CHAPTER 2

Development and Validation of the CQS
The Cultural Intelligence Scale

LINN VAN DYNE, SOON ANG, AND CHRISTINE KOH

Cultural intelligence (CQ) is a theoretical extension of contemporary approaches to understanding intelligence (Earley & Ang, 2003). CQ is defined as the capability to function effectively in culturally diverse settings. Traditionally, the study of intelligence focused mainly on "g," the academic or cognitive factor of intelligence. More recently, multiple intelligence theory (Sternberg, 1986, 1988) proposed nonacademic intelligences (Hedlund & Sternberg, 2000) that emphasize the capability to adapt to others. These newly recognized forms of intelligence include interpersonal intelligence (Gardner, 1993), emotional intelligence (Goleman, 1995; Salovey & Mayer, 1990), and social intelligence (Cantor & Kihlstrom, 1985). Each of these formulations of intelligence, however, assumes that familiarity with culture and context guides individual thoughts and social behaviors. As elaborated in Earley and Ang (2003), these relatively general capabilities may not apply when individuals have different cultural backgrounds.

DIFFERENT TYPES OF INTELLIGENCE

CQ is an important individual capability that is consistent with contemporary conceptualizations of intelligence: the ability to adapt and adjust to the environment (Cantor & Kihlstrom, 1985; Gardner, 1993; Mayer & Salovey, 1993; Sternberg, 2000). Specifically, we argue that just as nonacademic intelligences such as emotional intelligence (EQ) complement cognitive intelligence (IQ), because both are important for high-quality personal relationships and effectiveness in this increasingly interdependent world (Earley & Gibson, 2002), CQ is another complementary form of intelligence that explains adaptability to diversity and cross-cultural interactions. In sum, CQ differs from other types of intelligence, such as IQ and EQ, because it focuses specifically on settings and interactions characterized by cultural diversity. Drawing on Sternberg and Detterman's (1986) work, Earley and Ang (2003) identified three loci of individual intelligence with direct

relevance to human interaction: mental (metacognition and cognition), motivational, and behavioral. For additional information on the conceptualization of CQ, see Chapter 1 in this volume and Ang, Van Dyne, Koh, Ng, Templer, Tay, and Chandrasekar (2007).

Metacognitive CQ

Metacognitive CQ is an individual's cultural consciousness and awareness during interactions with those from different cultural backgrounds. The metacognitive factor of CQ is a critical component for at least three reasons. First, it promotes active thinking about people and situations when cultural backgrounds differ. Second, it triggers critical thinking about habits, assumptions, and culturally bound thinking. Third, it allows individuals to evaluate and revise their mental maps, consequently increasing the accuracy of their understanding.

Cognitive CQ

Cognitive CQ is an individual's cultural knowledge of norms, practices, and conventions in different cultural settings. Given the wide variety of cultures in the contemporary world, cognitive CQ indicates knowledge of cultural universals as well as knowledge of cultural differences. The cognitive factor of CQ is a critical component because knowledge about cultural similarities and differences is the foundation of decision making and performance in cross-cultural situations.

Motivational CQ

Motivational CQ is an individual's capability to direct attention and energy toward cultural differences. Using the expectancy-value framework of motivation, we conceptualize motivational CQ as a special form of self-efficacy and intrinsic motivation in cross-cultural situations. Self-efficacy and intrinsic motivation play an important role in CQ because successful intercultural interaction requires a basic sense of confidence and interest in novel settings.

Behavioral CQ

Behavioral CQ is an individual's capability to exhibit appropriate verbal and nonverbal actions when interacting with people from different cultural backgrounds. Behavioral CQ is based on having and using a broad repertoire or range of behaviors. Behavioral CQ is a critical component of CQ because behavior is often the most visible characteristic of social interactions. In addition, nonverbal behaviors are especially critical because they function as a "silent language" that conveys meaning in subtle and covert ways (Hall, 1959).

EXISTING RESEARCH AND NEW CONSTRUCTS

Given the proliferation of constructs and measures in management, organizational behavior, and psychology, new theories must have a strong conceptual foundation as well

as strong psychometric measures. New constructs must increase our understanding of relationships. Thus, we acknowledge the large and increasing amount of research related to CQ, with regard to culture (Adler, 2002; Erez & Earley, 1993; Hofstede, 1991; Triandis, 1994); expatriate adjustment (Bhaskar-Shrinivas, Harrison, Shaffer, & Luk, 2005; Black, Mendenhall, & Oddou, 1991; Caligiuri, Hyland, Joshi, & Bross, 1998; Mendenhall & Oddou, 1985; Shaffer, Harrison, Gregersen, Black, & Ferzandi, 2006; Takeuchi, Tesluk, Yun, & Lepak, 2005); expatriate selection and training (Spreitzer, McCall, & Mahoney, 1997); expatriate performance (Caligiuri, 2000; Kraimer, Wayne, & Jaworski, 2001; Ones & Viswesvaran, 1997; Tung, 1988); global leadership (House, Hanges, Javidan, Dorfman, & Gupta, 2004); global teams (Kirkman, Gibson, & Shapiro, 2001); cross-cultural training (Black & Mendenhall, 1990; Bhawuk & Brislin, 2000; Landis, Bennett, & Bennett, 2004; Lievens, Harris, Van Keer, & Bisqueret, 2003); and intercultural communication (Ting-Toomey, 1999; Gudykunst & Ting-Toomey, 1988).

In recognizing this research, we intend to make three key points. First, the breadth of this interdisciplinary research shows the importance of intercultural issues. Second, none of this research focuses specifically on individual capabilities to function effectively in situations characterized by cultural diversity and, therefore, CQ is unique in its conceptual focus. Third, CQ has the potential to enrich these other streams of research, just as this existing research can inform future research on CQ.

Returning to the idea that CQ must be different from existing constructs and must move beyond past research and improve our understanding of individual capabilities, we must consider whether CQ can be differentiated from cognitive ability and emotional intelligence (Mayer & Salovey, 1993), as well as adjustment and mental well-being (Black & Stephens, 1989; Ward & Kennedy, 1999). For incremental validity, we propose that CQ will make a meaningful contribution to the literature only if it increases variance above and beyond that of demographic characteristics, IQ, and EQ. For predictive validity, we examine the extent to which CQ predicts cultural judgment and decision making (CJDM), adjustment, and mental well-being.

In the next section, we report results of a series of studies that examine the construct validity of CQ. First, we describe the steps taken to define the four aspects of CQ and to develop items with which to measure these factors. Next, we describe how these items were refined and reduced to the 20-item, four-factor CQ scale (CQS) and how the stability of the scale was assessed across samples, time, countries, and methods of measurement (self-report and peer-report of CQS).

SCALE DEVELOPMENT OF THE 20-ITEM CQ SCALE

Before items were created to measure CQ, we reviewed existing intelligence and intercultural competency literatures. In addition, we interviewed eight executives with extensive global work experience. Based on these efforts, we developed operational definitions for the four theoretically based aspects of CQ: (1) Metacognitive CQ is the capability for consciousness during intercultural interactions, so we drew on educational and cognitive psychology operationalizations of metacognition (O'Neil & Abedi, 1996; Pintrich & De-

Groot, 1990) for awareness, planning, regulating, monitoring, and controlling cognitive processes of thinking and learning. (2) Cognitive CQ is the knowledge of norms, practices, and conventions in different cultural settings, so cultural knowledge domains identified by Triandis (1994) were supplemented with Murdock's (1987) Human Relations Area Files. Cultural knowledge includes knowledge of the economic, legal, and social systems in other cultures (Triandis, 1994). (3) Motivational CQ is the capability to direct attention and energy toward learning and functioning in intercultural situations, so we drew on Deci and Ryan (1985) for intrinsic satisfaction and Bandura (2002) for self-efficacy in intercultural settings. (4) Behavioral CQ is the capability to exhibit appropriate verbal and nonverbal actions when interacting with people from different cultural backgrounds, so we used intercultural communication research for verbal and nonverbal flexibility in cross-cultural interactions (Gudykunst & Ting-Toomey, 1988; Hall, 1959).

Item Pool Generation

Hinkin (1998) suggested starting with twice as many items as would be targeted in the final scale, to allow for psychometric refinement. We aimed for a parsimonious scale with four to six items for each CQ dimension to minimize response bias caused by boredom and fatigue (Schmitt & Stults, 1985), while providing adequate internal consistency reliability (Hinkin & Schriesheim, 1989). Using our operational definitions for the four CQ dimensions, we started with 53 items for the initial item pool (13–14 items per CQ dimension). Each item contained one idea, was relatively short in length, and used simple, direct language. Since negatively worded items can create artifacts (Marsh, 1996), we used positively worded items. Next, a nonoverlapping panel of three faculty and three international executives (each with significant cross-cultural expertise) independently assessed the randomly ordered 53 items for clarity, readability, and definitional fidelity (1 = very low quality; 5 = very high quality). We retained the ten best items for each dimension (40 items).

Study 1: Scale Development

Business school undergraduates (n = 576; 74 percent female; mean age 20; two years of work experience) in Singapore voluntarily completed the 40-item initial CQ questionnaire (1 = strongly disagree; 7 = strongly agree) for partial fulfillment of course requirements. In our analysis, we expected to confirm a four-factor structure since we designed the measure to reflect the four theoretical dimensions of CQ. Accordingly, we assessed dimensionality with confirmatory factor analysis (CFA) (LISREL 8: maximum likelihood estimation and correlated factors).

Starting with the initial 40 items, we conducted a comprehensive series of specification searches where we deleted items with high residuals, low factor loadings, small standard deviations or extreme means, and low item-to-total correlations. We retained 20 items with the strongest psychometric properties as the CQS: four meta-cognitive CQ, six cognitive CQ, five motivational CQ, and five behavioral CQ. Figure 2.1 lists the 20 items in the CQS. CFA demonstrated good fit of the hypothesized four-factor model to the data: χ^2

Figure 2.1 **Cultural Intelligence Scale (CQS)—Self-Report**

Read each statement and select the response that best describes your capabilities. Select the answer that BEST describes you AS YOU REALLY ARE (1 = strongly disagree; 7 = strongly agree)

CQ Factor	Questionnaire Items
Metacognitive CQ	
MC1	I am conscious of the cultural knowledge I use when interacting with people with different cultural backgrounds.
MC2	I adjust my cultural knowledge as I interact with people from a culture that is unfamiliar to me.
MC3	I am conscious of the cultural knowledge I apply to cross-cultural interactions.
MC4	I check the accuracy of my cultural knowledge as I interact with people from different cultures.
Cognitive CQ	
COG1	I know the legal and economic systems of other cultures.
COG2	I know the rules (e.g., vocabulary, grammar) of other languages.
COG3	I know the cultural values and religious beliefs of other cultures.
COG4	I know the marriage systems of other cultures.
COG5	I know the arts and crafts of other cultures.
COG6	I know the rules for expressing nonverbal behaviors in other cultures.
Motivational CQ	
MOT1	I enjoy interacting with people from different cultures.
MOT2	I am confident that I can socialize with locals in a culture that is unfamiliar to me.
MOT3	I am sure I can deal with the stresses of adjusting to a culture that is new to me.
MOT4	I enjoy living in cultures that are unfamiliar to me.
MOT5	I am confident that I can get accustomed to the shopping conditions in a different culture.
Behavioral CQ	
BEH1	I change my verbal behavior (e.g., accent, tone) when a cross-cultural interaction requires it.
BEH2	I use pause and silence differently to suit different cross-cultural situations.
BEH3	I vary the rate of my speaking when a cross-cultural situation requires it.
BEH4	I change my nonverbal behavior when a cross-cultural situation requires it.
BEH5	I alter my facial expressions when a cross-cultural interaction requires it.

(164 *df*) = 822.26, non-normed fit index (NNFI) = 0.91, comparative fit index (CFI) = 0.92, standardized root mean square residual (SRMR) = 0.06, and root mean square error of approximation (RMSEA) = 0.08 (p <0.05). Standardized factor loadings for items in the four scales (0.52–0.80) were significantly different from zero (t values: 9.30–17.51, p <0.05).

We compared this four-factor correlated model with alternate, theoretically possible models to assess relative fit compared to (1) an orthogonal four-factor model (model B), (2) three factors—metacognitive CQ and cognitive CQ combined versus motivational CQ versus behavioral CQ (model C), (3) two factors—metacognitive CQ and cognitive CQ combined versus motivational CQ and behavioral CQ combined (model D), (4) two factors—metacognitive CQ versus cognitive CQ, motivational CQ, and behavioral CQ combined (model E), and (5) one factor (model F).

Table 2.1

Comparing the Fit of Alternative Nested Models with CFA—Study 1 (n = 576)

	Model	χ^2	*df*	NNFI	CFI	SRMR	RMSEA	$\Delta\chi^2$	*p* value
A	20-item four-factor model	822.26	164	.91	.92	.06	.08		
Alternate nested models:[a]									
B	(a) Four-factor orthogonal model	1199.76	170	.87	.88	.17	.11	377.50	p <.001
C	(b) Three-factor model (metacognitive CQ and cognitive CQ combined versus motivational CQ versus behavioral CQ)	1234.17	167	.86	.88	.08	.11	411.91	p <.001
D	(c) Two-factor model (metacognitive CQ and cognitive CQ combined versus motivational CQ and behavioral CQ)	2137.25	169	.79	.81	.12	.15	1314.99	p <.001
E	(d) Two-factor model (metacognitive CQ versus the other three factors combined)	2453.43	169	.75	.77	.12	.16	1631.17	p <.001
F	(e) One-factor model with all items loading on a single factor	2753.78	170	.72	.75	.12	.17	1931.52	p <.001

[a]Compared to the hypothesized four-factor model.

Abbreviations: NNFI, non-normed fit index; CFI, comparative fit index; SRMR, standardized root mean square residual; RMSEA, root mean square error of approximation.

Nested model comparisons (see Table 2.1) demonstrate the superiority of the hypothesized four-factor model, because each of the $\Delta\chi^2$ statistics exceeds the critical value based on degrees of freedom. Model A (correlated four factors) demonstrated better fit than model B (orthogonal four factors) ($\Delta\chi^2$ [6 *df*] = 377.50, p <0.001). Model A (four factors) also had better fit than model C (three factors), which combined metacognitive CQ and cognitive CQ ($\Delta\chi^2$ [3 *df*] = 411.91, p <0.001). Likewise, model A (four factors) was a better fit than the two alternate two-factor models: model D (metacognitive CQ and cognitive CQ versus the other two factors: $\Delta\chi^2$ (5 *df*) = 1314.99, p <0.001) or model E (metacognitive CQ versus the other three factors: $\Delta\chi^2$ (5 *df*) = 1631.17, p <0.001). Finally, model A (four factors) was a better fit than model F with one factor ($\Delta\chi^2$ [6 *df*] = 1931.52, p <0.001).

In sum, the hypothesized model (model A) had the best fit. We averaged items for each factor to create scales representing each of the four CQ factors. Table 2.2 reports means, standard deviations, correlations, and Cronbach's alpha values. The four factors were moderately related (0.21–0.45), with acceptable variances (0.75–1.03). The corrected item-to-total correlations for each subscale (0.47–0.71) demonstrated strong relationships between items and their scales, supporting internal consistency. Composite reliabilities

Table 2.2

Means, Standard Deviations, Scale Reliabilities, and Intercorrelations—Study 1 (n = 576)

	MN	SD	1	2	3	4
1. Metacognitive CQ	4.71	0.75	(.71)			
2. Cognitive CQ	3.03	0.84	.39**	(.85)		
3. Motivational CQ	4.72	0.80	.45**	.33**	(.75)	
4. Behavioral CQ	4.10	1.03	.28**	.36**	.21**	(.83)

Note: Reliability coefficients are in parentheses along the diagonal.
*p <.05
**p <.01

Table 2.3

Means, Standard Deviations, Scale Reliabilities, and Intercorrelations—Study 2 (n = 447)

	MN	SD	1	2	3	4
1. Metacognitive CQ	4.89	0.87	(.77)			
2. Cognitive CQ	3.16	0.89	.23**	(.84)		
3. Motivational CQ	4.74	0.92	.32**	.25**	(.77)	
4. Behavioral CQ	4.22	1.05	.37**	.34**	.31**	(.84)

Note: Reliability coefficients are in parentheses along the diagonal.
*p <.05
**p <.01

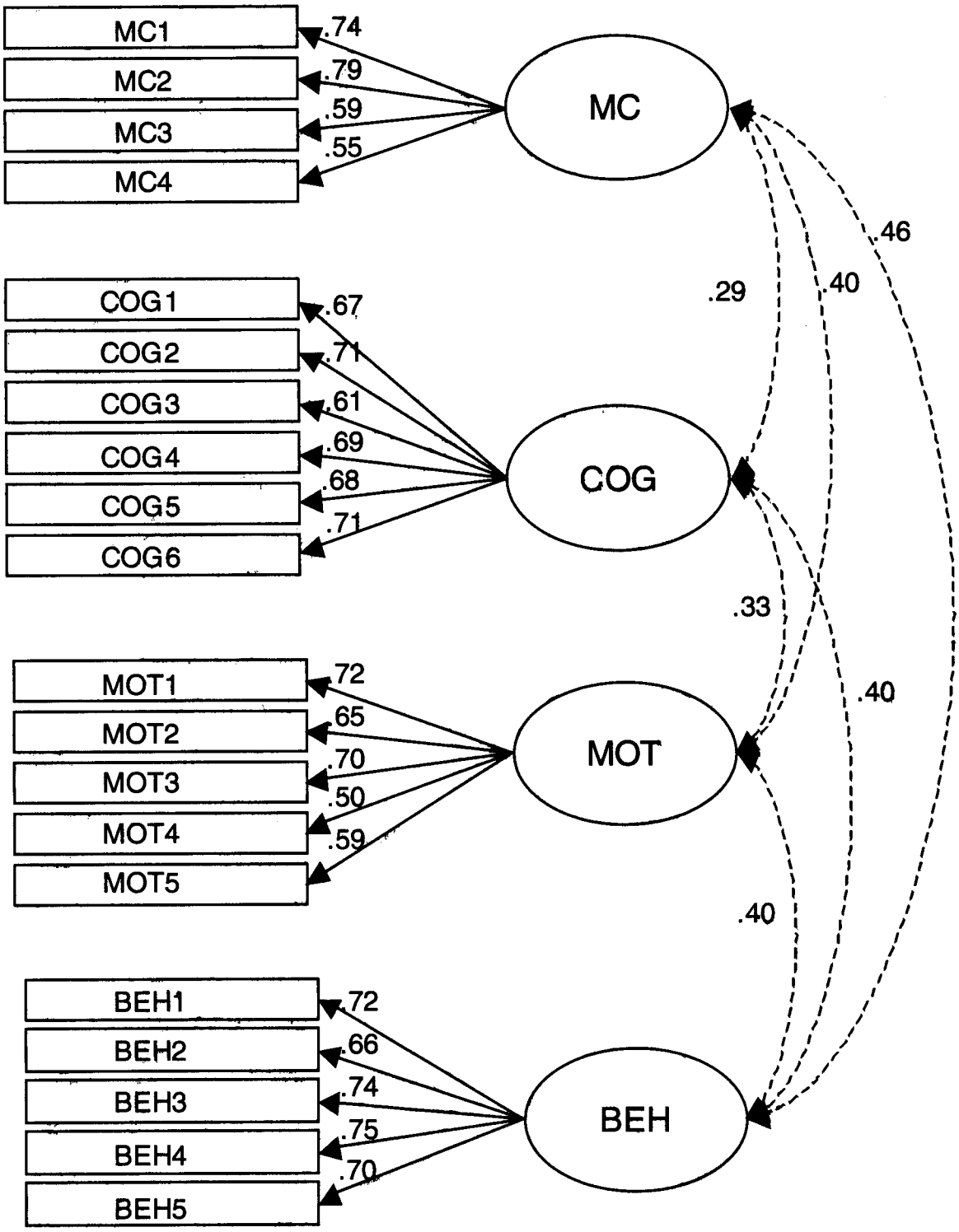
exceeded 0.70 (metacognitive CQ = 0.71, cognitive CQ = 0.85, motivational CQ = 0.75, and behavioral CQ = 0.83) (Fornell & Larcker, 1981).

Study 2: Generalizability across Samples

A second, nonoverlapping sample of 447 undergraduate students in Singapore (70 percent female; mean age 20; two years of work experience) voluntarily completed the 20-item CQS for partial fulfillment of course requirements. Structrual equation modeling (SEM) analysis demonstrated good fit of the data to the hypothesized four-factor model: χ^2 (164 *df*) = 381.28, NNFI = 0.96, CFI = 0.96, SRMR = 0.04, and RMSEA = 0.05 (p <0.05). Standardized loadings (0.50–0.79) were significantly different from zero (t values: 8.32–12.90, p <0.05), with moderate correlations between factors (0.23–0.37) and acceptable variances (0.87–1.05). Corrected item-to-total correlations for each subscale (0.46–0.66) demonstrated strong relationships between items and their scales, supporting internal consistency.

Results of study 2 extend the results in study 1 and provide additional support for the four factors of CQ as measured by four items for metacognitive CQ (α = 0.77), six for cognitive CQ (α = 0.84), five for motivational CQ (α = 0.77), and five for behavioral CQ (α = 0.84). Table 2.3 reports descriptive statistics and correlations for the four factors of CQ in study 2, and Figure 2.2 reports completely standardized parameter estimates for the four-factor model.

Figure 2.2 **Confirmatory Factor Analysis of 20-Item CQ Model—Study 2 (n = 447)**



Note: x^2 (164df) = 381.28, NNFI = .96, CFI = .96, SRMR = .04, and RMSEA = .05

Table 2.4

Multiple Group CFA across Time: Comparing the Fit of Alternative Models—Study 2 (n = 204)

	Model	χ^2	*df*	NNFI	CFI	SRMR	RMSEA	$\Delta\chi^2$	*p*-value
A	Four-factor model with factor loadings freely estimated across time	981.18	692	.94	.95	.06	.04		
B	Four-factor model with invariant factor loadings across time	1003.97	708	.94	.95	.07	.05	22.79	$p > .05$
C	Four-factor model with invariant intercepts across time	1021.56	722	.94	.95	.07	.05	17.59	$p > .05$
D	Four-factor model with invariance means across time	1045.35	726	.94	.94	.07	.05	23.79	$p < .05$

Abbreviations: CFA, confirmatory factor analysis; NNFI, non-normed fit index; CFI, comparative fit index; SRMR, standardized root mean square residual; RMSEA, root mean square error of approximation.

Study 3: Generalizability across Time

A subset of respondents (n = 204; 76 percent female; mean age 20) from the Singapore cross-validation sample in study 2 completed the CQS again four months later (at the start of the next semester) in exchange for partial fulfillment of course requirements. We used these responses to analyze temporal stability of the CQS.

We examined longitudinal measurement invariance of the CQS using CFA and an augmented covariance matrix as input (rather than a multisample approach) to account for timewise correlated errors (Vandenberg & Lance, 2000). We used a 20-item by two-measurement occasion matrix and specified eight latent variables (four T1 CQ factors and four T2 CQ factors), with unique variances of identical items correlated across time (Jöreskog, 1979).

Based on procedures suggested by Vandenberg and Lance (2000), we began with a correlated four-factor model with no constraints (parameters at T1 and T2 freely estimated). Results demonstrated acceptable fit (model A: χ^2 [692 *df*] = 981.18, NNFI = 0.94, CFI = 0.95, SRMR = 0.06, RMSEA = 0.04), indicating that the four-factor model held across the two time periods (see Table 2.4). We then developed two alternative models: model B (factor loadings constrained to be invariant) and model C (item intercepts constrained to be invariant). The chi-square difference between models A and B (nested factorial invariance model) failed to reach significance ($\Delta\chi^2$ [16 *df*] = 22.79, p = ns), providing strong support for invariance in factor loadings across T1 and T2. The chi-square difference between models B and C (item intercepts constrained to be invariant) also failed to reach significance ($\Delta\chi^2$ [14 *df*] = 17.59, p = ns), supporting item intercept invariance.

We also assessed means of the four factors across time. Unlike personality charac-

Table 2.5

Means, Standard Deviations, Scale Reliabilities, and Intercorrelations—Study 4 (n = 337)

	MN	SD	1	2	3	4
1. Metacognitive CQ	4.98	0.95	(.78)			
2. Cognitive CQ	3.66	0.98	.38**	(.81)		
3. Motivational CQ	5.34	0.94	.50**	.36**	(.80)	
4. Behavioral CQ	4.20	1.14	.37**	.43**	.31**	(.81)

Note: Reliability coefficients are in parentheses along the diagonal.
*p <.05
**p <.01

teristics that are relatively stable traits, Earley and Ang (2003) conceptualized CQ as a malleable capability that may change based on cultural exposure, training, modeling, mentoring, socialization, and other experiences. Thus, we anticipated that some means for the four CQ factors could change over time, depending on experience and/or training. Comparison of model C (invariant item intercepts) with model D (invariant means) showed a decrease in fit: model C (χ^2 [722 *df*] = 1021.56) versus model D (χ^2 [726 *df*] = 1045.35), with a significant change in χ^2 ($\Delta\chi^2$ [4 *df*] = 23.79, p <0.05). Analysis of individual means demonstrated significant changes in factor means for cognitive CQ, which increased 0.33 (t = 4.87, p <0.001), and behavioral CQ, which increased 0.21 (t = 2.87, p <0.01). This makes sense because respondents studied cultural values and participated in experiential role-playing exercises during the time interval that separated T1 and T2 assessment of CQ. Neither metacognitive CQ (–0.05 [t = –0.89, p >0.05]) nor motivational CQ (0.10 [t = 1.81, p >0.05)]) changed significantly. Thus, results provide evidence of malleability as well as test–retest reliability.

Study 4: Generalizability across Countries

A fourth sample of undergraduates (n = 337; 55 percent female; mean age 22; one year of work experience) at a large school in the midwestern United States voluntarily completed the 20-item CQS for partial fulfillment of course requirements. Table 2.5 reports descriptive statistics, correlations, and reliabilities for this sample.

As recommended by Kirkman and Law (2005), we assessed equivalence of the CQS across countries and compared study 4 (U.S.) with study 2 (Singapore) (n = 447) using sequential tests of model invariance (Byrne, 1998). Model A (four factors with loadings freely estimated across samples) demonstrated good fit: χ^2 (328 *df*) = 723.23, NNFI = 0.96, CFI = 0.97, SRMR = 0.05, RMSEA = 0.05, indicating equivalence in number of factors.

We tested two alternative models: model B (four factors with loadings forced to be invariant), to test if items were interpreted equally across settings, and model C, (four factors with factor covariances forced to be invariant), to test if covariances among factors were equivalent across settings. The chi-square difference between

models A and B (nested factorial invariance model) failed to reach significance ($\Delta\chi^2$ [16 *df*] = 13.74, p = ns), providing strong support for invariance in factor loadings across settings. The chi-square difference between models B and C (nested covariance invariance model) failed to reach significance ($\Delta\chi^2$ [10*df*] = 17.96, p = ns), supporting invariance in factor covariances. These multiple group tests of invariance demonstrated that the same four-factor structure holds across the two countries (Singapore and the United States).

Study 5: Generalizability across Methods

Given the self-report nature of the initial research that used the CQS, it is also important to consider observer ratings of the CQ of others. Accordingly, we developed an observer version of the CQS (Figure 2.3), which adapted each item to reflect observer ratings rather than self ratings. For example, the first item was changed from "I am conscious of the cultural knowledge I use when . . ." to "This person is conscious of the cultural knowledge he/she uses when. . . ."

We then applied multitrait multimethod (MTMM) techniques (Campbell & Fiske, 1959) to assess convergent and discriminant validity, using multiple assessors of CQ to examine generalizability across methods (self-ratings and observer ratings). If the CQS is a valid measure across methods, results for the self-report CQS should be parallel to results for the observer-report CQS. Accordingly, we used self-rated CQ to predict peer-rated interactional adjustment; and peer-rated CQ to predict self-rated interactional adjustment. Both approaches avoid common method variance because predictors (CQ) and outcomes (adjustment) are obtained from different sources (different methods of measuring CQ).

We examined these relationships with data from managers participating in an executive MBA program at a large university in the United States (n = 142; 47 percent female; average age 35). As part of a self-awareness class assignment, participants completed Web questionnaires that included self-report of CQ and interactional adjustment. In addition, each participant completed an observer questionnaire on one randomly assigned peer from their MBA team. This second Web questionnaire included a peer-report of the CQS and interactional adjustment.

We measured CQ with the 20-item CQS and interactional adjustment with three items from Black and Stephens (1989): "Rate how well you have adjusted to your current situation in terms of socializing with people, interacting with people on a day-to-day basis, getting along with people" (1 = extremely unadjusted, 7 = extremely adjusted; $\alpha = 0.91$). Respondents also provided data on sex (0 = female, 1 = male) and cross-cultural experience (number of countries lived in).

Table 2.6 reports descriptive statistics and results of the MTMM analyses, including self-report and peer-report of CQ and adjustment. Reliabilities for the two methods of self and peer ratings are shown in parentheses on the main diagonal ($\alpha = 0.79$–0.95). Values of the heterotrait–monomethod triangles are shown in italics, values of the heterotrait–heteromethod triangle are underlined, and values of the monotrait–heteromethod are shown in bold.

Figure 2.3 **Cultural Intelligence Scale (CQS)—Observer Report**

Read each statement and select the response that best describes this person's capabilities. Select the answer that BEST describes this person as he/she REALLY IS (1 = strongly disagree; 7 = strongly agree)

CQ Factor	Questionnaire Items
Metacognitive CQ	
MC1	This person is conscious of the cultural knowledge he/she uses when interacting with people with different cultural backgrounds.
MC2	This person adjusts his/her cultural knowledge as he/she interacts with people from a culture that is unfamiliar.
MC3	This person is conscious of the cultural knowledge he/she applies to cross-cultural interactions.
MC4	This person checks the accuracy of his/her cultural knowledge as he/she interacts with people from different cultures.
Cognitive CQ	
COG1	This person knows the legal and economic systems of other cultures.
COG2	This person knows the rules (e.g., vocabulary, grammar) of other languages.
COG3	This person knows the cultural values and religious beliefs of other cultures.
COG4	This person knows the marriage systems of other cultures.
COG5	This person knows the arts and crafts of other cultures.
COG6	This person knows the rules for expressing nonverbal behaviors in other cultures.
Motivational CQ	
MOT1	This person enjoys interacting with people from different cultures.
MOT2	This person is confident that he/she can socialize with locals in a culture that is unfamiliar.
MOT3	This person is sure he/she can deal with the stresses of adjusting to a culture that is new.
MOT4	This person enjoys living in cultures that are unfamiliar.
MOT5	This person is confident that he/she can get accustomed to the shopping conditions in a different culture.
Behavioral CQ	
BEH1	This person changes his/her verbal behavior (e.g., accent, tone) when a cross-cultural interaction requires it.
BEH2	This person uses pause and silence differently to suit different cross-cultural situations.
BEH3	This person varies the rate of his/her speaking when a cross-cultural situation requires it.
BEH4	This person changes his/her nonverbal behavior when a cross-cultural situation requires it.
BEH5	This person alters his/her facial expressions when a cross-cultural interaction requires it.

Examination of Table 2.6 shows that results meet Campbell and Fiske's (1959) guidelines for MTMM analysis. First, the coefficients on the reliability diagonal (numbers in parentheses) are the highest in the matrix. Second, the coefficients on the validity diagonals (in bold) show the correlations between self-ratings and peer-ratings for metacognitive CQ (0.41), cognitive CQ (0.54), motivational CQ (0.50), and behavioral CQ (0.45). Each of these is significantly different from zero, indicates convergent validity, and is high enough

Table 2.6

Results of the Five Traits × Two Methods MTMM Analysis—Study 5 (n = 142)

	MN	SD	1	2	3	4	5	6	7	8	9	10
Self-Rated												
1. Metacognitive CQ	5.11	1.04	(.79)									
2. Cognitive CQ	4.14	1.53	*.76***	(.95)								
3. Motivational CQ	5.29	1.29	*.55***	*.56**	(.92)							
4. Behavioral CQ	4.98	1.19	*.61***	*.54***	*.42***	(.85)						
5. Interactional Adjustment	5.59	0.94	*.21**	*.09*	*.16*	*.19**	(.91)					
Peer-Rated												
6. Metacognitive CQ	5.11	0.94	**.41****	.33***	.35***	.40***	.18	(.88)				
7. Cognitive CQ	4.81	1.13	.40***	**.54****	.49***	.44***	.11	*.49***	(.94)			
8. Motivational CQ	5.17	1.13	.37***	.48***	**.50****	.36***	.14	*.53***	*.61***	(.92)		
9. Behavioral CQ	4.83	1.05	.35***	.32***	.24***	**.45****	.27***	*.71***	*.54***	*.45***	(.90)	
10. Interactional Adjustment	5.87	0.80	.26***	.23***	.31***	.34***	**.37****	*.33***	*.22**	*.35***	*.30***	(.91)

Note: The four traits are metacognitive CQ, cognitive CQ, motivational CQ, behavioral CQ, and interactional adjustment.
The two methods are self-rating and peer-rating.
The numbers on the diagonal are the coefficient alphas.
Italic numbers are in the heterotrait-monomethod analyses.
Underlined numbers are in the heterotrait-heteromethod analyses.
Bold numbers are the results of the monotrait-heteromethod analyses.
Numbers in solid triangles are heterotrait-monomethod correlations.
Numbers in dotted triangles are heterotrait-heteromethod correlations.
*$p < .05$
**$p < .01$
Abbreviation: MTMM = multitrait-multimethod.

to warrant further investigation. Third, these validity coefficients are higher than other values in each respective column and row, providing evidence of discriminant validity.

Although the Campbell and Fiske (1959) analyses are standard, they are not sufficiently precise or normative to evaluate how well the data fit, with respect to the prescribed model (Schmitt & Stults, 1986). Therefore, as a further test, we also examined MTMM relationships with CFA, using the correlated trait-correlated method (CTCM) model (Marsh & Grayson, 1995; Widaman, 1985). The CTCM model considers each measured variable to be a function of trait, method, and error factors. Thus, it models both trait and method factors explicitly and assesses the degree of convergent and discriminant validity through variance partitioning into trait, method, and error.

For the CTCM model, we included five traits (the four CQ dimensions and interactional adjustment), each of which was measured by two methods (self-report and peer-report). The two measures of each trait load on a single trait factor, yielding five traits for this design. In addition, each item that uses the same method of measurement loads on a single factor, yielding two method factors. Thus, we specified model A as a five-trait–two-method model with a latent trait factor for each of the five traits (the four CQ dimensions and interactional adjustment) and two method factors for the traits that were assessed by self-rating and peer-rating. All of the trait factors and all of the method factors are allowed to correlate among themselves, while the trait and method factors are assumed to be uncorrelated (Widaman, 1985).

We compared results of the two-method–five-trait CFA: $\chi^2(364\ df) = 770.18$, NNFI = 0.94, CFI = 0.95, SRMR = 0.07, and RMSEA = 0.08 ($p < 0.05$) against two alternative models as recommended by Widaman (1985). Model B is a method-only model and included only two methods: $\chi^2(404\ df) = 1820.09$, NNFI = 0.82, CFI = 0.83, SRMR = 0.12, and RMSEA = 0.16. Model C is a trait-only model and included only five traits, $\chi^2(395\ df) = 2071.40$, NNFI = 0.84, CFI = 0.86, SRMR = 0.15, and RMSEA = 0.16. Comparison of model A (the two-method–five trait model) with model B (method-only) ($\Delta\chi^2$ [40 *df*] = 1049.91, $p < 0.001$) and with model C (trait-only) ($\Delta\chi^2$ [31 *df*] = 1301.22, $p < 0.001$) shows the superiority of model A, the two-method–five-trait model.

The CFA MTMM approach also allows partitioning of total observed variance of each measure into components associated with the trait and method factors (Marsh & Hocevar, 1988; Widaman, 1985). Results demonstrated that traits explained 43 percent of the total observed variance, methods explained 22 percent of the observed variance, and the remaining 35 percent was attributed to random error. In sum, the variance attributed to traits was the largest component of total observed variance, providing further convergent and discriminant validity evidence for the CQS.

To assess criterion validity of CQ, we used self-rated CQ to predict self-rated and peer-rated adjustment, controlling for sex and cross-cultural experience. We also used peer-rated CQ to predict self-rated and peer-rated adjustment. Although we examined all four possible relationships between CQ and adjustment (self-rated CQ → self-rated adjustment, peer-rated CQ → peer-rated adjustment, self-rated CQ → peer-rated adjustment, and peer-rated CQ → self-rated adjustment), we were especially interested in the relationships that involved two different sources (self-rated CQ → peer-rated adjustment

Table 2.7

Regression of Self and Peer CQ Scale on Interactional Adjustment—Study 5 (n = 142)

	Interactional Adjustment Peer-Rated				Interactional Adjustment Self-Rated			
Variable	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
Sex[a]	−.04	−.10	−.04	−.12	−.35***	−.40***	−.35***	−.41***
Cross-Cultural Experience	.13	−.03	.13	.05	.09	−.02	.09	.06
Self-rated								
Metacognitive CQ		.18				.13		
Cognitive CQ		.12				.06		
Motivational CQ		.27**				.22*		
Behavioral CQ		.22*				.20*		
Peer-rated								
Metacognitive CQ				.16				.03
Cognitive CQ				.05				.04
Motivational CQ				.34**				.20*
Behavioral CQ				.19*				.29**
F	0.84	2.87*	0.84	3.39**	6.69**	4.14**	6.69**	5.08***
ΔF		3.83**		4.60**		2.64*		3.88**
R^2	.02	.16	.02	.18	.12	.21	.12	.24
ΔR^2		.14		.16		.09		.12
Adjusted R^2	.00	.10	.00	.13	.10	.16	.10	.20

[a]0 = female, 1 = male
*$p < .05$
**$p < .01$
***$p < .001$

and peer-rated CQ →self-rated adjustment) because these avoid potential problems of common method bias.

Since motivational CQ and behavioral CQ focus on drive and flexibility in culturally diverse situations, we expected that each would predict interactional adjustment. In contrast, we expected that the two mental aspects of CQ (metacognitive CQ and cognitive CQ) would have less direct relevance to interactional adjustment.

Overall, hierarchical regression analysis (Table 2.7) shows CQ predicted adjustment, with increased variance ranging from 9 percent to 16 percent. In addition, and consistent with expectations, self-rated motivational CQ and self-rated behavioral CQ predicted peer-rated interactional adjustment ($\beta = 0.27$, $p < 0.01$ / $\beta = 0.22$, $p < 0.05$; 14 percent incremental explained variance; adjusted $R^2 = 0.10$). Likewise, peer-rated motivational CQ and behavioral CQ predicted self-rated interactional adjustment ($\beta = 0.20$, $p < 0.05$ / $\beta = 0.29$, $p < 0.01$; 12 percent incremental explained variance; adjusted $R^2 = 0.20$). We also note that self-rated motivational CQ and behavioral CQ predicted self-rated interactional adjustment ($\beta = 0.22$, $p < 0.05$ / $\beta = 0.20$, $p < 0.05$; 9 percent incremental variance; adjusted $R^2 = 0.16$). Finally, peer-rated motivational CQ and behavioral CQ predicted peer-rated interactional adjustment

($\beta = 0.34$, $p < 0.01$ / $\beta = 0.19$, $p < 0.05$; incremental variance 16 percent; adjusted $R^2 = 0.13$). In sum, MTMM analyses provide evidence of convergent, discriminant, and criterion validity of the CQS across self- and peer-ratings.

Study 6: Discriminant and Incremental Validity

Having assessed the psychometric characteristics of the CQS, measurement invariance of the four factors across time and across two countries, and comparability of self-report CQS compared to peer-report CQS, we now address discriminant and incremental validity of the CQS. Respondents in studies 2 and 4 completed a second questionnaire that measured cognitive ability, EQ, CJDM, interactional adjustment, and mental well-being. We obtained matched data for 251 respondents in study 2 and 249 respondents in study 4 (56 percent and 74 percent response rates respectively). Using this data, we first examined the discriminant validity of the four factors of CQ relative to cognitive ability, EQ, cultural judgment and decision making, interactional adjustment, and mental well-being. Second, we assessed incremental validity of CQ over and above demographic characteristics, cognitive ability, and EQ in predicting CJDM, interactional adjustment, and mental well-being.

Measures

For CJDM, we adapted five scenarios from Cushner and Brislin (1996). Participants read scenarios describing intercultural interactions and then selected the best response to explain the situation. We summarized each participant's correct responses (range 0–5). We measured interactional adjustment with three items from Black and Stephens (1989): "Rate how well you have adjusted to your current situation in terms of socializing with people, interacting with people on a day-to-day basis, getting along with people" (1 = extremely unadjusted, 7 = extremely adjusted; $\alpha = 0.93$). We measured mental well-being with four items from Goldberg and Williams (1988). "Rate your general well-being at this time: able to concentrate on whatever you have been doing, feel that you are playing a useful part, feel capable of making decisions, and able to face up to your responsibilities" (1 = not at all, 7 = to a very great extent; $\alpha = 0.82$).

We measured cognitive ability with the Wonderlic Personnel test (1999) of problem-solving ability. Prior research has demonstrated this scale is a reliable and valid measure of cognitive ability (e.g., see LePine, 2003). We assessed EQ with eight items from the Schutte et al. (1998) scale that is based on Salovey and Mayer's (1990) model of EQ. Items include, "I seek out activities that make me happy" and "I arrange events that others enjoy" ($\alpha = 0.80$). Participants reported their age (years) and sex (0 = female, 1 = male), and we coded each sample (0 = the United States, 1 = Singapore).

Since we previously demonstrated equivalence in number of factors, factor loadings, and structural relationships across these samples (see study 4), we combined sample 2 (n = 251) and sample 4 (n = 249) for these analyses (n = 500). Table 2.8 reports descriptive statistics, correlations, and reliabilities for the combined samples.

Table 2.8

Means, Standard Deviations, Scale Reliabilities, and Intercorrelations—Study 6 (n = 500)

	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Cultural decision making	3.23	1.11												
2. Interactional adjustment	5.63	1.16	.03	(.93)										
3. Mental well-being	4.98	0.97	.01	.49**	(.82)									
4. Metacognitive CQ	4.94	0.88	.17**	.17**	.24**	(.74)								
5. Cognitive CQ	3.41	0.96	.11*	.10*	.26**	.27**	(.83)							
6. Motivational CQ	5.00	0.98	.03	.23**	.41**	.43**	.34**	(.81)						
7. Behavioral CQ	4.21	1.09	.09*	.17**	.25**	.39**	.39**	.32**	(.82)					
8. Cognitive ability	27.59	5.58	.24**	−.05	−.12**	.06	−.05	−.10*	.03					
9. Emotional intelligence	5.27	0.78	−.03	.26**	.42**	.33**	.24**	.33**	.28**	−.05	(.80)			
10. Age	21.14	2.88	.10*	.07	.17**	.05	.11*	.14**	.10*	−.14**	.05			
11. Sex[a]	0.46	0.50	.08	.02	.09*	.02	.10*	.15**	.10*	−.01	.03	.24**		
12. Sample[b]	0.50	0.50	.11*	−.19**	−.37**	−.01	−.25**	−.29**	.02	.42**	−.19**	−.29**	−.22**	

Note: Reliability coefficients are in parentheses along the diagonal.

[a]0 = female, 1 = male

[b]0 = United States, 1 = Singapore

*p <.05

**p <.01

Discriminant Validity

We assessed discriminant validity of the four factors of CQ relative to cognitive ability, EQ, cultural judgment and decision making, interactional adjustment, and mental well-being, using confirmatory factor analysis with study 6 data. Results demonstrated good fit for the nine-factor model (χ^2 [595 *df*] = 1303.47, NNFI = 0.95, CFI = 0.96, SRMR = 0.05, RMSEA = 0.05), supporting the distinctiveness of the four CQ factors, cognitive ability, EQ, cultural judgment and decision making, interactional adjustment, and mental well-being. All factor loadings were significant, with *t* values ranging from 8.96 to 33.07.

Incremental Validity

We tested the incremental validity of CQ with hierarchical regression. For controls, we entered age, sex (0 = female, 1 = male), and sample (0 = the United States, 1 = Singapore) in step one, and cognitive ability and EQ in step two. In step three, we added the four factors of CQ (metacognitive CQ, cognitive CQ, motivational CQ, and behavioral CQ). We used Change F statistics to assess each regression step and *t* values to assess significance of individual beta values. Table 2.9 reports results of the regression analyses for CJDM, interactional adjustment, and mental well-being.

Predictive Validity

Since metacognitive CQ and cognitive CQ represent mental capabilities, and since CJDM emphasizes analytic abilities such as deliberate reasoning and evaluation of alternative, we expected metacognitive CQ and cognitive CQ to predict CJDM. In contrast, we did not expect motivational CQ or behavioral CQ to predict CJDM, because the capabilities to direct energy (motivational CQ) or display flexible behavior (behavioral CQ) are less directly relevant to mental analysis. Consistent with the logic described in study 5, we expected motivational CQ and behavioral CQ would predict interactional adjustment. Extending this, we also expected these two factors of CQ would predict mental well-being.

Hierarchical regression results showed that age, sex, and sample explained 4 percent of the variance in CJDM, 4 percent in interactional adjustment, and 14 percent in mental well-being. The addition of cognitive ability and EQ in step 2 increased the explained variance significantly for CJDM ($\Delta F = 12.20, p < 0.001$), interactional adjustment ($\Delta F = 13.67, p < 0.001$), and mental well-being ($\Delta F = 41.83, p < 0.001$). Results in step 3 demonstrate the incremental validity of the four factors of CQ, over and above demographic characteristics, cognitive ability, and EQ in predicting CJDM ($\Delta F = 4.97\ p < 0.01$), interactional adjustment ($\Delta F = 3.73, p < 0.01$), and well-being ($\Delta F = 10.64, p < 0.001$). Overall, the adjusted R^2 statistics explained 10 percent of the variance in CJDM, 10 percent of the variance in interactional adjustment, and 31 percent of the variance in mental well-being.

As expected for CJDM, results demonstrate that metacognitive CQ ($\beta = 0.16, p < 0.01$) and cognitive CQ ($\beta = 0.11, p < 0.05$) increased explained variance, over and above the

Table 2.9

Hierarchical Regression Analysis—Study 6 (n = 500)

	Cultural Decision Making			Interactional Adjustment			Mental Well-Being		
Variable	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3
Age	.12**	.13**	.12**	.02	.03	.01	.06	.07	.05
Sex[a]	.09	.07	.07	−.03	−.04	−.05	.00	.00	−.03
Sample[b]	.16**	.06	.07	−.19***	−.17**	−.17**	−.35***	−.30***	−.26***
Cognitive ability		.24***	.22**		.04	.04		.04	.03
Emotional intelligence		−.02	−.08		.23***	.16**		.36***	.26***
Metacognitive CQ			.16**			.05			.01
Cognitive CQ			.11*			−.06			.02
Motivational CQ			−.04			.11*			.21***
Behavioral CQ			−.01			.10*			.10*
F	6.43***	8.91***	7.32***	6.63***	9.65***	7.14***	27.04***	35.63***	26.31***
ΔF		12.20***	4.97**		13.67***	3.73**		41.83***	10.64***
R^2	.04	.08	.12	.04	.09	.12	.14	.26	.32
ΔR^2		.04	.04		.05	.03		.12	.06
Adjusted R^2	.03	.07	.10	.03	.08	.10	.14	.26	.31

[a]0 = female, 1 = male
[b]0 = the United States, 1 = Singapore
*p <.05
**p <.01
***p <.001

effects of demographic characteristics, cognitive ability, and EQ. Together, metacognitive CQ and cognitive CQ increased explained variance in CJDM by 4 percent. Overall, the adjusted R^2 was 10 percent. Also as expected, results for interactional adjustment demonstrate that motivational CQ ($\beta = 0.11$, $p < 0.05$) and behavioral CQ ($\beta = 0.10$, $p < 0.05$) increased explained variance, above and beyond demographic characteristics, cognitive ability, and EQ. Incremental variance was 3 percent, and overall adjusted R^2 was 10 percent. Finally, results also demonstrated that motivational CQ ($\beta = 0.21$, $p < 0.001$) and behavioral CQ ($\beta = 0.10$, $p < 0.05$) increased explained variance in mental well-being, above and beyond demographic characteristics, cognitive ability, and EQ. Incremental variance was 6 percent, and adjusted R^2 was 31 percent.

DISCUSSION

Overall, results of these six studies allow us to draw several important conclusions. First, the sequential and systematic scale development process described in studies 1–4 provides strong evidence that the CQS has a clear, robust, and meaningful four-factor structure. In addition, results demonstrate that this structure is stable across samples (study 2), across time (study 3), and across countries (study 4). In addition, results in study 5 show the same

pattern of relationships for the self-report version of the CQS (Fig. 2.1) compared to the peer-report version of the CQS (Fig. 2.3), such that self-report CQ predicted peer-report adjustment and peer-report CQ predicted self-report adjustment. Finally, results in study 6 support the discriminant validity of the CQS compared to cognitive ability, EQ, CJDM, interactional adjustment, and mental well-being. Study 6 also demonstrates that the CQS has incremental validity in predicting cultural judgment and decision making, adjustment, and mental well-being. More specifically, metacognitive CQ and cognitive CQ increased explained variance in cultural judgment and decision making by 4 percent; motivational CQ and behavioral CQ increased explained variance in adjustment by 3 percent; and motivational CQ and behavioral CQ increased explained variance in mental well-being by 6 percent

From a theoretical perspective, the findings of these six studies (n >1,500 unique respondents) indicate that the 20-item CQS holds promise as a reliable and valid measure of CQ. Potential uses of the scale in substantive research include further exploration of the nature and dimensionality of CQ. For example, future research could examine subdimensions for each factor of CQ. Additional theoretical work is also needed on the nomological network of CQ, including predictors, consequences, mediators, and moderators. Future research should also assess additional outcomes of CQ. For example, it would be interesting and useful to examine CQ as a predictor of selection into global leader positions (Lievens et al., 2003; Spreitzer et al., 1997), transfer of intercultural training (Paige, 2004; Yamazaki & Kayes, 2004), cross-cultural negotiations effectiveness (Gelfand et al., 2001), and initiative to span structural holes (Van Dyne & Ang, 2006). It also would be beneficial to examine the extent to which CQ explains job performance, contextual performance, and adaptive performance of those in domestic jobs who work in multicultural groups, those who have regular work contact with employees, suppliers, and/or customers in other countries, and those in expatriate and global leader positions (Black, Gregersen, Mendenhall, & Stroh, 1999; Gelfand, Erez, & Aycan, 2007; Shaffer et al., 2006; Tsui & Gutek, 1999).

The scale also has promising practical application. For example, it can provide important insights and personal information to individuals on their own CQ. According to Paige and Martin (1996), feedback and self-awareness are keys to enhancing intercultural effectiveness. Thus, comparison of self-report with peer-report or supervisor-report scores on the 20-item CQS should provide individuals with important insights about their personal capabilities for functioning effectively in situations characterized by cultural diversity. Accordingly, knowledge of CQ would also provide a foundation for personal self-development.

Organizations could use the CQS (both self-report and observer-report versions) to identify employees who would be particularly well-suited for overseas assignments. It also could be used to screen out those who are proficient in domestic settings but unlikely to succeed in cross-cultural settings or in jobs that require frequent and ongoing interaction with those who have other cultural backgrounds. Finally, knowledge of CQ could be used to develop corporate training and self-awareness programs or to identify employees who could serve as supportive mentors to those starting overseas assignments.

In conclusion, the results of these six studies are promising and suggest both theoretical and practical implications that warrant continued research on CQ. We hope that the CQS provides a strong foundation for future research toward significant theoretical and practical

implications for self-awareness, cross-cultural interactions, corporate selection, training and development, and employee motivation, adjustment, well-being, and performance. In sum, the CQS has exciting implications for global leadership and effectiveness of individuals in work and nonwork international and domestic settings that are culturally diverse.

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