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Assessing the measurement invariance of the four-dimensional cultural intelligence scale across countries: A composite model approach

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ABSTRACT

Over the past decade, the cultural intelligence construct and its underlying dimensions have been used in a number of studies. Prior research has tested the determinants and outcomes of cultural intelligence, using pooled data from different countries and cultures, and has compared the results across contexts. However, these studies often disregarded measurement invariance, which is a necessary requirement for such analyses. We assess the measurement invariance of the commonly used four-dimensional cultural intelligence scale across five countries (China, France, Germany, Turkey, and the U.S.) by means of a composite model logic, using partial least squares structural equation modeling (PLS-SEM). Our results question the scale's dimensionality concerning China and France, and reveal an item set that is invariant across the other countries. Our findings indicate that researchers should be aware of the potential lack of measurement invariance regarding the standard measurement of cultural intelligence. They should therefore be cautious when comparing the results of cross-country and cross-cultural research.

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1. Introduction

Interacting and communicating effectively with people from diverse cultural backgrounds are essential skills in business life and becoming even more important in a globalized world context. Thus, researchers and practitioners are increasingly interested in developing a better understanding of the determinants and outcomes of individuals' cultural intelligence (CQ), which refers to "a person's capability to adapt effectively to new cultural contexts" (Earley & Ang, 2003, p. 59). CQ has been researched in multiple areas, particularly in the assessment of cross-cultural and intercultural competences—for an overview, see Ang and Van Dyne (2008), Leung, Ang, and Tan (2014), and Matsumoto and Hwang (2013).

To properly evaluate CQ's impact on the perceptions, attitudes, and behaviors of individuals across countries and cultures, researchers require a clear understanding of how to measure CQ.

Most prior studies in this field draw on Ang, Van Dyne, and Koh's (2006) 20-item CQ scale (see also Leung et al., 2014; Matsumoto & Hwang, 2013), with its four underlying dimensions: behavioral CQ, cognitive CQ, metacognitive CQ, and motivational CQ. The scale was developed in the U.S. and Singapore (Ang, Van Dyne, & Koh, 2006; Ang et al., 2007; Van Dyne, Ang, & Koh, 2008), but translated versions have been used in dozens of studies in non-English-speaking countries, such as China (Bücker, Furrer, Poutsma, & Buyens, 2014), Germany (Remhof, Gunkel, & Schlägel, 2013), and Turkey (Şahin, Gürbüz, Köksal, & Ercan, 2013). Numerous studies have applied the scale to compare CQ's effects across countries or cultures (Bücker, Furrer, & Peeters Weem, 2012; Ang et al., 2007; Engle & Nehrt, 2012; Engle, Dimitriadi, & Sadrieh, 2012; Imai & Gelfand, 2010), or have used it on pooled samples comprising individuals with different cultural backgrounds (e.g., Elenkov & Manev, 2009; Huff, 2013; Huff, Song, & Gresch, 2014; Lin, Chen, & Song, 2012; Malek & Budhwar, 2013; Ramalu, Rose, Kumar, & Uli, 2010). While these studies' findings contribute to a better understanding of CQ, researchers often inadequately examine the CQ scale's validity in country settings that differ from the context in which it had been developed and initially tested. Before comparing the results of, or pooling data from different countries and cultures,

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researchers need to establish measurement invariance (Steenkamp & Baumgartner, 1998; Vandenberg & Lance, 2000). Measurement invariance refers to “whether or not, under different conditions of observing and studying phenomena, measurement operations yield measures of the same attribute” (Horn & McArdle, 1992, p. 117). If measurement invariance is not established, the results of cross-country and cross-cultural CQ studies cannot be readily compared, because the similarities and differences in prior findings could be a reflection of the study participants’ diverse understandings and interpretations of the CQ scale’s items rather than robust empirical evidence. In fact, lacking measurement invariance could explain the differences in CQ’s effects in prior research. For instance, using a sample of Turkish respondents, ahin et al. (2013) researched the effect of openness to experience (i.e., individuals’ willingness to explore, consider, and tolerate new and unfamiliar experiences and ideas) (McCrae & Costa, 1987) on CQ. They found a weak effect on the cognitive CQ dimension (0.15) and a medium effect on the behavioral CQ dimension (0.47). In contrast, Oolders, Chernyshenko, and Stark (2008) offer evidence of openness to experience having a strong effect on cognitive CQ (0.31) in New Zealand, while Varela and Gatlin-Watts (2014) find this has a weak effect on behavioral CQ (0.04) in the U.S. Given the increasing internationalization of European business and in light of the migration crisis, the general business environment for European firms will change fairly drastically. Firms face the challenge to adapt to culturally more diverse customers, employees, and business partners. A precise assessment of CQ would for instance provide firms with the opportunity to identify potential areas of improvement in their organization, thus allowing for early interventions to foster the development of CQ in operations that would benefit from improved CQ. A better understanding of the measurement properties of CQ across different national cultural backgrounds is required to evaluate this construct’s true potential to assess the links between firms’ cross-cultural competencies and different variables that are of managerial relevance.

While the need to establish measurement invariance prior to undertaking cross-country or cross-cultural comparisons has long been acknowledged in the international management literature (e.g., Harzing, Reiche, & Pudelko, 2013; Hult et al., 2008), only a few studies have assessed the CQ scale’s measurement invariance (see Table A.1 in the Appendix). These studies primarily focused on the invariance across time (Ang et al., 2006; Rosenblatt, Worthley, & MacNab, 2013; Varela & Gatlin-Watts, 2014), which is an important requirement when analyzing CQ in a longitudinal study design. Only Ang et al. (2007) and Bucker et al. (2012) have examined measurement invariance across countries, but focused on just two sets of countries (Singapore vs. the U.S. and Netherlands vs. China). Further, both studies relied on covariance-based structural equation modeling (CB-SEM), which follows a common factor model approach in the estimation of the construct measures. Recently, however, scholars have started questioning the reflex-like application of common factor models, emphasizing that the composite model—as implemented in partial least squares SEM (PLS-SEM)—offers a more general and potentially more realistic approach to measurement (e.g., Rigdon, 2012; 2014; Sarstedt, Hair, Ringle, Thiele, & Gudergan, 2016). Owing to its greater flexibility concerning measurement and model estimation (e.g., Hair, Hult, Ringle, & Sarstedt, 2016), PLS-SEM has gained prominence in international business research (Richter, Sinkovics, Ringle, & Schlagel, 2016), strategic management research (Hair, Sarstedt, Pieper, & Ringle, 2012), and related fields (e.g., Hair, Sarstedt, Ringle, & Mena, 2012; Peng & Lai, 2012; Ringle, Sarstedt, & Straub, 2012). Thus, assessing the CQ construct’s measurement invariance by means of composite-based PLS-SEM is both timely and warranted.

Our main research question is whether measurement invariance

can be established for the CQ scale between five countries from distinct cultural clusters—including Germanic and Latin Europe—with different characteristics in terms of formal institutions (rules, laws, and regulations), informal institutions (cultural norms and values) (Berry, Guillen, & Zhou, 2010), and institutional environments. In answer to recent calls to examine the CQ measures’ psychometric properties more closely (e.g., Bucker, Furrer, & Lin, 2015; Fink & Mayrhofer, 2009), we assess the cross-country measurement invariance of Ang et al.’s (2006) standard 20-item, four-dimensional scale of CQ. Applying Henseler, Ringle, and Sarstedt’s (2016) recently proposed measurement invariance of composite model (MICOM) procedure, we research CQ’s effect on respondents’ expatriation intentions across China, France, Germany, Turkey, and the U.S. In doing so, we extend prior studies that have investigated the CQ scale’s measurement invariance across countries (Ang et al., 2007; Bucker et al., 2012) by explicitly considering a composite modeling approach to measurement and examining a larger number of countries. Further, we contribute to the literature on PLS-SEM by offering an illustration of the MICOM procedure’s use across multiple countries, documenting the problems that arise when comparing translated versions of a scale across multiple countries in an effort to establish measurement invariance.

We research the CQ scale’s measurement invariance in the context of expatriation intentions. While expatriates have become an important human resource for internationally active firms (e.g., Chang, Gong, & Peng, 2012; Choi & Johanson, 2012; Fang, Jiang Makino, & Beamish 2010), little is known about the reasons for individuals becoming expatriates or deciding to not do so (e.g., Felker & Gianecchini, 2015; Vaiman, Haslberger, & Vance, 2015). Prior studies have focused on the roles of aspects such as international experience (Tharenou, 2003, 2008) and personality traits (Mol, Born, Willemsen, van der Molen, & Derous, 2009) when explaining expatriation intentions. However, we still lack research on the effects of cross-cultural knowledge or the motivation to use this knowledge on individuals’ expatriation intentions. Recent surveys (e.g., Development Dimensions International, 2016; ManpowerGroup, 2016) report that CEOs perceive cultural competence and a global mindset as some of the most important leadership skills for 21st century managers. At the same time, these surveys also reveal that managers perceive working with people from different cultural contexts as one of their weakest skills. Thus, developing a better understanding of CQ’s roles is essential when predicting whether future managers will consider pursuing an international career, including being an expatriate manager.

Our results cast doubt on the CQ scale’s universal usefulness across countries, most notably in China and France. The original scale items need to be adjusted for Germany, Turkey, and the U.S. so as to meet the minimum measurement quality requirements. When using a reduced CQ scale, further comparisons across these three countries underline motivational CQ’s roles and, to a lesser extent, cognitive CQ’s roles in shaping expatriation intentions. Metacognitive CQ and behavioral CQ have no effects. Mirroring calls for further research (Andresen & Margenfeld, 2015; McEvoy & Buller, 2013; Shaffer, Kraimer, Chen, & Bolino, 2012; Vance, 2005), our results also offer a nuanced understanding of CQ’s influences on expatriation intentions in different national settings.

2. Theoretical background

2.1. Cultural intelligence: concept and dimensionality

Earley and Ang’s (2003) concept of CQ is rooted in Sternberg’s (1999) theory of successful intelligence, according to which “... intelligence is the ability to achieve success in life, given one’s

personal standards, within one's sociocultural context" (Sternberg, 1999, p. 293). Based on the theory of multiple intelligences (Gardner, 1993; Sternberg, 1985), which encompasses different facets of intelligence, Earley and Ang (2003) suggested that CQ consists of four elements, namely cognitive, metacognitive, motivational, and behavioral CQ. Cultural intelligence builds on, and is related to, other intelligences, such as emotional intelligence (Salovey & Mayer, 1990), but focuses on the specific context of intercultural settings in which rules and norms for social interaction vary strongly. That is, while emotional intelligence may help individuals to successfully interact with others within a specific cultural context, it may be ineffective in another (Ang, Van Dyne, & Tan, 2011).

While research has proposed and empirically tested different operationalizations of the CQ construct (e.g., Alon, Boulanger, Meyers, & Taras, 2016; Thomas et al., 2015; Van Dyne et al., 2012), the vast majority of empirical studies rely on Ang et al.'s (2006) measurement scale (see also Ang et al., 2006; Ang & Van Dyne, 2008). This CQ scale closely follows Earley and Ang's (2003) conceptualization concerning the four dimensions that constitute CQ.

The first dimension, cognitive CQ, reflects an individual's knowledge of culture (Ang & Van Dyne, 2008). Based on their education and own experiences, individuals with high cognitive CQ develop a broad cultural knowledge and the skills to perform effectively in cross-cultural settings (Earley & Ang, 2003). Such individuals possess a broad knowledge base of other cultures' political and economic systems, languages, as well as the norms, values, and religious beliefs. Individuals with high cognitive CQ can assess the similarities in and differences between cultures (Brislin, Worthley, & Macnab, 2006).

The second dimension, metacognitive CQ, reflects an individual's mental capability to acquire and understand cultural knowledge (Ang & Van Dyne, 2008). Compared to cognitive CQ, metacognitive CQ refers to an individual's grasp of the process through which he or she effectively applies factual cultural knowledge in (new) cross-cultural situations. Individuals with high metacognitive CQ are aware of their cross-cultural knowledge. Such individuals constantly update their cultural knowledge based on their experiences and expand their knowledge through interactions with individuals from different cultural backgrounds and by reflecting on these interactions (Brislin et al., 2006; Triandis, 2006). Individuals' awareness and understanding of the process of remembering and connecting past and new cross-cultural experiences, as well as of existing and new information, enable them to reduce potential cultural misunderstandings, difficulties, struggles, and conflicts in cross-cultural situations.

The third dimension, motivational CQ, refers to an individual's drive and interest in adapting to cultural differences (Ang et al., 2006). Individuals with high motivational CQ are willing to apply their cultural knowledge, skills, and abilities to cross-cultural interactions and activities (Earley & Ang, 2003). While knowledge (cognitive CQ) and the understanding of how to use this knowledge (metacognitive CQ) are important factors, an individual must also be motivated to function effectively in cross-cultural situations (Earley, 2002).

Finally, the fourth dimension, behavioral CQ, reflects an individual's capability to provide appropriate verbal and non-verbal actions in culturally diverse interactions (Ang & Van Dyne, 2008). Understanding how to use cross-cultural intelligence and the motivation to use it is a necessary, but not sufficient requirement to cope with cross-cultural situations. Knowledge and motivation must also be reflected in an individual's de facto behavior. Individuals with high behavioral CQ are able and willing to appropriately change their verbal and non-verbal behaviors if a cross-

cultural situation requires such changes (Earley & Ang, 2003).

The national culture perspective (e.g., Hofstede, 2001; House, Hanges, Javidan, Dorfman, & Gupta, 2004) suggests (1) that cultural norms and values influence individuals' preferences, attitudes, and behaviors, (2) with the latter three varying across countries because cultural norms and values vary (Taras, Kirkman, & Steel, 2010). As a result, theoretical frameworks and concepts cannot be readily applied to different cultural contexts without limitation (Hofstede, 1993; 2001). Country-related differences may influence the theoretical foundations that underlie hypothesized relationships, as well as the measurement instruments that researchers use to assess the constructs that constitute a theory. To test theories related to the antecedents and consequences of CQ across cultures, there must be confidence that the underlying instruments used to operationalize a theory's constructs (i.e., CQ and its dimensions) are measured equally across countries (Riordan & Vandenberg, 1994). The assessment of measurement invariance in the CQ scale is important, because if the psychometric properties of the measurement instrument differ across cultures, comparisons of model estimates are highly problematic. Specifically, without measurement invariance, the identified similarities and differences may be an artifact of the measurement instrument's varying psychometric properties across cultures. Thus, measures that vary across cultures can result in wrong conclusions that may mislead researchers into believing that differences or similarities occurred where none exist.

Reasons for lacking measurement invariance are manifold. For instance, individuals from different cultures do not normally use the same conceptual frame of reference when responding to items (Riordan & Vandenberg, 1994). Further, differences in cultural norms and values may also result in different interpretations of a scale's anchor points, or in a different calibration of a rating scale's scores (Riordan & Vandenberg, 1994); for instance, the midpoint on a 7-point Likert scale does not necessarily have the same or a comparable meaning for individuals from different cultural backgrounds. Thus, before testing whether a theory is useful to describe or explain a phenomenon across different cultural contexts, researchers must ensure that the measurement theory and the underlying measurement instruments exhibit measurement invariance across cultural contexts.

2.2. Conceptual model

Our conceptual model considers the relationship between the CQ dimensions and expatriation intention, which refers to an individual's conscious plan to work (i.e., high expatriation intention) or to not work (i.e., low expatriation intention) as an expatriate in the future (e.g., Engle, Schlägel, Dimitriadi, Tatoglu, & Ljubica, 2015). Expatriates have become an important human resource for internationally active firms. Expatriates acquire, exchange, and transfer new knowledge while assigned to foreign subsidiaries. In this way, expatriates enable multinational firms to manage their foreign operations more successfully (e.g., Chang et al., 2012; Choi & Johanson, 2012; Fang, Jiang, Makino, & Beamish, 2010). While expatriation has become more important for corporations, multinational firms that rely on expatriates find it increasingly difficult to recruit internal or external candidates for these positions, or to newly assign former expatriates (Mol et al., 2009). Thus, identifying the factors that drive an individual's intentions to become an expatriate is of substantial interest for both management theory and practice. However, prior research has primarily focused on CQ's effects on various work-related outcomes, such as cross-cultural adjustment (e.g., Templer, Tay, & Chandrasekar, 2006; Wu & Ang, 2011) and expatriates' job performance (e.g., Ang et al., 2007; Lee & Sukoco, 2010), while little attention has been devoted to

researching the antecedents of expatriation behavior (e.g., Felker & Gianecchini, 2015; Vaiman et al., 2015).

Expatriates live and work in a foreign country and interact daily with the local nationals, as well as with other expatriates from different cultural backgrounds. Individuals who can interact effectively in such cross-cultural settings will more confidently interact successfully with others during a potential expatriation assignment and will therefore have a higher intention to work as an expatriate. This effect should hold for all four CQ dimensions (Fig. 1).

Owing to their education and experience, individuals with high cognitive CQ develop broad cultural knowledge and skills to effectively perform in cross-cultural settings (Earley & Ang, 2003). Such individuals possess broad knowledge bases regarding the political and economic systems in other cultures, their languages, as well as their norms, values, and religious beliefs. Individuals with high cognitive CQ are also better able to assess the similarities and differences between different cultures (Brislin et al., 2006). These individuals are likely to positively evaluate their cultural knowledge and language skills and may therefore be more inclined to work as an expatriate. Conversely, individuals with low cognitive CQ are likely to believe that they lack the cross-cultural competences deemed necessary to succeed during an expatriation assignment, ultimately resulting in a lower expatriation intention. We therefore propose that cognitive CQ is positively associated with the intention to work abroad as an expatriate. Thus:

Hypothesis 1. *Cognitive CQ is positively associated with expatriation intention.*

Metacognitive CQ refers to an individual's grasp of the process through which he or she applies factual cultural knowledge effectively in (new) cross-cultural situations. Individuals with high metacognitive CQ are aware of their cross-cultural knowledge; they constantly control the accuracy of their cultural knowledge and can adjust their knowledge bases in response to new information or to changes in the environment (Triandis, 2006). They update their cultural knowledge when necessary, based on their experience, and expand their knowledge through interactions with individuals from different cultural backgrounds and by reflecting on these interactions (Brislin et al., 2006). As individuals with high metacognitive CQ may assume that they can cope better with an expatriate position's demands (e.g., Lee & Sukoco, 2010; Templer et al., 2006), they should be more inclined to work as an expatriate. In contrast, individuals with low metacognitive CQ are likely to believe that they are unable to deal with the challenges of an international assignment, since they are less able to use and adjust their cultural knowledge; thus, their expatriation intention is lower. Therefore:

Hypothesis 2. *Metacognitive CQ is positively associated with expatriation intention.*

Individuals with high motivational CQ are willing to apply their cultural knowledge, skills, and abilities in cross-cultural interactions and activities (Earley & Ang, 2003). Such individuals are confident that they can cope with the stress associated with adjusting to a different cultural context. While knowledge (cognitive CQ) and the understanding of how to use this knowledge (metacognitive CQ) are important factors, individuals must also be motivated to use these skills—even under difficult and challenging circumstances—when they face cross-cultural problems (Earley, 2002). Individuals with a pronounced motivational CQ are more likely to believe that they possess the necessary motivation to use their cultural knowledge and skills to effectively respond to a demanding cross-cultural situation. Thus, these individuals are likely to exhibit a stronger expatriation intention—and vice versa.

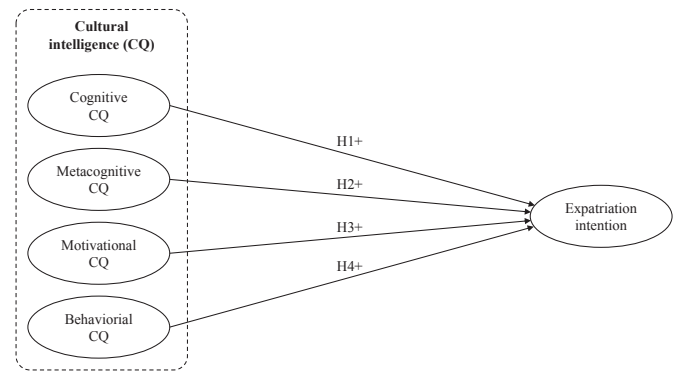


Fig. 1. Conceptual model.

Hence:

Hypothesis 3. *Motivational CQ is positively associated with expatriation intention.*

While cultural knowledge, understanding how to use this knowledge, and the motivation to use it are essential, these aspects are not sufficient to cope with cross-cultural situations. Knowledge and motivation must be reflected in an individual's de facto behavior, which the fourth CQ dimension, behavioral CQ, captures (Ang & Van Dyne, 2008). Individuals with high behavioral CQ appropriately change their verbal and non-verbal behaviors if a cross-cultural situation requires this (Earley & Ang, 2003). Such individuals are likely to expect few cultural conflicts in cross-cultural situations, as they have adapted to different cultural settings in the past and are likely to do so in the future. Thus, individuals with high behavioral CQ are likely to be more willing to work as an expatriate than those with low behavioral CQ. Thus:

Hypothesis 4. *Behavioral CQ is positively associated with expatriation intention.*

3. Analysis

3.1. Samples and measures

To explore national context's influence on the relationship between CQ and expatriation intention, our study follows Franke and Richey's (2010) recommendations. We consider data from five countries with different characteristics in terms of formal institutions (rules, laws, and regulations), as well as informal institutions (cultural norms and values) (Berry et al., 2010). We chose countries from the following distinct cultural clusters (Gupta, Hanges, & Dorfman, 2002; Ronen & Shenkar, 2013): Anglo (U.S.; $n = 210$), Confucian Asia (China; $n = 224$), Germanic Europe (Germany; $n = 300$), Latin Europe (France; $n = 213$), and the Near East (Turkey; $n = 178$). The five countries' institutional environments also differ on multiple dimensions (see Table A.2 in the Appendix).

In line with prior research on the determinants of individuals' expatriation intentions (e.g., Engle et al., 2015; Froese, Jommersbach, & Klautzsch, 2013; Lowe, Downes, & Kroeck, 1999; Mol et al., 2009; Remhof, Gunkel, & Schlaegel, 2014), we used business students as sampling units to ensure comparability across samples and with previous studies (e.g., Bello, Leung, Radebaugh, Tung, & Van Witteloostuijn, 2009; Tsui, Nifadkar, & Ou, 2007). Student samples are more homogenous than non-student samples (van de Vijver & Leung, 1997), and thus, reduce the impact of influencing factors other than national context, such as socio-economic status, education, work experience, and age. Further,

the development and emergence of business students' CQ are important, since they represent future managers who are likely to operate in an international context. This research focuses on students in early stages of vocational maturity before entering their working lives, because such a sample allows one to investigate occupational preferences at a time when students face important career decisions. Table 1 presents the sample characteristics.

In all the countries, the surveys were administered in a classroom setting to ensure equivalence and consistency in terms of the survey formats and the data collection procedures across the country samples (Leung, 2008). Bachelor and Master's students were asked to complete the paper-and-pencil questionnaire individually during a lecture. Study participation was voluntary (i.e., the participants received no incentives) and all the questionnaires were completed anonymously to ensure confidentiality. On average, less than 1% of the students across all the countries did not participate or turned in unusable questionnaires. One of the authors and four collaborators collected data within the same time period in each country. The percentage of missing data for all the items was below 3% across the five countries. Missing data were imputed with reference to the mean of that participant's answers to the construct's other items if no more than one item of a variable was missing. If more than one value was missing, the values were imputed with reference to the median score of all the individuals who responded to that particular item.

We measured CQ using Ang et al.'s (2006) 20-item, four-factor CQ scale, which many prior studies have also used—for an overview, see Bücken et al. (2015). We measured expatriation intention with three items adapted from Engle et al. (2015). Table A.3 in the Appendix offers a complete list of all the items included in the questionnaires. We developed the questionnaire in English and then translated it into Chinese, French, German, and Turkish. To ensure that the questionnaire items and response formats had equivalent meanings across the countries, we employed the translation and back-translation procedure (Brislin, 1970). Drawing on at least two translators per country who are fluent in both English and in that native language, the first translator translated the questionnaire from English into that country language. The second translator then translated the translated version back into English. The translated version was then compared to the original English version. We resolved any discrepancies via mutual agreement between the translators and one of the researchers. Pilot tests and short interviews with the respondents during these pretests reflected a clear understanding of what was being asked in each country. Appendix A.5 includes the original questionnaire items of the CQ construct, as well as the German, French, Turkish, and Chinese translations.

3.2. Model estimation and invariance assessment

To estimate the model relationships, we draw on PLS-SEM. PLS is a composite-based approach to SEM that relaxes the strong assumption that a common factor explains all the covariation between a block of indicators. That is, the method imposes no restrictions on the covariances between the same construct

indicators but instead forms composites as linear combinations of their respective indicators. These linear combinations then serve as proxies for the conceptual variables under investigation (e.g., Henseler et al., 2014). Recently, researchers have argued that modeling constructs as composites is a more realistic approach to measurement, since it explicitly considers the proxy nature of construct measures (Henseler et al., 2014; Rigdon, 2012; Sarstedt, Hair, et al., 2016). Further, we focus on predicting expatriation intention via the four CQ dimensions, which calls for the use of PLS-SEM as a prediction-oriented approach to SEM (Rigdon, 2012). Our analysis uses the SmartPLS 3 software to estimate the model parameters (Ringle, Wende, & Becker, 2015). In line with Hair et al. (2016) recommendations, we used path weighting, a maximum of 300 iterations, and a stop criterion of 10^{-7} in the PLS-SEM algorithm settings.

To assess measurement invariance, our analysis draws on Henseler et al.'s (2016) MICOM procedure, which involves three steps: (1) configural invariance (i.e., equal parameterization and way of estimation), (2) compositional invariance (i.e., equal indicator weights), and (3) the equality of composite mean values and variances.¹ If configural and compositional invariance are established, partial measurement invariance is confirmed, which allows one to compare the path coefficient estimates across the groups. In addition, if partial measurement invariance holds and the composites' mean values and variances are equal across the groups, full measurement invariance is confirmed, which supports the pooled data analysis.

Fig. 2 summarizes the sequence of analyses in a flowchart, merging qualitative assessments (e.g., translation and back-translation) with statistical tests (i.e., the MICOM procedure).

4. Results

4.1. Measurement model evaluation

Drawing on standard evaluation guidelines (e.g., Hair, Sarstedt, Pieper, et al., 2012; Hair, Sarstedt, Ringle, et al., 2012; Henseler, Ringle, & Sinkovics, 2009), our initial assessment of the measurement models focuses on the measures' internal consistency reliability, convergent validity, and discriminant validity. The results show considerable variability in the measures' reliability and validity (Table A.3 and A.4 in the Appendix). Most notably, in the sample from France, several indicators across all the CQ dimensions exhibit very low loadings, yielding AVE values well below the 0.50 threshold. For instance, the cognitive CQ and behavioral CQ dimensions exhibit AVE values of merely 0.310 and 0.207. The latter dimension's measures also lack internal consistency, as evidenced by the extremely low composite reliability value of 0.419. To rule out a potential misspecification of the measurement model (i.e., formative instead of reflective), which could yield such loading patterns, we ran Gudergan, Ringle, Wende, and Will's (2008) confirmatory tetrad analysis in PLS (CTA-PLS) on the model. The results show that none of the tetrads vanishes in any of the four CQ dimensions, supporting the original reflective measurement model specification.² In light of these results, we also ran consistent PLS (PLSc) on the data (Dijkstra & Henseler, 2015). PLSc is a modified version of Lohmöller's (1989) original PLS-SEM algorithm that

Table 1
Sample characteristics.

Characteristics	CN	FR	DE	TR	US
Age (mean)	24.9	21.4	23.6	24.3	20.9
Gender (percentage of females)	53.0	52.1	56.0	37.0	48.1
Number of foreign languages (median)	1.0	2.0	2.0	1.0	1.0
Number of visited countries (median)	1.0	5.0	8.0	2.0	3.0

Notes: CN = China, FR = France, DE = Germany, TR = Turkey, US = United States.

¹ To remain consistent with Henseler et al. (2016), we refer to composites in our invariance assessment when describing the entities that represent constructs in a PLS path model.

² We also ran the CTA-PLS procedure on the other country samples. The results univocally confirmed the original scale's reflective measurement model specification.

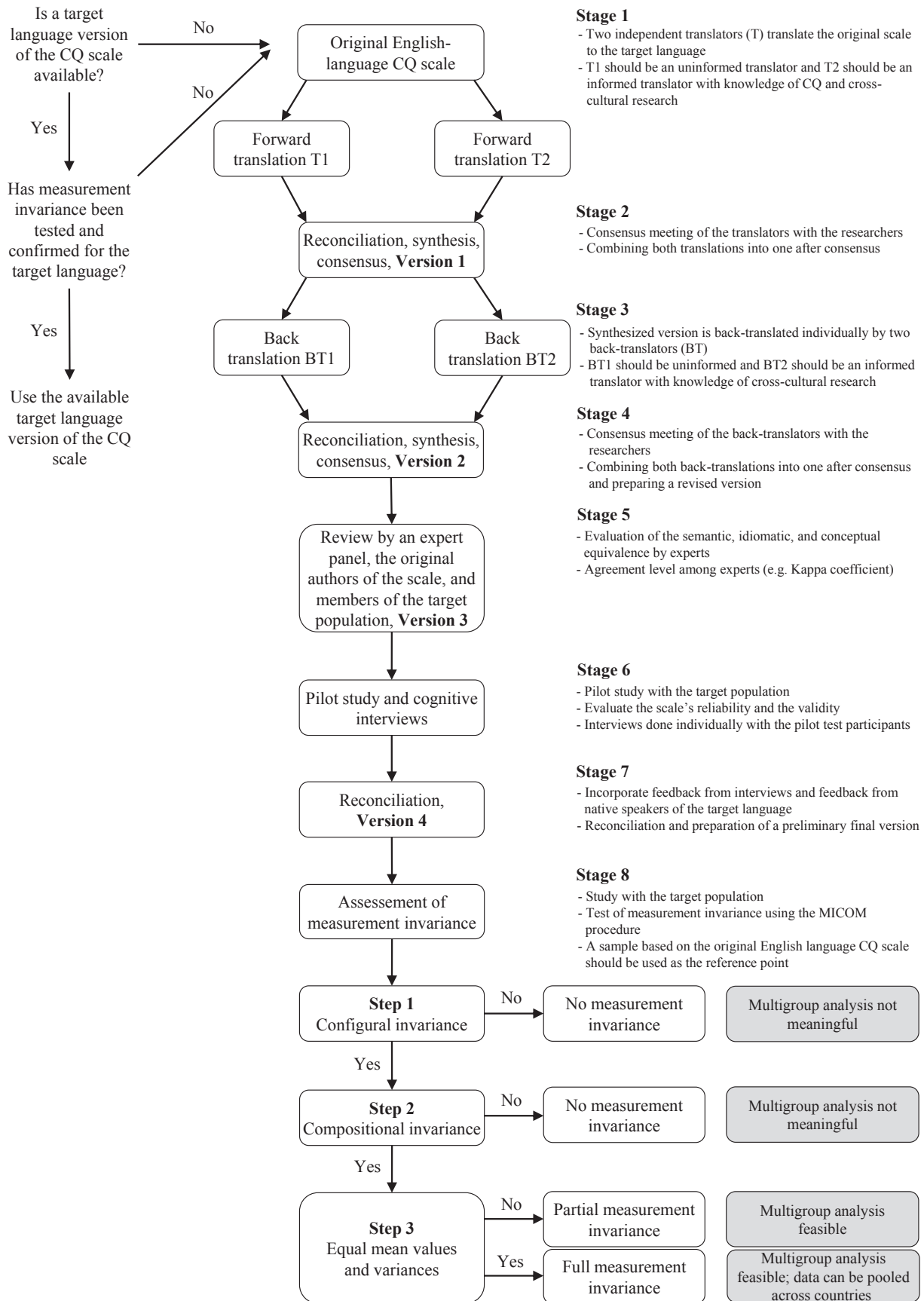


Fig. 2. Stages in the cultural adaptation process and steps in the test of measurement invariance.

produces model estimates that follow a common factor model approach to measurement. The PLS analysis also yields extremely low AVE values (e.g., 0.144 for the cognitive CQ dimension), thereby confirming the results of the PLS-SEM analysis. Eliminating items with particularly low loadings does not raise the measurement quality significantly without compromising the scale's content validity (e.g., Hair et al., 2016). For instance, four of the five items of the behavioral CQ dimension exhibit loadings of 0.305 and lower (Table A3); eliminating these items would leave a single item in this construct's measurement model. However, single items do not allow one to sufficiently capture a complex construct such as cognitive CQ (e.g., Sarstedt, Diamantopoulos, Salzberger, & Baumgartner, 2016; Sarstedt, Diamantopoulos, & Salzberger, 2016) and, from a predictive validity perspective, lag behind (e.g., Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). The latter aspect proves particularly problematic when using a variance-based approach to SEM, such as PLS (Hair et al., 2016). Similarly, when eliminating the two items with the lowest loadings in cognitive CQ's measurement model (0.152 and 0.266; Table A3), the resulting AVE of 0.446 still does not surpass the common threshold of 0.50. Thus, we must dismiss these measurement models and exclude the sample from France from further analysis.

Similar problems emerged with the sample from China, albeit to a lesser extent. While all the measures are internally consistent, three of the four CQ dimensions exhibited AVE values of below 0.50. The results from a complementary PLS analysis do not improve the AVE values significantly. For instance, the motivational CQ dimension has an AVE value of merely 0.306 in the PLS analysis. Even worse, the metacognitive and behavioral CQ dimensions do not exhibit discriminant validity—the corresponding 95% bias-corrected and accelerated (BCa) confidence interval of the heterotrait-monotrait (HTMT) ratio of correlations statistic (Henseler et al., 2016) includes 1. Eliminating single indicators in an effort to increase the monotrait-heteromethod correlations, or decrease the heterotrait-heteromethod correlations, does not resolve this discriminant validity problem. For instance, the item “I vary the rate of my speaking when a cross-cultural situation requires it” of the behavioral CQ construct exhibits heterotrait-heteromethod correlations of up to 0.614. Eliminating this item only marginally decreases the HTMT value between the metacognitive CQ and the behavioral CQ constructs from 0.992 to 0.980, still clearly indicating a lack of discriminant validity. Since merging the two constructs would violate the configural invariance requirements (Henseler et al., 2016), we disregard the sample from China from further analysis.

The analysis of the samples from Germany, Turkey, and the U.S. shows that the measurement models meet most of the assessment criteria. All the construct measures exhibit discriminant validity, the internal consistency values are consistently above 0.70, and most of the AVE values indicate sufficient convergent validity. However, similar to the samples from France and China, the AVE values of the cognitive CQ dimension of the samples from Germany, Turkey, and the U.S. are around 0.50 or lower. However, eliminating three cognitive CQ items (“I know the rules (e.g., vocabulary, grammar) of other languages,” “I know the marriage systems of other cultures,” and “I know the arts and crafts of other cultures”) increases the AVE value above the threshold without negatively affecting the measures' internal consistency reliability, while still covering relevant aspects from the concept domain. Thus, we eliminated these three items from all three countries' measurement models of cognitive CQ, yielding a reduced model with three items measuring the cognitive CQ dimension—all the other measurement models remain intact. Tables 2 and 3 illustrate the measurement evaluation results of the reduced model across the samples from Germany, Turkey, and the U.S.

Table 2
AVE and composite reliability values (reduced model).

Variable	AVE			Composite reliability		
	DE	TR	US	DE	TR	US
Expatriation intention	0.724	0.760	0.866	0.887	0.904	0.951
Metacognitive CQ	0.615	0.501	0.577	0.864	0.796	0.845
Cognitive CQ	0.598	0.597	0.533	0.817	0.816	0.771
Motivational CQ	0.564	0.559	0.558	0.864	0.863	0.862
Behavioral CQ	0.525	0.549	0.538	0.846	0.857	0.853

Notes: AVE = average variance extracted, DE = Germany, TR = Turkey, US = United States.

4.2. Measurement invariance assessment

Owing to the model adjustments in the previous step of the analysis, the PLS path models setups are equal across the three countries, which is a necessary requirement to establish configural invariance in step 1 of the MICOM procedure. Further, because our group-specific model estimations also draw on identical algorithm settings, configural invariance is established.

To test whether the composite scores are the same across the groups—despite possible differences in the weights (step 2)—we ran the permutation procedure with 1000 permutations and a 5% significance level for each combination of countries. To assess compositional invariance, we compared the original composite score correlations c with the empirical distribution of the composite score correlations resulting from the permutation procedure (c_u). If c exceeds the 5% quantile of c_u , compositional invariance is established. The results in Table 4 show that this only applies to the comparison between the samples from Turkey and the U.S. When comparing Germany to Turkey, the metacognitive CQ and motivational CQ dimensions violate the compositional invariance requirements. In addition, motivational and behavioral CQ's composite scores also differ significantly between the German and the U.S. samples, as evidenced by the 5% quantile of c_u exceeding the original composite correlation c . Therefore, partial measurement invariance is only established between Turkey and the U.S., thus allowing for a multigroup analysis that compares the path coefficients between the samples from these two countries to identify significant differences (Sarstedt, Henseler, & Ringle, 2011). We refrain from running a multigroup analysis of the other comparisons, and analyze the samples from each country separately.

Finally, we also test for full measurement invariance between the samples from Turkey and the U.S. by checking the equality of the composite mean values and variances, using the permutation test suggested by Henseler et al. (2016) (step 3 of the MICOM procedure). The results provide evidence of the measures' full invariance, as all the composite means and variances are equal across the samples from the two countries. Thus, we could also analyze the path model by using a pooled sample of Turkish and U.S. respondents. In this case, we had to account for potential structural model differences by specifying interaction effects, or running a latent class analysis (Hair et al., 2016). However, since we focus on cross-country comparisons, we did not pool the data, but analyzed country-specific effects.

4.3. Structural model assessment

Our structural model assessment initially checked for collinearity between the constructs. As all the VIF values were below the threshold of 5, we can conclude that collinearity is not an issue.

Table 3
Discriminant validity assessment results (reduced model).

Variable		Expatriation intention	Metacognitive CQ	Cognitive CQ	Motivational CQ
Metacognitive CQ	DE	[0.401; 0.651]			
	TR	[0.285; 0.583]			
	US	[0.176; 0.464]			
Cognitive CQ	DE	[0.359; 0.612]	[0.755; 0.944]		
	TR	[0.264; 0.574]	[0.434; 0.752]		
	US	[0.221; 0.543]	[0.485; 0.854]		
Motivational CQ	DE	[0.506; 0.716]	[0.821; 0.943]	[0.634; 0.847]	
	TR	[0.452; 0.733]	[0.749; 0.965]	[0.410; 0.735]	
	US	[0.442; 0.718]	[0.311; 0.616]	[0.269; 0.605]	
Behavioral CQ	DE	[0.199; 0.433]	[0.724; 0.885]	[0.461; 0.747]	[0.639; 0.843]
	TR	[0.281; 0.607]	[0.813; 0.998]	[0.375; 0.747]	[0.597; 0.867]
	US	[0.160; 0.459]	[0.636; 0.863]	[0.413; 0.739]	[0.420; 0.705]

Notes: The numbers in brackets are the 95% bias-corrected and accelerated confidence intervals of the HTMT statistic (Henseler, Ringle, & Sarstedt, 2015). Confidence intervals were derived from bootstrapping 5000 samples, using the no sign changes option. In each cell, the first bracket indicates the results for the sample from Germany (DE), the second bracket the sample from Turkey (TR), and the third bracket the sample from the United States (US).

Table 4
Compositional invariance assessment.

Variable	DE vs. TR		DE vs. US		TR vs. US	
	c	5% quantile of c_u	c	5% quantile of c_u	c	5% quantile of c_u
Expatriation intention	0.999	0.997	0.999	0.998	1.000	0.999
Metacognitive CQ	0.981	0.984	0.998	0.987	0.981	0.960
Cognitive CQ	0.999	0.975	0.983	0.974	0.990	0.954
Motivational CQ	0.991	0.992	0.985	0.993	0.995	0.992
Behavioral CQ	0.981	0.968	0.974	0.975	0.991	0.974

Notes: Violations of compositional invariance requirements (i.e., $c > 5\%$ quantile of c_u) are printed in bold.

Table 5
Results of the structural model assessment.

Variable	DE	TR	US	Difference (TR vs. US)	p value of difference
Metacognitive CQ	0.144	-0.051	0.080	-0.131	0.204
Cognitive CQ	0.089	0.121*	0.131*	-0.010	0.949
Motivational CQ	0.455***	0.414**	0.478**	-0.064	0.539
Behavioral CQ	-0.127	0.099	-0.039	0.138	0.152
R^2	0.303	0.261	0.301		
Q^2	0.200	0.189	0.248		
SRMR	0.063	0.056	0.065		

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Next, we assessed the PLS path model's predictive relevance by running the blindfolding procedure with an omission distance of 8. All the resulting cross-validated redundancy values Q^2 were above zero, supporting the model's predictive accuracy. This result was also supported by the R^2 values, which suggest that the model has satisfactory in-sample predictive power compared to prior research in this domain (e.g., Engle et al., 2015; Remhof et al., 2013, 2014). When analyzing the path coefficient estimates, we find that, in the samples from Turkey and the U.S., cognitive CQ exerts a significantly positive effect on expatriate intention, providing partial support for Hypothesis 1. Across all three countries, motivational CQ has by far the strongest effect on expatriation intention. This finding provides support for Hypothesis 3. In contrast, metacognitive CQ and behavioral CQ have no effects across the three countries. Thus, Hypotheses 2 and 4 are not supported. Finally, in light of the partial measurement invariance, we compared the samples from Turkey and the U.S. by means of a multigroup analysis (Sarstedt, Henseler, et al., 2011). The results of Chin and Dibbern's (2010) permutation test with 1000 permutations show that the path coefficient estimates are invariant across the samples from

Turkey and the U.S., since no significant differences emerge. Table 5 presents the structural model's results.

4.4. Robustness check: unobserved heterogeneity

Following prior research that highlights the need to check PLS path model estimates for unobserved heterogeneity (e.g., Becker, Rai, Ringle, & Vockner, 2013; Sarstedt & Ringle, 2010), we applied the finite mixture PLS (FIMIX-PLS) procedure (Hahn, Herrmann, Huber, & Johnson, 2002) to the data, using SmartPLS 3 software (Ringle et al., 2015). FIMIX-PLS is the most commonly used approach to latent class analyses in PLS-SEM (e.g., Ringle, Sarstedt, Schlittgen, & Taylor, 2013), and recent research has called for its routine application in PLS-SEM analyses (e.g., Hair, Ringle, & Sarstedt, 2012; Sarstedt, Ringle, Smith, Reams, & Hair, 2014). In light of the minimum sample size requirements to reliably estimate the model (Hair et al., 2016), our analysis considered a two-segment to four-segment solution (Sarstedt, Ringle, & Gudergan, 2016). The analysis drew on AIC₃ and CAIC, which have been shown to work well in a FIMIX-PLS context, to choose the number of segments (Sarstedt, Becker, Ringle, & Schwaiger, 2011). While across all three countries, AIC₃ and CAIC indicate a two-segment solution, the corresponding entropy values range between 0.20 and 0.30. This result indicates that the observations' probabilities of a two-segment membership oscillate around 0.50, suggesting fuzzy segment membership. Thus, the country-specific models represent the observations well (Rigdon, Ringle, & Sarstedt, 2010; Ringle, Sarstedt, & Mooi, 2010).

5. Discussion

5.1. Summary

Researchers have adopted Ang et al.'s (2006) CQ scale as one of the primary measures of cultural intelligence. Although research

has long acknowledged the need to establish equivalence in measurement prior to undertaking substantive cross-country or cross-cultural comparisons, few studies to date have assessed this scale's measurement invariance. While [Ang et al. \(2006\)](#), [Rosenblatt et al. \(2013\)](#), and [Varela and Gatlin-Watts \(2014\)](#) have assessed the scale's measurement invariance across time, only [Ang et al. \(2007\)](#) and [Bücker et al. \(2012\)](#) have tested for invariance across countries—a necessary requirement when pooling data across different countries, or cultures, and not only when engaging in cross-country or cross-cultural comparisons (e.g., [Steenkamp & Baumgartner, 1998](#); [Vandenberg & Lance, 2000](#)). Given that prior studies compared only two countries, our understanding of the scale's psychometric properties in terms of measurement invariance is very limited. Further, prior research univocally applied CB-SEM in the measurement invariance assessment, thereby following a common factor measurement philosophy. However, research has not yet examined the CQ scale's measurement invariance from a composite model perspective, which has gained prominence along with the increasing popularity of PLS-SEM across a variety of disciplines ([Hair, Sarstedt, Pieper, et al., 2012](#); [Hair, Sarstedt, Ringle, et al., 2012](#); [Richter et al., 2016](#); [Sarstedt et al., 2014](#)). Our study is the first to take a composite model perspective of measurement invariance assessment, highlighting the potential of [Henseler et al.'s \(2016\)](#) MICOM procedure for international business research. Overall, our assessment of the CQ scale gives rise to two primary concerns.

First, several of the CQ dimensions do not achieve adequate convergent validity and internal consistency reliability in the samples from France and China. Furthermore, in the sample from China, the metacognitive and behavioral CQ dimensions do not discriminate empirically. In light of this lack of discriminant validity, “researchers cannot be certain results confirming hypothesized structural paths are real or whether they are a result of statistical discrepancies” ([Farrell, 2010](#), p. 324). Additional analyses show that these extremely weak measurement model results cannot be attributed to a measurement misspecification and hold when using a consistent version of PLS (i.e., PLS_c), thereby assuming a common factor model approach to measurement. Even worse, any effort to modify the measurement models in order to achieve adequate validity levels would have had adverse consequences for the measure's content validity. [Bücker et al. \(2012\)](#) report similar findings in their measurement assessment of the CQ scale in a Chinese context, in which several items and construct measures had very low reliability levels. These authors also found a lack of discriminant validity between the four CQ dimensions. Concurring with [Bücker et al. \(2012\)](#), our findings suggest that the original CQ scale, as proposed by [Ang et al. \(2006\)](#), needs extensive adjustment in terms of the conceptualization, dimensionality, and choice of measurement items on a country-by-country basis. Simply merging CQ dimensions, or creating a higher-order construct in an effort to avoid discriminant validity problems—as proposed by [Bücker et al. \(2012\)](#)—is not reasonable, since such steps go against the original scale's conceptualization. When modifying the scale to fit these countries' contexts, researchers must keep in mind that any adjustments will conflict with configural invariance requirements, unless the resulting scale can be equally transferred to other countries such as Germany or the U.S.

Second, the evaluation of the samples from Germany, Turkey, and the U.S. disclosed problems with the cognitive CQ measures' convergent validity, which prompted the deletion of three items. The final—reduced—CQ model exhibits satisfactory measurement quality across Germany, Turkey, and the U.S., and fulfills configural invariance requirements as defined in [Henseler et al.'s \(2016\)](#) MICOM procedure. Further compositional invariance

assessment disclosed differences in two of the four CQ dimensions when comparing the samples from Germany and Turkey, as well as differences in one of the CQ dimensions when comparing samples from Germany and the U.S. Thus, partial measurement invariance was only established between the Turkish and U.S. samples.

Complementing the measurement validation perspective, this study also contributes to the increasing research on the determinants of expatriation intention. Extending prior research, which examined CQ's influence on the intention to work abroad in a single-country setting ([Remhof et al., 2013](#)), this study enhances our understanding of whether and to what extent different CQ dimensions influence expatriation intention across a set of countries. Specifically, in support of [Hypothesis 1](#), cognitive CQ positively affects expatriation intention, albeit only among Turkish and U.S. respondents. In support of [Hypothesis 3](#), we also found that the motivational CQ dimension is the primary driver of respondents' intention to work as an expatriate across Germany, Turkey, and the U.S. Finally, and contrary to [Hypotheses 2 and 4](#), we found that the metacognitive and behavioral CQ dimensions have no significant effect on expatriation intention.

5.2. Research implications

Our findings have implications for the CQ scale's use in cross-cultural research, since they highlight the problems associated with measuring CQ in, and comparing it across, different countries and cultures. Cultural intelligence, or at least certain dimensions of the construct (most notably, cognitive CQ), appear to be strongly culturally bound, with their interpretation rooted in or influenced by cultural norms, values, and beliefs. Cross-cultural differences in these norms, values, and beliefs substantially alter the meaning of words, phrases, or whole items of the construct. Even experts' careful translation and back-translation, together with extensive pilot testing of the construct items, cannot fully account for such differences. As a result, the different cultural groups might have interpreted the measures of the underlying CQ dimensions differently. Systematic differences in the response styles contribute further to these problems. For instance, respondents from France and China have different tendencies regarding agreeing with questions, regardless of their content ([Sarstedt & Mooi, 2014](#)). While limited research has explored why translated measures sometimes function differently across cultural contexts, researchers recently began to strongly emphasize that a translation-back-translation procedure is not sufficient to ensure measurement invariance (e.g., [Chidlow, Plakoyiannaki, & Welch, 2014](#); [Holden & Michailova, 2014](#); [Tsui et al., 2007](#)). Our findings echo these concerns and highlight the importance of a systematic evaluation of the psychometric properties underlying a measurement instrument before translating it into another language. The translation of a measurement instrument does not necessarily guarantee that respondents from a different cultural context interpret the meaning of items in the same way and that respondents refer to anchor points and scores of a measurement instrument in the same way across countries. Our study is just an initial step in the cross-cultural validation of the CQ scale, and more detailed analysis (including qualitative and quantitative assessments) is needed of the reasons for the lack of measurement invariance.

Our results casts doubt on efforts to establish a universal version of the CQ scale that can be applied to different cultures and countries without limitations. Adapting the construct measures to different cultural settings seems more appropriate. By identifying CQ items that are (in)variant across countries, our

results contribute to the recent discussion (e.g., [Buckley, Chapman, Clegg, & Gajewska-De Mattos, 2014](#); [Byrne, 2016](#); [He & van de Vijver, 2015](#)) on the etic-emic dilemma ([Berry, 1969](#); [Davidson, Jaccard, Triandis, Morales, & Diaz-Guerrero, 1976](#)) in cross-cultural and cross-country research. [Earley and Ang \(2003, p. 9\)](#) note that parts of CQ's cognitive aspects "... are universal, or etic, at a general level. At a culture-specific level, how each is defined may vary." Further, the authors state that when "... CQ is brought down to an individual, context-specific level, features are often emic" ([Earley & Ang, 2003, p. 66](#)). That is, while some items seem to be generalizable to other countries (i.e., etic), other items seem to be less consistent across countries (i.e., emic), suggesting that a combined emic-etic approach (e.g., [He & van de Vijver, 2015](#)) and contextualization of the measure ([Chidlow et al., 2014](#)) is needed to refine the CQ scale. As our understanding of the CQ construct develops, the items classified as etic could be used as a core item set, while emic items could be added, depending on the specific cultural context. Such a refined CQ scale would allow one to test measurement invariance and, at the same time, would account for country-specific and culture-specific differences, increasing the precision and meaningfulness of cross-cultural and cross-country comparisons. However, such an endeavor would have to surmount the challenge of classifying items as emic or etic, especially since "within most etic aspects of CQ lie emic aspects as well" ([Earley & Ang, 2003, p. 67](#)).

The results also call into question the measurement specification of some CQ dimensions. Even though, empirically, the CTA-PLS results clearly support a reflective measurement specification of all the dimensions across the five countries, conceptually, some dimensions, most notably cognitive CQ, should rather be specified formatively. Following [Bollen and Diamantopoulos's \(2016\)](#) guidelines, changes in the latent variable cognitive CQ (e.g., owing to a changing standard of comparison) do not necessarily entail a simultaneous change in the values of its indicators. Instead, changes in an indicator—such as language skills (e.g., owing to training)—are likely to change the value of the latent variable CQ. Similarly, following [Jarvis, Mackenzie, and Podsakoff \(2003\)](#), one can have a good knowledge of the economic systems of other countries without having good language skills. These considerations suggest that the cognitive CQ construct should rather be measured formatively, which could explain this dimension's poor measurement quality across the five countries. Future research should therefore reconsider the construct operationalizations from a formative measurement model perspective. However, such an endeavor necessitates revisiting the original item pool, or developing a new one, since prior item purifications may have deleted items that are conceptually necessary to validly measure the construct from a formative measurement model perspective ([Diamantopoulos & Sigauw, 2006](#)).

Our findings regarding the metacognitive and behavioral CQ dimensions' missing impacts suggest that these dimensions influence expatriation intention indirectly through more proximal (i.e., mediating) determinants, such as self-efficacy and perceived behavioral control (e.g., [Engle et al., 2015](#); [Remhof et al., 2014](#)). Thus, future research should go beyond the analysis of direct effects and should draw on intentional theoretical frameworks, such as the model of goal-directed behavior ([Perugini & Bagozzi, 2001](#)), to examine the underlying mechanisms that link individuals' CQ and their expatriation intentions. For instance, it would be particularly interesting to research the roles of emotions (e.g., [Tan, Härtel, Panipucci, & Strybosch, 2005](#)) and desires (e.g., [Tharenou, 2013](#)) in the formation of expatriate intentions.

While our findings open various avenues for further research, future studies should also address the study's limitations. First, our results are based on self-reported data and a cross-sectional study design, which limit inference on the causality of the relationships between the CQ dimensions and expatriation intentions. Given the cross-sectional design, we could not examine whether expatriation intention turns into actual behavior; that is, whether the participants actually started working as an expatriate—a limitation that is common to previous studies of expatriation intention (e.g., [Froese et al., 2013](#); [Mol et al., 2009](#); [Remhof et al., 2014](#)). Although individuals' behaviors may be determined by various factors, meta-analytic evidence shows that an individual's intention is one of the main determinants of de facto behaviors across a variety of domains ([Armitage & Conner, 2001](#))—including expatriation ([Tharenou, 2003](#)). Nonetheless, we encourage researchers to use a longitudinal research design to assess causality and to examine whether and to what extent the CQ dimensions explain de facto expatriation behaviors via expatriation intentions. Second, future research should go beyond the student sample and should consider individuals who currently work in an organization or have recently started working for an organization. Results from such research would further improve our understanding of CQ's role in shaping expatriation intentions. Third, in this study, we relied on a sample of five countries, covering 5 of the 11 cultural clusters identified by [Ronen and Shenkar \(2013\)](#). Future research should examine the CQ scale's measurement invariance across a larger number of countries and a larger number of cultural clusters. In doing so, researchers should provide the translated questionnaire items of the CQ construct in an [Appendix](#), thereby enabling future studies to reuse and refine the measures. When extending the focus to a larger set of countries, researchers should adjust the MICOM procedure to avoid any alpha inflation due to the large number of comparisons. Research has suggested a variety of approaches to maintain the familywise error rate in multiple comparisons, such as the Bonferroni adjustment, which can be readily transferred to the MICOM procedure. Future research should also test whether differences in sample sizes have a bearing on the MICOM procedure results. While [Henseler et al.'s \(2016\)](#) initial study on the MICOM procedure offers no indications in this regard, [Chin and Dibbern's \(2010\)](#) assessment of the permutation procedure in the context of multigroup analysis suggests that pronounced differences in group-specific sample sizes have adverse consequences for the test's statistical power. Thus, future research should systematically assess the MICOM procedure's performance for different sample size constellations. Finally, future research should extend our study by assessing the measurement invariance of alternative CQ operationalizations and related concepts (e.g., [Alon et al., 2016](#); [Thomas et al., 2015](#); [Van Dyne et al., 2012](#)).

5.3. Managerial implications

While the nature of our sample (university students) limits the generalizability of our findings, our results uncover an association between CQ and expatriation intention that has valuable implications for practice. Complementing prior research that highlights CQ's effect on the general adjustment, cultural adjustment, interaction adjustment, and work adjustment of employees (e.g., [Huff, 2013](#); [Malek & Budhwar, 2013](#); [Ramalu et al., 2010](#); [Van Dyne et al., 2008](#)), our results suggest that organizations should improve their recruitment efforts to test for applicants' CQ ([Ng, Van Dyne, & Ang, 2009](#)). The CQ scale offers a means to select adequate candidates for positions (1) that require high interaction with individuals from other countries, (2) that

include frequent international travel, or (3) for which an expatriation period is planned.

Our results also suggest that organizations seeking to enhance their workforce's expatriation intentions should help their employees to develop CQ. Prior research provides insights into various intervention strategies on how to effectively influence CQ through foreign language courses, the support of formal educational programs (e.g., an MBA) in foreign countries, as well as through training, workshops, and other learning opportunities (e.g., Alon & Higgins, 2005; Earley & Peterson, 2004). Organizations that proactively seek to increase the expatriation intention of their current employees, new hires, and potential future job applicants could use their questionnaire responses to make evidence-based decisions on appropriate interventions to increase their CQ and, ultimately, their expatriation intention. Given individuals' decreasing interest in accepting an expatriate position (e.g., Harvey, Napier, & Moeller, 2011), such tailored interventions may be more effective in improving CQ than standard intervention programs.

6. Conclusion

We have assessed the measurement invariance of Ang et al.'s (2006) four-dimensional CQ scale across five countries employing a composite model approach to predict expatriation intentions. The PLS-SEM-based MICOM procedure results suggest that the CQ scale's dimensionality is not equal across all the countries, indicating the most commonly used measure of CQ lacks measurement invariance. Further analysis reveals an item set that is invariant across Germany, Turkey, and the U.S. Jointly, these results suggest that researchers should be cautious when comparing the results of cross-country and cross-cultural research.

Appendix

Table A.1 Overview of studies that have assessed measurement invariance in CQ measures

Study	Sample characteristics	Measurement invariance focus	Results of measurement invariance assessment
Ang et al. (2006)	204 students (Singapore)	Time (longitudinal study)	- Configural, metric, and scalar invariance
Ang et al. (2007)	784 students (447 Singaporean students and 337 American students)	Two countries	- Configural, metric, and covariance invariance
Bücker et al. (2012)	607 (299 Dutch and 308 Chinese students)	Two countries	- The four-dimensional model does not fit the data - Invariance for two dimensional CQ model (partial metric and scalar invariance)

Table A.1 (continued)

Study	Sample characteristics	Measurement invariance focus	Results of measurement invariance assessment
Klafehn, Li, & Chiu (2013)	412 students (206 participants and 206 peers; mainly US)	Participants vs. peers	- Configural, metric, and scalar invariance
Rosenblatt et al. (2013)	212 management students and professionals (mixed nationality)	Time (longitudinal study)	- Configural, metric, and partial scalar invariance
Thomas et al. (2015)*	3526 participants form five language groups (English = 2091, French = 496, Indonesian = 543, Turkish = 153, traditional Chinese = 243)	Five language groups	- Configural and metric invariance model for first-order factors and the second-order construct
Varela & Gatlin-Watts (2014)	84 students (US)	Time (longitudinal study)	- Configural and metric invariance

Notes: *Thomas et al. (2015) have developed a three-dimensional model (knowledge, skills, metacognition) of cultural intelligence (10 items) with a similar, but different, wording of items compared to the 20-item CQ scale (Ang et al., 2006).

Table A.2 Country characteristics

Characteristic	CN	FR	DE	TR	US
Informal institutional environment					
Individualism/collectivism	20	71	67	37	91
Long/short-term orientation	87	39	31	46	29
Masculinity/femininity	66	43	66	45	62
Power distance	80	68	35	66	40
Uncertainty avoidance	30	86	65	85	46
Formal institutional environment (2014)					
Rule of law	0.45	0.74	0.80	0.50	0.71
Political stability	-0.62	0.36	0.93	-1.06	0.62
Freedom rating	6.50	1.00	1.00	3.50	1.00
Democracy index	3.00	8.04	8.64	5.12	8.11
Corruption perception index	36.00	69.00	79.00	45.00	74.00
Freedom of the press index	72.91	21.89	10.23	45.87	23.49

Notes: CN = China, FR = France, DE = Germany, TR = Turkey, US = United States. The informal institutional environment is represented by Hofstede's (2001, 2016) five cultural value dimensions. The freedom rating (Freedom House, 2016a) evaluates a country by political rights and civil rights, with 1 representing the most free and 7 representing the least free. The democracy index (The Economist, 2016) measures the state of democracy on a scale from 1, an authoritarian regime, to 10, a full democracy. A high freedom of the press index (Freedom House, 2016b) indicates that the press is not free, while a low index indicates that it is free. The corruption perception index (Transparency International, 2016) indicates a country's corruption in its public sector, ranging from 0, highly corrupt, to 100, very honest. The rule of law index (World Justice Project, 2016) is a subjective indicator of how the general public experiences the rule of law. This index includes, among other factors, indicators that measure the absence of corruption, fundamental rights, and regulatory enforcement. A high rule of law score indicates a strong performer in these categories, whereas a low score indicates a weak performer. The political stability index (The World Bank, 2016) is a measure of the level of political stability in a country, ranging from -2.5, weak political stability, to 2.5, strong political stability.

Table A.3
Reliability and convergent validity assessment (full model)

Construct item	Item reliability					AVE					CR				
	CN	FR	DE	TR	US	CN	FR	DE	TR	US	CN	FR	DE	TR	US
Expatriation intention															
To what extent have you considered working in a foreign country?	0.931	0.941	0.844	0.885	0.940	0.810	0.905	0.724	0.760	0.866	0.977	0.966	0.887	0.904	0.951
To what extent have you prepared yourself to accept a job in a foreign country?	0.882	0.956	0.859	0.905	0.914										
To what extent is it likely that you will accept a job in a foreign country if offered in the next five years?	0.887	0.955	0.850	0.822	0.939										
Metacognitive CQ															
I am conscious of the cultural knowledge I use when interacting with people with different cultural backgrounds.	0.623	0.764	0.797	0.519	0.740	0.514	0.448	0.615	0.501	0.577	0.804	0.739	0.864	0.796	0.845
I adjust my cultural knowledge as I interact with people from a culture that is unfamiliar to me.	0.557	0.769	0.760	0.722	0.792										
I am conscious of the cultural knowledge I apply to cross-cultural interactions.	0.853	0.757	0.851	0.846	0.799										
I check the accuracy of my cultural knowledge as I interact with people from different cultures.	0.794	0.210	0.725	0.705	0.705										
Cognitive CQ															
I know the legal and economic systems of other countries.	0.702	0.152	0.684	0.625	0.594	0.482	0.310	0.501	0.459	0.396	0.847	0.694	0.857	0.835	0.795
I know the rules (e.g., vocabulary, grammar) of other languages.	0.589	0.733	0.625	0.601	0.641										
I know the cultural values and religious beliefs of other cultures.	0.685	0.699	0.730	0.709	0.630										
I know the marriage systems of other cultures.	0.706	0.606	0.769	0.653	0.587										
I know the arts and crafts of other countries.	0.727	0.266	0.717	0.698	0.523										
I know the rules for expressing nonverbal behaviors in other cultures.	0.745	0.610	0.713	0.764	0.773										
Motivational CQ															
I enjoy interacting with people from different cultures.	0.624	0.766	0.856	0.656	0.671	0.450	0.490	0.564	0.559	0.558	0.803	0.824	0.864	0.863	0.862
I am confident that I can socialize with locals in a culture that is unfamiliar to me.	0.750	0.728	0.658	0.781	0.701										
I am sure I can deal with stresses of adjusting to a culture that is new to me.	0.639	0.668	0.757	0.733	0.802										
I enjoy living in cultures that are unfamiliar to me.	0.668	0.807	0.825	0.789	0.846										
I am confident that I can get accustomed to the shopping conditions in a different culture.	0.666	0.487	0.631	0.769	0.669										
Behavioral CQ															
I change my verbal behavior (e.g., accent, tone) when a cross-cultural interaction requires it.	0.576	0.914	0.762	0.652	0.665	0.484	0.207	0.525	0.549	0.538	0.822	0.419	0.846	0.857	0.853
I use pause and silence differently to suit different cross-cultural situations.	0.763	0.247	0.646	0.617	0.774										
I vary the rate of my speaking when a cross-cultural situation requires it.	0.796	0.210	0.741	0.777	0.744										
I change my nonverbal behavior when a cross-cultural situation requires it.	0.726	0.305	0.822	0.819	0.731										
I alter my facial expressions when a cross-cultural situation requires it.	0.588	0.016	0.635	0.816	0.748										

Notes: CR = composite reliability, AVE = average variance extracted, CN = China, FR = France, DE = Germany, TR = Turkey, US = United States.

Table A.4
Discriminant validity assessment (full model)

Variable		Expatriation intention	Metacognitive CQ	Cognitive CQ	Motivational CQ
Metacognitive CQ	CN	[0.093; 0.327]			
	FR	[0.009; 0.155]			
	DE	[0.421; 0.654]			
	TR	[0.261; 0.569]			
	US	[0.170; 0.466]			
Cognitive CQ	CN	[0.261; 0.547]	[0.390; 0.645]		
	FR	[0.028; 0.117]	[0.060; 0.242]		
	DE	[0.413; 0.615]	[0.695; 0.862]		
	TR	[0.284; 0.540]	[0.483; 0.772]		
	US	[0.221; 0.521]	[0.435; 0.787]		
Motivational CQ	CN	[0.207; 0.482]		[0.428; 0.694]	
	FR	[0.005; 0.369]	[0.013; 0.398]	[0.062; 0.278]	
	DE	[0.524; 0.728]	[0.829; 0.946]	[0.524; 0.728]	
	TR	[0.425; 0.719]	[0.745; 0.963]	[0.515; 0.773]	
	US	[0.454; 0.747]	[0.290; 0.591]	[0.311; 0.608]	
Behavioral CQ	CN	[0.100; 0.309]	[0.911; 1.079]	[0.302; 0.566]	[0.575; 0.864]
	FR	[0.034; 0.070]	[0.011; 0.487]	[0.194; 0.351]	[0.007; 0.441]
	DE	[0.213; 0.455]	[0.721; 0.883]	[0.381; 0.667]	[0.618; 0.843]
	TR	[0.250; 0.563]	[0.814; 0.998]	[0.498; 0.763]	[0.597; 0.858]
	US	[0.181; 0.474]	[0.625; 0.856]	[0.486; 0.781]	[0.421; 0.737]

Notes: Numbers in brackets are the 95% bias-corrected and accelerated confidence intervals of the HTMT values. Confidence intervals were derived from bootstrapping 5000 samples, using the no sign changes option. In each cell, the first bracket indicates the results of the sample from China (CN), the second bracket the sample from France (FR), the third bracket the sample from Germany (DE), the fourth bracket the sample from Turkey (TR), and the fifth bracket the sample from the United States (US).

Appendix A.5

English CQ scale

Meta-cognitive CQ

1. I am conscious of the cultural knowledge I use when interacting with people with different cultural backgrounds.
2. I adjust my cultural knowledge as I interact with people from a culture that is unfamiliar to me.
3. I am conscious of the cultural knowledge I apply to cross-cultural interactions.
4. I check the accuracy of my cultural knowledge as I interact with people from different cultures.

Cognitive CQ

1. I know the legal and economic systems of other cultures.
2. I know the rules (e.g., vocabulary, grammar) of other languages.
3. I know the cultural values and religious beliefs of other cultures.
4. I know the marriage systems of other cultures.
5. I know the arts and crafts of other cultures.
6. I know the rules for expressing non-verbal behaviors in other cultures.

Motivational CQ

1. I enjoy interacting with people from different cultures.
2. I am confident that I can socialize with locals in a culture that is unfamiliar to me.
3. I am sure I can deal with the stresses of adjusting to a culture that is new to me.
4. I enjoy living in cultures that are unfamiliar to me.
5. I am confident that I can get accustomed to the shopping conditions in a different culture.

Behavioral CQ

1. I change my verbal behavior (e.g., accent, tone) when a cross-cultural interaction requires it.
2. I use pause and silence differently to suit different cross-cultural situations.
3. I vary the rate of my speaking when a cross-cultural situation requires it.
4. I change my non-verbal behavior when a cross-cultural situation requires it.
5. I alter my facial expressions when a cross-cultural interaction requires it.

German CQ scale

Meta-cognitive CQ

1. Ich bin mir des Wissens über andere Kulturen bewusst, dass ich im Umgang mit Personen verschiedener kultureller Hintergründe anwende.
2. Ich passe mein Wissen über andere Kulturen an, wenn ich mit Personen fremder Kulturen umgehe.
3. Ich bin mir des Wissens über andere Kulturen bewusst, dass ich im interkulturellen Umgang anwende.
4. Ich überprüfe die Genauigkeit meines Wissens über andere Kulturen, wenn ich mit Personen verschiedener Kulturen umgehe.

Cognitive CQ

1. Ich kenne die Rechts- und Wirtschaftssysteme anderer Kulturen.
2. Ich kenne die Regeln (z.B. Vokabular, Grammatik) anderer Sprachen.
3. Ich kenne kulturelle Werte und religiöse Glaubensrichtungen anderer Kulturen.
4. Ich kenne die Hochzeitstraditionen anderer Kulturen.
5. Ich kenne die Kunst und das Kunsthandwerk anderer Kulturen.
6. Ich kenne die Regeln für den Ausdruck non-verbaler Verhaltens in anderen Kulturen.

Motivational CQ

1. Ich geniee den Umgang mit Personen verschiedener Kulturen.
2. Ich bin uberzeugt, dass ich mit Ortsansassigen einer mir unbekanntem Kultur umgehen kann.
3. Ich bin mir sicher, dass ich mit den Belastungen umgehen kann, die durch die Anpassung an eine neue Kultur entstehen.
4. Ich geniee es, in mir unbekanntem Kulturen zu leben.
5. Ich bin uberzeugt, dass ich mich an die Einkaufsgegebenheiten einer anderen Kultur gewohnen kann.

Behavioral CQ

1. Ich verandere mein verbales Verhalten (z. B. Akzent, Tonfall), wenn ein interkultureller Umgang dies erfordert.
2. Ich verwende Pausen und Schweigen unterschiedlich, um mich an verschiedene interkulturelle Situationen anzupassen.
3. Ich verandere meine Sprechgeschwindigkeit, wenn eine interkulturelle Situation dies erfordert.
4. Ich verandere mein nonverbales Verhalten, wenn eine interkulturelle Situation dies erfordert.
5. Ich verandere meine Mimik, wenn eine interkulturelle Situation dies erfordert.

*French CQ scale**Meta-cognitive CQ*

1. Je suis conscient(e) des connaissances culturelles que j'utilise lorsque j'interagis avec des personnes de cultures differentes (=interaction interculturelle).
2. J'adapte mes connaissances culturelles lorsque j'interagis avec des personnes dont la culture ne m'est pas familiere.
3. Je suis conscient(e) des connaissances culturelles que je mobilise lors d'interactions interculturelles.
4. Je verifie l'exactitude de mes connaissances culturelles quand j'interagis avec des personnes de cultures differentes.

Cognitive CQ

1. Je connais les systemes economiques et juridiques d'autres cultures.
2. Je connais les regles (ex. vocabulaire, grammaire) d'autres langues.
3. Je connais les valeurs culturelles et les croyances religieuses d'autres cultures.
4. Je connais les systemes de mariage d'autres cultures.
5. Je connais l'art et l'artisanat d'art d'autres cultures.
6. Je connais les regles pour exprimer des comportements non-verbaux dans d'autres cultures.

Motivational CQ

1. J'aime l'interaction avec des personnes venant de differentes cultures.
2. Je suis confiant(e) dans ma capacite  socialiser avec des personnes locales dans une culture qui ne m'est pas familiere.
3. Je suis sur(e) d'etre capable de gerer le stress lie  l'adaptation  une culture nouvelle pour moi.
4. J'aime vivre dans des cultures qui ne me sont pas familieres.
5. Je suis confiant(e) dans ma capacite  m'habituer  la maniere de faire des achats dans une culture differente.

Behavioral CQ

1. J'adapte ma communication verbale (ex: accent, ton) quand l'interaction interculturelle le demande.
2. Je nuance mes pauses et mes silences afin de m'adapter  diverses situations interculturelles.
3. J'adapte mon debit de parole quand la situation interculturelle le demande.
4. Je change mon comportement non-verbal (attitudes, gestes, etc.) quand une situation interculturelle le demande.
5. J'adapte l'expression de mon visage si une situation interculturelle le demande.

*Turkish CQ scale**Meta-cognitive CQ*

1. Farklı kultrel gecmii olan kiilerle birlikteyken kullandığım kultrel bilginin farkındayım.
2. Alıkın olmadığım kultrden birileriyle etkileime getiğimde kultrel bilgimi duruma uygun olarak kullanırım.
3. Kultrlerarası etkileimlerde kullandığım kultrel bilginin farkındayım.
4. Farklı kultrlerden birileriyle etkileim halindeyken kultrel bilgimin doğruluğuna dikkat ederim.

Cognitive CQ

1. Baka kultrlerin yasal ve ekonomik sistemleri hakkında bilgi sahibiyim.
2. Baka dillerin kurallarını (kelime, gramer vb.) bilirim.
3. Baka kultrlerin değerlerini ve dini inanlarını hakkında bilgi sahibiyim.
4. Baka kultrlerin evlilik sistemleri hakkında bilgi sahibiyim.
5. Baka kultrlerin el sanatları hakkında bilgi sahibiyim.
6. Baka kultrdeki jest, mimik vb. sozel olmayan davranılarının sergileme kurallarını bilirim.

Motivational CQ

1. Baka kultrlerden insanlarla bir arada olmaktan holanırım.
2. Alıkın olmadığım bir kultrde yerel insanlarla kaynaabileceğime eminim.
3. Benim iin yeni olan bir kultre uyum sađlamada karılaacađım gulklerle baa ıkacađıma eminim.
4. Alıkın olmadığım kultrlerde yaamaktan holanırım.
5. Farklı bir kultrdeki alıveri yapma kurallarına alıabileceğime eminim.

Behavioral CQ

1. Sozel davranılarımı (ses tonu, aksan vb.) kultrlerarası iletiimin gereklerine gore ayarlarım.
2. Konuurken tonlama ve duraksamayı, kultrlerarası duruma uygun olarak deđiik bir Őekillerde kullanırım.
3. Konuma biimimi kultrlerarası iletiimin gereklerine gore ayarlarım.
4. Kultrlerarası iletiimde ne kadar gerekliyse sozel olmayan davranılarımı ona gore ayarlarım.
5. Yuz ifademi kultrlerarası iletiimin gereklerine gore deđitiririm.

Chinese CQ scale

Meta-cognitive CQ

1. 当我与不同文化背景的人交往时，我会注意我所使用的文化知识。
2. 当我与对我来说是来自陌生文化背景的人交往时，我会校正我的文化知识。
3. 在跨文化交流时，我会注意我所使用的文化知识。
4. 我与不同文化背景的人交往时，我会确认我对其相关文化认知的准确。

Cognitive CQ

1. 我了解其他文化的法律和经济体系。
2. 我了解其他语言的规则，比如词汇、语法。
3. 我了解其他文化的文化价值观和宗教信仰。
4. 我了解其他文化的婚姻体制。
5. 我了解其他文化的工艺和艺术作品。
6. 我知道其他文化的行为举止所表达的含义。

Motivational CQ

1. 我喜欢与不同文化的人交流。
2. 我有信心，可以在陌生的文化环境下，很好的与当地人进行社交。
3. 当我适应一个崭新的文化环境时，我确信可以应对来自其中的压力。
4. 我享受生活在陌生的文化环境中。
5. 我确信我可以适应不同文化下的购物环境。

Behavioral CQ

1. 当跨文化交流需要时，我会改变我的语言表达，比如口音、语调。
2. 我会使用不同的停顿或沉默来适应不同的文化交流场合。
3. 当跨文化情景需要时，我会改变我的讲话速度。
4. 当跨文化情景需要时，我会改变我的非语言行为。
5. 当跨文化交流需要时，我会改变我的面部表达方式。

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