

## Development and validation of a hybrid measure of organisational communication satisfaction

### ABSTRACT

The purpose of the study was to develop a hybrid quantitative audit of organisational communication satisfaction for the public service. In Study One, a two-factor solution was obtained, based on parallel analysis as a factor determination strategy with data obtained from 264 civil servants using a 30 item measure. In Study Two, the items of the new EFA-generated organisational communication satisfaction scale were renumbered consecutively and the scale was cross-validated on a new sample of 288 civil servants from the Addis Ababa City Administration. The cross-validation necessitated model respecification and re-estimation. The respecified model underwent validation at different levels. All seven aspects of validity, namely content validity, construct validity, factorial validity, reliability, convergent validity, discriminant validity and nomological validity were addressed and found to be adequate, pointing to a refinement in the measurement of communication satisfaction. However, limitations are also indicated as avenues for further enquiry.

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## **INTRODUCTION**

One of the earliest definitions by Thayer (1969) portrays communication satisfaction as personal satisfaction experienced when communicating successfully. Only much later was satisfaction with communication conceptualised in a unidimensional sense, as the appraisal gap between a person's ideal and actual satisfying informational experiences (Pace & Faules, 1994). However, this understanding of communication satisfaction as a mere meeting of information needs omits the important dimension of relational satisfaction, which has an essentially affective dimension.

A multidimensional view of communication satisfaction first surfaced in a theoretical paper by Downs, Hazen, Quiggins and Medley (1973), which set the scene for advances in the reconceptualisation of the construct. A factor analysis of communication satisfaction (Downs & Hazen, 1977) gave the multidimensionality of communication satisfaction some grounding, with multiple dimensions emerging, which were in essence relational and informational. While it is well established that communication satisfaction has both informational and relational facets, the relative importance of the facets remains undecided. How many dimensional units communication satisfaction exactly encompasses, remains equally unclear (Pearce & Segal, 2004).

Although many researchers have supported the multidimensionality view and attested to its psychometric soundness (Ahmed, 2006), owing in part to the robust datasets used (Clampitt & Girard, 1993), the stability of the multidimensional structures proposed or validated has been disconfirmed. For instance, Pincus (1986) does not support the validity of the seven-factor structure of the communication satisfaction questionnaire as originally stipulated. Furthermore, Clampitt and Girard (1987) found a five-factor communication satisfaction structure to be more valid, triggering further validity studies into the questionnaire. Later, Gregson (1990) identified a three-factor solution. More recently, Deconinck, Johnson, Busbin and Lockwood (2008) disconfirmed the convergent and discriminant validity of the construct and indicated that the separate facets of communication climate, media quality and co-worker communication could be compressed into one dimension.

Furthermore, the way that relational and informational aspects are conceptualised has been shown to have cultural dimensions, indicating that "communication satisfaction occurs when ideas are exchanged within a climate characterised by trust, respect, support, honesty, constructive feedback and mutual understanding" (Varona, 2002:8).

In general, and despite the demonstrated utility of the communication satisfaction construct, the recommendation in the research literature is that "much remains to be done" (Clampitt & Girard, 1993), especially when one considers culture-based conceptualisations of the construct (Varona, 2002). The lack of methodological rigour in previous studies may also have led to insufficient understanding of the construct and its inter-dimensional relationships.

### **Contextualisation**

With empirical evidence from the literature, Savolainen (2001) argues that the construct of communication satisfaction may have culture-specific traits. This was demonstrated in the Guatemalan study by Varona (2002), and Japanese research by Koike, Gudykunst, Stewart, Ting-Toomey and Nishida (1988), who showed that there may be contextual features that indicate cross-cultural distinctions. This culture-based variability is possible, given the relationship between emotion and culture (Kitayama, Markus & Kurakawa, 2000), indicating the possibility that the present scales of organisational communication satisfaction developed in the US may not apply universally. This lends support to the recommendation that research should continue into the factorial structure of communication satisfaction in differing contexts (Mount & Back, 1999). To date “we do not know the precise number of the facets of satisfaction” (Carriere, Bourque & Bonaccio, 2007:61) and hence cannot be confident about the present measures and their comprehensiveness.

Certainly, a number of communication evaluation scales of Western origin are currently in use in organisational studies. While there is absolutely no need to reinvent the wheel, the relevant aspects of organisational communication scholarship in an African environment would require contextual theorising and instrument development with culturally relevant constructs (Cusella, 1984).

### **Study Objectives**

The study aimed to develop, validate and test:

- A hybrid measurement instrument for communication satisfaction based on existing communication evaluation instruments
- A model of communication satisfaction in the Addis Ababa civil service.

## **1. THEORETICAL AND CONCEPTUAL FRAMEWORK**

Human resource theory was considered to be the most appropriate to situate the phenomenon of organisational communication satisfaction in the reforming Ethiopian public service because of its broad theoretical scope, heuristic value, epistemological and ontological appropriateness, and conceptual consistency.

Human resource theory provides principles for the running of organisations in ways that contribute to employee satisfaction (Miller, 2003). Two foundational dimensions of employee satisfaction are horizontal, encompassing supervisor and subordinate relations; and these constitute, amongst other factors, relational trust, respect, openness, positive feedback and a sense of solidarity (Varona, 1996). The mission of the human resource manager is to respect the humanity of the subordinate in communication that is symmetrical and characterised by warmth and closeness (Bolman & Deal, 1991). Intimacy and the desire for belonging are particularly evident in collectivist organisational cultures that predominate in intimacy and trust-oriented national cultures

(Hofstede, 2002). Power distance and uncertainty avoidance in collectivist society organisations are important considerations for human resource managers who aim to create a climate that is reassuring and respectful to subordinates.

As the human resources frame suggests, the organisation can be likened to a family or clan, where relational feelings and needs are central. In such organisations the manager has roles of liberation fulfilment and worker empowerment (Jacobs, 2012). These managerial and worker functions are accomplished through communication. As Rogers and Rogers (1976:3) most aptly state, “the behavior of individuals in organisations is best understood from a communication point of view”.

From within human resource theory, communication satisfaction can be looked at from the perspectives of content, flow, channel and style (Miller, 2003). The content of communication can address issues of innovation by subordinates who are encouraged to contribute ideas that help the organisation. This innovation communication contributes to worker satisfaction through self-expression, especially when managers listen and value inputs. Social communication is also valued as evidence of the organisation being viewed as a social institution for human interaction. Social communication – as opposed to professional or strictly job-related interchange – is communication that occurs in social spaces or contexts as exemplified in social media.

According to Miller (2003), communication in organisations is directional, flowing downward, upward, horizontally and diagonally. The multidirectional flow of information is assumed to enhance the communication satisfaction of the workforce, which is afforded the opportunity to use multiple lines and sources of information.

Channels of communication are context dependent, increasing the possibility of communication satisfaction. The media richness theory suggests that different media have different levels of abilities for producing communication satisfaction. Rich media produce relational and informational satisfaction between subordinates and superiors and they reduce uncertainty and ambiguity (Byrne & LeMay, 2006; Simon, 2006). As Short and Williams (1983) indicate, the richness of particular media may relate to degrees of humanness and warmth, which may have implications for affective satisfaction in collectivist organisations.

The style of communication also has relevance in human resource theory, which suggests that informal communication is more likely to produce communication satisfaction for the subordinate (Miller, 2003). Formal communication and its implied detachment may not address the desire for more equality by subordinates and their need for affiliation and inclusion in the social organisation. Power distance, as a cultural reality in collectivist organisations, does not necessarily suggest that it is enjoyed by subordinates. In fact, it has been noted that informal communication has become more central to ensure the successful conduct of business in present-day organisations (Baker, 2000).

Human resource theory therefore suggests that relational and informational elements would explain and predict communication satisfaction amongst subordinates in the modernising Addis Ababa City civil service sector.

## **2. METHODOLOGY AND RESEARCH DESIGN**

In recent years, structural equation modelling (SEM) has become a dominant method of instrument development and validation in software engineering (Schalles, 2013), as demonstrated in practice by Iyer and Israel (2012), Gray and Laidlaw (2004), and others. SEM and its principal function – confirmatory factor analysis (CFA) – have been shown to be significant in research on instrument validation (Anglim, 2007), and more recently have become mandatory in scale construction (Bowen & Guo, 2012). A particular benefit of SEM is the ability to measure error, thereby overcoming threats to validity (Aragon & Gesell, 2003) in studies of constructs such as communication satisfaction.

In this study progression was made from Study One: Exploratory Factor Analysis (EFA) using SPSS 20, through Study Two: Confirmatory Factor Analysis (CFA) involving Amos 20, to identify factors for the hybrid measure of organisational communication satisfaction and to validate the proposed model based on the factors identified and the paths implied in the set of hypotheses forming the model.

SEM-based model testing and validation can be done with great scientific confidence and advance theorising in organisational communication. As demonstrated in this study, the methodology involving modelling is in line with the goal of organisational communication “to develop theories that go beyond common sense” (Cusella, 1984:293). The study also has an impact on communication practice in the Ethiopian civil service, identifying conditions of communication through the sequential EFA and CFA studies.

### **2.1 Study One (Exploratory Factor Analysis)**

EFA, an older member of the SEM family of tests (Hoyle, 2012), is a statistical procedure with several steps that identify latent factors from a large sample of administered items (Worthington & Whittaker, 2006).

In this study EFA was used to see how the hypothesised dimensions or factors of organisational communication satisfaction are able to explain the empirical data gathered, using the scale. Ultimately, the purpose was to validate the proposed measure by testing whether the items assigned to each factor actually load on the a priori formed factor. This procedure requires a fairly large sample and a sampling plan.

#### **2.1.1 Sampling design**

A typical quantitative study involves 1) selecting a target population, 2) selecting the accessible population, 3) stating criteria for selection, 4) working out a sampling plan and

5) drawing the actual study sample (Landreneau & Creek, 2011). In this study, the target population, or the theoretical population, were all public servants in the city government of Addis Ababa, and the accessible population included those that could actually be selected from the target public service units of the ten sub-cities of the city government of Addis Ababa.

The sampling design was based on the recommendations of Babbie (1992) and Black (2004), about the need for combining sampling methods as may be justified. In the same vein, this study used a combination of probability sampling methods that included cluster sampling, systematic random sampling and simple random sampling.

The use of cluster sampling involved the selection of primary sampling units (clusters of sub-city civil service administrations) and secondary sampling units (individual civil servants). The primary sampling units were selected using systematic random sampling, while the secondary sampling units were chosen using simple random sampling.

The next step was to determine, using systematic random sampling, the 50% of the ten sub-cities that would be selected for the EFA (Main Study One) and the remaining 50% for the CFA (Main Study Two). This was followed by a sampling of civil servants.

### *2.1.2 Sampling civil servants*

Sampling civil servants in this study involved the selection of civil servants in the sampled clusters of sub-cities. The number of civil servants from each sub-city was determined in order to have an overall sample of a predetermined number of 650. The total usable sample was projected to be in excess of the minimum sample of 500, which a structural equation modelling study would require. Since the purpose of the study was not to produce survey data, the requirements of probability proportionate to size did not apply. Also, this sampling technique is most recommended when cluster samples vary considerably (McGinn, 2011). The Addis Ababa sub-city clusters tend to be proportionate in terms of the size of populations of interest.

However, consistently across the clusters, simple random sampling was employed to select 65 civil servants in each sub-city administration. The random sampling would ensure that each civil servant in the frame had an equal chance of being selected, using the procedure suggested by Galloway (1997):

- The sampling frame was obtained from the sub-city
- Each case was assigned an unique number
- A decision was made on the required sample
- The number selection was based on a table of random numbers.

The sampling design helped to enhance response rates and data quality management (Byrne, 2001; Ashton, 2006) at every stage of the separate studies that addressed intra-dimensional and inter-construct relationships with an initial set of pre-identified and preselected constructs.

### *2.1.3 Pre-selection and identification of constructs for the EFA procedure*

The number of constructs that contribute to organisational communication satisfaction is considerable, but the most salient were selected from the literature before being subjected to exploratory factor analysis.

Based on previous research, theory and psychometric judgement, this study first identified relevant communication satisfaction constructs from existing scales of organisational communication satisfaction. However, it was necessary to scrutinise all of these for appropriateness and relevance to the collectivist context, before six constructs were preselected for inclusion in a pilot instrument. For instance, it was felt that the construct of timeliness<sup>1</sup> of information, which could be a very important dimension in other cultures, would be less important to the Ethiopian civil servant than relational trust based on reflection on the culture of the Ethiopian civil service. Switzer, Wisniewski, Belle, Dew, and Schultz (1999) state that in selecting, developing and assessing measurement instruments, attention must be paid to the historical and cultural context of a study population. But this is not enough. Therefore the organisational communication measurement literature was consulted to identify weaknesses and strengths of the existing instruments and their factor structure (Greenbaum et al., 1987; Rubin et al., 1994). An examination of the psychometric literature (Switzer et al., 1999) provided guidance on the need for and construction of a hybrid measure of organisational communication satisfaction for the Ethiopian context.

Therefore, before the EFA plan could be performed, the psychometric hybridisation guidance of Switzer et al. (1999) was followed to select, modify and provide constructs for the proposed hybrid measure by

- Describing the original instruments
- Showing shortcomings in the present scales that justified the development of a hybrid instrument
- Indicating procedure in item/construct selection or creation
- Presenting changes made to original items/constructs or response formats
- Showing expected functional differences in the hybrid scale from present instruments.

The above five-step procedure as adapted for this study is presented next. It starts with a description of the original measures that were selected by using the criteria of availability, content and context relevance and psychometric quality from among a plethora of measures starting with the Communication Satisfaction Questionnaire.

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<sup>1</sup> There are two time orientations in chronemics, the study of time. In the polychronic time system strict scheduling is not the norm and arrangements tend to be fluid; all that matters is relationship quality (Cohen, 1997). In monochronic cultures, such as America's "the schedule is sacred", was anchored in the Industrial Revolution when "factory life required the labor force to be on hand and in place at an appointed hour" (Guerrero et al., 1999:238). Information clearly has a chronomic dimension related to culture.

### ***Communication Satisfaction Questionnaire***

The communication satisfaction questionnaire, originally developed by Downs and Hazen (1977), is a 51-item scale with eight dimensions. Each factor has five items scorable on a seven-point Likert scale ranging from “very satisfied” to “very dissatisfied”. The scale also has outcome variables, namely job satisfaction and productivity. There are also five items asking for demographic information. Different studies have employed modified forms of the questionnaire with subscales removed, changed or items reworded to suit changed organisational contexts.

### ***The International Communication Association Audit***

The International Communication Association audit is a team-developed communication assessment tool of the International Communication Association with eight dimensions and 134 items, making it the longest of its kind. It has a needs approach to communication satisfaction evaluation, in that respondents are asked to indicate the amount of information they need and the amount of information actually received.

### ***Organisational Communication Development Audit Questionnaire***

Originally developed by Wiio (1978) in Finland, the scale assesses links between communication and outcome variables (Rubin et al., 1994). It has 76 items with 12 dimensions. The format of this questionnaire is somewhat different from other scales and it has been in use over long periods since the 1970s, during which time it has been subjected to investigation and modification.

### ***Psychometric inadequacies of the three measures***

A number of studies have revealed important psychometric limitations of the instruments. In reality, there is no such thing as a perfect scale, given the complexities of the occupational setting and the contextual nature of communication. Each instrument has drawbacks.

Hecht (1978), after reviewing various communication measures, reported that the communication satisfaction questionnaire was thorough, but later researchers (Zwijze-Koning & De Jong, 2007) concluded that the measure was not exhaustive and a call was made for additional factors. Critical of the content validity of the communication satisfaction questionnaire, they caution that using the measure in its present form may lead to “a potential danger of misdiagnosis” (Zwijze-Koning & De Jong, 2007). Clampitt and Girard (1987) suggested revision to six-factors.

Thus, despite the praises it has received, the communication satisfaction questionnaire “is not without limitations” (Gray & Laidlaw, 2004), justifying ongoing psychometric

modification in relation to changing organisational cultures and contexts. Deconinck et al. (2008) demonstrated that the factor structure of the questionnaire was not stable across organisations. Crino and White (1981) reported that some dimensions of communication satisfaction showed high correlation, indicating that they may not be separate constructs. Downs (1988) made the recommendation that an important psychometric step would be “developing questions that are specific to a particular organisation and adding them to the communication satisfaction audit”, a relevant point in the present study.

#### *2.1.4 Steps in construct selection*

According to Stanton, Sinar, Balzer and Smith (2002), scale developers may use both statistical and judgemental procedures for factor deletion and factor retention. Psychometrically, both orthogonal and oblique factor rotation methods may be employed. Step-by-step, the following were considered in the hybridisation effort:

- Modifiability of the scale for the study population
- Psychometric excellence of the scale
- Expected burden on respondents (length of scale and number of items and dimensions)
- Practical issues (simplicity of scoring procedure).

#### ***Changes made to original items/constructs and response format***

As hybridisation would require, modifications were made to the items and constructs of the selected scales. Subordinate communication was dropped in view of its relevance in gauging communication satisfaction amongst subordinates. Media quality, organisational integration and corporate information were also dropped, because in earlier studies (e.g. Deconinck et al., 2008) media quality merged with other communication facets, as did organisational integration and corporate information. Gray and Laidlaw (2004) also found that the factors were highly correlated and therefore not independent dimensions.

But the dimension of job satisfaction from the organisational communication development audit questionnaire was considered to be pivotally relevant. There is also a preponderance of empirical evidence linking communication satisfaction and job satisfaction, although Gregson (1990) demonstrated that while the link is essential, the two constructs are uncorrelated. This was not replicated by Varona (2002), who found that Guatemalan conceptualisations of communication satisfaction included job dimensions, which may have relevance to the cultural context of Ethiopia.

The job satisfaction dimension was presented as an independent construct in the organisational communication development audit questionnaire, but in others it was operationalised through single communication satisfaction questionnaire items, which deserve to be criticised for insufficiency. Changes have been made to this particular job dimension, in the sense that the relevant items were taken from the organisational communication development audit questionnaire and modified to suit the seven-point Likert scale. One item on social benefits was dropped because it lacked clarity.

Relational trust is of considerable significance, but is mentioned in single items in the three communication scales, except the International Communication Association Audit, where it occurs with a relational label containing numerous items. Trust in communication is so important that it has been related to both quality and quantity of communication, and implicitly to communication satisfaction (Overwalle, Meylighen & Heath, 2011; Roberts & O'Reilly, 1974). Trust has been linked to positive outcomes such as satisfaction, and has resurfaced as a major research subject today (Thomas, Zolin & Hartman, 2009). Thus five items forming the dimension of trust were selected. The response format was also modified to suit the communication satisfaction questionnaire style and presented as a seven-point Likert scale.

Using the psychometric guidance and empirical literature, the following were finally selected as constitutive constructs:

- Communication climate
- Supervisory communication
- Co-worker communication
- Personal feedback dimensions from the communication satisfaction questionnaire.

Two additional dimensions (job satisfaction and relational trust) were included in the hybrid measure. This was done before they were subjected to EFA, which would decide whether the constructs were reproduced in the empirical observations. It was expected that there might be differences in psychometric properties.

### ***Expected functional difference of the proposed hybrid measure***

The function of scales is affected by a number of considerations, including – most notably – relevance, validity and reliability. In view of the relationship between communication and culture, the hybrid measure was expected to tap more reliably the perceptions of Ethiopian civil servants about their communication experiences in occupational settings.

The proposed scale has constructs more relevant to Ethiopian conceptualisations of communication satisfaction, because it has a clear focus on relationships and trust which may be more important in collectivist societies like those of Ethiopia (Hofstede, 2001). DeCoster (2011) argues that hybridising measures “is perfectly legitimate” and Pardee states that “hybrids have a hybrid vigor” (2008:8). The proposed hybrid measure also represents a response to “the need for shorter, psychometrically sound scales in organisational research” (Stanton et al., 2002:168).

The new scale was expected to prove more contextually relevant and short enough to motivate higher completion. However, the proposed psychometric structure was only a hypothesis, which may or may not have held until hypothesis testing was conducted. Therefore an EFA was undertaken to determine whether these dimensions

were reproduced in the actual data and whether the items loaded on the factors, with dimensionality issues also confirmed or disconfirmed.

### **Results of the exploratory factor analysis**

The parallel analysis output based on a usable EFA sample (n = 264) was consistent with current research on communication satisfaction factors (Gray & Laidlaw, 2004). It also concurred with research that demonstrates that the construct of communication satisfaction is best conceptualised in terms of informational and relational domains (Putti, Aryee & Phua, 1990). The two factors capture about 54% of the variance accounted for.

The two-factor solution obtained was based on the parallel analysis guided extraction that led to the formation of a 17-item scale with the following breakdown and allocation of items:

Relational factor = 1, 5, 7, 11, 13, 14, 21, 28 & 29 (9 items)

Informational factor = 3, 4, 9, 10, 16, 19, 20 & 26 (8 items)

These were renumbered consecutively and presented for a CFA as q1-q17.

Among the items belonging to the relational factor were:

*Extent to which my supervisor listens and pays attention to me (q1).*

*Extent to which I trust my colleagues (q2).*

Items that loaded on the informational factor are exemplified by the items:

*Extent to which informal communication is active and accurate (q15).*

*Extent to which I receive reports on how problems in my job are being handled (q16).*

## **2.2 Study Two (Confirmatory Factor Analysis)**

Confirmatory Factor Analysis (CFA) is a special form of SEM (Ullman, 2006), that is used in hypotheses testing and construct refinement. According to Noar (2009), CFA can lend support to the psychometric quality of a scale across samples and over time, compare simultaneously differing alternative models and help select the model best fitting the dataset. DeCoster (1998) points out additional advantages of CFA, namely testing relationships between constructs, examining correlations between factors and evaluating the convergent and divergent validity of a scale.

CFA assumes that the factor structure of a measure has already been identified and what is left is "to evaluate or confirm the extent to which the researcher's measurement model is replicated in the sample data" (Worthington & Whittaker, 2006:808). Of key importance in CFA is the evidence that comes from the fit between the data and the model demonstrating construct validity. In this study, the factor structure produced by EFA was used as input for instrument validation and model fitting, using the standard CFA procedure. Sampling in CFA is not different from the same practice in EFA and the sample parameters have to be generally similar. Preliminary features of the CFA data are presented below.

2.2.1 *Sample characteristics*

The population of respondents from which the CFA data were gathered was 288. It was qualitatively similar to the EFA population but larger, since CFA requires more participants than EFA (Guadagnoli & Velicer, 1988). The final usable CFA data came from 277 respondents.

2.2.2 *Reliability*

Reliability as measured, using coefficient alpha, was generally high. It was  $\alpha = .93$  for the relational construct, .87 for the informational dimension, and .94 for the new measure as a whole.

2.2.3 *Normality*

The CFA data were free from univariate normality problems with a maximum skewness of -.74 and kurtosis of -1.17. However, there was also a severe multivariate nonnormality with the initial Marda's value 71.159.

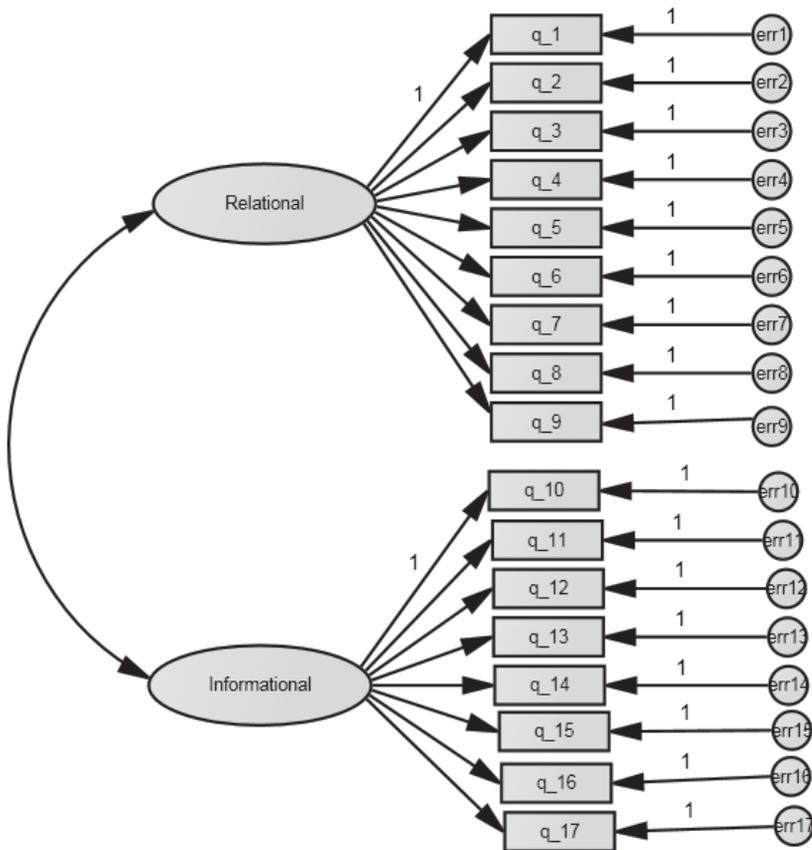


Figure 1. Proposed two-factor model of communication satisfaction

Several tests added to a full diagnosis of the model fit. These included the standardised regression weights connecting constructs and their indicators, as well as squared multiple correlations between constructs and indicators showing the r-squared.

#### *2.2.4 Parameter estimation*

The hypothesised two-factor structure of organisational communication satisfaction and its parameters, including regression coefficients and variances and covariance, were estimated from the data. In other words, the operationalised constructs of informational satisfaction and relational satisfaction and their hypothesised relation were estimated. The estimation was based on the maximum likelihood procedure. The estimator was used because of its robustness even in the absence of multivariate normality assumptions. The estimator also makes possible the calculation of the chi square as the most common measure of fit. The chi square helps to test the relationship between the theoretical postulates and the empirical datasets gathered for the CFA. However, the test was not without limits and so other fit indices had to be used to offset the limitations. Because the data in this second main study were not found to be multivariate normal, a bootstrap procedure involving the Bollen-Stine subtype was employed to address the normality problem. This particular bootstrap involves resampling as a way of parameter estimation, which helps estimate standard errors of parameters when data are clearly multivariate nonnormal.

All the communication satisfaction measured variables operated as dependent variables; the two factors were unobserved, as were all the disturbance terms. Also available and displayed is a summary of all variables and the specified variables in each of the two dimensions presented for CFA.

The parameter summary included fixed and estimated regression weights, including factor weights and disturbance terms. The summary also included the totality of covariances as well as variances. There was also a degree of freedom report which determined the identifiability of the model.

#### ***Model assessment***

The initial run produced a bad fit between the hypothesised structure and the data relating to the CFA. The model chi-square test gave significant p-values as expected, because of its particular sensitivity to large samples ( $n > 200$ ), as well as its assumptions of normality. The p-value-based test was not the only test, however, and other more suitable tests from different categories were conducted. The first was the relative chi square, which is also called normed chi square (Garson, 2004). The ( $\chi^2/df$ ) of 327.593/118 (2.77) was an indication of marginal fit of the originally proposed model. A drop in the relative chi-square value was therefore important in producing an acceptable test value, even though there is admission to be made of a post hoc procedure. It should be noted that other fit indices also indicated a poor fit.

The modification indices indicated paths which might improve the fit of the proposed model. The relevant Amos output suggested covariance paths, as well as regression lines. While the modification indices for new regression lines to improve fit should be rejected based on the 'meaningfulness rule' (Byrne, 2001:107), it is important that covariance paths be added on substantive grounds alone and as per expected parameter change values. In this study, the visual inspection of the modification indices and parameter change values led to the discovery that a covariance between two disturbance terms (er8 and er17), as indicated in the large modification indices value of 24.91, would lead to a significant .468 parameter change. Another covariance line suggested in the output was between er5 and er10 (with a modification index of a high 21.127 and parameter change of .485). Together the two covariance paths helped to improve the model fit, in spite of the controversy surrounding the creation of cross-factor error paths.

Indeed, the correlation of error terms or creation of error paths, even if suggested by modification indices, is not a subject on which there is complete agreement in the psychometric community. Smolkowski (2012) indicates that correlated errors are acceptable, but must be applied conservatively and only in the presence of substantive rationale. Jöreskog (1993) also agrees to the possibility of error correlations being allowed, but says that any such correlation must have an empirical/substantive justification. Similarly, Bollen and Lennox (1991) argue that correlated disturbance terms are possible, especially in items with similar statements.

Thus, there are valid reasons not to ignore errors. One is that "all observation is fallible, no matter how refined the measuring instrument and no matter how careful the procedure of allying it" (Duncan, 1975:113). Marsh (1989) and Gerbing and Anderson (1984) mention that ignoring correlated errors leads to overestimates of structural parameters, as well as the acceptability of model fit. However, there are also conditionalities. One condition is that correlated measurement errors can be allowed on the grounds that they do not first alter the structural parameter estimates (Fornell, 1983); the other refers to the measurement estimates (Bagozzi, 1983). In this study, the correlation of errors did not alter the model in a fundamental manner, either structurally or from a measurement point of view.

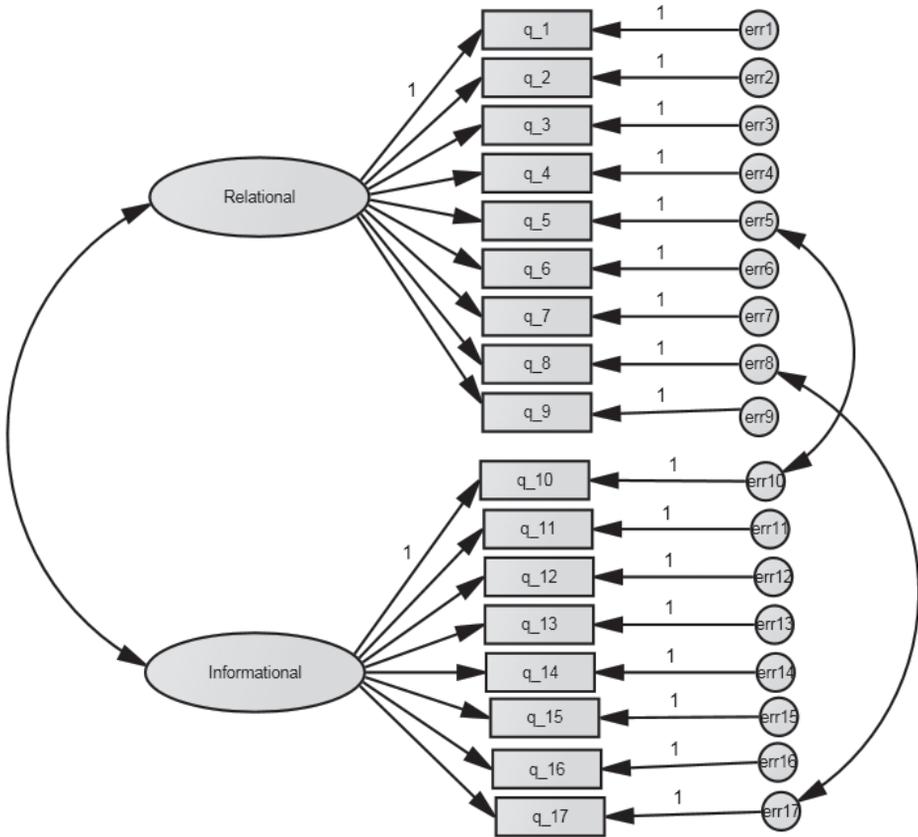
Byrne (2001) suggests that the correlation of error terms may indicate overlap in item content as perceived by respondents. It may also show contamination of one response by a response to a previous question.

A possible explanation for the presence of correlated errors is that in some cases respondents did not seem to distinguish between the individuality of items in a set in the constructs, due possibly to meanings being culturally shaped. Perhaps, for the same cultural-perceptual reasons, the six originally proposed dimensions had to be reduced to just two because respondents could not distinguish between the constructs.

### **Model revision**

The revised model's test of the dimensionality of organisational communication satisfaction as a two-factor conceptual structure produced a normed chi-square (as opposed to model chi-square) value of 271.019 with 116 degrees of freedom. The value of 2.33( $\chi^2/df$ ) indicated that the model fit was acceptable on chi-square evidence alone, and represented a  $\chi^2$  drop of 56.574 (327.593-271.019). In other words, the normed chi square as the conventional test of fit, indicated that the model implied covariances, the observed sample covariances concurred, and the data-model fit was reasonably good. Several authors (e.g., Carmines & Mclver, 1981) recommend a  $\chi^2/df$  value of 2-3 for a model to be acceptable.

A more stringent recommendation is that the chi-square value should be less than 2 (Ullman, 2001). However, the  $\chi^2$  is also known to be sensitive to large samples, which may inflate it to a degree as in this study ( $n = 277$ ), and its use is conservatively employed, or even in some cases ignored, in favour of other fit indices that are less sensitive to sample size (Schumacker & Lomax, 2004). According to Barrett (2007), the Type I error (rejection of a correct model) that might arise is due to the mathematical reality that the larger the sample size, the larger the multiplication of discrepancy will be in the exact fit test, which is exactly what the chi square does.



**Figure 2. Nested two-factor model of communication satisfaction**

The Bollen-Stine bootstrap of  $p = .005$ , although larger than the model chi square, was too significant to accept the model. Besides the usual sample sensitivity of the test resulting in false significance reports, the multivariate nonnormality of the data was also to blame. But even if there were multivariate nonnormality, there was no kurtosis and skewness problem at the univariate level. Based on existing guidelines (Walker, 2010:20), there was no univariate nonnormality, since there were no univariate values exceeding the cutoffs of 3 (skewness) and 8 (kurtosis). Even after the elimination of outliers (cases 18, 190, 261, 150, 202, 230 and 224), the original severe nonnormality with Marda's value of 71.159 was reduced, but to a still high value of 63.189. The elimination of the extreme values was based on extreme distance from the centroid in relation to a relevant reading of a table of chi-square statistics. However, the reduced Marda's coefficient reflected reduced, but continued nonnormality severity. All the same, the strategy of using a Bollen-Stine bootstrap of 200 iterations indicated that in all iterations the model did not fail or fit worse in any bootstrap sample.

Thus, Amos reported that the model fit better in all 200 bootstrap samples, and fit worse or failed to fit in none. However, the exact reading of the procedure fell short of meeting the Bollen-Stine  $p$ -value of .05 for accepting satisfactory model fit.

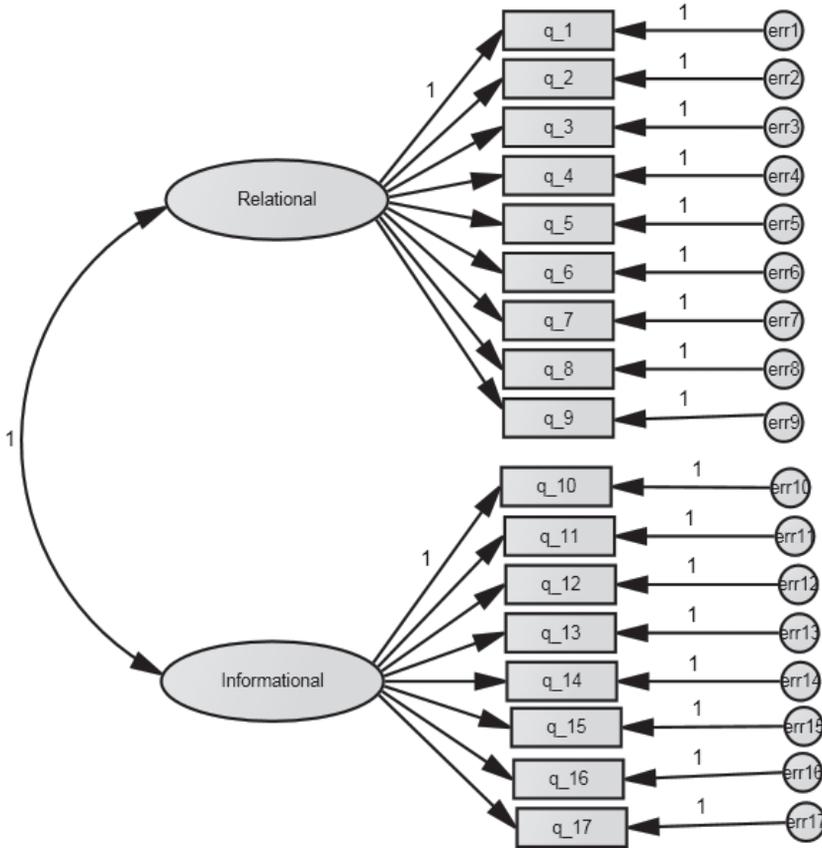
Nonetheless, fit indices should not be the only criterion in model assessment. As Kline (2005) advises, researchers should avoid what he calls “fit index tunnel vision” and consider complementary tests of fit. Thus in this study, model evaluation was also done using other parameters which are not necessarily less important than traditional fit indices. One of these was the inspection of critical ratios. According to Byrne (2001), critical ratios give information about the variable relationships indicated. As a rule, critical ratio values  $>1.96$  indicate significant paths (Garson, 2004). In this study, all critical ratio values, which ranged between 8.85 and 12.79, are an indication that all relationships are significant.

On statistical grounds, the model fit diagnostics must also address two other important statistics, namely residuals and regression weights. The standardised residuals as indicators of model fit provided further evidence of the fit of the revised model. According to Savalei and Bentler (2012), residuals are highly informative because they point out the difference between observed and estimated covariances, giving a reliable indication of degree as well as location of fit. Residuals, when standardised, must be 2.58 at most (Byrne, 2001). In this CFA study, the output for the relevant statistics showed that all standardised residuals were in line with the critical ratio  $\leq 2.58$  rule of thumb (Jöreskog & Sörbom, 1988). There was only one item with a value of 2.60, which exceeded the acceptability limit. This value only marginally went beyond the residuals recommendation. The obtained regression weights (.550 - .831) were also significant, based on the CFA literature. According to Comrey and Lee (1992), regression weights are good at .55, very good at .63, and excellent at .70. In this regard, 13 of the regression weights would be considered excellent and only 4 just good.

The squared multiple correlations also indicated that the effect sizes were significant. According to Aron and Aron (1999), scores of .01 represent small effect, .06 medium effect and .14 large effect. In this study all squared multiple correlations were within the range .33 to .69 and would therefore be considered significant. Indeed, the correlations give a measure of the proportion of variance explained by the dimensions onto which the measure variables load, indicating the items' power to measure the specified factors. The two factors in the model explain a significant part of the variance within the range indicated.

Following recommendations from SEM authorities, B.M. Byrne (personal communication, August 15, 2012) and D.A. Kenny (personal communication, August 17, 2012), a one-factor model was also fitted by constraining the correlation between the two factors to 1 (see Figure 3) to test the possibility that communication satisfaction may be unidimensional and fit the data better. However, the corresponding indices gave an indication of the

model's poorer fit to the data. Thus Bollen-Stine bootstrap  $p = .001$  was inferior to that of the bifactor model of  $p = .005$ . In addition, a goodness of fit index of .85, a comparative fit index of .92, and a normed fit index of .88, as well as a chi-square/degrees of freedom value of 2.82, show that the one-factor model did not fit better.



**Figure 3: Nested one-factor model of communication satisfaction**

It is neither necessary nor possible to report all fit statistics given the very large number and type of fit indices. According to Hooper, Coughlan and Mullen (2008), there are no golden rules for evaluating model fit, but reporting a variety of indices is necessary since varied indices demonstrate a different dimension of model fit.

**Table 1: Model Fit Statistics**

Type of fit index	Overall model	Recommended (Hooper et al., 2008)
Normed fit index	.91	≥ 0.90
Comparative fit index	.94	≥ 0.90
Chi square/degrees of freedom	2.33	<2 excellent; 3-5 acceptable
Root mean square error of approximation	0.07	0.06 to 0.08
Goodness of fit indices	.89	.90
Tucker-Lewis index	.93	≥ .90
Incremental fit index	.94	≥.90

### 2.3 Validity Checks

As indicated in the methodology section, validity assurance is an important procedure in determining the psychometric soundness of a measurement instrument. In the literature on methodology, six aspects of validity have been identified, namely content validity, construct validity, factorial validity, reliability, convergent validity, discriminant validity, and nomological validity (Lewis et al., 2005). In this study, all steps in and aspects of instrument validation and evaluation were addressed to ensure the scientific soundness of the organisational communication satisfaction scale.

#### 2.3.1 Content validity

The abridged instrument of organisational communication satisfaction with 17 items is believed to have sufficient relevant content, relevance to the study population to which it was administered, in addition to having comprehensiveness of the content domain in the relevant area of application (Anastasi, 1988).

#### 2.3.2 Factorial validity

Peter (1981:134) defines factorial validity as “the vertical correspondence between a construct which is at an unobservable, conceptual level and a purported measure of it which is at an operational level”. The factorial validity of an instrument relates to the degree of its relationship to the dimensional units of a construct (Barki & Hartwick, 1994:425; Peter, 1981).

In this study the repeated tests of exploratory factor analysis, the confirmatory factor analysis and the various fit indices (see Table 1) also confirmed the factorial validity of the instrument.

#### 2.3.3 Reliability

The most common measure of reliability is Cronbach’s alpha, which gives an indication of the extent to which indicators belong together to a factor (Garson, 2004:4). The items, as

measured by Cronbach's alpha, were generally above .70, giving a measure of confidence of their reliability. The overall alpha was .94. In the CFA study, the relational factor had an alpha of .90 and the informational dimension an alpha value of .88. This ensured the reliability of the constructs. In the exploratory study the reliability was high (.96).

The number of items per factor also gives an indication of factor reliability. A number of indicators were identified in each of the two factors: nine for the relational construct and eight for the informational construct, which added to the reliability of the constructs. According to Stevens (2002:395), a factor is reliable if it has four or more predictors with loadings of 0.60. In this study most loadings were greater than .70, and therefore above the recommended value for adequate reliability.

The use of SEM enhances reliability beyond all other conventional regression models. Measurement error terms clearly indicate the amount of error, and so the path coefficients are unbiased by error (Garson, 2004:5). Measurement error was clearly quantified, and therefore all measurements were scientifically and demonstrably reliable.

#### 2.3.4 *Convergent validity*

A measure often has to show that theoretically-related constructs are empirically tested, and their expected relationship demonstrated. Convergent validity is tested using a correlation index involving constructs on a measure. Conceptually-related dimensions are expected to show a high degree of correlation. In this study, it was expected that relational and informational factors would demonstrate high correlation. This was borne out by the CFA test, which gave a correlation of .96 between the two factors of the organisational communication satisfaction scale. However, this same value of .96 may signal a problem when it comes to discriminant validity.

#### 2.3.5 *Discriminant validity*

In studies with high interfactor correlations, such as the present study, a demonstration of discriminant validity is crucial to save the research from misanalysis (Farrell & Rudd, 2009). There were two relevant concerns in this study: the presence of cross-loads, as well as a high correlation value, which often leads to a suspicion of discriminant validity problems.

From among a few existing strategies to determine discriminant validity, this study employed a chi-square difference test (Zait & Berteau, 2011). This procedure enabled the researcher to compare two models, one with a constrained bifactor structure, and a second where the factors were tested as orthogonal or unrelated constructs. If these two tests produce a significant p-value each, then there is evidence of discriminant validity (Farrell, 2009).

In this study, the two model tests produced a significant probability value, which led to the conclusion that the two factors had discriminant validity. In other words, the discriminant validity was evidence that the two constructs of relational satisfaction and informational satisfaction, which are theoretically distinct, are indeed empirically shown to be so.

### *2.3.6 Nomological validity*

In this study, the significant interfactor correlation between the dimensions identified through EFA and confirmed by CFA indicated that this study is of nomological value to studies of organisational communication satisfaction. In other words, the relationship between informational satisfaction and relational satisfaction, which can be summed up to form a higher order construct of general communication satisfaction, adds to our understanding of the network of relationships in the communication satisfaction dimensional network (Cohen,1997).

The main thrust of this work is that the six communication satisfaction constructs that were originally proposed, using nonstatistical criteria, were not reproduced in the exploratory factor analysis. That is, the hypothesis that organisational communication satisfaction responses can be explained by six factors (horizontal communication, personal feedback, supervisory communication, communication climate, relational trust and job satisfaction) was not accepted. Instead, the rival hypothesis that organisational communication satisfaction is best understood as a two-dimensional construct was empirically validated and theoretically justified.

## **3. CONCLUSIONS**

The following conclusions were made, based on the context of the discussion of the instrument development and validation. Firstly, communication satisfaction for the Ethiopian civil servant comprised a relationship dimension as well as an information factor, but the relationship factor appeared to be more important. The factor also had better internal consistency as measured by Cronbach's alpha ( $\alpha$ ). Comprising both relational and informational factors, the organisational communication satisfaction scale was highly reliable and valid when measured against the postulated criteria of validity: content, construct, convergent, discriminant and nomological. However, the correlation between the two dimensions of relational communication satisfaction and informational satisfaction was very high, perhaps suggesting a degree of conceptual overlap. Nonetheless, the data also revealed that a two-factor solution with correlated disturbance terms was the most interpretable of all models tested. Apart from interpretability, there was theoretical support for the hybrid organisational communication satisfaction scale.

## **4. LIMITATIONS**

There are a number of limitations to this study that future research may address. The absence of local studies was a challenge, making comparison difficult. Methodologically, the inter-factor correlation of disturbance terms and the model re-specification could, in part, be ascribed to the cross-cultural use of psychometric content of a Western conceptual domain leading to a differing culturally-based perceptual frame. Additionally, invariance model testing was ruled out due to the considerable gender imbalance in the data set from the civil service population. Together these shortcomings point to the need for a cautious reading of the psychometric and communication issues in the study.

## 5. IMPLICATIONS FOR FURTHER RESEARCH

The limitations outlined in this psychometric work in organisational communication indicate avenues for future research. What arises most importantly as a research recommendation from this study, is the need for replication of the model among a different population in multiple cultural contexts, where a contingency approach could be designed to test the stability of the factor structure that has resulted from this study. The stability of the factor structure could also be tested in a cross-sectional design, involving demographic groups such as those based on gender and age as well as status. Future research may also consider the limitations of questionnaire designs and use longitudinal communication satisfaction data to model communication satisfaction.

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