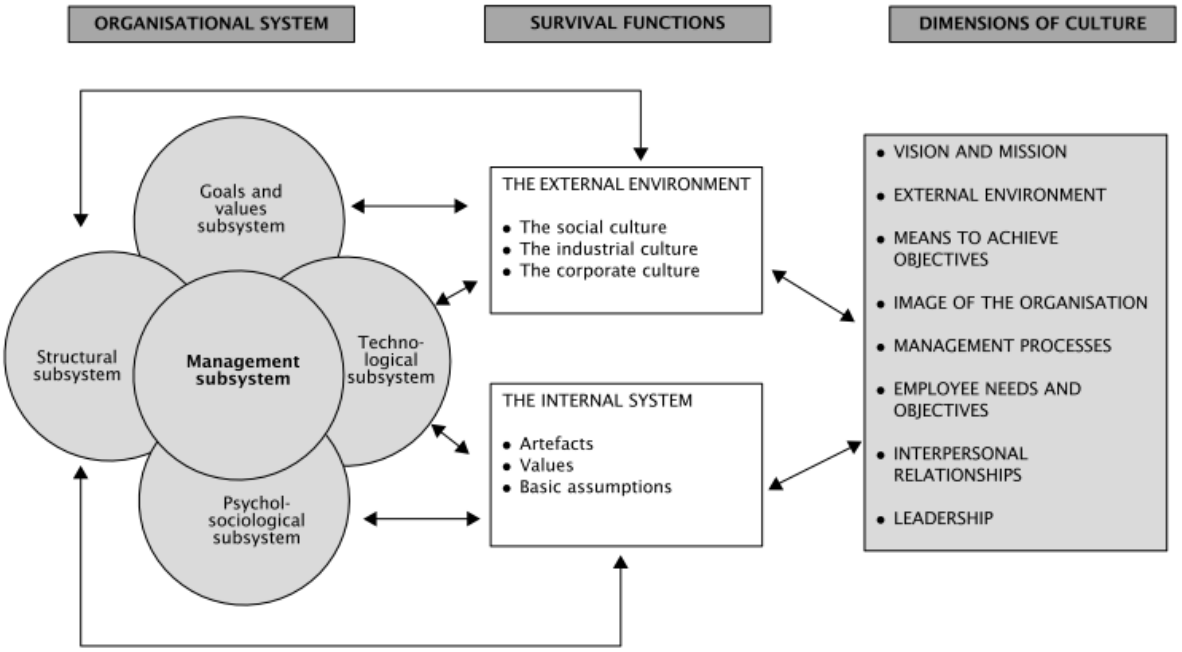



**Fig. 1. Martins' model of organizational culture (adapted from Martins, 1987, p. 92; as adapted in 1997)**

The organization system consists of five subsystems, namely goals and values and technological, psychosocial, structural and management subsystems (Martins, 1989).

**(1) Goals and values** as a subsystem consist of various objectives that can be linked to the organization's mission and strategy. This is the very reason for the organization's existence, and organizations usually exist because of a need in the broader community (Martins, 1989).

**(2) The technological subsystem** refers to the specialized knowledge, skills, machines, equipment and layout of the facilities used in the transformation from inputs to outputs. This can also be seen as a subsystem of artefacts and creations (Martins, 1989).

**(3) The psychosociological subsystem** comprises groups and individuals in the organization and refers to the relationships between them as well as the reason for individual needs and goals to be integrated with those of the organization in a common goal (Martins, 1989).

**(4) The structural subsystem** refers to the task expectations and the technology that have a significant influence on the organization's structure. Structures of authority are formed and systems of workflow are designed on the basis of how the tasks are grouped. Other structural elements include reporting lines, work rules and communication flow (Martins, 1989).

**(5) The management subsystem** relates to how the organization relates to its environment, goal setting and objectives, developing comprehensive strategies and operational plans, designing structures and establishing control processes and managing human resources (Martins, 1989).

## 2. Research objective

The research objective of this study was to determine if any factorial invariance exists between the four race groups.

## 3. Research methodology

Because the SACI instrument used in this study was shortened to 60 items for operational reasons, principal axis factoring (PAF) was conducted to identify and confirm the dimensions comprising organizational culture.

Structural equation modelling was then applied, firstly, to the overall data set, and secondly, to each of the race groups to confirm the validity of the questionnaire and to determine if any invariance existed between the race groups.

**3.1. Research approach.** A scientific quantitative survey was used to achieve the research objectives.

**3.2. Participants and sampling.** The sample frame consisted of 3 000 permanent employees from middle-management levels and below in an ICT company in South Africa (N = 20 771). Proportionate random stratified sampling was applied, which allowed the researcher to sample the rare extremes of the population for higher statistical precision, compared to random sampling (Marcyzk, DeMatteo, and Festinger, 2005).

A total of 455 usable questionnaires were received, which yielded a response rate of 15.14%. As indicated in Table 1, most of the participants were

male (70.8%). The majority of the respondents were white (39.6%), followed by black (38%), coloured (13.2%) and Indian (9.2%). This suggested an adequate representation of the organization's labor force. The majority of the sample comprized employees at operational level (62.4%) (see Table 1).

Table 1. Biographical and demographical profile of the respondents ($n$ = 455)

| Variable | Category | Frequency ($f$) | Percentage (%) |
|---|---|---|---|
| Gender | Male | 322 | 70.8 |
| | Female | 133 | 29.2 |
| Race | African | 173 | 38.0 |
| | Coloured | 60 | 13.2 |
| | Indian | 42 | 9.2 |
| | White | 180 | 39.6 |
| Generation | Baby Boomers | 152 | 33.4 |
| | Generation X | 248 | 54.5 |
| | Generation Y | 55 | 12.1 |
| Level | Management | 35 | 7.7 |
| | Operational | 284 | 62.4 |
| | Specialist | 99 | 21.8 |
| | Supervisor | 37 | 8.1 |

**3.3. Measuring instrument.** The SACI was developed locally for the South African context, and measures the extent to which employees identify the various elements of the organization's existing and ideal culture (Martins and Coetzee, 2007). The overall reliability (Cronbach alpha coefficient) of the SACI was measured at 0.933, and the internal consistency of the dimensions ranged from 0.655 to 0.932 (Martins, Martins and Terblanche, 2004). The questionnaire comprises the following seven dimensions:

- leadership;
- means to achieve objectives;
- management processes;
- employee needs and objectives;
- vision and mission;
- external environment;
- diversity strategy.

Respondents make use of a five-point Likert scale to rate each statement. A low rating (1) indicates that the respondent strongly disagrees, while a high rating (5) indicates strong agreement. A typical question for the *Leadership* dimension is: "My immediate manager sets an example everyone can follow – he/she walks the talk". A typical question for *Means to achieve objectives* is: "Conflict between divisions/functions in the company does not cause a waste of resources." All factors are scored in such a way that a low score indicates non-acceptance of the cultural dimension, while a high score indicates acceptance (Martins and Coetzee, 2007).

**3.4. Research procedure.** Permission to conduct the study was obtained from the management of the organization in which the study was conducted. The survey was conducted with a web-based questionnaire application. Survey questionnaires were sent electronically via the company's electronic communication system to the sample of 3 000 permanent employees, requesting them to participate in the survey. In the invitation e-mail, it was clearly stated that participation was voluntary, and that no information provided would be linked to the identity of a specific person (i.e. anonymity would not be compromised). No incentives were provided to encourage participation.

**3.5. Data analysis.** The University of South Africa's statistical department analyzed the data using the Statistical Program for Social Science (SPSS) Version 20 for Windows (Pallant, 2007).

## 4. Results

**4.1. Factor and reliability analysis for the SACI.** Because the SACI instrument used in this study was shortened to 60 items for operational reasons, a factor analysis was conducted to identify and confirm the dimensions comprising organizational culture. In an effort to reduce the dimensionality of the data, patterns of correlations between the questions used to measure the respondents' perceptions of organizational culture were examined by subjecting the set of items to PAF. Using 60 items in PAF revealed the presence of ten factors with eigenvalues exceeding 1, but the scree plot indicated a solution of nine factors. Allowing the solution to consider only nine factors resulted in Q40 being excluded because its communality was below .3, and the subsequent nine-factor solution explained more of the variance in the data.

Nine of the remaining 59 items, namely Q41, Q51, Q52, Q55, Q59, Q60, Q65, Q70 and Q71, were excluded in the final analysis because they did not load sufficiently on any of the components and their deletion resulted in more variance in the data being explained by the solution. Q27 was discarded because the factor that it loaded on had higher internal consistency (Cronbach alpha) without it, and also resulted in more variance being explained by the solution.

Table 2 shows that PAF using the remaining 49 items revealed the presence of only seven factors with eigenvalues exceeding 1. The scree plot (Figure 2) indicated the presence of eight factors, cumulatively explaining 62.976% of the variance in the data. Using Cattell's (1966) scree test, it was decided to retain these eight factors for further investigation.

To assist with the interpretation and scientific utility of these eight factors, Varimax rotation was performed. The rotated solution revealed the presence of a simple structure (Thurstone, 1947), with each of the eight factors showing a number of strong loadings (loadings lower than .4 were excluded from the solution). Each of the extracted factors demonstrated acceptable internal consistency, as illustrated by the Cronbach alpha coefficients listed in Table 3. The generally agreed upon lower limit for the Cronbach alpha is 0.70, although it may decrease to 0.60 in exploratory research (Hair, Black, Babin , Anderson and Tatham, 2006).

Table 2. Total variance explained by exploratory factor analysis

| Factor | Initial eigenvalues | | | Rotation sums of squared loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of variance | Cumulative % | Total | % of variance | Cumulative % |
| 1 | 19.540 | 40.708 | 40.708 | 8.026 | 16.720 | 16.720 |
| 2 | 4.451 | 9.273 | 49.981 | 6.403 | 13.341 | 30.060 |
| 3 | 2.335 | 4.864 | 54.845 | 4.324 | 9.009 | 39.070 |
| 4 | 1.875 | 3.907 | 58.751 | 3.674 | 7.654 | 46.724 |
| 5 | 1.285 | 2.677 | 61.428 | 2.533 | 5.278 | 52.002 |
| 6 | 1.192 | 2.484 | 63.912 | 1.887 | 3.930 | 55.932 |
| 7 | 1.089 | 2.269 | 66.181 | 1.797 | 3.744 | 59.676 |
| 8 | .996 | 2.074 | 68.255 | 1.584 | 3.300 | 62.976 |
| 9 | .964 | 2.008 | 70.263 | | | |
| 10 | .771 | 1.606 | 71.869 | | | |
| 11 | .743 | 1.548 | 73.417 | | | |

Table 3. Reliability statistics for the eight extracted factors

| Subscale | Description | N of items | Cronbach Alpha |
|---|---|---|---|
| F1 | Leadership | 12 | 0.947 |
| F2 | Means to achieve objectives | 14 | 0.924 |
| F3 | Employees needs and objectives | 8 | 0.904 |
| F4 | Organisational strategy | 4 | 0.899 |
| F5 | Management processes | 4 | 0.852 |
| F6 | Company mission and objectives | 2 | 0.910 |
| F7 | Community involvement | 2 | 0.890 |
| F8 | EE strategy | 2 | 0.884 |
| Overall | All dimensions | 49 | 0.969 |

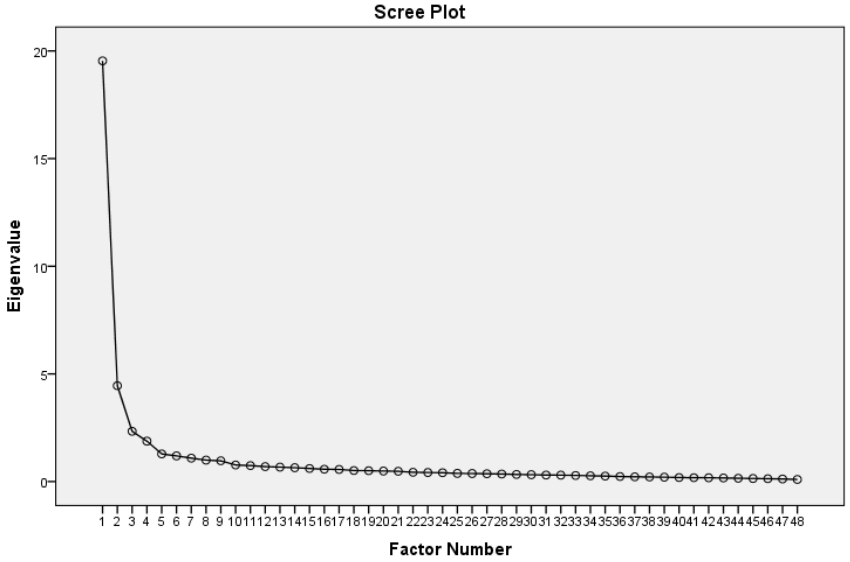
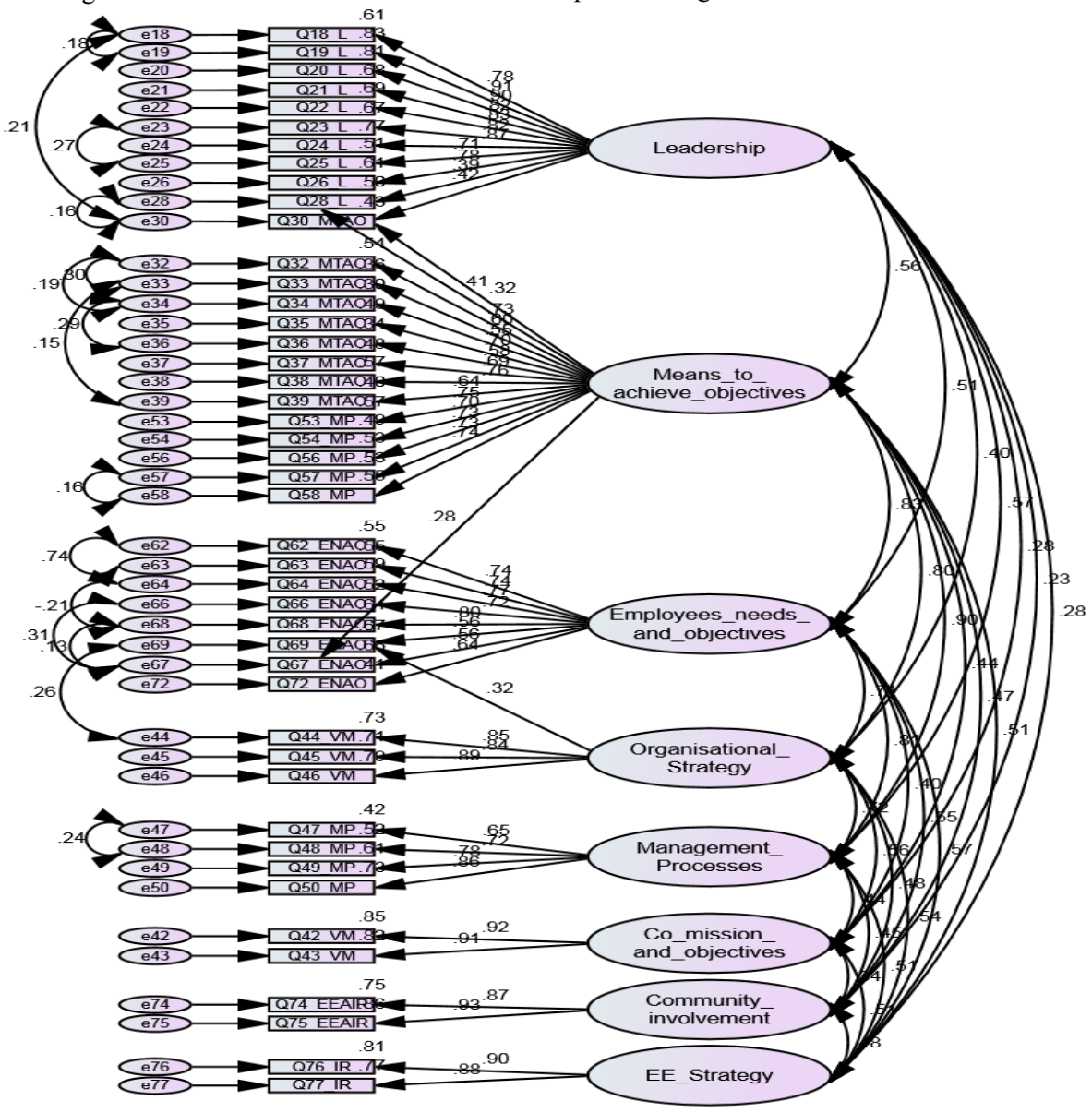



**Fig. 2. Scree plot**

**4.2. Overall structural equation modeling.** A confirmatory factor analysis (CFA) was conducted in order to develop and specify the measurement model (Hair et al., 2010) on the first-order latent construct level. The AMOS (Analysis of Moment Structures) computer program was used to conduct the CFA.

The CFA was conducted using the eight factors identified during the EFA. The next step in the process was the testing of hypotheses relating to group invariance. In accordance with the guidelines provided by Jöreskog, and explained by Byrne (2004), the testing of hypotheses relating to group invariance typically begins with scrutinizing the measurement model. In particular, the pattern of factor loadings for each observed measure is tested for its equivalence across the groups. Once it is known which observed measures are group invariant, these parameters are constrained to be equal, while subsequent tests of the structural parameters are conducted. As each new set of parameters is tested, those known to be group invariant are constrained to be equal across groups. Given the univariate approach to the testing of these hypotheses, as implemented in the Amos program (Bentler and Wu, 2002), this orderly sequence of analytic steps is both necessary and strongly recommended. As a prerequisite for invariance, it is customary to consider a baseline model, which is then estimated separately for each group. The baseline measurement model that was developed is depicted in Figure 3 below.




Notes: latent variable (factor or construct) observed variable
direct effects → ; reciprocal effects ←, →; correlation or covariance ↔

**Fig. 3. Baseline measurement model**

Once the measurement model has been specified, its validity needs to be determined, which depends on establishing acceptable levels of goodness-of-fit. According to Hair et al. (2010), goodness-of-fit (GOF) indicates how well the specified model reproduces the observed covariance matrix among the indicator items. These results are portrayed in Table 4.

Table 4. Goodness-of-fit indices for the overall measurement model

| Indices | Value |
|---|---|
| Absolute fit indices | |
| Chi-square (CMIN) | 1837.009 |
| Ratio of CMIN to its degrees of freedom (df) | 898 |
| *p*-value | 0.000 |
| Goodness-of-fit index (GFI) | 0.860 |
| Root mean square error of approximation (RMSEA) | 0.045 |
| Incremental fit indices | |
| Incremental fit index (IFI) - Bollen's IFI | 0.945 |
| Tucker Lewis index (TLI) | 0.939 |
| Comparative fit index (CFI) | 0.945 |

The GOF indices obtained for the measurement model were as follows:

- *Chi-square (CMIN)*. A chi-square of 1837.009 with 898 degrees of freedom, $p \approx 0$, was obtained. Since the chi-square test assesses the difference between observed and expected covariance matrixes, the smaller the difference is, the better the model fit will be (Hair et al., 2010). However, as the sample size increases, so does the statistical power of the chi-square; even if the matrixes are practically identical (Hair et al., 2010), the difference could be deemed significant. The chi-square value obtained for the measurement model did not indicate a good model fit, but the size of the sample (average $n = 455$) reduced the meaningfulness of this GOF index (Schumacker and Lomax, 1996).

  Numerous authors therefore disregard the chi-square index for samples larger than 200, suggesting the use of other GOF indices to determine GOF (Schumacker and Lomax, 1996; Hair et al., 2010).

- *Goodness-of-fit index (GFI)*. A GFI of 0.860 was obtained for the measurement model. The GOF index is a measure of fit between the hypothesized model and the observed covariance matrix. The possible range of GFI values is 0 to 1, with higher values indicating better fit, while values of 0.90 or close to 0.90 are considered good (Hair et al., 2010; Hu and Bentler, 1999). The GFI value of 0.860 obtained thus indicated an adequate model fit.

- *Root mean square error of approximation (RMSEA)*. A RMSEA of 0.045 was obtained. The RMSEA avoids issues of sample size by analyzing the discrepancy between the hypothesized model and the population covariance matrix. The RMSEA ranges from 0 to 1, with smaller values indicating a better model fit, while a value of 0.06 or less is indicative of an acceptable model fit (Hu and Bentler, 1999). The RMSEA of 0.045 obtained thus indicated a good model fit.
- *Incremental fit index (IFI)*. An IFI of 0.945 was obtained. The incremental fit index, also known as Bollen's IFI, is also relatively insensitive to sample size. Values that exceed .90 are regarded as acceptable. The IFI of 0.945 obtained thus indicated a good model fit.
- *Tucker Lewis Index (TLI)*. A TLI of 0.939 was obtained. The TLI is similar to the NFI, but is not normed, and this value can fall below 0 or above 1 (Hair et al., 2010). Hair et al. (1995) recommend a level of 0.90 or above as indicating a good model fit. The TLI of 0.939 obtained thus indicated a good measurement model fit.
- *Comparative fit index (CFI)*. A CFI of 0.945 was obtained. According to Hair et al. (2010), the CFI is an incremental fit index that is an improved version of the normed fit index. The CFI analyzes the model fit by examining the discrepancy between the data and the hypothesized model, while adjusting for the issues of sample size inherent in the chi-square test of model fit and the normed fit index (Gatignon, 2010). According to Hair et al. (2010) and Hu and Bentler (1999), the CFI is normed so that values range from 0 to 1, with larger values indicating a better fit, and a value of 0.90 or larger generally considered to indicate acceptable model fit. The obtained CFI of 0.945 thus indicates a good measurement model fit.

Except for the chi-square index, all the other GOF indices were at a level recommended by various authors (Hair et al., 2010; Hu and Bentler, 1999; Schumacker and Lomax, 1996).

**4.3. Multigroup invariance.** In an effort to assess whether the measurement model was equivalent across black, coloured, Indian and white groups, the pattern of factor loadings for each observed measure was tested for its equivalence across the groups.

The baseline model used to compare the regression weight equality constraints model was the one obtained from CFA across all race groups.

The regression weights for the four different groups were constrained to be equal in the model (measurement weights). The testing of a baseline model then yields one that could be identically specified for each of the four race groups. However, it is important to note that just because the revised model was specified in the same way for each race group, this in no way guarantees the equivalence of item measurements and underlying theoretical structure across each race group. These hypotheses need to be tested statistically.

The GOF indices for the four race groups are depicted in Table 5.

If the discussed guidelines are considered for the four race groups, the results indicate that the GOFs for the white and black race groups both indicated good measurement fit. However, the results for the other two race groups indicated less adequate measurement fit.

An investigation of the results of the variances revealed the following:

- The variance for all the dimensions of the overall data was significant.
- The variance for all the dimensions for the black and white respondents was significant except for organizational strategy.
- The variance for all the dimensions for the coloured respondents was significant except for leadership and organizational strategy
- The variance for four dimensions for the Indian respondents was significant, with leadership and organizational strategy being insignificant.

Table 5. GOF indices overall and across the four race groups

| Indices | Overall | Black | Coloured | Indian | White |
|---|---|---|---|---|---|
| Absolute fit indices | | | | | |
| Chi-square (CMIN) | 1837.009 | 1430.067 | 1789.152 | 2294.792 | 1547.444 |
| Chi-square/degrees of freedom (df) | 2.046 | 1.593 | 1.990 | 2.555 | 1.723 |
| *p*-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| GOF index | 0.860 | .764 | .538 | .470 | .749 |
| Root mean square error of approximation (RMSEA) | 0.045 | .056 | .122 | .176 | .061 |
| Incremental fit indices | | | | | |
| Incremental fit index (IFI) – Bollen's IFI | 0.945 | .918 | .698 | .634 | .905 |
| Tucker Lewis index (TLI) | 0.939 | .909 | .657 | .587 | .894 |
| Comparative fit index (CFI) | 0.945 | .917 | .688 | .625 | .903 |

It is important to note that for all four race groups, the variance for only organizational strategy was not significant. The variances for the following six of the eight dimensions for all four race groups were significant:

- management processes;
- company mission and objectives;
- community involvement;
- employment equity strategy;
- employee needs and objectives;
- means to achieve objectives.

The results of the significant covariances are displayed in Tables 6 to 9 below. Only significant differences at the .001 level are displayed.

Table 6. Covariances: black

| | | | Estimate | S.E. | C.R. | *p* |
|---|---|---|---|---|---|---|
| Leadership | <--> | Means_to__achieve_objectives | .203 | .052 | 3.932 | *** |
| Leadership | <--> | Employees'_needs__and_objectives | .172 | .047 | 3.643 | *** |
| Leadership | <--> | Management__processes | .248 | .063 | 3.960 | *** |
| Means_to__achieve_objectives | <--> | Employees_needs__and_objectives | .447 | .073 | 6.144 | *** |
| Means_to__achieve_objectives | <--> | Management__processes | .593 | .083 | 7.108 | *** |
| Means_to__achieve_objectives | <--> | Co mission__and_objectives | .272 | .054 | 5.013 | *** |
| Means_to__achieve_objectives | <--> | Community__involvement | .278 | .063 | 4.378 | *** |
| Means_to__achieve_objectives | <--> | EE_strategy | .436 | .076 | 5.710 | *** |
| Employees'_needs__and_objectives | <--> | Management__processes | .529 | .083 | 6.403 | *** |
| Employees'_needs__and_objectives | <--> | Co_mission__and_objectives | .257 | .056 | 4.633 | *** |
| Employees'_needs__and_objectives | <--> | Community__involvement | .315 | .068 | 4.613 | *** |
| Employees'_needs__and_objectives | <--> | EE_strategy | .434 | .080 | 5.441 | *** |
| Management__processes | <--> | Co mission__and_objectives | .346 | .065 | 5.302 | *** |
| Management__processes | <--> | Community__involvement | .260 | .073 | 3.567 | *** |
| Management__processes | <--> | EE_strategy | .496 | .088 | 5.623 | *** |

Table 6 (cont.). Covariances: black

| | | | Estimate | S.E. | C.R. | *p* |
|---|---|---|---|---|---|---|
| Co_mission__and_objectives | <--> | EE_strategy | .415 | .074 | 5.625 | *** |
| Community__involvement | <--> | EE_strategy | .450 | .089 | 5.068 | *** |

Note: Estimate = estimated path coefficient (predicted) for arrows in the model; SE = standard error; CR = criterion ratio; P = probability value (***significant at the .001 level).

Table 7. Covariances: coloured

| | | | Estimate | S.E. | C.R. | *p* |
|---|---|---|---|---|---|---|
| Means_to__achieve_objectives | <--> | Management__processes | .541 | .123 | 4.402 | *** |
| Management__processes | <--> | Co mission__and_objectives | .332 | .095 | 3.494 | *** |
| Community__involvement | <--> | EE_strategy | .410 | .108 | 3.791 | *** |

Table 8. Covariances: indian

| | | | Estimate | S.E. | C.R. | *p* |
|---|---|---|---|---|---|---|
| Means_to__achieve_objectives | <--> | Employees'_needs__and_objectives | .639 | .182 | 3.513 | *** |
| Means_to__achieve_objectives | <--> | Management__processes | .659 | .180 | 3.663 | *** |
| Employees'_needs__and_objectives | <--> | Management__processes | .831 | .216 | 3.842 | *** |
| Employees'_needs__and_objectives | <--> | Community__involvement | .695 | .192 | 3.615 | *** |
| Community__involvement | <--> | EE_strategy | .683 | .179 | 3.812 | *** |

Table 9. Covariances: white

| | | | Estimate | S.E. | C.R. | *p* |
|---|---|---|---|---|---|---|
| Leadership | <--> | Means_to__achieve_objectives | .163 | .037 | 4.379 | *** |
| Leadership | <--> | Employees'_needs__and_objectives | .170 | .041 | 4.108 | *** |
| Leadership | <--> | Management__processes | .199 | .045 | 4.438 | *** |
| Means_to__achieve_objectives | <--> | Employees'_needs__and_objectives | .471 | .077 | 6.134 | *** |
| Means_to__achieve_objectives | <--> | Management__processes | .545 | .074 | 7.413 | *** |
| Means_to__achieve_objectives | <--> | Co mission__and_objectives | .222 | .047 | 4.676 | *** |
| Means_to__achieve_objectives | <--> | Community__involvement | .290 | .056 | 5.216 | *** |
| Means_to__achieve_objectives | <--> | EE_strategy | .311 | .056 | 5.584 | *** |
| Employees'_needs__and_objectives | <--> | Management__processes | .523 | .084 | 6.241 | *** |
| Employees'_needs__and_objectives | <--> | Co mission__and_objectives | .207 | .051 | 4.032 | *** |
| Employees'_needs__and_objectives | <--> | Community__involvement | .336 | .066 | 5.092 | *** |
| Employees'_needs__and_objectives | <--> | EE_strategy | .362 | .067 | 5.403 | *** |
| Management__processes | <--> | Co_mission__and_objectives | .224 | .055 | 4.056 | *** |
| Management__processes | <--> | Community__involvement | .334 | .065 | 5.169 | *** |
| Management__processes | <--> | EE_strategy | .337 | .063 | 5.322 | *** |
| Co mission__and_objectives | <--> | Community__involvement | .206 | .051 | 4.020 | *** |
| Co mission__and_objectives | <--> | EE_strategy | .292 | .054 | 5.390 | *** |
| Community__involvement | <--> | EE_strategy | .246 | .056 | 4.375 | *** |

An investigation of the results of the covariances indicated that both the black and white race groups mostly displayed significant relationships between the dimensions, in line with the overall base model. In only three instances, the coloured and Indian groups each displayed significant relationships between dimensions. All four race groups were subsequently compared to investigate the invariance between the four groups for the regression weights. The results are indicated in Table 10 below.

Table 10. Nested model comparisons

| Model | DF | CMIN | *p* | NFI Delta-1 | IFI Delta-2 | RFI rho-1 | TLI rho2 |
|---|---|---|---|---|---|---|---|
| Measurement weights | 123 | 141.719 | .119 | .006 | .007 | -.005 | -.005 |

The chi-square change from the baseline model across all groups to the measurement weight model was not significant, $\chi 2$ (123) = 141.719, $p$ = .119 (ns).

Hence the null hypothesis of equal measurement (regression) weights across the four groups could not be rejected. Multigroup invariance could be assumed.

The results of the four race groups did not indicate significant differences in terms of the regression weights of the latent constructs relating to the items.

It can thus be assumed that the constructs for all four race groups were formed in the same way.

## Conclusion

The results of the confirmatory factor analysis confirmed the validity and reliability of the SACI. The data were thus used to proceed with invariance testing among the four race groups.

The results of the analysis indicated that multigroup invariance could be assumed. However, one should note that the results of the Indian and coloured groups indicated a less adequate GOF. The results of the variances for the two groups also indicated that six of the dimensions had significant variances.

It can thus be stated that the constructs for all four race groups as measured by the organizational culture questionnaire were formed in the same manner. However, the GOF for the black and white respondents indicated good measurement fit, while the results for the coloured and Indian respondents indicated less adequate measurement fit.

In summary, it would appear that the questionnaire can be used with confidence to measure the organizational culture constructs. The black and white respondents seemed to experience higher levels of comfort with the constructs, especially leadership, than their coloured and Indian colleagues. The higher observed levels of confidence of the black and white respondents could probably be attributed, firstly, to the larger samples of respondents who participated in the survey, and secondly, to a higher level of agreement with or understanding of the organization's culture.

It is proposed that larger samples be considered in follow-up surveys to again test multigroup invariance. A supportive analysis that could be considered for future studies would be to constrain the covariances to be equal among the groups, as was done with the regression weights in this study.

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