Measuring Network Competence in an Emerging Market: Results of a pilot study in South Africa.

by

Gert Human[1]
School of Management Studies
University of Cape Town

Abstract

This paper details an attempt to establish the validity and reliability of the "NetCompTest" scale as proposed by Ritter, Wilkinson and Johnston (2004) to gauge network competence in business-to-business markets in South Africa. It suggests that the scale, developed and tested mostly in a European cultural context and mature marketing setting under conditions of high competition and innovation, may benefit from such an emerging market analysis. The paper provides a brief motivation for the importance of network thinking in an emerging market context, before summarising key observations on network competence. The bulk of the paper reports on the findings of the study to consider the reliability and construct validity of the NetCompTest scale. Although the validity of NetCompTest scale could not be confirmed, the investigation yielded a "best fit" model that may be tested in subsequent studies. Importantly, the findings open the debate regarding the underlying organisational and personal factors that impact on the measurement of network competence in emerging markets contexts.

Introduction

The quest for marketing knowledge often yields new methodologies to assist in a better understanding of observed phenomena. Applying these new methodologies in a variety of contexts requires pre-testing and possibly demands some adjustment of the original construct (Wright, Filatotchev et al. 2005). In particular, various authors (Steenkamp and Trijp 1997; Sweeney, Hausknecht et al. 2000; Rossiter 2002; Steenkamp and Burgess 2002; Nairn, Ede et al. 2004; Stacey 2005) note that researchers should not only seek to establish the validity and reliability of measurement instruments, but also consider measurement invariance before concluding on a scale's usefulness in a particular cultural context. This implies that although it may be argued that networks are of significant relevance in emerging markets, the devices employed to analyse networks must fit emerging market contexts. Furthermore, investigating the validity and reliability of a scale in a context other than the one in which it was conceived (Sweeney, Hausknecht et al. 2000) may also yield additional insights that can assist researchers in avoiding the temptation to treat such a construct as an "off the shelf" tool. Given this plethora of support for cross-cultural validation, the primary research question of

[1] Address for Correspondence:
Mr. Gert Human, School of Management Studies, University of Cape Town, Private Bag, Rondebosch, 7700 South Africa
Email: Gert.Human@uct.ac.za

this pilot study is: *Is the NetCompTest scale a reliable and valid construct for measuring network competence of B2B firms in emerging market context of South Africa*. Finding answers to this explorative question should pave the way for confirmatory research on network competence in emerging markets such as South Africa.

Theoretical Foundations

According to McGee et al. (2005) a shift in the strategic context of business, driven by the institutionalization of new technologies, created a network economy where interconnectivity and co-operation become common practice. These business networks received growing attention as the information technology in the world expanded exponentially and the global village became an increasingly familiar place. Both of these drivers are well document, but Leek *et al*. (2003) argued that in addition to these well-known phenomena, we have witnessed a change in the nature of industrial structures and customer expectations, as instead of straightforward buyer-seller relationships, many modern strategies involve interconnected and complex structures. Batt and Purchase (2004) echo this view and extend the argument by noting that business networks are forming around knowledge bases such that the maximisation of knowledge is obtained through network collaboration rather than through individual business units. Referring specifically to knowledge-driven networks, they noted the reliance on external actors to acquire the desired resources for firms to grow and survive. Hence, the conclusion by Bat and Purchase (2004): "*Firms seldom survive and prosper solely through their individual efforts. Each firm's performance depends upon the activities and performance of others and hence upon the nature and quality of the direct and indirect relationships a firm develops with its counterparts*". Various authors (Ritter 1999; Parkhe, Wasserman et al. 2006) concede that although still in its infancy, the impact of network thinking has gripped the attention of marketing researchers, and is shaping global business architecture. Emerging market networks, being part of the global business landscape and fast growing in importance as many multi-national firms rush to capture the growth that these markets offer, demand similar attention.

Business Networks: Importance for emerging markets

Firms from emerging economies that have strong networks and well-developed social capital may facilitate cooperation in developing knowledge and transferring it locally and/or internationally. In addition, networks may be more difficult to operate in developed economies because of the legal and institutional infrastructure preventing their fluid operation due to legal restrictions on cooperation or collusion between firms. Therefore, firms in emerging economies may develop network capabilities to overcome their lack of market institutions, and thus gain advantage.

A simple, yet compelling, argument concerning the importance of business networks in emerging markets is the fact that both the relative lack of resources (or limited access to resources) and the exposure to sophisticated global competitors often render it impossible for the individual firm to rely on its own devices. Many scholars (Burgess 2003; Khanna, Palepu et al. 2005; Wright, Filatotchev et al. 2005) agree that businesses in emerging markets face unique challenges, and the assumption that strategies that are successful in developed markets will work in emerging markets needs to be challenged. Arguably, emerging markets may provide a new context in which to understand the relative strengths and weaknesses of these

different perspectives. This is magnified by the heterogeneity of emerging economies, as there is considerable variation in their economic progress and institutional development.

Some authors (Cavusgil 1997; Sowinski 2000; Bandyopadhyay 2001; Claver and Quer 2005; Klemz, Boshoff et al. 2005) allude to these unique challenges of emerging markets, and noted that the key challenges facing players in these markets often include: (a) Emerging economies are highly volatile because of frequent changes in institutions, industry structure and the macro-economy; (b) The institutional frameworks may require different ways of interacting with business partners and authorities. ''Institutional voids'' often inhibit the efficiency of markets and increase business risks. Consequently, firms may internalise markets for intermediate goods and services, such as capital and human capital, and they may rely to a larger extent on personal relationships when interacting with others; (c) Many of the capabilities needed to compete in emerging economies are context-specific. Firms and individuals develop their capabilities to suit a specific context, which may create major barriers to entry; (d) Many industries are highly fragmented with many small firms competing for a share of the market. With the entry of foreign investors, the market structure may rapidly change, creating uncertainty.

In considering how relationships and networks affect market exchange in Sub-Saharan Africa, Fafcamps (2001) noted that market exchange arguably plays a larger role than in developed economies, and that the presence of transaction costs naturally leads market participants to enter in long-term trading relationships. However, the reliance on other network actors ensures that collaboration between internal and external actors requires *expertise* and *competence* if the relationship is to be successfully maintained (Ritter, Wilkinson et al. 2002). In addition, Freytag and Ritter (2005) also suggest that when the overall collaborative efforts of the network are well-directed, the network may become stronger and the inherent dynamics of business networks may create additional managerial challenges. These observations not only underline the importance of considering the appropriateness of the NetCompTest scale in an emerging market, but also call for clarity on the concept of network competence.

Network competence

The study of networks has received significant attention from developed countries and a rich body of literature is to be found on firm competence (Snow and Hrebiniak 1980; Winter 1988; Prahalad and Hamel 1990; Meyer 1991; Hamel and Heene 1994; Ritter 1999; Awauh 2001; Bush, Rose et al. 2001; Harland and Knight 2001; Ritter, Wilkinson et al. 2002; Savolainen 2002; Ritter and Gemünden 2003; Harmsen and Jensen 2004; Ritter and Gemünden 2004; Sanchez and Heene 2004; Atuahene-Gima 2005), with special attention paid to core competence (Hamel and Heene 1994; Hamel and Prahalad 1994; Hamel 2002). In comparison, networks as a firm competence, and network competence as a concept has received much less attention.

More specific reference to competence in a B2B marketing context is made by Hedaa *et al*. (2004) when considering ways to express the relationship between a buyer and a seller. Drawing on the contributions from previous authors (Håkanson, Johanson et al. 1976; Ford and Saren 1996; Ford, Gadde et al. 1998) they noted that a supplier needs to have competence, capability and/or ability that is the basis for its interaction with customers. Several authors ((Håkanson, Johanson et al. 1976; Ford and Saren 1996; 1998) also draw a distinction between *problem-solving ability* and *transfer ability* of a competence. Problem-

solving ability is the competence to fulfill a customer's demands and provide value for the customer, and consists of process and product competence, whilst transfer ability describes the competence to transfer the problem-solving ability, such as logistics or market technologies, to a given customer's situation. Importantly, Hedaa *et al*. (2004) noted the evolution of business marketing by describing various "waves" of strategic orientations (production, product and market), concluding that today another change in orientation from individual relationships towards an understanding of complex systems of relationships (networks) has evolved. This implies that the quality of a solution for customers is measured not only in relation to one problem, but also how well the solution fits into the network structure. A key observation here is that it is acknowledged that most firms find themselves simultaneously on several waves with different customer groups. Hence, different customers require different treatments, and in turn this calls for different competencies required from firms. Clearly, limiting any measurement of network competence to a specific point in time may not be entirely appropriate. Again, this points to the importance of longitudinal research designs.

Awauh (2001) distinguishes between core (a "must have" in order to run the business) and distinctive competence (a competence that differentiates the firm from its competitors) whilst citing the importance of socialisation, cost reductions that stem from collaborative relationships, network competence as an asset, and mutual learning in competence development. Moreover, it is argued that most discussions on core competence are very ethnocentric, and the *imbeddedness* (the width and dept of the devotion to the network) of the firm in networks of exchange relationships and how that impinges on its core competence development is not taken into account. This position results in the introduction (Awauh 2001) of a modified model of competence development through a network of exchange relationships. Importantly, this approach appears to be different from what (Ritter and Gemünden 2003) suggest, because it refers to the development of competence through networks and not network competence as a competence in itself.

Awauh's approach assumes that the firm's competence development is influenced by its interaction with others. This depends on: (a) the transfer of elements, including product/service exchanges, information exchanges, financial exchanges and social exchanges between interacting parties; (b) mutual learning as a result and driver of exchanges and (c) mutual adaptations that all parties involved may choose to make in a quest for optimisation /maximisation. In this continuous cycle the competence of the interacting parties may develop over time. This suggests that although each actor has his own interests at heart, and will seek to promote those interests, in a situation where parties understand the interdependence of the network, they may well be mindful of how they conduct themselves to benefit (not harm) the network. Hence, the learning that comes from other parties in the network is very important, since the activities of actors are interconnected. Any actor's inability to meet customers' demands might have a profound effect on the others with whom they interact, especially their immediate trading partners. It is suggested that this argument points to the immense importance of network thinking and particularly towards the network competence of firms.

A key question remains: W*hy and how are firms able to build up and use networks of relationships that contribute to competitive advantage?* Ritter et al. (2002) suggest that the answer to this question is to be found partially in the notion of "network competence," and that this can be measured along two key dimensions: (a) The degree of network management qualifications, which can be of either a specialist nature or a social nature and (b) the execution of network management tasks which are either relationship-specific or cross-

relational. Hence, the definition of network competence refers to the sum of how well the firm is qualified to operate in a network(s), combined with how well network management tasks can be executed. Network qualification suggests a collection of resources, whilst network management task execution refers to the ability to employ these resources to synergistically operate within a network. Combined this constitutes a competence – network competence. Following the notion that network competence (consisting of a particular variable structure) can be measured and therefore managed to enhance firm competitiveness and/or performance, as well as the cited importance of cross-cultural validation, the primary hypothesis for this study is formulated as follows:

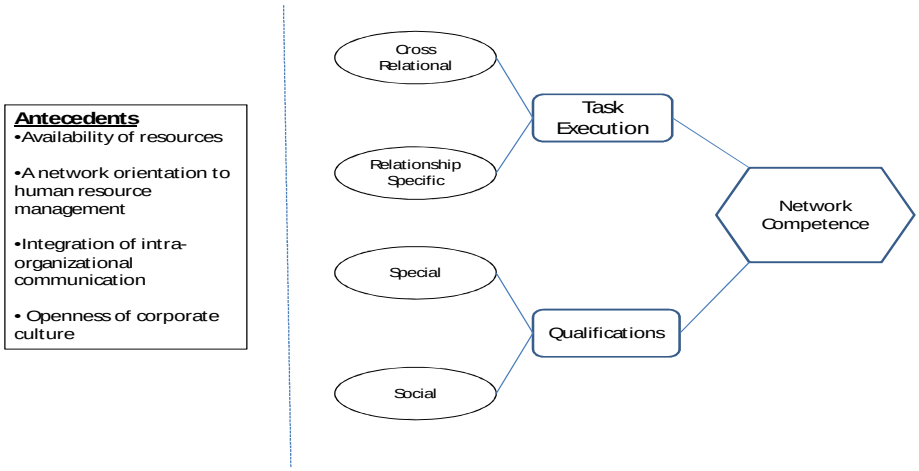
> *H_1: The NetCompTest scale demonstrates sufficient internal reliability and construct validity in a South African cultural context.*

Walter *et al*. (2005) distinguish between network competence and network capability by noting that while network competence is a firm's ability to develop and use inter-firm relationships, network capability is a firm's ability to initiate, maintain, and utilise relationships with various external partners. The latter (network capability) is not the focus of this study and will not be included in this investigation. In addition, it is postulated (Ritter, Wilkinson et al. 2002; Ritter and Gemünden 2003) that the availability of resources, a network orientation towards human resource management, the integration of intra-organisational communication, and the openness of corporate culture are antecedents (see Figure 1) that account for the development and establishment of network competence within the networking company. These antecedents may or may not apply to South African conditions to varying degrees, and it was decided to expand the analysis of the NetCompTest scale to investigate the underlying differentiating power that relates to these antecedents. As a result, selected variables that were expected to impact on the performance of the scale or that may contain some differentiating power were included in the pilot questionnaire. These variables were categorised as either personal factors or organisational (firm) factors. This lead to the inclusion of two further hypotheses:

> *H_2: There is no significant difference in the overall network competence scores produced by the pilot NetCompTest scale based on organisational factors in a South African cultural context.*

> *H_3: There is no significant difference in the overall network competence scores produced by the pilot NetCompTest scale based on personal factors in a South African cultural context.*

In both H_2 and H_3 the score for each first-order dimension will also be considered, as these scores may reveal specific relational qualities that can contribute towards construct development and scale refinement.



Source: Adapted from Ritter, Wilkinson & Johnston (2002) and Ritter & Gemünden (2003).

Figure 1: Antecedents and conceptual model of network competence

Methodology and Sample

A non-probability convenience sampling method was employed to collect data from 268 respondents in 31 different B2B businesses, using a self-administered questionnaire. The majority of respondents (93%) came from for-profit organisations in the private sector, whilst 77.6% of the respondents were from South African firms. In addition, 88% of the respondents indicated that they derived the majority of their sales from business activities in South African markets. The standard industrial classification (CIS) (Department of trade and industry, 2005) was used to classify respondents. The category *labelled as "wholesale and retail trade, repair of motor vehicles and motorcycles, personal and household goods, and hotels and restaurants*", had the highest representation (22.4%) in the sample. The financial services category (17.5%), manufacturing (15.3%), and construction (12.2%) were also well-represented in the sample.

The majority of respondents (50.8%) indicated that they were from top management, whilst 86.4% (cumulatively) indicated that they held either top or middle management positions. Sales (17.2%), operations management (35.8%) and marketing (11.2%) constituted the largest functional representations in the sample. Seventy percent of the businesses represented in the sample employ fewer than 300 people. However, 13.1% have more than 5000 employees. Accordingly, and as expected, the majority (42%) of the firms have a turnover of R10 million or less, while 32% of the firms in the sample have an annual turnover of more than R50 million. About a third (34.1%) of the respondents was younger than 40 years, and the average age of respondents was between 36 and 40 years. In addition, 73% of the respondents were males.

As the primary objective of the study was to explore the appropriateness of the network competence scale under South African conditions, the analysis focused on the reliability and validity in an attempt to gauge the usefulness of the scale in a particular context. Thus, the methodology for data analysis in this study employed both conventional and newer measures of reliability and validity analysis. Reliability, referring to the ability of the measurement construct to produce the same or similar results with repeated measurements, was considered through Cronbach's alpha coefficient and item-to-total correlations. Construct validity was

considered through the use of exploratory factor analysis, confirmatory factor analysis, and structural equation modelling was employed to suggest a "best fit" variable structure for future analysis. As indicated above, the study also analysed personal and organisational variables specific to South African conditions in order to establish potential areas for further investigation that may impact on the applicability of the scale.

Findings

Reliability

According to Cooper and Schindler (2006), reliability can be defined as the extent to which a measurement is free of variable errors. Thus, the reliability indicates the precision of measurement scores or how accurately such scores will be reproduced if the measurement is repeated. A generally accepted approach (Ruekert and Churchill Jr 1984; Locke 2000; Jarvis, MacKenzie et al. 2003) for assessing the reliability is to determine the portion of the systematic variation in a measurement scale. In order to achieve this, the association between scores obtained from two scales, when one scale is a similar replicated version of the other, is determined. If the scores derived from the two scales are high, the scales are consistent in yielding the same result, and are therefore reliable. A correlation coefficient is commonly used for this measurement, and according to McDaniel and Gates (2006) most emphasis in modern social science has been placed on internal consistency and reliability. In this case, item scores obtained from administering the scale are split in half and the resulting halves are correlated. It follows that item-to-total correlations are employed to measure the correlation of each item to the total. Although this approach might be useful, it is also limited in the way that the halves are obtained. This problem can be overcome by using Cronbach's alpha coefficient. Cronbach's alpha is a mean reliability coefficient calculated from all possible split-half partitions of the measurement scale. The overall Cronbach alpha for the 22-item scale exceeded 0.7 ($\alpha = 0.8748223$), indicating good reliability. However, item 6 and item 7 produced unsatisfactory (<0.3) item-to-total correlations (item 6 = 0.28930217; item 7 = 0.26679613). This suggests that these two items may be eliminated from the scale without affecting the overall reliability of the scale.

Validity

Validity refers to the extent to which differences in the observed scale scores reflect true differences in the characteristics or constructs being measured (Ruekert and Churchill Jr 1984; Bagozzi and Foxall 1995; Locke 2000; Stacey 2005). Thus, validity (like reliability) is concerned with error. However, in the case of validity, consistent or systematic error, rather than variable error, is under consideration, In order to consider the appropriateness of the data for factor analysis an explorative principal component factor analysis was done, and this yielded the correlation matrix shown in table 1. A single item (item 5) produced a correlation coefficient less than 0.3. In addition, the KMO measure of sampling adequacy was above 0.6 (0.836) and the Bartlett's test of sphericity was also satisfactory ($\chi^2 = 2768.66$; df = 231.000; $\rho = 0.000$). This initial analysis suggests that the data generated by the scale are suitable for factor analysis.

Table 1: Correlation Matrix for principle component factor analysis (Varimax Rotation)

	Q1	Q2	Q3	Q4	Q5	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22
Q1	1.000																			
Q2	0.403	1.000																		
Q3	0.202	0.342	1.000																	
Q4	0.271	0.298	0.368	1.000																
Q5	0.250	0.325	0.361	0.827	1.000															
Q8	0.109	0.065	0.144	0.085	0.062	1.000														
Q9	0.137	0.254	0.304	0.258	0.232	0.495	1.000													
Q10	0.393	0.313	0.388	0.387	0.364	0.258	0.500	1.000												
Q11	0.353	0.328	0.453	0.365	0.375	0.247	0.464	0.802	1.000											
Q12	0.258	0.248	0.315	0.264	0.290	0.143	0.367	0.482	0.595	1.000										
Q13	0.192	0.166	0.273	0.154	0.199	0.147	0.254	0.367	0.467	0.607	1.000									
Q14	0.259	0.149	0.125	0.048	0.068	0.164	0.096	0.252	0.199	0.203	0.445	1.000								
Q15	0.197	0.065	0.091	0.004	0.027	0.237	0.214	0.265	0.189	0.242	0.432	0.752	1.000							
Q16	0.177	0.123	0.195	0.091	0.097	0.163	0.155	0.313	0.294	0.251	0.395	0.525	0.585	1.000						
Q17	0.177	0.003	0.084	0.027	0.011	0.213	0.184	0.220	0.187	0.246	0.313	0.513	0.613	0.553	1.000					
Q18	0.245	0.218	0.174	0.191	0.183	0.223	0.320	0.373	0.324	0.362	0.437	0.400	0.428	0.511	0.477	1.000				
Q19	0.197	0.286	0.268	0.190	0.152	0.157	0.197	0.333	0.302	0.326	0.278	0.332	0.298	0.354	0.308	0.478	1.000			
Q20	0.162	0.106	0.185	0.080	0.049	0.210	0.248	0.294	0.258	0.364	0.450	0.298	0.341	0.487	0.411	0.555	0.484	1.000		
Q21	0.111	0.118	0.171	0.102	0.134	0.207	0.141	0.225	0.210	0.229	0.357	0.407	0.359	0.479	0.371	0.460	0.481	0.593	1.000	
Q22	0.105	0.079	0.128	0.099	0.086	0.160	0.247	0.250	0.200	0.270	0.349	0.298	0.270	0.378	0.368	0.438	0.428	0.618	0.681	1.000

The principal component Varimax rotation (with Kaiser normalisation) suggested that the items loaded on five factors. However, only four out of the five factors met the Monte Carlo criteria, leaving four factors for interpretation.

As expected, items 1 to 5 loaded on the cross-relational dimension. However, items 10 (0.689), 11 (0.732) and 12 (0.563) also loaded on this dimension, whilst items 1 and 3 loaded on the "special" and "relationship-specific" dimensions, respectively. Items 18 to 22 loaded on the social scale (as expected), whilst items 16 and 17 loaded on both the "social" and "special" dimensions (social: item 16 = 0.408, item 17 = 0.323; special: item 16 = 0.637, item 17 = 0.694). In addition, item 18 (0.413) also loaded on the "special" dimension. Apart from these variations, the "cross-relational" and "social" dimensions seem to be supported by the data, as these dimensions could be described with relative ease. The dimensions labelled "special" and "relationship-specific" seemed to attract weaker factor loadings and were more difficult to explain. As expected, items 13, 14 and 15 loaded on the "special" dimension, but item 12 (as mentioned above) did not load onto this dimension. As indicated, items 16 and 17 also loaded on this dimension. Finally, items 6, 7, 8, and 9, loaded on the relationship-specific dimension. Given that the loadings explained only 57.68% of the variance in the data, and the fact that the loadings did not behave as predicted by the model, it was decided that this result did not constitute sufficient evidence to confirm the validity of the scale, and that the data should be subjected to more rigorous statistical analysis.

Two additional principle component analyses were performed. Firstly, an Oblimin (principle component correlation) rotation with Kaiser normalisation indicated that the items are not highly correlated as the correlations were all smaller than the 0.3 threshold. Hence, an Oblimin rotation was not considered useful. Secondly, another Varimax rotation was done to observe the item loadings on the second order dimensions, namely "task implementation" and "qualifications". The results from this rotation supported the model structure for second-order dimensions, except for items 12 and 13, which did not load as expected, and for item 6, which did not load at all. These results were not considered to be sufficiently confirming of the validity of the NetCompTest scale as they did not deal with first-order factors as suggested by the theory. Therefore, it was decided to subject the data to structural equation modelling.

Structural equation modelling not only allows the researcher the opportunity to consider multiple observed variables, but it also explicitly takes measurement error into account and gives greater recognition to measurement constructs. In addition, it also provides for

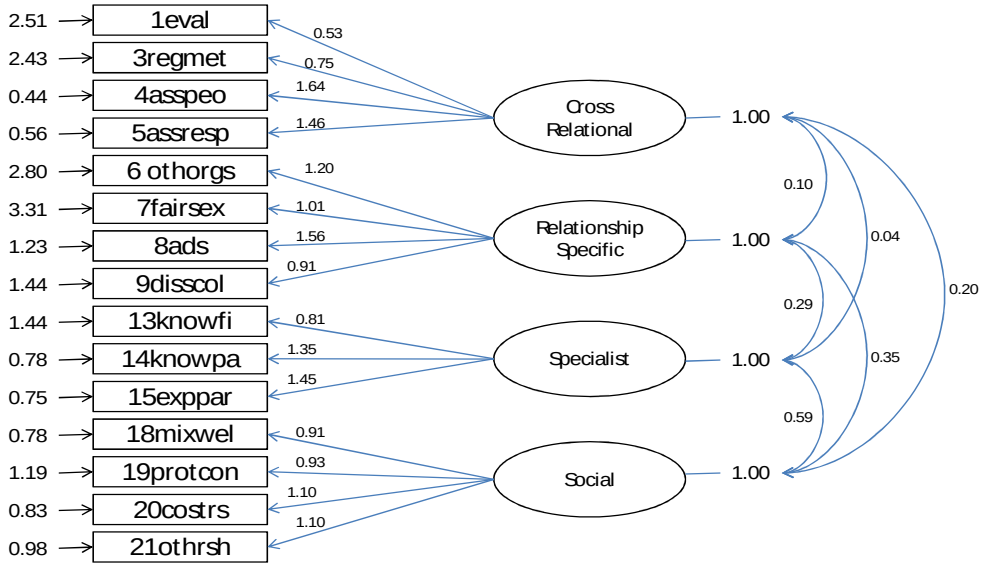
considering differences between groups simultaneously. First, the data were subjected to confirmatory factor analysis in order to consider each of the dimensions separately before attempting a composite model fit. This analysis yielded the following results: The "cross-relational" dimension did not yield an *a priori* good fit, and had a root mean square error of approximation (RMSEA) of 0.15 which improved if item 2 was eliminated. Adding items 10, 11 and 12 as suggested by the EFA (exploratory factor analysis) did not provide an acceptable fit (RMSEA = 0.24) either. In the case of the "relational-specific" dimension, an *a priori* weak fit (RMSEA = 0.25) was also observed, but improved (RMSEA = 0.074, $\chi^2 = 0.088$) after items 10 and 11 were dropped from the scale. Neither did the "specialist" dimension yield an *a priori* good fit (RMSEA = 0.32), and dropping item 12 (as suggested by the EFA) led to a saturated model with no degrees of freedom. However, adding item 16 yielded a much improved fit (RMSAE = 0.018). Finally, the "social" dimension also yielded a weak *a priori* fit (RMSEA = 0.10) which can be significantly enhanced (RMSEA = 0.02) by dropping items 16, 17 and 22. As this is the case across all dimensions, this appears to be consistent with the findings of the EFA. This analysis resulted in the removal of items 2, 10, 11, 12, 17 and 22 before attempting to achieve a "best fit" model for an *a priori* structure of first-order factors (dimensions).

The *a priori* structure containing the four first-order factors, as suggested by Ritter *et al.* (2002), did not achieve a good fit ($\chi^2 = 790$; RMSEA = 0.109 and NCP [estimated non-centrality parameter] = 587). Hence, the validity of the variable structure for first-order factors could not be confirmed. Seventeen model structure options were considered in the search for a "best fit" model and none of these achieved a satisfactory fit. Table 2 summarises the fit statistics for the three "best fit" models. Models 9 (Figure 2) and 12 yielded the best fit models for first-order variables. In the case of model 12, although achieving an acceptable fit ($\chi^2 = 232.30$; df = 110; p = 0.000; RMSEA = 0.056), items were allowed to cross-load, and the model was considered not useful for the purposes of this study. This leaves model 9 as the "best fit" model.

Table 2: Fit statistics for the three "best fit" SEM models

Goodness of Fit Statistics	**Model 4**	**Model 9**	**Model 12**
Degrees of Freedom	98	84	110
Satorra-Bentler Scaled Chi-Square	237.00 (P = 0.00)	200.79 (P = 0.00)	193.09 (P = 0.00)
Estimated Non-centrality Parameter (NCP)	139.00	116.79	83.09
Root Mean Square Error of Approximation (RMSEA)	0.075	0.074	0.056
Normed Fit Index (NFI)	0.91	0.91	0.93
Comparative Fit Index (CFI)	0.94	0.94	0.97
Standardized RMR	0.095	0.096	0.083
Goodness of Fit Index (GFI)	0.87	0.89	0.90
Adjusted Goodness of Fit Index (AGFI)	0.83	0.84	0.86

For model 9 the Chi-square is significant ($p < 0.05$), but the estimated NCP is different from zero. Hence, RMSEA (0.074) is considered. Commonly, RMSEA values between 0.05 and 0.08 indicate a reasonable error of approximation (Kline 2005). Thus, model 9 is accepted.



Model 9: (χ^2 = 240.88; df = 84; p = 0.000; RMSEA = 0.074)

Figure 2: Model 9 - Best fit for first-order factors.

Model 9 suggests a 15-item scale that loads on four first-order variables to measure the network competence of firms in business-to-business environments. This proposed adjusted NetCompTest scale is presented in table 4 and will be subjected to another round of investigation in the future. Moreover, these findings show that the validity of the NetCompTest scale could not be confirmed, and therefore H_1 is not accepted.

Table 4: Adjusted 15-item scale for network competence

Task Implementation:	**Cross-relational** 1. We evaluate the way our relationship with each business partner depends on our relationship with other business partners. 2. We organise regular meetings among those in our firm involved in relationships with our business partners. 3. We assign people to each relationship with our business partners. 4. We assign responsibility to people for each relationship with our business partners. **Relationship specific** 5. We use organisations apart from our existing business partners, to identify potential technical partners (e.g. Chambers of commerce, consultants, industry associations, government organisations). 6. We visit industrial fairs and exhibitions to identify potential business partners. 7. We look at company advertisements in specialised journals to identify potential business partners. 8. We discuss ways of collaborating with people from our business partners.
Qualifications:	**Special** 9. They have good knowledge about the way our firm works. 10. They have good knowledge about the way our technical partners firms work. 11. They are experienced in dealing with technical partners. **Social** 12. They mix well with other people. 13. They easily sense potential conflict. 14. They can work out constructive solutions when there is conflict. 15. They can easily put themselves in another person's position.

Personal and Organisational Factors

Personal and organisational factors that were expected to have an influence on the overall network competence scores (and its four latent variables separately) were included in this analysis. Organisational factors included firm type, firm nationality, economic sector, black economic empowerment (BEE), and firm size. Personal factors included managerial function, managerial level, respondent age, respondent nationality, ethnicity, and gender.

In terms of firm type (referring to whether it is a for-profit company, a not-for-profit organisation, or a government institution), using ANOVA analysis, no significant ($p > 0.05$) differences relating to the overall network competence score, as well as the means of latent variables, were observed. Similarly, no significant ($p > 0.05$) differences in the mean scores for latent variables and the overall network competence score were observed for firm nationality (referring to whether a firm is fully South African-owned, partially foreign-owned, or fully foreign-owned). Respondents were also asked whether the majority of their sales originated in domestic or international markets. Levene's test for equality of variances was employed to compare these means for each latent variable and the overall network competences score. The data suggested that in the case of the specialists dimension ($F = 0.713$; $p = 0.399$) and the social dimension ($F = 2.068$; $p = 0.152$) the means for these groups are different. However, a t-test for equality of means indicated that these ($t = 0.525$ and $t = 0.803$, respectively) differences are not significant at the 95% level.

It was expected that the mean network competence scores would differ significantly across industries as defined by the standard industrial classification (SIC) of all economic activity in South Africa. Surprisingly, with the exception of one dimension (cross-relational), no significant ($p < 0.05$) difference was found between the means.

Further analysis revealed that for cross-relational tasks the mean scores of "private household exterritorial organisations, representatives of foreign governments and other activities not adequately defined" appeared to differ significantly from the means obtained from other categories. According to the Cohen criteria, these differences represent a medium (0.06) to large (0.14) effect at 0.09886. This result may point towards a need for better cross-sector analysis. However, the sector definitions in the standard industrial classification (SIC) are rather broad in nature, and more refined definitions might yield better results.

In South Africa the recent past has seen the introduction of black economic empowerment legislation to ensure a transformation in the economy. This means that many firms are required to establish relationships with black-owned companies − essentially expanding their business networks. Hence, it was expected that the perceived level of BEE compliance empowerment would correlate positively with network competence. Correlation analysis revealed that overall network competence ($r = 0.231$; $p = 0.000$), specialist qualifications ($r = 0.267$; $p = 0.000$), and social qualification ($r = 0.263$; $p = 0.000$) correlate significantly positively with perceived BEE compliance at the 99% confidence level. Both the remaining dependent variables (cross-relational and relationship-specific) also exhibit positive, but weaker, correlations with perceived BEE compliance.

The final organisational variable included in the study is firm size as measured by the number of employees and sales. For firm size by number of employees, the ANOVA analysis revealed no significant ($p < 0.05$) difference between groups, with the exception of the cross-relational

variable. For this variable ($F = 3.284$, $df = 6$, $p = 0.004$) significant differences were found between firms having more than 5000 employees and firms with fewer than 50 employees, as well as for firms with between 300 and 1000 employees. For firm size measured by annual sales, no significant ($p < 0.05$) difference (ANOVA) between groups was found. These findings suggest that, as expected, firm size might not play a significant role in network competence.

Similar to organisational factors, personal factors (respondent) were also analysed for differences between groups. In considering the functional deployment of respondents, the analysis indicates that there are statistically significant ($p < 0.05$) differences in network competence according to managerial position for two of the latent variables in the network competence scale. These differences were observed for the relationship-specific dimension ($p = 0.010$), as well as for the overall network competence score ($p = 0.039$). This finding suggests that managers from human resources sections score the relationship-specific competence of the firm differently from how managers in the marketing and information sections do it. There is also a difference between the mean scores of HR managers and sales managers on the overall network competence for the firm. This finding is treated with scepticism as the number of HR managers in the sample is very small (2.6%).

No significant ($p < 0.05$) difference between groups according to managerial level was found, suggesting that managerial seniority has little impact on perceived network competence. In contrast, respondent age appeared to contain some significant ($p < 0.05$) differences between groups for the relationship-specific dimension ($F = 3.343$, $p = 0.003$) and specialist ($F = 2.305$, $p = 0.035$) dimension. This result suggests that the respondents in the age category 46-50 years and respondents in the age categories younger than 45 years seem to respond differently. This finding is also limited as only 8.2% of the sample came from the 46 to 50 age category.

Interestingly, a t-test for equality of means revealed that the differences between South Africans and non-South Africans on four out of the five dimensions (including the overall network competence score), is significant ($p < 0.05$). However, only 7.5% of the sample consisted of non-SA citizens − thus, stronger evidence may be required. It was expected that within-country diversity (Burgess 2003) might reveal different network competence scores based on ethnicity. Therefore, it was somewhat surprising to find that no significant difference ($p < 0.05$) was observed for four out of five (including the overall network competence) dimensions. The only significant difference ($p = 0.014$) was found for the relationship-specific dimension between “blacks” and those who “choose not to respond to this question” (a category dictated by research convention in South Africa to avoid racial discrimination). Finally, t-test analysis also revealed no significant ($p < 0.05$) difference in the network competence scores between males and females.

These finding indicate that for most of the variables there appear to be no significant differences in the network competence scores based on various organisational and personal variables. However, some significant differences in terms of industry type, firm size, functional area, respondent age and nationality were found, and H_2 and H_3 could not be accepted, suggesting that network competence scores might be influenced by variations in personal and organisation characteristics.

Conclusions

Emerging market scholars should not distance themselves from network research, because business-to-business marketing stands to gain significant insights from such investigations. This exploratory study, though significantly limited, suggests that emerging market researchers and practitioners should proceed with caution when using the NetCompTest scale to measure network competence. The study reveals that the validity of the scale could not be confirmed under South African conditions. This result merely points to the urgency for more studies and further testing in emerging market conditions. However, there is no doubt that the scale makes a significant contribution to the literature and provides emerging market researchers with a strong basis from which to adjust the scale appropriately to the context in which it is applied. In addition, the study also suggests that personal and organisation characters might play a role in the performance of the scale. This suggestion, although weak, needs to be subjected to in-depth analysis to confirm the situational imperatives for applying the network competence scale. Future research will not only have to seek the optimisation of the measurement construct, but also its relationship with other variables such as firm performance in emerging markets and the distinctiveness of the scale to other measures.

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