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Measuring Consumer Cultural Intelligence and Customer Satisfaction through AI Chatbot Service with the Mediating Role of Communication: Evidence from Shopee Users in Malaysia

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Abstract

This study investigates the relationship between four dimensions of CQ (metacognitive, cognitive, motivational, and behavioral) and satisfaction with the communication of Shopee's AI chatbots, as well as whether such relationships are statistically explained by the perception of the quality of communication. CQ in a multi-ethnic market, like Malaysia, in customers' encounters with chatbots has been under-researched. The subjects were recruited using purposive and snowball sampling to yield 196 valid responses from Malaysian consumers aged 18 to 24 who used Shopee's chatbot or in-app virtual customer service in the last six months and were sampled quantitatively in a cross-sectional design. There were 35 items on a Likert scale, which measured six constructs, and the data were analyzed using reliability analysis, Pearson correlation, multiple regression, and Sobel tests in SPSS. All constructs were reliable (α = .803–.852). The four CQ dimensions accounted for 58.0% of the variance in satisfaction, with motivational (β = .383), metacognitive (β = .357), behavioral (β = .162), and cognitive (β = .130) CQ having the largest standardized beta coefficients. The quality of communication was strongly correlated with satisfaction (r = .714), and Sobel tests were significant for all four dimensions of CQ (all between Z = 5.71 and 6.31, p < .001), with bootstrap confidence intervals excluding zero and direct effects remaining significant (partial mediation). The construct with the lowest score (M = 2.96) was Satisfaction (M = 2.96), while CQ means ranged between 3.68 and 4.22. The results bring CQ to human-AI service interactions and call for platforms to design for CQ. Since this information is cross-sectional and self-reported, these findings suggest associations, not causal relationships.

Keywords: Cultural Intelligence, AI Chatbot, Communication Quality, Customer Satisfaction, Shopee

Introduction

AI chatbots have evolved into a standard first line of defense in eCommerce customer service. They respond to questions regarding product and delivery, guide customers through the return/replacement process, and handle service-related concerns after hours and in volume that no human team could and would manage. (Huang & Rust, 2021). The reasons why they rely on a chatbot and their expectations influence their experience with them (Følstad & Skjuve, 2019); the quality of the information and quality of the service they perceive influence their satisfaction with the chatbot service (Ashfaq et al., 2020). Chung et al. (2020) showed that the elements of interaction, entertainment, trendiness, customisation and problem solving received attention from customers in e-service delivery by chatbots. Shopee is one of the giant eCommerce platforms in Malaysia that offers its users an in-app chatbot and virtual CS in which they can track their orders, raise complaints, and request refunds, making it a perfect environment to explore customer perceptions of automated service. The Malaysian market is also culturally and linguistically diverse, meaning that a single standardised chatbot can't possibly be the solution – cultural capability is most likely to make a difference when interacting with diverse customers.

An automated reply is not a guarantee of a good user experience. While miscommunication reduces customers' intention to adopt CS chatbots, the perception and adoption of CS chatbots that ask for clarification is no less than that of CS chatbots that do not make any mistakes (Sheehan et al., 2020). Also, expectations play a role, as did when expectations of the chatbot's effectiveness before the interaction were not fulfilled, leading to lower satisfaction from the chatbots, both when they were angry and when they were not (Crolic et al., 2022), as per the expectation–disconfirmation satisfaction theory (Oliver, 1980). The message can also be interpreted differently by the customers. Customers may have different expectations of what is meant by a clear, polite, and appropriately worded response due to Malaysia's ethnic diversity: 70.7% Malaysian citizens from the Bumiputera community, 22.0% from the Chinese community, 6.5% from the Indian community, and 0.8% from other communities (Department of Statistics Malaysia [DOSM], 2026). The length of time the response is delivered or not delivered can be equally significant as the response is relevant, clear, and understood, as seen by the person using the chatbot.

The existing studies have also looked at the service quality and satisfaction of the service of the chatbot (Ashfaq et al., 2020; Chung et al., 2020), miscommunication and anthropomorphic perceptions in intercultural service encounters with human frontline service providers (Crolic et al., 2022; Sheehan et al., 2020), and the cultural intelligence of the human frontline service providers (Costers et al., 2019; Paparoidamis et al., 2019) and among the customers (Sharma et al., 2009) in intercultural service encounters with a chatbot. It is not yet understood whether customers' own cultural intelligence is associated with their satisfaction when the service partner is a chatbot, or whether perceived quality of communication helps explain this association. While a chatbot doesn't have a culture of its own, there are cultural characteristics in its responses, such as language, formality, and politeness, which customers need to understand and react to. The Literature Review introduces the rationale for why the topic of Customer CQ is important for this task and what the difference is between Customer CQ and Communication quality. Studying each of the four CQ dimensions individually expands the utility of the CQ dimensions since each of these dimensions was shown to predict a different outcome in the original validation work (Ang et

al., 2007), and a single composite could mask the importance of which capabilities; adding communication quality links one customer capability to a customer-perceived property of the communication. To the best of our knowledge, this is the first study to measure the four CQ dimensions and to link them to satisfaction with an AI chatbot using communication quality as the intervening variable. No such study could be found by making web searches on 18 October 2026 that combined cultural intelligence, chatbot or virtual assistant, communication quality, and customer satisfaction.

The study pursues the following objectives and research questions.

Research Objectives

- RO1: To examine the relationship between metacognitive CQ and customer satisfaction with AI chatbots.
- RO2: To examine the relationship between cognitive CQ and customer satisfaction with AI chatbots.
- RO3: To examine the relationship between motivational CQ and customer satisfaction with AI chatbots.
- RO4: To examine the relationship between behavioural CQ and customer satisfaction with AI chatbots.
- RO5: To determine the mediating effect of communication quality in the relationship between metacognitive CQ and customer satisfaction.
- RO6: To determine the mediating effect of communication quality in the relationship between cognitive CQ and customer satisfaction.
- RO7: To determine the mediating effect of communication quality in the relationship between motivational CQ and customer satisfaction.
- RO8: To determine the mediating effect of communication quality in the relationship between behavioural CQ and customer satisfaction.

Research Questions

- RQ1: What is the relationship between metacognitive CQ and customer satisfaction with AI chatbots?
- RQ2: What is the relationship between cognitive CQ and customer satisfaction with AI chatbots?
- RQ3: What is the relationship between motivational CQ and customer satisfaction with AI chatbots?
- RQ4: What is the relationship between behavioural CQ and customer satisfaction with AI chatbots?
- RQ5: What is the mediating effect of communication quality in the relationship between metacognitive CQ and customer satisfaction?
- RQ6: What is the mediating effect of communication quality in the relationship between cognitive CQ and customer satisfaction?
- RQ7: What is the mediating effect of communication quality in the relationship between motivational CQ and customer satisfaction?
- RQ8: What is the mediating effect of communication quality in the relationship between behavioural CQ and customer satisfaction?

The hypotheses (H1–H8) are formulated in the Literature Review and tested by means of Pearson correlation, a multiple regression model with the four CQ dimensions being entered together, and Sobel tests of the indirect effect of each of the CQ dimensions.

According to the authors, the study theoretically expands the CQ research from the interpersonal/employee-side service encounter to the customers' capabilities in the human–AI service encounter and investigates if perceived CQ is a feasible explanatory variable. It essentially provides a framework for how to assess and improve chatbot service in platforms by identifying the customer capabilities that are most correlated with satisfaction and measuring the correlation between the quality of the chatbot communication and the customer's satisfaction. The contribution is intentionally limited to: Platform, Age group, Time. The rest of the paper is a review of the literature and formulation of the hypotheses, description of the method, description of results, discussion of results and implications, and limitations, directions for future research, and conclusion.

Literature Review and Hypothesis Development

Theoretical Underpinnings

The study is based on the stimulus – organism – response (S-O-R) model (Mehrabian & Russell, 1974). The stimulus is the chatbot's response; the customer's internal state is cultural intelligence and the quality of the communications from the chatbot; and the response is satisfaction. The two complementary views are: communication accommodation theory (Giles, 1973; Giles & Ogay, 2007) that provides a description of how people modify their language and manner to communicate with a communication partner, and expectation–disconfirmation theory (Oliver, 1980) that states that satisfaction is determined by the match between expectations and actual experiences. The concept of cultural intelligence is based on the four-factor model of Earley and Ang (2003) and Ang et al. (2007). The results are not tested directly in these frameworks; they are used to guide the interpretation of the results.

Consumer Cultural Intelligence

Cultural intelligence is the ability to work in culturally diverse environments (Earley & Ang, 2003). In fact, it has four different components: metacognitive CQ (awareness and checking of cultural assumptions), cognitive CQ (knowledge of cultural norms and practices), motivational CQ (interest in and confidence in the ability of intercultural interaction); and behavioural CQ (ability to adapt verbal and non-verbal behavior) (Ang et al., 2007; Van Dyne et al., 2012). The dimensions are conceptually different, as they relate to different outcomes: metacognitive and cognitive CQ predicted cultural judgement and decision making; motivational and behavioural CQ predicted cultural adaptation; metacognitive and behavioural CQ predicted task performance (Ang et al., 2007). CQ should therefore be considered as four distinct, but interrelated capabilities, as is done in the present study, rather than a single score.

CQ has been primarily studied in services, with the majority of the research being conducted on the provider side. Frontline employees' CQ was positively correlated with their service recovery performance through work engagement (Costers et al., 2019), while the relationship between employee CQ and their service recovery performance varied in two national markets, with different service recovery components moderating the relationship between perceived service quality and customer loyalty (Paparoidamis et al., 2019). The customer side

is not so advanced. Based on exploratory qualitative research, Sharma et al. (2009) suggested that perceived cultural distance and intercultural competence influence the comfort level in interaction and the level of perceived service satisfaction in intercultural interactions.
In this context, consumer CQ is the customer's ability to decipher and react to culturally deviant exchanges with Shopee's chatbot. It is not a property of the chatbot: In the study, the question of whether the chatbot is culturally intelligent or not is not addressed. Items were modified to the chatbot encounter (see Measurement Instruments).

Cultural Intelligence in Chatbot Service Encounters
The Chatbot doesn't have its own culture, but its responses aren't culturally neutral. Each answer is expressed in a specific language or combination of languages, in a specific degree of formality, a specific degree of directness and a specific manner of expressing politeness or apology. Customers may speak multiple languages and registers, and these decisions are obvious to customers, and are evaluated in relation to what each customer expects from a service provider. Social rules and expectations are the same with computers as with humans (Nass & Moon, 2000), and the response of a chatbot is considered a social act. If a reply is too sharp, too formal or comes on too high a level, it can be interpreted as disrespect or as being incompetent.

The customer then has four tasks, each of which corresponds to one CQ dimension. The customer needs to detect cultural cues in the reply and determine how to interpret them (metacognitive CQ), evaluate the cultural appropriateness of the reply (cognitive CQ), persist in the attempt if the reply is not culturally appropriate (motivational CQ), and adjust the reply form to make the reply more culturally appropriate (behavioural CQ). The skills Earley and Ang (2003) mentioned for the interaction between culturally different people. The opposite side: The customer interacts with a system whose output is influenced by design and training decisions taken by the system's creator, not with a human who or does not necessarily share the customer's background. In the following, consumer CQ is thus discussed as a ability of the user (consumer) that is used during the reading and reacting to culturally coded cues within a chatbot's text. It is not an assumption that the chatbot is a cultural agent and it doesn't evaluate the chatbot's cultural competence. It remains to be seen whether CQ is transferable from person-to-person interactions to chatbot interactions. This would be a futile effort if consumers' CQ were not related to the way they view a chatbot encounter, from H1 to H4..

Metacognitive CQ
Metacognitive CQ refers to the self-awareness, planning, and monitoring of the own cultural assumptions while interacting with others (Ang et al., 2007). In the original validation studies (Ang et al., 2007) it was predicted for cultural judgement and decision making, as well as task performance. In a chatbot encounter, customers with a high metacognitive CQ may become aware of an unexpectedly direct, scripted or generic response being due to system constraints, rather than to a lack of respect; they adjust their expectations of the chatbot, and they plan how they will express their next question. But satisfaction is a judgement of whether an experience met expectations (Oliver, 1980), and a violation of expectations reduced satisfaction with a chatbot (Crolic et al., 2022), this recalibration could help safeguard satisfaction.
H1: Metacognitive CQ is positively associated with customer satisfaction with Shopee's AI chatbot.

Cognitive CQ

Cognitive CQ is knowledge of the norms, values, and communication conventions of different cultures (Ang et al., 2007). The unique characteristics of its signature in the original validation study were cultural judgment and decision-making, not adaptation or task performance (Ang et al., 2007): knowledge enables people to make judgements and decisions about a situation. With a sense of politeness, formality, and directness in Malaysian customer service, it is easier for customers to recognize if their responses are appropriate or not, which can lead to more accurate expectations of the chatbots' capabilities. Knowledge is not for action but for interpretation, and the expected path to satisfaction is better-calibrated expectations.

H2: Cognitive CQ is positively associated with customer satisfaction with Shopee's AI chatbot.

Motivational CQ

Motivational CQ is the interest, drive, and self-efficacy to interact with culturally diverse others (Ang et al., 2007) and was predictive in the original validation study. It takes repeated attempts to resolve a service issue with a chatbot – customers rephrase, clarify or restart. Customers who are confident and willing to stick around are more likely to obtain the desired result from the chatbot than those who are not confident and not willing to continue interacting with it after the first incorrect response (Sheehan et al., 2020). However, some employee-side evidence points towards a motivational route, in that CQ was found to relate to service recovery performance via work engagement (Costers et al., 2019), but in this case it is the employee, and not the customer.

H3: Motivational CQ is positively associated with customer satisfaction with Shopee's AI chatbot.

Behavioural CQ

Behavioural CQ is the ability to adjust verbal and non-verbal behaviour to the context (Ang et al., 2007) and was used to predict cultural adaptation and task performance in the original validation study. Behavioural adaptation in a text-based conversation with a chatbot is rephrasing, restating, informalising, or simplifying the question, changing language or altering the approach if the answer was off-track. These changes can increase the likelihood of a relevant response and/or a resolved problem. They can also indicate additional effort on the part of the customer, as the initial request was not comprehended, and adaptation is not without cost, especially if the customer has to repeat or reformulate the request; we still think, however, that on balance, the capacity to adapt is correlated with more positive results.

H4: Behavioural CQ is positively associated with customer satisfaction with Shopee's AI chatbot.

Communication Quality

Quality of communication in this study is defined as the customer's evaluation of the quality of the communication in the encounter; if the messages were clear, culturally competent, on time, and relevant to the customer's question, and the tone was respectful. The facets are based on the responsiveness, assurance, and empathy components of service quality (Parasuraman et al., 1988), and evidence that perceived service quality and information quality influence chatbot satisfaction (Ashfaq et al., 2020). Communication quality is not a measure of response correctness, which is the extent to which the content is accurate, since a correct answer may be unclear, brief or inappropriate in the context. It is also distinct from overall judgement of the experience (customer satisfaction): communication quality is a

judgement about the communication of the chatbot while satisfaction is a judgement on whether the experience as a whole was satisfactory (Oliver, 1997). Similarly, Chung et al. (2020) distinguish among perceived interaction, customisation and problem-solving aspects of chatbot e-service, indicating that customers assess the level of interaction with the chatbot, rather than simply the content. There is a strong relationship between the two constructs; they are treated as distinct constructs and measured using distinct items.

Distinguishing Cultural Intelligence From Communication Quality

Both cultural intelligence and the quality of communication have to do with culture and communication; both have to do with both culture and communication; the boundary between them has to be drawn. They vary in four respects. For one thing, they're in different places. Communication quality is a property of a specific chatbot encounter as perceived by the customer, whereas CQ is a capability of the customer and exists prior to the start of any particular chat. Second, there are different ratings of the respondants. The items for customers' awareness, knowledge, motivation and behaviour (for example, I adjust the way I ask questions to Shopee's chatbot if I sense a cultural mismatch) are written as CQ items whereas the items that ask the customers to evaluate the chatbot (for example, the tone used by Shopee's chatbot is respectful and polite) are written as communication quality items. Thirdly, they respond differently to the response. The quality of the communication received by the customer defines the reply and is expressed in terms of clarity, timeliness, relevance and tone. CQ is a description of what the customer does in response to a reply, particularly an unexpected reply. Two customers may both find a reply well-explained and courteous, yet they may differ in their ability to deal with a subsequent less well-explained and courteous reply. Fourth, a general evaluation of communication effectiveness is valid for every communicator, regardless of his or her background, while the evaluation of CQ is specifically related to communication with cultural differences.

There is still some relationship expected between the two constructs. Some consumers have stronger CQ, and they are better able to formulate their requests so that they will elicit a response from the chatbot, and are also more likely to "take it with a grain of salt" when the chatbot responds (Giles & Ogay, 2007); therefore, it is suggested that CQ be a mediator between H5 and H8. The mediator must be different from the predictor, and connected to the predictor. A single point of contact is recognized. The communication quality item on cultural appropriateness (CQ2) is related to culture as is the cognitive CQ item on recognising answers that are not consistent with the cultural expectations of the Malays (CCQ3). The first rate the chatbot's response and the second rate the ability of the customer to detect the mismatch, but there is an overlap discussed in Limitations and Future Research Directions. The correlation between the four CQ dimensions and communication quality ($r = .423$ to $.488$; Table 4) are moderate, but not high enough to indicate that the four constructs could not be distinguished from one another (Kline, 2016).).

Customer Satisfaction

The overall evaluative judgement of the experience, as compared to expectations, is what is referred to as customer satisfaction (Oliver, 1980, 1997). In this case, it is viewed as a single overall construct to determine whether the Shopee's chatbot service aligned with expectation, whether it has done a good job on the query, whether it has created a good experience and whether it would be recommended. Satisfaction is seen as the result and communication

quality as a measure that is developed during the encounter that might precede it. Satisfaction is important because it affects customers' behavioural intentions (Zeithaml et al., 1996). Research in the field of chatbots found that satisfaction is correlated with perceived information and service quality (Ashfaq et al., 2020), and it is decreased when the expectations of the efficacy of the chatbot are not met (Crolic et al., 2022).

Hypothesis Development and Research Framework

H1–H4 are direct links between each of the CQ dimensions and satisfaction. The mediation hypotheses are intended to explain why such associations may occur and three complementary arguments suggest that communication quality is a promising mediator. First, consumer CQ can be seen as a part of the internal state, a stimulus, within the stimulus–organism–response framework (Mehrabian & Russell, 1974) that must be processed before the person can provide a response, and in this field, it is the processing of the responses that determines how the stimulus is perceived (communication quality), which in turn influences the response (satisfaction). Second, communication accommodation theory (Giles, 1973; Giles & Ogay, 2007) has suggested that people adapt their communication attempts to match or mismatch a partner: Customers who have higher CQ can be more likely to adjust their communication to be similar to the chatbot and to receive more comprehensible responses from it, thus raising the perceived quality of the communication. Third, in the expectation-disconfirmation terms (Oliver, 1980), perceived quality of communication is a mediating variable between whether the encounter met expectations.

The routes are likely to be different in size. Metacognitive CQ could help to adjust the expectation of the chatbot; cognitive CQ could help to identify what is appropriate; motivational CQ could help to continue asking clarifying questions that produce relevant responses; behavioral CQ could help to use different words and tonality to produce clearer and more relevant replies. So, each dimension is expected to be indirectly related to satisfaction via communication quality.

H5: Communication quality mediates the relationship between metacognitive CQ and customer satisfaction.
H6: Communication quality mediates the relationship between cognitive CQ and customer satisfaction.
H7: Communication quality mediates the relationship between motivational CQ and customer satisfaction.
H8: Communication quality mediates the relationship between behavioural CQ and customer satisfaction.

Two cautions apply. The lack of a significant statistical indirect effect does not imply the theoretical mechanism, and the cross-sectional nature of the design does not imply the temporal order. It is possible for the reverse reading to occur when customers endorse the communication of the chatbot; they are more satisfied with the experience. However, this reading cannot be ruled out here. The framework is shown in Figure 1, where the four CQ dimensions are independent variables, the communication quality is a mediator, and customer satisfaction is a dependent variable.

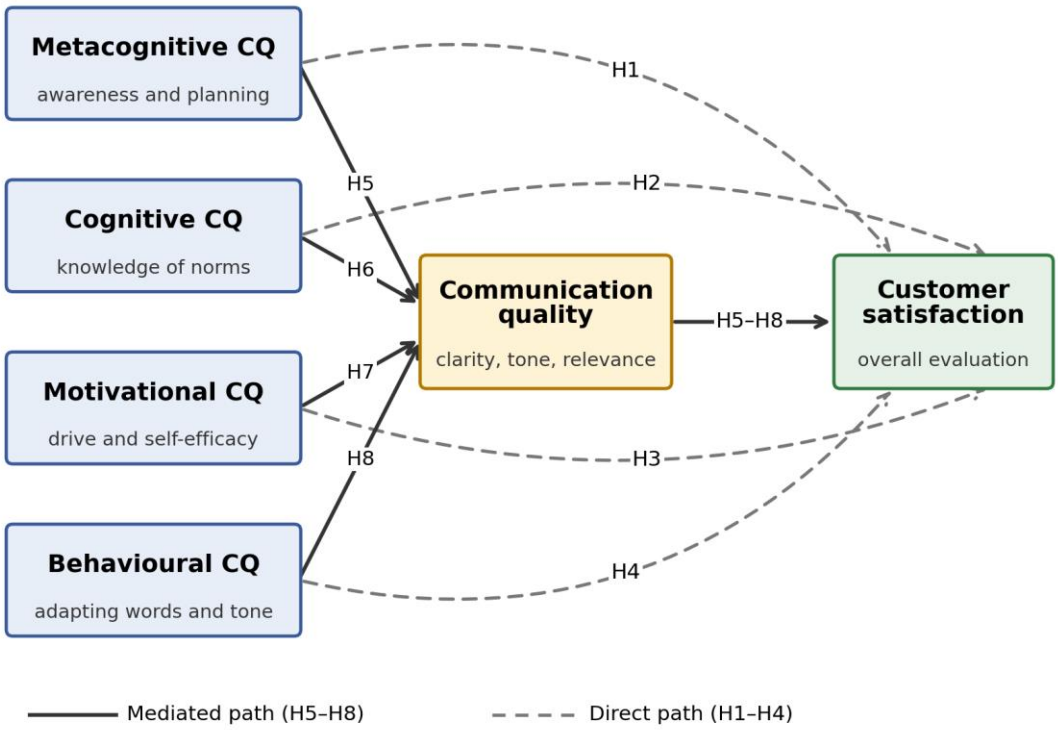


Figure 1 Conceptual framework of the study

Note. H1–H4 are the direct associations between each CQ dimension and customer satisfaction; H5–H8 are the indirect associations through communication quality.

Methodology

Research Design

The study is quantitative, explanatory and cross-sectional; it is based on positivist approach with a deductive type of approach (Saunders et al., 2019). The type of data collected was also cross-sectional (Creswell & Creswell, 2018), and a survey was the approach selected considering the type of hypotheses studied were relationships among perceptions measured with standardised items in a defined population. The unit of analysis is the recent experience of each Shopee customer when interacting with the Shopee chatbot service.

Population and Sampling

The target population consisted of Malaysian consumers aged 18-24 who have interacted with the virtual customer service or Shopee's AI chatbot in the last six months. The recency criterion was such that people would be likely to remember the encounter quite recently. A screening question ("Have you used Shopee's virtual customer service or Shopee's AI chatbot in the last 6 months?") was used to verify eligibility and those who answered "No" were thanked and dismissed. Age was reported on Section A and 100% of the respondents who remained were between the ages of 18-24. Due to the lack of a sampling frame of eligible users, purposive and snowball sampling was implemented: the link was sent in WhatsApp groups, in Instagram story polls and in APU student networks and participants were

encouraged to share it. Finally, 186 out of 383 responses were considered valid (one duplicate was excluded, and 186 responses failed one or more of the three screening criteria: Malaysian citizen, age 18-24, and having used chatbots during the past six months) and retained after data cleaning (R), which resulted in a total of 196 valid responses. The last sample size is larger than the suggestion for testing individual predictors with a regression containing four predictors, which is 104 + m = 108 (Green, 1991). There are limitations to generalisation because it is a non-probability design (see Limitations and Future Research Directions).

Measurement Instruments

The questionnaire (Appendix A) included a screening question and three sections: A: Age, Gender, Ethnicity, Shopee usage frequency; B: Consumer CQ; C: Communication quality; D: Customer satisfaction; and an optional comment box, which was not analysed. Each of the 30 substantive items was rated on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). For Consumer CQ, 20 items (5 items for each dimension), adapted from the Cultural Intelligence Scale (Ang et al., 2007) with rewording of each item to refer to Shopee's chatbot, were used to measure this. The quality of communication was assessed using five items related to the clarity, cultural appropriateness, timeliness and relevance, tone, and specificity of responses, and, for this study, the dimensions of responsiveness, assurance, and empathy of SERVQUAL (Parasuraman et al., 1988). Five items were used to measure customer satisfaction with the following: Overall satisfaction, Expectations met, Satisfaction with query handling, Overall positive experience, and Willingness to recommend, which were adapted from Oliver's (1997) conceptualisation of satisfaction. The items are adapted and/or newly worded in this context; therefore, there are no previously validated instruments and the reliability evidence provided in the Reliability and Preliminary Analysis section serves as the primary psychometric evidence available. There is some conceptual similarity between scales, acknowledged in Limitations and Future Research Directions.

The CQS (Ang et al., 2007) was designed for interaction with another cultural group and some of its components are irrelevant for a text conversation with a Chatbot. The cognitive items deal with knowledge, for example, the legal, economic and marriage system in other cultures, but the behavioural items cover speech rate, pauses, facial expressions and other nonverbal behaviour, and the motivational items cover enjoying life in other cultures. These are all missing in the Shopee chat window. The items were then modified in accordance with three general guidelines: items should well represent the content domain of the construct being measured (Hinkin, 1998). First, the focal capability of each dimension remained: awareness and awareness of one's own cultural assumptions (metacognitive); knowledge of cultural norms (cognitive); interest, confidence and persistence in dealing with others (motivational) and adjustment of verbal behaviour (behavioural). Secondly, the referent was shifted from a culturally different person to the chatbot's responses. Third, the cultural frame was set for Malaysian e-commerce customer service, which means that the cognitive items asked about cultural norms in e-commerce customer service (CCQ1 - CCQ5) and behavioural items asked about the norm regarding phrasing, language, and tone in text (BCQ1 - BCQ5), available in a chat. The original scale has four metacognitive, six cognitive, and five each of motivational and behavioural items. In the present instrument, there are five items in each dimension, thus providing an equal number of items for each subscale. The list of all adapted items is found in Appendix A.

There is a cost to adapting items as the validity evidence of the original scale does not simply carry over. There are three parts to the evidence in this study for the adapted scales. The items can be traced to the original dimension definitions, as described above. All subscales achieved acceptable level of reliability (Table 2: α = .803 – .852). The pattern of the correlations in Table 4 is also consistent with different constructs: communication quality and the dimensions of CQ are moderately correlated (r = .285 to .446) with one another and with themselves. There was no confirmatory factor analysis conducted and thus there was no formal test of convergent and discriminant validity. The revised CQ items are not intended to be used as a stand-alone questionnaire. They should be considered to be an initial step towards finding items that are validated in independent samples (see Limitations and Future Research Directions).

Data Collection and Ethics

The data were gathered using an online questionnaire using Google Forms that was presented for four weeks. The purpose of the study and that it was anonymous and voluntary was explained in the opening statement, which also indicated that informed consent would be shown by proceeding. There were no attempts to collect personally identifiable data; data were stored on password-protected devices that could only be accessed by the researcher, and the results were presented in a summary fashion, without the inclusion of personally identifiable data. The Asia Pacific University of Technology and Innovation (APU) Ethics form was completed as part of the supervised project and revealed that the project did not have any significant ethical issues that warrant a full submission to the APU Research Ethics Committee. To minimize common method bias, the predictors, mediator, and outcome were displayed in separate sections, and anonymity was guaranteed (Podsakoff et al., 2003); even though these steps help reduce the risk, all variables were measured by the same respondents at the same time.

Data Analysis

The results were analyzed after screening for completeness in IBM SPSS Statistics (version 31); one respondent who wrote a straight line (across all 30 items) was flagged and retained, and a sensitivity analysis removing this respondent (N = 195) did not alter any of the conclusions (R^2 = .573; all four regression coefficients and all four indirect effect results remained significant). The analysis was done in 5 steps. The frequencies were used to describe the sample first. Secondly, Cronbach's alpha was calculated for each construct, and the value of $\alpha \geq .70$ was considered acceptable (Nunnally & Bernstein, 1994; Hair et al., 2019). Third, the absolute values of the skewness and kurtosis were examined against those of 2 and 7 (West et al., 1995; Curran et al., 1996), in addition to looking at the histograms. Fourth, the Pearson correlations between each of the four predictors, the mediator, and satisfaction were interpreted referring to Cohen's (1988) criteria of small (r<.33), medium (r<.50), and large (r<.71); and H1–H4 were tested using unstandardized and standardized regression coefficients, SE, VIF, R^2, adjusted R^2 and the overall F test in a multiple regression with the four CQ dimensions entered simultaneously. Fifth, in the causal-steps model of Baron and Kenny (1986) the Sobel (1982) test of indirect effect was used to test for each CQ dimension with communication quality as the mediator between the predictor and the outcome variables H5–H8. The statistic is Z = ab/SE(ab), where a is the path from the CQ dimension to communication quality and b is the path from communication quality to satisfaction controlling for the CQ dimension; $|Z| > 1.96$ is significant at α = .05 (two-tailed). As a check

on the Sobel, percentile bootstrap 95% confidence intervals (5,000 samples, calculated in Python) were included for each indirect effect; these intervals generally preferred over the Sobel (MacKinnon et al., 2002, 2004; Preacher & Hayes, 2004), took the place of the Sobel in modest samples where the assumption of a normal distribution for the indirect effect may have been violated. Total (c) and direct (c') effects were calculated using simple and multiple regression and mediation was considered partial when the direct effect was still significant when the mediator was included. The strength of the statistical evidence for an indirect effect, not the size, is indicated by Z.

Results

Respondent Demographics

Table 1

Respondent profile (N = 196)

Characteristic	Category	n	%
Age	18–19	54	27.6
	20–21	61	31.1
	22–24	81	41.3
Gender	Female	108	55.1
	Male	85	43.4
	Prefer not to say	3	1.5
Ethnicity	Chinese	66	33.7
	Indian	61	31.1
	Malay	40	20.4
	Other	29	14.8
Shopee usage	Daily	64	32.7
	Weekly	78	39.8
	Monthly	34	17.3
	Less often	20	10.2

The sample is ethnically diverse, but is not proportionate to the citizen population; the number of Malay respondents (20.4%) is lower than the number of citizens (58.4%), and Chinese (33.7% versus 22.0%) and Indian (31.1% versus 6.5%) respondents are over-represented (DOSM, 2026). The most frequently reported age group was 22-24 (41.3%), females (55.1%) were a slight majority, and Chinese and Indian respondents collectively accounted for 64.8% of the respondents. Most of them are frequent users of the platform, with 72.5% of them using the platform daily or weekly, so they were familiar with Shopee, but not with the frequency of using the Shopee chatbot.

Reliability and Preliminary Analysis

Table 2

Reliability and distribution of the six constructs

Construct	Items	Cronbach's α	Skewness	Kurtosis
Metacognitive CQ	5	.803	−0.771	0.341
Cognitive CQ	5	.841	−0.693	−0.113
Motivational CQ	5	.829	−1.257	2.901
Behavioural CQ	5	.821	−0.546	−0.386
Communication quality	5	.852	−0.230	−0.597
Customer satisfaction	5	.845	0.013	−0.700

The item-total correlations for all constructs were above the .70 threshold and exceeded α = .80. Skewness (−1.257 to 0.013) and kurtosis (−0.700 to 2.901) values were acceptable, and

parametric tests were used for the correlation, regression, and Sobel tests. The most skewed of the constructs was Motivational CQ, where the responses tended to cluster at the top end of the scale. Each of the five items for each construct was evaluated for reliability. Due to the adaptation or original construction of the items for this study (see Measurement Instruments), only the psychometric evidence from these items was reported, and no factor analysis was conducted. No formal normality tests were reported; only distribution checks were done, which were based on skewness, kurtosis, and histograms.

Descriptive Statistics

Table 3

Means and standard deviations (five-point scale)

Construct	M	SD
Metacognitive CQ	4.05	0.71
Cognitive CQ	3.72	0.86
Motivational CQ	4.22	0.62
Behavioural CQ	3.68	0.84
Communication quality	3.20	0.97
Customer satisfaction	2.96	0.98

All four dimensions of self-rated CQ had high levels (M = 3.68–4.22), with the highest level of CQ being motivational and the lowest being behavioural. The level of communication was deemed moderate (M = 3.20), and customer satisfaction was the lowest-scoring construct (M = 2.96), which was near the scale midpoint. There were no observations below the middle for all four CQ scores, with the narrowest range (SD = 0.62) being for the motivational score and the widest ranges (SD = 0.97, 0.98) being for communication quality and satisfaction, respectively, both of which were negatively skewed. The only construct that had a mean lower than 3.00 was satisfaction (-0.04 points). These are descriptive comparisons; no inferential test of differences from the midpoint or differences between constructs was conducted, and the constructs have different item content. The means and standard deviations are shown graphically in Figure 3.

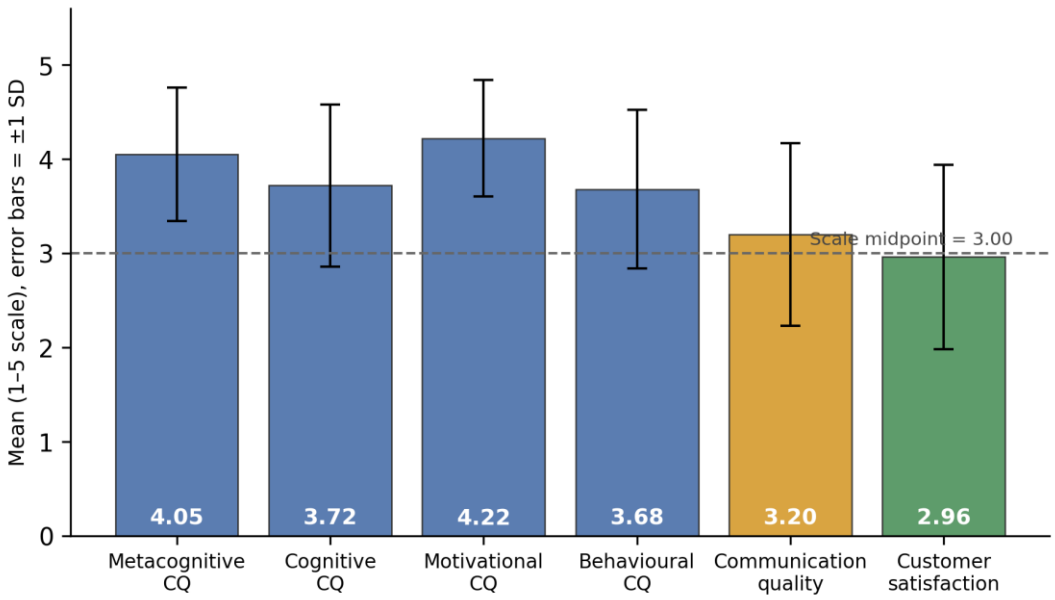


Figure 3 Means and standard deviations of the six constructs

Correlation Analysis

Table 4

Pearson correlations among the study constructs (N = 196)

Construct	1	2	3	4	5	6
1. Metacognitive CQ	—					
2. Cognitive CQ	.323	—				
3. Motivational CQ	.290	.285	—			
4. Behavioural CQ	.439	.423	.446	—		
5. Communication quality	.461	.423	.443	.488	—	
6. Customer satisfaction	.582	.423	.596	.545	.714	—

The direction of all the correlations in the matrix was positive and significant ($p < .001$, two-tailed), which corresponds with the direction of associations with satisfaction that were hypothesized for H1–H4. The motivational, metacognitive, and behavioural CQ and cognitive CQ correlated with satisfaction at .545–.596 and .423, respectively, and the correlation was the highest with communication quality at .714. These were large, except for the cognitive CQ correlation, which was medium, by Cohen's (1988) benchmarks. In the regression below, cognitive CQ was found to have the weakest bivariate association with satisfaction, thus reflecting its place in the regression. Cognitive CQ was similarly found to be the least directly associated with satisfaction in bivariate analyses, and is therefore in the same position in the regression below. These four CQ dimensions were moderately correlated with each other ($r = .285 – .446$) with each other and with communication quality ($r = .423 – .488$), However, they are not redundant with each other at .85, which indicates that there is too much similarity between them (Kline, 2016).

Regression Analysis

Table 5

Regression of customer satisfaction on the four CQ dimensions

Predictor	B	SE B	β	t	p	VIF
Metacognitive CQ	0.497	0.074	.357	6.72	< .001	1.29
Cognitive CQ	0.148	0.060	.130	2.47	.014	1.27
Motivational CQ	0.611	0.085	.383	7.23	< .001	1.28
Behavioural CQ	0.189	0.068	.162	2.77	.006	1.56

Note: $R = .761$, $R^2 = .580$, adjusted $R^2 = .571$, $F(4, 191) = 65.869$, $p < .001$. B = unstandardized coefficient; SE B = standard error of B; VIF = variance inflation factor.

The model was important and accounted for 58.0% of the variance in satisfaction. All four CQ dimensions also had an important unique positive contribution at the .05 level, with motivational CQ (β = .383) and metacognitive CQ (β = .357) being the highest, followed by behavioural CQ (β = .162) and cognitive CQ (β = .130). The four dimensions explain slightly more than half of the variance in satisfaction ($R^2 = .580$). The coefficients indicate the contribution of each dimension while the other three are kept constant, which means that they are smaller than the correlations for bivariate dimensions (e.g., cognitive CQ $r = .423$, β = .130). The predictors are moderately correlated ($r = .285 – .446$; Table 4), but the variance inflation factors were low (VIF = 1.27 – 1.56; below 5; Hair et al., 2019) and therefore the estimates are not affected by multicollinearity. The results obtained in the unstandardised format were a 0.61-point higher satisfaction score for motivational CQ (B = 0.611, SE = 0.085), a 0.50-point higher satisfaction score for metacognitive CQ (B = 0.500, SE = 0.074), a 0.19-point higher satisfaction score for behavioural CQ (B = 0.191, SE = 0.068), and a 0.15-point

higher satisfaction score for cognitive CQ (B = 0.151, SE = 0.060), while the other three dimensions remained constant.

Mediation Analysis

Table 6

Sobel tests and bootstrap confidence intervals for indirect effects through communication quality

Hyp.	Indirect path	a (SE)	b (SE)	Indirect effect ab [95% bootstrap CI]	Sobel Z	c	c'
H5	Metacognitive CQ → Communication quality → Satisfaction	0.632 (0.087)	0.575 (0.053)	0.363 [0.241, 0.500]	6.03	0.809***	0.446***
H6	Cognitive CQ → Communication quality → Satisfaction	0.475 (0.073)	0.662 (0.055)	0.314 [0.208, 0.428]	5.71	0.482***	0.168**
H7	Motivational CQ → Communication quality → Satisfaction	0.696 (0.101)	0.568 (0.051)	0.395 [0.262, 0.562]	5.85	0.951***	0.556***
H8	Behavioural CQ → Communication quality → Satisfaction	0.561 (0.072)	0.598 (0.056)	0.335 [0.237, 0.438]	6.31	0.635***	0.300***

Note: Coefficients are unstandardised. a = CQ dimension → communication quality; b = communication quality → satisfaction, controlling for the CQ dimension; c = total effect of the CQ dimension on satisfaction; c' = direct effect after controlling for communication quality. Bootstrap intervals are percentile intervals from 5,000 resamples. All a, b, and ab paths p < .001. * p < .05, ** p < .01, *** p < .001.

The Sobel test was used separately for each dimension of the CQ as the mediator and satisfaction as the outcome (Table 6). The path from the CQ dimension to communication quality (a) and communication quality to satisfaction (b) were both significant, as was the indirect effect (ab) between both dimensions, which ranged between 5.71–6.31 (p < .001), supporting H5–H8. Percentile 95% BC levels (5,000 resamples) were not zero for all four indirect effects and were found to be in agreement with the Sobel findings and do not depend on a normal sampling distribution. The differences in the size of the mediation (intervals of Z) are of a similar size (ab = 0.31 – 0.40), and the intervals overlap, meaning that differences in Z should not be interpreted as differences in the size of the mediation and should not be used for ranking the dimensions. The pattern for all four dimensions was of partial mediation, as the direct effect of each dimension of CQ on satisfaction remained significant even after controlling for communication quality (c' = 0.17–0.56), but was smaller than the total effect (c = 0.48–0.95). The total association was approximately 42%–65% due to the quality of communication, but these percentages are descriptive and are prone to fluctuations in a sample of this size. Z is a measure of statistical strength, and significance is determined at α = .05 (two-tailed). The direct and indirect results are summarised in Figure 2.

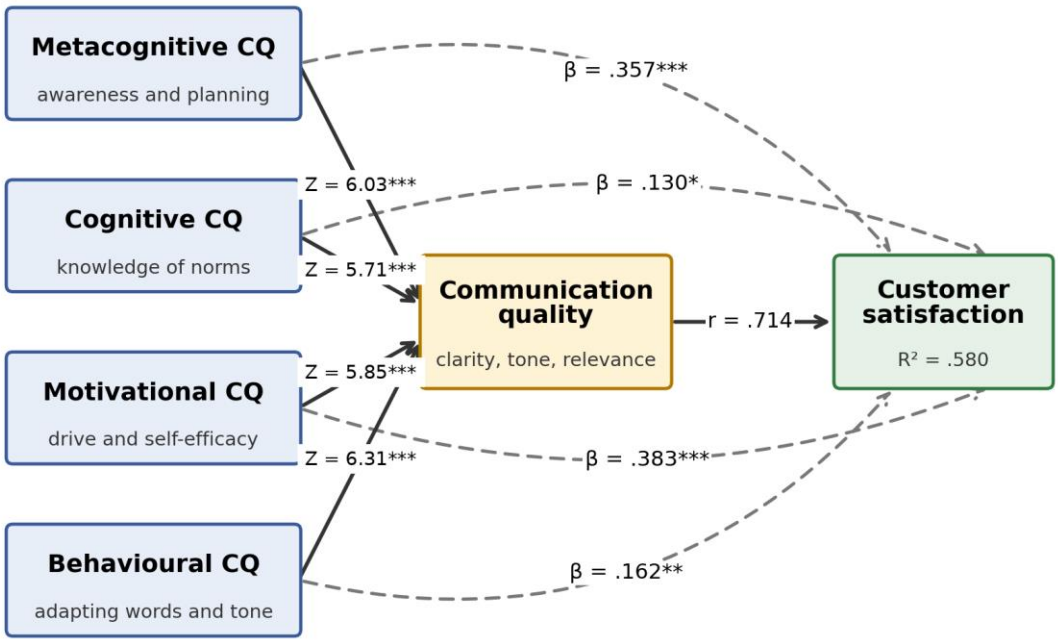


Figure 2 Summary of direct and indirect results

Note. Direct paths show standardised regression coefficients (β) from the model with the four CQ dimensions entered together (H1–H4); mediated paths show Sobel Z values (H5–H8); r is the bivariate correlation between communication quality and satisfaction. * p < .05, ** p < .01, *** p < .001.

Summary of Hypothesis Testing

Table 7

Summary of hypothesis tests

Each decision follows from the statistics reported in the Regression Analysis and Mediation Analysis sections.

Hypothesis	Proposed relationship	Result
H1	Metacognitive CQ → Customer satisfaction	Supported (β = .357, p < .001)
H2	Cognitive CQ → Customer satisfaction	Supported (β = .130, p = .014)
H3	Motivational CQ → Customer satisfaction	Supported (β = .383, p < .001)
H4	Behavioural CQ → Customer satisfaction	Supported (β = .162, p = .006)
H5	Metacognitive CQ mediation via communication quality	Supported (Sobel Z = 6.03, p < .001)
H6	Cognitive CQ mediation via communication quality	Supported (Sobel Z = 5.71, p < .001)
H7	Motivational CQ mediation via communication quality	Supported (Sobel Z = 5.85, p < .001)
H8	Behavioural CQ mediation via communication quality	Supported (Sobel Z = 6.31, p < .001)

Discussion

Discussion of Direct Relationships

All four CQ dimensions were positively related to satisfaction, and so H1–H4 were confirmed. This fits in with the notion of CQ as a set of skills to help manage culturally diverse interactions (Ang et al., 2007), and that the cultural competence of the provider side relates to service outcomes (Costers et al., 2019; Paparoidamis et al., 2019); and the notion that intercultural competence is relevant to satisfaction in intercultural service encounters (Sharma et al., 2009), which was the assumption behind H1–H4. The present data further investigate this direction for customers' self-assessed CQ in a chatbot encounter, but the citations used different settings and measures, and the present design does not demonstrate that CQ results in satisfaction.

The largest standardised coefficients were those of motivational CQ (β = .383) and metacognitive CQ (β = .357), whereas the smallest were for behavioural CQ (β = .162) and cognitive CQ (β = .130), and the analysis does not assess if adjacent coefficients differ significantly. The original validation study was unable to predict two results. Here, behavioural CQ, which predicted cultural adaptation and task performance at that site (Ang et al., 2007), had only a small unique contribution, whilst cognitive CQ was the lowest, but its association with judgement rather than cultural adaptation is consistent with the pattern observed here. One possible explanation is that satisfaction with a chatbot is more related to persistence and rewording of expectations rather than knowledge or rewording per se (cf. Sheehan et al., 2020), another is that effort caused by a poor initial response partly accounts for rewording; and the fourth is that some variance is shared among the four dimensions since they were entered together in the model, and their interrelationships are moderate (r = .285–.446). The motivational items also involve persevering over culturally generic responses, which conceptually overlaps with tolerance of a bad encounter and likely overestimates this association.

Discussion of the Mediating Role of Communication Quality

All four indirect effects were significant (Sobel Z = 5.71 – 6.31; bootstrap 95% CIs were not zero); hence there was a statistical indirect effect through communication quality for all 4 hypotheses (H5–H8). The evaluation of how a chatbot communicates with customers, as discussed in the Hypothesis Development section, is closely related to the evaluation of satisfaction (Ashfaq et al., 2020; Sheehan et al., 2020) and it fits with the stimulus–organism–response and expectation–disconfirmation reasoning, but those frames are not tested directly. The size of the Z values is likely to be influenced by the strong bivariate association of communication quality and satisfaction (r = .714) measured in the same survey, and should not be interpreted as effect sizes or be used to rank the dimensions. The direct effects of all four CQ dimensions continued to hold even when controlling for communication quality, suggesting partial mediation: communication quality is related to a portion of the relationship of CQ and satisfaction, and other factors are at play. This classification does not represent the causal pathway, as the design does not allow the quality of communication to be distinguished from its role as a mediator from the satisfaction of communication as a consequence.

Unexpected Findings

Looking at the results, self-rated CQ was higher (M = 3.68–4.22) than the satisfaction (M = 2.96) and in between was the communication quality (M = 3.20). This trend aligns with the notion that customers' cultural competence alone doesn't ensure a positive interaction with a chatbot, but multiple chats are allowed to remain open. In line with evidence that unmet expectations of chatbots cause a dip in satisfaction (Crolic et al., 2022), Chatbot communication is one candidate. There were other unobserved service factors which may have had a negative impact on satisfaction in addition to CQ, including issue type and whether the issue was resolved, access to a human agent, and waiting time. Measure context can also play a part: for an assessment of self, this may be rated more generously than a service; the constructs may have different items, and there may not have been any formal comparison performed. These explanations are not proven by the present data, and the pattern is only suggestive.

Theoretical Implications

The study is an extension of the CQ research from the interpersonal, employee side to customers' own capabilities in a human-AI service encounter and retains four dimensions. In this context, all four were related to satisfaction, but each had a specific contribution, thereby further supporting the multidimensional nature of CQ in this context. Communication quality is indicated as a customer-perceived aspect of the communication interaction, which is statistically correlated to CQ and satisfaction. Modest and specific contribution: Data from one platform in one age group at one time point and the explanatory frames provided as interpretation, not a tested theory. Looking specifically at the results, persistence and awareness, not necessarily cultural knowledge, seem to be the skills that are most closely linked with satisfaction in the overall text-based chatbot experience, which could be tested by designs that demonstrate order. The study also indicates how CQ can be utilized outside of a person-to-person encounter. Customers read culturally coded replies from a chatbot and reply to them, and the quality of the communication perceived by the customers is maintained independent from the CQ, which is a capability of the customer. Moderate correlations between the two are in line with their potential as separate constructs, but formal test of discriminant validity is required.

Practical Implications

All the recommendations below are associated with outcomes. First, the quality of the communication had the highest correlation with customer satisfaction (r = .714), which indicates that platforms that rate chatbots primarily on speed and automation rates might be missing what customers consider to be most important for satisfaction. Operational measures would be complemented by short post-chat ratings of clarity, relevance, cultural appropriateness, and tone. Second, motivational metacognitive CQ had the greatest unique relationship with satisfaction, suggesting that customers who persisted and recalibrated received better from the chatbot; the less the chatbot depended on these abilities, the less it was relied upon, which aligns with findings that customers' satisfaction was not impacted by the need for clarification (Sheehan et al., 2020). Thirdly, satisfaction (M=2.96) and communication quality (M=3.20) were the lowest-scoring constructs among a sample that rated their CQ highly, meaning the area with the greatest promise for improvement is with the communication of the chatbot, rather than with the capability of the customer. Fourth, as satisfaction was positively related to behaviorally-oriented CQ, the platforms might be able

to collect data about how often customers reword requests as a measure of effort, but no such data were gathered by this study. The hypotheses presented in this study are ideas that are categorized as hypotheses for design research since this study did not measure the language features of the chatbot. These recommendations are based on associations in one sample and should be confirmed using platform data before being used as confirmed.

Limitations and Future Research Directions

The sample consisted of non-probabilistic users aged 18 to 24 from the Shopee platform in Malaysia, and the sample was ethnically unrepresentative of the citizen population nationality or residence was not verified by a questionnaire item the findings cannot be generalised to other age groups, platforms or countries. Because of the design characteristics of the cross-sectional, single-source, self-reported design, associations cannot be made with this study, and common method bias is dealt with as a procedural issue and not as a statistical one. The Sobel test assumes that the sampling distribution of the indirect effect is normal; although bootstrap intervals were included, they are based on the same cross-sectional, self-reported data, and do not imply causal order. The scales have been adapted or created for this study, are not factor analysed, and some CQ items refer to the chatbot encounter itself, and the regression did not control for gender, ethnicity, or usage frequency. Since confirmatory factor analysis was not conducted, convergent and discriminant validity were evaluated based on the reliability of the adapted items and the correlation pattern among the constructs, but the adapted items must be validated in independent samples. Two concepts overlap with the test items in the current study: the communication quality item on cultural appropriateness is similar to the cognitive CQ item on recognising replies that are not as expected for the Malaysian culture; and the motivational CQ items relating to persistence when confronted with culturally generic replies are similar to the motivational CQ items that relate to tolerance of poor encounters. Both of these conceptual overlaps can inflate the associations. The ethics declaration states that the recruitment was done via APU student WhatsApp groups, social media, and peer networks, which may lead to a student-centered sample and might not represent all young Shopee users. The title and conclusions of this sample are specific to the subset of Generation Z (18- 24-year-olds) it covers.

Future research should measure the four mediation pathways in a single model and apply confirmatory factor analysis or structural equation modelling to the measurement and structural parts. The results would be further challenged by studies of other age groups and other platforms; longitudinal and/or experimental designs that alter the ways in which the chatbots communicate would aid in establishing order, and chat-log or behavioural data would minimize the use of self-report.

Conclusion

All four dimensions of consumer cultural intelligence were positively significant with respect to customer satisfaction among 196 Malaysian consumers aged between 18 and 24 who had interacted with Shopee's chatbot (RQ1-RQ4). The perceived communication quality was highly correlated with satisfaction and indirectly associated with satisfaction between the dimensions of CQ (RQ5–RQ8) statistically. Although the self-rated CQ scores were high, satisfaction was the lowest-scoring construct; it seems that having high cultural ability does not necessarily translate into satisfactory customer experiences when using a chatbot. Thus, the main research question can be answered: Both customers' CQ and perceived

communication quality are associated with satisfaction with the chatbot, with the bivariate association between communication quality and satisfaction being the strongest. These are associations, rather than causal, because of the nature of the evidence and self-report. Platforms should then look at the perceived communication quality of the Chatbot service along with speed and automation rates.

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