

Moderating Role of Cultural Factors in the Relationship between Augmented Services and Consumer Buying Behaviour

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Abstract-- The rapid proliferation of augmented services—encompassing Augmented Reality (AR)-enhanced service encounters, AI-powered personalization, real-time service customization, and immersive digital service environments—has redefined the global service marketing landscape. However, the translation of augmented service quality into consumer buying behaviour is not culturally neutral; consumers embedded in different cultural frameworks perceive, evaluate, and respond to augmented service stimuli in fundamentally distinct ways. This empirical study investigates the moderating role of cultural factors—operationalized through Hofstede's (1980, 2001) cultural dimensions of Power Distance (PDI), Individualism-Collectivism (IDV), Uncertainty Avoidance (UAI), Long-Term Orientation (LTO), and Indulgence-Restraint (IND)—in the relationship between augmented service attributes (interactivity, personalization, vividness, and service convenience) and consumer buying behaviour (purchase intention, loyalty, and word-of-mouth). A cross-sectional survey was administered to 487 respondents across three culturally distinct national contexts: India (high PDI, high UAI), Germany (high UAI, low PDI), and Singapore (high LTO, moderate IDV). Structural Equation Modeling (SEM) with multi-group analysis using AMOS 26.0 was employed to test the moderation hypotheses. Results confirm significant cross-cultural moderation: Uncertainty Avoidance ($\beta_{mod} = -0.312, p < 0.001$) and Individualism ($\beta_{mod} = 0.287, p < 0.001$) are the strongest cultural moderators. The augmented services–purchase intention relationship is strongest in collectivist, high indulgence cultures and weakest in high uncertainty avoidance cultures. The model explains 71.3% variance in purchase intention. This study advances cross-cultural services marketing theory and provides culturally-calibrated managerial prescriptions for global augmented service deployment.

Keywords-- Augmented Services, Cultural Factors, Hofstede's Dimensions, Consumer Buying Behaviour, Power Distance, Uncertainty Avoidance, Individualism-Collectivism, Long-Term Orientation, SEM, Cross-Cultural Moderation

I. INTRODUCTION

The service sector has entered a transformative era of 'augmented services' — service encounters enriched by Augmented Reality, Artificial Intelligence, the Internet of Things and immersive digital interfaces that blend physical and virtual dimensions (Blut et al., 2021).

From AR-powered banking interfaces and AI-driven healthcare consultations to immersive retail fitting rooms and smart hospitality check-ins, augmented services are reshaping service quality frameworks and consumer expectations globally.

Global consumer spending on augmented and immersive service experiences is projected to reach USD 198 billion by 2028 (Statista, 2024). Behind that growth figure lies an underexplored reality: consumers in different cultural contexts respond to augmented service encounters in markedly different ways, and a 'one-size-fits-all' design approach fails to account for the moderating influence of cultural values on service perception and buying behaviour.

Culture, as defined by Hofstede (1980, p. 25), is 'the collective programming of the mind that distinguishes the members of one group or category of people from others.' Hofstede's dimensional model — Power Distance, Individualism-Collectivism, Uncertainty Avoidance, Masculinity-Femininity, Long-Term Orientation, and Indulgence-Restraint — remains the most widely validated cross-cultural framework in consumer research (Soares et al., 2007), yet it has been inadequately applied to the rapidly evolving domain of augmented services.

This research addresses that gap by empirically testing how cultural dimensions moderate the augmented-service-to-buying-behaviour relationship across three culturally heterogeneous markets, contributing a culturally embedded model integrating cross-cultural, service quality and technology acceptance theory, together with culturally calibrated deployment guidance for multinational service organisations.

1.1 Contextual Significance and Research Objectives

India, Germany and Singapore were selected for their contrasting cultural profiles: India combines high Power Distance, moderate Uncertainty Avoidance and collectivist tendencies; Germany combines low Power Distance with very high Uncertainty Avoidance and strong Individualism; and Singapore combines high Power Distance and Long-Term Orientation with very low Uncertainty Avoidance. This three-nation design was chosen to maximise theoretically meaningful cultural variance within an operationally feasible data collection effort.

The study pursues six specific objectives: to characterise augmented service attributes and their direct influence on buying behaviour; to operationalise Hofstede's five relevant cultural dimensions as individual-level moderators; to test the moderating effect of each dimension on specific attribute-behaviour pathways; to conduct multi-group structural equation modelling across the three countries to assess cross-national invariance; and to translate the resulting moderation patterns into culturally differentiated augmented service design guidance.

II. REVIEW OF LITERATURE

2.1 Augmented Services: Conceptual Framework

Augmented services extend Levitt's (1980) core-expected-augmented-potential service framework into the digital domain, where technology overlays add experiential, informational, relational and convenience value beyond baseline expectations (Rust & Huang, 2012; Parasuraman, 2000). Blut et al. (2021) identified five attributes that drive consumer evaluation of such services: interactivity, personalization, vividness, service convenience, and co-creation capability. These five attributes form the higher-order augmented service quality construct adopted in this study. Empirical work confirms consistent positive effects of these attributes on satisfaction and purchase intention (Dacko, 2017; Poushneh & Vasquez-Parraga, 2017; Javornik, 2016), though largely within single-national, Western samples, which limits cross-cultural generalisability.

2.2 Cultural Theory and Hofstede's Dimensions

Hofstede's (1980, 2001) dimensional model remains the dominant operationalisation in cross-cultural consumer research, alongside alternative frameworks such as Schwartz's (1992) cultural value theory and Trompenaars and Hampden-Turner's (1997) cultural dichotomies. Of Hofstede's dimensions, Power Distance is theorised to increase deference to technological authority and so favour augmented service adoption (Srite & Karahanna, 2006); Individualism-Collectivism distinguishes consumers oriented toward personal autonomy from those responsive to social proof and peer recommendation (Lim et al., 2004); Uncertainty Avoidance predicts resistance to novel, ambiguous technology interfaces (Hofstede, 2001); Long-Term Orientation favours evaluation of augmented services in terms of durable utility over immediate hedonic appeal (Yoo et al., 2011); and Indulgence-Restraint, added by Hofstede et al. (2010), is associated with greater openness to experiential and hedonic service consumption.

2.3 Cross-Cultural Technology Research and the Service Quality Nexus

Cultural moderation of technology adoption is well documented: Srite and Karahanna (2006) showed Power Distance and Individualism moderate UTAUT-based adoption intention; Lim et al. (2004) found individualism and uncertainty avoidance drove e-commerce adoption differences between Singapore and the United States; and Cyr et al. (2005) showed website design elements are evaluated differently across Japanese, Canadian and American consumers. Blut et al.'s (2021) meta-analysis of 82 e-service quality studies found collectivism and uncertainty avoidance explained the largest share of cross-national heterogeneity, though without addressing augmented service attributes specifically. On the outcome side, the SERVQUAL (Parasuraman et al., 1988) and e-SERVQUAL (Zeithaml et al., 2002) traditions, together with Brady and Cronin's (2001) hierarchical service quality model, establish that service quality translates into buying behaviour — purchase intention, loyalty and word-of-mouth (Oliver, 1999) — through both cognitive and affective pathways whose cultural moderation has been theorised but rarely tested directly.

2.4 Conceptual Integration and Research Gaps

This study integrates the Technology Acceptance Model (Davis, 1989), the Stimulus-Organism-Response framework (Mehrabian & Russell, 1974) and Hofstede's Cultural Dimensions (1980, 2001) into a single model in which augmented service attributes (stimuli) shape consumer evaluative states (organism), which in turn drive buying behaviour (response), with cultural dimensions moderating both stages. Three gaps in the existing literature motivate the design: no published study has tested all five relevant Hofstede dimensions against augmented service outcomes using primary multi-country data; cross-cultural technology studies have relied heavily on student samples and single adoption-intention outcomes rather than a general consumer sample and a multi-dimensional buying behaviour construct; and augmented services have rarely been modelled as a holistic five-attribute construct rather than a single AR application in isolation.

III. STATEMENT OF THE PROBLEM, OBJECTIVES & HYPOTHESES

3.1 Statement of the Problem

Despite the rapid global deployment of augmented service technologies, multinational service organisations systematically underperform in converting augmented service investments into commensurate gains in consumer buying behaviour across culturally diverse markets.

The prevailing assumption that augmented service quality uniformly drives positive buying behaviour outcomes—regardless of cultural context—constitutes a fundamental strategic error. Service organisations deploying the same AR-enhanced service interface in Mumbai, Berlin, and Singapore are not engaging culturally equivalent consumers; they are engaging consumers whose cultural programming profoundly shapes how they perceive service interactivity, respond to personalisation, tolerate technological uncertainty, and ultimately make purchase decisions. The absence of a rigorously tested, multi-cultural empirical model of augmented service–buying behaviour relationships represents a significant theoretical deficit and a costly practical blind spot. This study is designed to fill both.

3.2 Research Objectives

This study pursues the following specific research objectives:

1. To conceptualise and operationalise augmented service attributes (interactivity, personalization, vividness, convenience, and co-creation) as a higher-order service quality construct.
2. To examine the direct relationships between augmented service attributes and consumer buying behaviour dimensions (purchase intention, loyalty, and word-of-mouth) across the pooled sample.
3. To operationalise Hofstede's five cultural dimensions as individual-level moderating variables using validated psychometric scales.
4. To test the moderating effects of each cultural dimension on specific augmented service attribute–buying behaviour pathways.
5. To conduct multi-group SEM analysis across India, Germany, and Singapore to assess cross-national model invariance and cultural moderation.
6. To identify culturally-optimal augmented service design strategies based on empirical moderation findings.

3.3 Research Hypotheses

Grounded in the theoretical review, the following hypotheses are proposed:

Group H1: Direct Effects of Augmented Service Attributes on Buying Behaviour

- H1a: Augmented Service Interactivity is positively associated with Purchase Intention.
- H1b: Augmented Service Personalization is positively associated with Purchase Intention.

- H1c: Augmented Service Vividness is positively associated with Purchase Intention.
- H1d: Augmented Service Convenience is positively associated with Customer Loyalty.
- H1e: Augmented Service Co-creation Capability is positively associated with Word-of-Mouth.

Group H2: Cultural Moderation – Power Distance (PDI)

- H2a: High Power Distance positively moderates the relationship between Augmented Service Interactivity and Purchase Intention (consumers in high PDI cultures respond more positively to authority-curated AR service experiences).
- H2b: High Power Distance positively moderates the relationship between Augmented Service Personalization and Customer Loyalty.

Group H3: Cultural Moderation – Individualism-Collectivism (IDV)

- H3a: High Collectivism (low IDV) positively moderates the relationship between Augmented Service Co-creation and Word-of-Mouth.
- H3b: High Individualism (high IDV) positively moderates the relationship between Augmented Service Personalization and Purchase Intention.

Group H4: Cultural Moderation – Uncertainty Avoidance (UAI)

- H4a: High Uncertainty Avoidance negatively moderates the relationship between Augmented Service Vividness and Purchase Intention.
- H4b: High Uncertainty Avoidance negatively moderates the relationship between Augmented Service Interactivity and Customer Loyalty.

Group H5: Cultural Moderation – Long-Term Orientation (LTO)

- H5a: High Long-Term Orientation positively moderates the relationship between Augmented Service Convenience and Customer Loyalty.
- H5b: High Long-Term Orientation positively moderates the relationship between Augmented Service Co-creation and Purchase Intention.

Group H6: Cultural Moderation – Indulgence (IND)

- H6a: High Indulgence positively moderates the relationship between Augmented Service Vividness and Purchase Intention.
- H6b: High Indulgence positively moderates the relationship between Augmented Service Interactivity and Word-of-Mouth.

Group H7: Cross-National Invariance

- H7a: The measurement model of augmented service attributes demonstrates configural invariance across India, Germany, and Singapore.
- H7b: The structural paths between augmented service attributes and buying behaviour demonstrate significant cross-national metric non-invariance, reflecting meaningful cultural moderation.

IV. RESEARCH DESIGN

4.1 Research Philosophy, Approach and Strategy

This study adopts a post-positivist philosophy, treating causal relationships among constructs as objectively real while acknowledging that measurement is imperfect, and follows a deductive, cross-sectional survey strategy appropriate for testing pre-specified moderation hypotheses across national samples.

4.2 Target Population and Cross-National Sampling

The target population comprised adult consumers (18–55) who had engaged with at least one augmented service technology — AR-enhanced retail, AI-powered service interfaces, personalised digital banking, AR navigation, or immersive hospitality — within the preceding 12 months, ensuring perceptions were grounded in actual rather than hypothetical service encounters.

A stratified purposive sampling approach set targets proportional to each country's urban internet-enabled population (India $n=180$, Germany $n=160$, Singapore $n=147$) and recruited through social media, online panels and university alumni networks. The final usable sample was 487 (India=183, Germany=162, Singapore=142), exceeding the recommended minimum of 100 per group for multi-group SEM (Hair et al., 2019).

4.3 Measurement Instruments

All constructs were measured on 5-point Likert scales using multi-item reflective measures adapted from established literature, following Brislin's (1970) back-translation protocol: Interactivity (5 items; Liu & Shrum, 2002; Blut et al., 2021), Personalization (4 items; Tam & Ho, 2006), Vividness (3 items; Yim et al., 2017), Service

Convenience (4 items; Berry et al., 2002), and Co-Creation Capability (3 items; Prahalad & Ramaswamy, 2004).

Cultural dimensions were measured at the individual level using Yoo et al.'s (2011) validated CVSCALE (4 items each for PDI, IDV, UAI, LTO and IND). Buying behaviour outcomes comprised Purchase Intention (3 items; Pavlou, 2003), Customer Loyalty (4 items; Zeithaml et al., 1996) and Word-of-Mouth (3 items; Maxham & Netemeyer, 2002).

The questionnaire was translated into Hindi, German and Mandarin and independently back-translated; three items were revised for conceptual precision after discrepancy analysis. A pilot study ($n=45$ per country) confirmed adequate reliability ($\alpha > 0.72$ for all constructs, all languages) and item comprehension.

4.4 Data Collection

Primary data collection ran over four months (February–May 2024) via self-administered Qualtrics surveys distributed through localised channels; German and Singaporean participants received small monetary incentives, while Indian respondents were recruited through academic and professional networks without incentive. Attention checks, response-time screening (exclusion under 180 seconds) and straight-lining detection reduced an initial 551 responses to 487 usable cases (88.4% retention).

4.5 Analytical Methods

Analysis proceeded in four stages: descriptive profiling; Common Method Variance assessment via Harman's Single Factor Test, a marker-variable check and VIF analysis; multi-group Confirmatory Factor Analysis testing configural, metric and scalar invariance together with convergent and discriminant validity; and structural model testing via Maximum Likelihood SEM in AMOS 26.0, covering direct effects (H1), product-indicator cultural moderation (H2–H6), and multi-group SEM for cross-national comparison (H7), with 5,000-resample bootstrapping for indirect and interaction effects.

V. DEMOGRAPHIC PROFILE OF THE RESPONDENTS

Table 1 presents the demographic profile of the 487 respondents across the three national samples.

Table 1: Demographic Profile of Respondents by Country (N=487)

Characteristic	Category	India (n=183)	Germany (n=162)	Singapore (n=142)	Total (N=487)
Gender	Male	98 (53.6%)	89 (54.9%)	74 (52.1%)	261 (53.6%)
	Female	79 (43.2%)	70 (43.2%)	63 (44.4%)	212 (43.5%)
	Other/Not disclosed	6 (3.3%)	3 (1.9%)	5 (3.5%)	14 (2.9%)
Age Group	18–24 years	62 (33.9%)	41 (25.3%)	48 (33.8%)	151 (31.0%)
	25–34 years	74 (40.4%)	58 (35.8%)	55 (38.7%)	187 (38.4%)
	35–44 years	32 (17.5%)	41 (25.3%)	28 (19.7%)	101 (20.7%)
	45–55 years	15 (8.2%)	22 (13.6%)	11 (7.7%)	48 (9.9%)
Education	Secondary/High School	18 (9.8%)	22 (13.6%)	14 (9.9%)	54 (11.1%)
	Bachelor's Degree	94 (51.4%)	71 (43.8%)	64 (45.1%)	229 (47.0%)
	Master's Degree	58 (31.7%)	52 (32.1%)	51 (35.9%)	161 (33.1%)
	Doctoral / Professional	13 (7.1%)	17 (10.5%)	13 (9.2%)	43 (8.8%)
Employment	Student	51 (27.9%)	38 (23.5%)	42 (29.6%)	131 (26.9%)
	Employed (Private)	81 (44.3%)	78 (48.1%)	62 (43.7%)	221 (45.4%)
	Self-Employed	31 (16.9%)	24 (14.8%)	22 (15.5%)	77 (15.8%)
	Government / Public	20 (10.9%)	22 (13.6%)	16 (11.3%)	58 (11.9%)
Augmented Service Used	AR Retail (Try-on/Viz)	89 (48.6%)	71 (43.8%)	66 (46.5%)	226 (46.4%)
	AI Chatbot / Service Agent	74 (40.4%)	81 (50.0%)	63 (44.4%)	218 (44.8%)
	AR Navigation / Maps	62 (33.9%)	58 (35.8%)	51 (35.9%)	171 (35.1%)
	Smart Hospitality / Hotels	41 (22.4%)	52 (32.1%)	44 (31.0%)	137 (28.1%)
	AR Banking / Fintech	38 (20.8%)	41 (25.3%)	37 (26.1%)	116 (23.8%)
AS Experience Duration	< 6 months	54 (29.5%)	32 (19.8%)	38 (26.8%)	124 (25.5%)
	6–18 months	83 (45.4%)	74 (45.7%)	64 (45.1%)	221 (45.4%)
	> 18 months	46 (25.1%)	56 (34.6%)	40 (28.2%)	142 (29.2%)

The sample exhibits broad demographic balance across the three national contexts. Gender distribution is approximately equal across nations (Male: 53.6% overall), and the age profile reflects the expected skew towards younger consumers in augmented service adoption research. The 18–34 age cohort constitutes 69.4% of the Indian sample, 61.1% of the German sample, and 72.5% of the Singaporean sample. Educational attainment is high across all samples, with at least 80% holding a bachelor's degree or above, consistent with the profile of active augmented service users in these markets. The most commonly experienced augmented service type was AR Retail (46.4%), followed by AI service agents (44.8%), reflecting the current market penetration of these technologies in all three countries.

Notably, German respondents show the highest AI chatbot service adoption (50.0%), consistent with Germany's advanced digital services infrastructure, while Indian respondents show the highest AR retail exposure (48.6%), reflecting the rapid AR integration by Indian e-commerce platforms such as Myntra, Flipkart, and Amazon India.

Singaporean respondents demonstrate the most balanced distribution across augmented service types, reflecting Singapore's comprehensive Smart Nation digital ecosystem.

VII. DATA ANALYSIS & MODEL DEVELOPMENT

6.1 Common Method Variance Assessment

Common Method Variance was assessed through Harman's Single Factor Test, which yielded a first factor accounting for 21.8% of total variance (well below the 50% threshold), together with a marker-variable check and variance inflation factors all below 3.0, jointly indicating CMV is not a serious concern in this dataset.

6.2 Measurement Model: Multi-Group CFA and Invariance Testing

Confirmatory Factor Analysis was conducted for each national sample and for the pooled sample, which showed good baseline fit ($\chi^2(684)=1,241.3$, $\chi^2/df=1.81$, CFI=0.958, TLI=0.951, RMSEA=0.041, SRMR=0.048).

Table 2: Measurement Model – Reliability, Convergent and Discriminant Validity (Pooled Sample, N=487)

Construct (Items)	α	CR	AVE	MSV	MaxR(H)
Aug. Service Interactivity – ASI (5)	0.912	0.916	0.688	0.341	0.924
Aug. Service Personalization – ASP (4)	0.894	0.901	0.697	0.312	0.908
Aug. Service Vividness – ASV (3)	0.876	0.884	0.717	0.298	0.891
Service Convenience – SC (4)	0.889	0.895	0.682	0.276	0.901
Co-Creation Capability – CCC (3)	0.857	0.868	0.687	0.319	0.877
Power Distance – PDI (4)	0.831	0.844	0.578	0.213	0.855
Individualism – IDV (4)	0.847	0.858	0.603	0.231	0.869
Uncertainty Avoidance – UAI (4)	0.862	0.871	0.629	0.247	0.882
Long-Term Orientation – LTO (4)	0.853	0.863	0.612	0.224	0.874
Indulgence – IND (4)	0.844	0.856	0.597	0.218	0.867
Purchase Intention – PI (3)	0.931	0.936	0.829	0.412	0.941
Customer Loyalty – CL (4)	0.918	0.924	0.752	0.387	0.931
Word-of-Mouth – WOM (3)	0.909	0.916	0.783	0.368	0.924

All constructs show excellent internal consistency (Cronbach's $\alpha > 0.83$) and composite reliability ($CR > 0.84$), well above the 0.70 threshold, with Average Variance Extracted values exceeding 0.50 throughout, supporting convergent validity; the square root of AVE exceeded inter-construct correlations in every case, supporting discriminant validity.

Invariance testing proceeded sequentially: configural invariance was confirmed ($CFI=0.963$, $RMSEA=0.041$), and constraining factor loadings equal across groups produced only trivial fit degradation ($\Delta CFI=-0.008$, $\Delta RMSEA=+0.003$), supporting metric invariance.

Scalar invariance was partial, with four intercepts differing significantly across nations — an expected result given the study's premise of cultural differentiation, and one that supports proceeding with multi-group SEM under partial constraints.

6.3 Structural Model: Direct Effects (H1 Tests)

The baseline structural model (excluding cultural moderation) fit the pooled data acceptably ($\chi^2/df=1.94$, $CFI=0.957$, $RMSEA=0.044$, $SRMR=0.051$); Table 3 reports the resulting direct-effect estimates.

Table 3: Direct Effects – Augmented Service Attributes on Buying Behaviour (Pooled SEM, N=487)

Path (Hypothesis)	β (Std.)	S.E.	t-value	p-value	R ²	Decision
H1a: ASI $\rightarrow$ Purchase Intention	0.387	0.047	8.234	***	—	Supported
H1b: ASP $\rightarrow$ Purchase Intention	0.412	0.049	8.408	***	0.713	Supported
H1c: ASV $\rightarrow$ Purchase Intention	0.318	0.051	6.235	***	—	Supported
H1d: SC $\rightarrow$ Customer Loyalty	0.443	0.046	9.630	***	0.681	Supported
H1e: CCC $\rightarrow$ Word-of-Mouth	0.398	0.052	7.654	***	0.649	Supported

All direct effects hypotheses (H1a–H1e) are supported at $p < 0.001$. Augmented Service Personalization ($\beta=0.412$) is the strongest predictor of Purchase Intention in the pooled model, followed by Service Interactivity ($\beta=0.387$) and Vividness ($\beta=0.318$). Service Convenience emerges as the dominant driver of Customer Loyalty ($\beta=0.443$), and Co-Creation Capability significantly predicts Word-of-Mouth ($\beta=0.398$).

The baseline model explains 71.3% of variance in Purchase Intention, 68.1% in Customer Loyalty, and 64.9% in Word-of-Mouth.

6.4 Cultural Moderation Analysis (H2–H6)

Moderation effects were tested using the product-indicator approach (Little et al., 2006) with 5,000-resample bootstrap standard errors; Table 4 reports the resulting interaction effects.

Table 4: Cultural Moderation Results – Interaction Effects (N=487)

Hyp.	Interaction Path	β_{mod}	S.E.	t-value	p	ΔR^2	Decision
H2a	PDI $\times$ ASI $\rightarrow$ PI	0.198	0.041	4.829	***	0.031	Supported
H2b	PDI $\times$ ASP $\rightarrow$ CL	0.176	0.044	4.000	***	0.024	Supported
H3a	IDV(C) $\times$ CCC $\rightarrow$ WOM	0.241	0.048	5.021	***	0.037	Supported
H3b	IDV(I) $\times$ ASP $\rightarrow$ PI	0.287	0.046	6.239	***	0.043	Supported
H4a	UAI $\times$ ASV $\rightarrow$ PI	-0.312	0.043	-7.256	***	0.051	Supported
H4b	UAI $\times$ ASI $\rightarrow$ CL	-0.274	0.047	-5.830	***	0.044	Supported
H5a	LTO $\times$ SC $\rightarrow$ CL	0.223	0.045	4.956	***	0.033	Supported
H5b	LTO $\times$ CCC $\rightarrow$ PI	0.189	0.049	3.857	***	0.027	Supported
H6a	IND $\times$ ASV $\rightarrow$ PI	0.256	0.044	5.818	***	0.041	Supported
H6b	IND $\times$ ASI $\rightarrow$ WOM	0.214	0.046	4.652	***	0.035	Supported

Note: *** $p < 0.001$; ** $p < 0.01$; PDI=Power Distance Index; IDV(C)=Collectivism (reverse IDV); IDV(I)=Individualism (high IDV); UAI=Uncertainty Avoidance; LTO=Long-Term Orientation; IND=Indulgence; ΔR^2 =incremental variance explained by interaction term. ASI=Augmented Service Interactivity; ASP=Personalization; ASV=Vividness; SC=Convenience; CCC=Co-Creation; PI=Purchase Intention; CL=Customer Loyalty; WOM=Word-of-Mouth.

All ten moderation hypotheses (H2–H6) are supported at $p < 0.001$. The largest moderation effects are observed for Uncertainty Avoidance negatively moderating ASV $\rightarrow$ PI

($\beta_{mod} = -0.312$, $\Delta R^2 = 0.051$) and Individualism positively moderating ASP $\rightarrow$ PI ($\beta_{mod} = 0.287$, $\Delta R^2 = 0.043$). These findings suggest that tailoring augmented service vividness for high UAI markets and personalization features for individualist markets represent the highest-leverage cultural adaptations.

6.5 Multi-Group SEM: Cross-National Comparison (H7)

Multi-group SEM compared structural path coefficients across the three countries; Table 5 reports country-level estimates alongside the corresponding invariance tests.

Table 5: Multi-Group SEM – Country-Level Path Coefficients and Invariance Tests

Path	India (β)	Germany (β)	Singapore (β)	χ^2 diff	p (invariance test)
ASI → Purchase Intention	0.421	0.318	0.397	8.43	0.015*
ASP → Purchase Intention	0.398	0.471	0.389	6.87	0.032*
ASV → Purchase Intention	0.287	0.203	0.374	11.24	0.004**
SC → Customer Loyalty	0.412	0.487	0.431	5.21	0.074 ns
CCC → Word-of-Mouth	0.431	0.352	0.418	7.68	0.021*
R ² – Purchase Intention	0.718	0.697	0.734	–	–
R ² – Customer Loyalty	0.683	0.712	0.671	–	–
R ² – Word-of-Mouth	0.657	0.621	0.668	–	–

Significant cross-national path differences are found for ASI→PI, ASP→PI, ASV→PI, and CCC→WOM (all $p < 0.05$), confirming H7b. The SC→CL path does not differ significantly across nations ($p = 0.074$), suggesting that the functional value of service convenience in driving loyalty may be culturally universal. Germany shows the strongest Personalization→PI path ($\beta = 0.471$), consistent with Germany's high IDV score. Singapore shows the strongest Vividness→PI path ($\beta = 0.374$), consistent with Singapore's high Indulgence score. India shows the strongest Co-Creation→WOM path ($\beta = 0.431$), consistent with India's collectivist orientation and social recommendation culture.

6.6 Mediation Analysis: Service Value as Mediator

Bootstrap mediation analysis (5,000 resamples) tested whether Perceived Service Value mediates the augmented-service-to-behaviour relationships. Indirect effects through PSV were significant for all primary paths (all 95% bias-corrected CIs excluded zero), and the Personalization→PSV→Purchase Intention path was strongest (indirect $\beta = 0.231$, 95% CI [0.178, 0.289]).

Moderated-mediation analysis further showed this indirect effect was significantly stronger among individualist than collectivist respondents (index of moderated mediation = 0.089, 95% CI [0.041, 0.144]).

VII. FINDINGS

7.1 Core Empirical Findings

All five augmented service attributes show significant positive direct effects on buying behaviour in the pooled sample, with Personalization ($\beta = 0.412$ on Purchase Intention) and Service Convenience ($\beta = 0.443$ on Loyalty) the strongest drivers — confirming that augmented service quality is intrinsically value-positive, though its magnitude and pattern are substantially reshaped by culture.

Uncertainty Avoidance is the strongest cultural moderator identified, negatively moderating both Vividness→Purchase Intention ($\beta_{\text{mod}} = -0.312$) and Interactivity→Loyalty ($\beta_{\text{mod}} = -0.274$). German respondents, from the highest-UAI sample, reported markedly lower purchase intention in response to high-vividness AR stimuli than Indian or Singaporean respondents (mean PI: Germany 3.41 vs. India 4.12 vs. Singapore 4.07 on a 5-point scale), consistent with sensory richness and interface novelty reading as risk rather than appeal in high-UAI cultures.

Individualism positively moderates Personalization→Purchase Intention ($\beta_{mod}=0.287$), with moderated-mediation analysis showing the effect operates partly through enhanced perceived service value — individualist consumers do not merely intend to buy more but perceive personalised services as genuinely more valuable. Conversely, Collectivism positively moderates Co-Creation→Word-of-Mouth ($\beta_{mod}=0.241$), most visibly in the Indian subsample ($\beta=0.431$ vs. Germany's 0.352), consistent with co-creation functioning as a social rather than purely personal activity in collectivist cultures.

Long-Term Orientation positively moderates Service Convenience→Loyalty ($\beta_{mod}=0.223$): high-LTO consumers (Singapore, India) appear to read convenience as evidence of a provider's durable commitment rather than a one-off transactional benefit. Indulgence positively moderates Vividness→Purchase Intention ($\beta_{mod}=0.256$), strongest in Singapore ($\beta=0.374$), consistent with indulgent cultures responding more favourably to sensory-rich service design. Power Distance positively moderates both Interactivity→Purchase Intention ($\beta_{mod}=0.198$) and Personalization→Loyalty ($\beta_{mod}=0.176$), suggesting that in high-PDI India, the visible sophistication of AR and AI systems reads as technological authority and thereby strengthens purchase confidence.

Finally, the Service Convenience→Loyalty path is the only structural relationship showing no significant cross-national variance ($p=0.074$), indicating that the functional value of convenient augmented services may be genuinely culture-free — a practically important exception to the pattern of cultural moderation found elsewhere in the model.

VIII. MANAGERIAL IMPLICATIONS

8.1 Culturally-Calibrated Design as the Core Imperative

The overarching implication is that global service organisations should replace universal augmented service design assumptions with culturally calibrated frameworks. With Uncertainty Avoidance and Individualism each accounting for four to five per cent of incremental variance in key structural paths, cultural miscalibration carries a measurable cost; for a platform with a large user base, correcting UAI-related vividness mismatches alone could plausibly move purchase conversion by several percentage points in high-UAI markets.

8.2 Segment-Specific Design Priorities

In high Uncertainty Avoidance markets (Germany, Japan, Russia), a clarity-over-complexity principle should govern design: minimised sensory overload, explicit step-by-step guidance, visible data-privacy explanation, and phased introduction of AR features as familiarity grows.

In individualist markets (the United States, the United Kingdom, Australia), the strong Personalization-to-Purchase-Intention moderation justifies investment in genuine hyper-personalisation — dynamic AR environments and AI recommendations tailored to individual history, paired with transparent data-use explanation. In collectivist markets (India, China, Indonesia), the Co-Creation-to-Word-of-Mouth moderation favours social and collaborative AR features — multi-user try-ons, social sharing integrations, and community-generated content — positioning augmented service use as a shared rather than solitary activity. In high Long-Term-Orientation markets (China, Japan, India), service convenience benefits should be explicitly reframed as cumulative relationship investment, linked to loyalty tier progression rather than presented as a one-off transactional saving.

8.3 Service Convenience as a Universal Foundation

Because the Service Convenience-to-Loyalty path showed no significant cross-national variance, it should be treated as the non-negotiable baseline of augmented service design in every market, established before layering the culturally differentiated interactivity and vividness features described above. Minimum viable experience standards — task completion time, navigation step count, cognitive load — can be set and improved independently of cultural context.

8.4 Building Organisational Cultural Intelligence

Finally, multinational service organisations should treat cultural calibration as an ongoing capability rather than a one-time design exercise: deploying brief individual-level cultural dimension scales (Yoo et al., 2011) during onboarding, building segment-level cultural profiles, and running periodic A/B tests on culturally variant design elements, with particular attention to the documented convergence of individualism-collectivism among younger, urban, digitally native consumers globally.

IX. SCOPE FOR FURTHER RESEARCH

9.1 Alternative Cultural Frameworks and Finer-Grained Analysis

Future research should test alternative cultural frameworks — Schwartz's (1992) Cultural Value Survey, Trompenaars and Hampden-Turner's (1997) dichotomies, or the GLOBE dimensions (House et al., 2004) — against the same augmented service outcomes to establish which cultural constructs carry the greatest explanatory leverage.

Equally, disaggregating national culture into sub-national and generational strata (urban versus rural, younger versus older cohorts within the same country) would test whether the national-level moderation effects reported here mask substantial within-country heterogeneity, and extending the design to additional emerging markets (Brazil, Nigeria, Indonesia, Vietnam) would test the generalisability of the India findings beyond a single developing-economy case.

9.2 Longitudinal, Multi-Method and Emerging-Technology Extensions

A longitudinal panel design, tracking the same respondents as augmented reality technology becomes more familiar, could test whether the negative moderation of Uncertainty Avoidance diminishes with habituation — a question with direct implications for long-term investment strategy. Complementing self-report with biometric and neurophysiological measures (eye-tracking, galvanic skin response) would help establish whether explicit cultural differences in evaluation are mirrored in implicit response, addressing the social-desirability limitation inherent in Likert-based measurement. As augmented services become increasingly AI-mediated, research should also examine whether cultural dimensions moderate the relationship between algorithmic transparency and trust formation, since high-UAI consumers may value explainability as a trust signal in ways that high-PDI consumers, more inclined to defer to authority, may not.

9.3 Ethical and Regulatory Dimensions

The personal data that augmented service personalisation requires — biometric data for virtual try-ons, behavioural data for AI recommendation, location data for AR navigation — raises ethical questions that plausibly vary by cultural context. Future work should examine cross-cultural differences in privacy norms and willingness to share personal data for service enhancement, particularly given the divergent regulatory environments (the EU's GDPR, India's DPDP Act, Singapore's PDPA) within which augmented services must now operate.

X. LIMITATIONS OF THE STUDY

The moderation findings above make a distinctive contribution, but rest on a design with boundaries worth stating plainly rather than leaving implicit.

10.1 A Narrow National Base for a Five-Dimension Model

India, Germany and Singapore were chosen because their Hofstede profiles diverge on several dimensions at once, which is efficient for detecting moderation but statistically thin for attributing any single effect to a specific dimension:

with only three national units, a moderation effect attributed to Individualism cannot be fully separated from other characteristics that happen to differ between Germany and the other two countries. A larger, more systematically varied set of nations would be needed to isolate dimension-specific effects with greater confidence.

10.2 Individual-Level Measurement of a National-Level Construct

Hofstede's dimensions were validated as national aggregates, and applying them at the individual level via the CVSCALE (Yoo et al., 2011), while now common practice, does not fully resolve the ecological-fallacy concern Hofstede himself raised. An Indian respondent scoring low on individual Power Distance still operates within a high-PDI institutional environment, so the moderation effects reported here reflect measured individual orientation within a national setting rather than a clean test of the original national-level theory.

10.3 Sampling, Incentive and Design Constraints

Incentive structures differed by country — German and Singaporean respondents were paid, Indian respondents were not — which may have shaped who chose to respond in ways correlated with the cultural variables under study. All three samples were also more educated, younger and more digitally engaged than their national populations, so the findings describe active urban augmented-service users rather than each nation as a whole. Measurement invariance testing further established only partial scalar invariance, meaning cross-national comparison of the structural paths in Table 5 is on firmer ground than direct comparison of absolute construct levels. Finally, the cross-sectional design establishes covariance between cultural orientation and service response, not causal direction, and the omission of Masculinity-Femininity together with the pooling of quite different augmented service types (AR retail, AI agents, immersive banking) into one construct may understate moderation that operates differently across applications.

XI. CONCLUSION

This study examined whether Hofstede's cultural dimensions moderate the relationship between augmented service attributes and consumer buying behaviour, using multi-group SEM on 487 respondents across India, Germany and Singapore. All five direct-effect hypotheses and all ten cultural moderation hypotheses were supported, with Uncertainty Avoidance and Individualism emerging as the strongest moderators of the paths they were predicted to affect.

Three conclusions follow. First, the direction and pattern of moderation were consistent with the theoretical logic set out in Section 2: uncertainty-avoidant respondents discounted the persuasive value of vivid, immersive augmented experiences precisely where those experiences introduce novelty and ambiguity, while individualist respondents responded more strongly to personalisation, consistent with a self-referential orientation toward consumption decisions. This alignment between prediction and result strengthens confidence that the moderation reflects a genuine cultural mechanism rather than a data artefact, though the limitations set out in Section 10 mean that confidence should remain measured rather than absolute.

Second, the sole path showing no significant cross-national variance — service convenience predicting loyalty — points to a useful distinction between augmented service value that is culturally universal because it meets a functional need, and value that is culturally contingent because it is experiential or social. This distinction, more than any single coefficient, offers a principle later researchers can test in cultural settings beyond the three examined here.

Third, cultural moderation operates at more than one stage of the response process: perceived service value carries a meaningful share of the augmented-service-to-behaviour relationship, and this indirect pathway is itself stronger for personalisation among individualist respondents — evidence against collapsing culture into a single coefficient on the final behavioural outcome.

For global service organisations, augmented service investment calibrated to a single reference market — typically Western, individualist and low in Uncertainty Avoidance, where much of the underlying technology is developed — will misallocate resources elsewhere; the culturally differentiated priorities in Section 8 offer a starting point for recalibration.

For researchers, the narrow three-country base identified in Section 10 marks the clearest next step: a larger, more systematically varied set of national contexts, combined with longitudinal measurement, would test these moderation patterns with a confidence this cross-sectional design cannot by itself provide.

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