

ความเป็นนวัตกรรม ความเครียดจากเทคโนโลยี การรับรู้ความง่ายในการใช้งาน และการรับรู้ความเสี่ยง
ในการยอมรับบริการธนาคารดิจิทัลของชุมชนชนกลุ่มน้อยในประเทศจีน

INNOVATIVENESS, TECHNOSTRESS, PERCEIVED EASE OF USE, AND PERCEIVED RISK IN
DIGITAL BANKING ADOPTION AMONG AN ETHNIC MINORITY COMMUNITY IN CHINA

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บทคัดย่อ

การยอมรับบริการดิจิทัลในชุมชนชนกลุ่มน้อยที่มีทรัพยากรจำกัดสะท้อนให้เห็นว่าเทคโนโลยีมีปฏิสัมพันธ์กับอัตลักษณ์ทางวัฒนธรรม ความเครียดทางปัญญา และความไว้วางใจที่เป็นสถาบันในลักษณะที่แบบจำลองการยอมรับมาตรฐานไม่สามารถอธิบายได้อย่างเพียงพอ การศึกษานี้มีวัตถุประสงค์เพื่อตรวจสอบปัจจัยที่ส่งผลต่อความตั้งใจในการยอมรับธนาคารดิจิทัลของผู้อยู่อาศัยในเขตปกครองตนเองทิเบตกานซี โดยขยายแบบจำลองการยอมรับเทคโนโลยี (TAM) ด้วยตัวแปรความเครียดจากเทคโนโลยี การรับรู้ความเสี่ยง ความเป็นนวัตกรรม และความไว้วางใจ จากแบบสอบถาม 394 ชุดที่เก็บรวบรวมด้วยวิธีการสุ่มตัวอย่างแบบหลายขั้นตอน แบบจำลองการไถ่เกลี่ยที่มีตัวแปรกำกับถูกทดสอบด้วยการวิเคราะห์สมการโครงสร้าง PLS-SEM ผลการวิจัยพบว่า การรับรู้ประโยชน์ใช้สอยทำหน้าที่เป็นตัวแปรคั่นกลางระหว่างความเป็นนวัตกรรม ความเครียดจากเทคโนโลยี และการรับรู้ความง่ายในการใช้งานกับความตั้งใจในการใช้ธนาคารดิจิทัล การรับรู้ความเสี่ยงมีผลกำกับเชิงลบต่อความสัมพันธ์ระหว่างการรับรู้ประโยชน์ใช้สอยกับความตั้งใจ และความไว้วางใจเป็นตัวพยากรณ์โดยตรงที่แข็งแกร่งที่สุดตัวหนึ่ง โดยสมมติฐานทั้งสิบข้อได้รับการสนับสนุน ผลการศึกษานี้สนับสนุนทฤษฎีการรวมดิจิทัลและทฤษฎีการยอมรับเทคโนโลยี โดยแสดงให้เห็นว่าในบริบทที่ถูกกีดกันทางการเงินและมีความโดดเด่นทางวัฒนธรรม ความตั้งใจในการยอมรับถูกกำหนดโดยความไว้วางใจของชุมชน การตอบสนองทางอารมณ์ต่อการออกแบบส่วนติดต่อผู้ใช้ และการรับรู้ความเสี่ยงที่ฝังรากอยู่ในวัฒนธรรม ซึ่งแบบจำลองเชิงเหตุผลมาตรฐานไม่สามารถคาดการณ์ได้อย่างแม่นยำ

คำสำคัญ: การรวมดิจิทัล; ช่องว่างทางดิจิทัล; การยอมรับเทคโนโลยี; ความเครียดจากเทคโนโลยี; ชุมชนชนกลุ่มน้อย

ABSTRACT

The adoption of digital services in ethnically distinct, resource-constrained communities reveals how technology interacts with cultural identity, cognitive stress, and institutionalized trust in ways that standard adoption models inadequately capture. This study examines antecedents of D-banking adoption intention among residents of Ganzi Tibetan Autonomous Prefecture—one of China's most financially underserved ethnic minority regions—by extending the Technology Acceptance Model with Technostress, Perceived Risk, Innovativeness, and Trust. Drawing on 394 valid survey responses and a moderated mediation model tested via PLS-SEM, Perceived Usefulness mediated the effects of Innovativeness, Technostress, and Perceived Ease of Use on Intention to Use D-banking; Perceived Risk negatively moderated the Perceived Usefulness–Intention relationship; and Trust emerged as one of the strongest direct predictors, with all ten hypotheses supported. These findings demonstrate that in financially excluded, culturally distinct settings, adoption intention is governed as much by community-mediated trust, affective responses to interface design, and culturally embedded risk perception as by cognitive utility evaluation, with direct implications for inclusive fintech design and digital inclusion policy.

Keywords: Digital Inclusion, Digital Divide, Technology Acceptance, Technostress, Ethnic Minority Communities

INTRODUCTION

Digital banking (D-banking) has emerged as a pivotal instrument for advancing financial inclusion, enabling account management, payment, and savings services through mobile platforms without branch network constraints (Arner et al., 2020). China's national commitment to digital inclusive finance—codified in the Fintech Development Plan (2022–2025)—mandates full harnessing of fintech's role in narrowing the urban–rural digital divide (People's Bank of China, 2022). Yet beneath aggregate penetration metrics lie deep structural inequalities rooted in ethnicity, geography, and cultural distance from formal financial systems that existing frameworks have inadequately addressed.

Ganzi Tibetan Autonomous Prefecture, situated on the southeastern fringe of the Qinghai–Tibet Plateau at elevations exceeding 3,500 meters, exemplifies this paradox. Home to approximately 1.2 million residents—82.3% Tibetan (Ganzi Bureau of Statistics, 2023)—the prefecture faces banking outlet density at only 45% of the national average and 4G coverage below 60% in pastoral zones (Wang & Yang, 2024). Despite substantial policy investment, adoption of the Sichuan Rural Commercial Bank (SCRB) mobile application remains low, constrained by limited digital literacy, culturally embedded risk perceptions, and Technostress from interface complexity and infrastructural fragility.

Three gaps motivate this study. First, the inhibiting role of Technostress in digitally underserved ethnic minority communities has received limited empirical attention (Tarafdar et al., 2019). Second, Perceived Risk has typically been treated as a direct predictor of intention; its moderating function—attenuating the utility–intention relationship under elevated risk—has rarely been examined in rural, resource-constrained contexts (Featherman & Pavlou, 2003). Third, community-mediated institutional trust—where confidence in a digital system derives from collective social validation rather than direct experience—has not been theorized in ethnic minority digital inclusion contexts. This study addresses these gaps by developing an extended TAM incorporating Innovativeness, Technostress, Perceived Ease of Use, and Trust as antecedents, Perceived Usefulness as mediator, and Perceived Risk as both a direct deterrent and a contextual moderator. The model was tested using PLS-SEM with data from 394 Ganzi residents.

The Technology Acceptance Model (TAM; Davis, 1989) provides the core explanatory architecture, proposing that Perceived Ease of Use and Perceived Usefulness jointly determine behavioral intention, with standard TAM extended here to accommodate dispositional antecedents, negative affective states, and contextual risk factors necessary to explain adoption in Ganzi's distinctive setting. Diffusion of Innovations Theory (DOI; Rogers, 2003) supplements TAM by incorporating Innovativeness as a dispositional antecedent that shapes both direct adoption intentions and utility perceptions, consistent with Agarwal and Prasad's (1998) empirical demonstration that personal innovativeness predicts Perceived Usefulness and adoption intention.

Innovativeness and D-Banking Adoption

Innovativeness—the dispositional tendency to adopt new technologies voluntarily ahead of peers (Goldsmith & Hofacker, 1991)—operates through two pathways in D-banking contexts: directly, by generating intrinsic motivation for engagement with novel features, and indirectly, by shaping perceptions of utility through approach orientation rather than anxiety (Agarwal & Prasad, 1998; Chen & Hu, 2023). H1: Innovativeness positively influences Intention to Use D-banking. H4: Perceived Usefulness mediates the relationship between Innovativeness and Intention to Use D-banking.

Technostress and D-Banking Adoption

Technostress—the negative psychological state arising when technology demands surpass perceived coping resources (Tarafdar et al., 2019)—is manifested in Ganzi through interface complexity, fear of irreversible transaction errors, and anxiety from network instability. It operates through two adoption pathways: a direct avoidance mechanism that suppresses intention, and an indirect path that impairs cognitive evaluation of technological benefits, thereby eroding Perceived Usefulness (Ahmad et al., 2023). H2: Technostress negatively influences Intention to Use D-banking. H5: Perceived Usefulness mediates the relationship between Technostress and Intention to Use D-banking.

Perceived Ease of Use and D-Banking Adoption

Perceived Ease of Use—the degree to which a system is believed to be free of effort (Davis, 1989)—reduces cognitive load and fosters confidence among populations with limited digital literacy. Its influence operates through both a direct path (effortless systems are intrinsically preferred) and an indirect path through the ease-of-use heuristic, wherein users infer utility from perceived usability (Venkatesh & Davis, 2000). H3: Perceived Ease of Use positively influences Intention to Use D-banking. H6: Perceived Usefulness mediates the relationship between Perceived Ease of Use and Intention to Use D-banking.

Perceived Usefulness, Trust, and Perceived Risk

Perceived Usefulness (Davis, 1989) serves as the primary cognitive mediator, aggregating dispositional, usability, and affective inputs into a unified belief about functional value. H7: Perceived Usefulness positively influences Intention to Use D-banking. Trust—the user's belief that the platform is reliable and capable of protecting financial interests (McKnight et al., 2002)—operates in Ganzi as a hybrid construct blending regulatory confidence with community-mediated social validation; consistent with Trust Transfer Theory, long-standing familiarity with SCRB physical branches serves as a heuristic for evaluating the digital platform (Yu et al., 2020). H8: Trust positively influences Intention to Use D-banking. Perceived Risk encompasses financial loss, privacy violation, and psychological discomfort (Featherman & Pavlou, 2003); in Ganzi, it functions dually: as a direct deterrent activating loss-aversion heuristics, and as a moderator attenuating the Perceived Usefulness–Intention relationship under elevated risk. H9: Perceived Risk negatively moderates the Perceived Usefulness–Intention relationship. H10: Perceived Risk negatively influences Intention to Use D-banking.

RESEARCH OBJECTIVES

1. To examine the direct effects of Innovativeness, Technostress, Perceived Ease of Use, Trust, and Perceived Risk on the Intention to Use D-banking among residents of Ganzi Tibetan Autonomous Prefecture.

2. To examine the mediating role of Perceived Usefulness in the relationships between Innovativeness, Technostress, and Perceived Ease of Use and the Intention to Use D-banking.

3. To examine the moderating role of Perceived Risk in the relationship between Perceived Usefulness and the Intention to Use D-banking.

The hypothesized relationships are integrated in the conceptual model shown in Figure 1. Innovativeness, Technostress, and Perceived Ease of Use are modeled as antecedents that influence Intention to Use D-banking both directly (H1–H3) and indirectly through Perceived Usefulness (H4–H6); Perceived Usefulness (H7), Trust (H8), and Perceived Risk (H10) exert direct

effects on intention; and Perceived Risk additionally moderates the Perceived Usefulness–Intention relationship (H9).

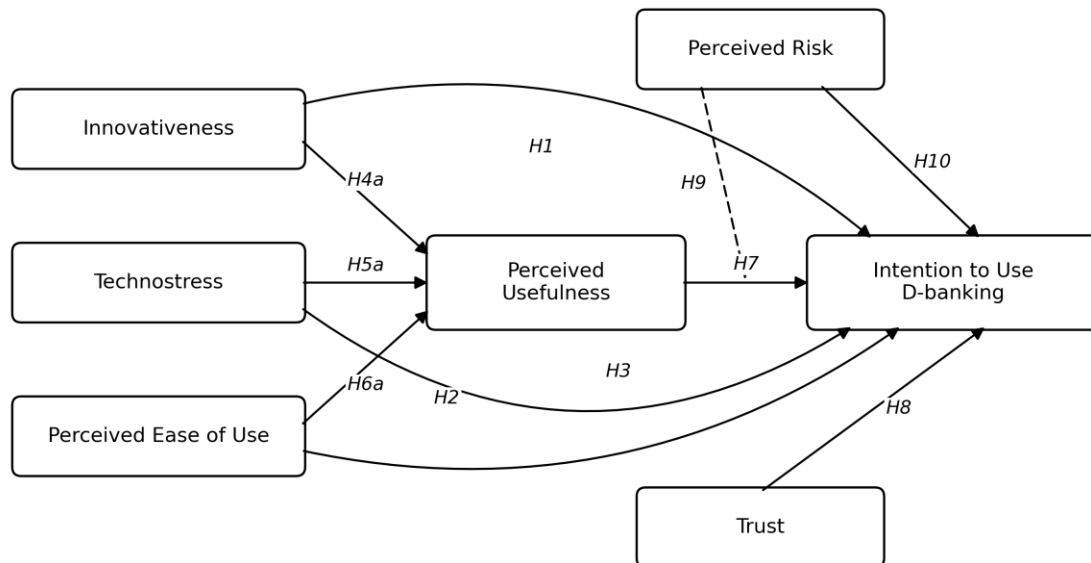


Figure 1 *Conceptual Model of the Study*

Note. Solid arrows denote hypothesized direct effects; the dashed arrow denotes the hypothesized moderating effect of Perceived Risk (H9). H4a–H6a are the first-stage paths of the mediation hypotheses H4–H6.

METHOD

1. Population and Sample

A multi-stage sampling strategy ensured proportional representation across Ganzi's eighteen counties. The target population comprised permanent residents aged 18 and above who owned smartphones, with particular attention to farmers, herders, small business owners, and individuals aged 45 and above.

Sampling proceeded in three stages. In the first stage, Ganzi's eighteen counties were stratified into three strata by degree of urbanization and banking-outlet density, and two counties were randomly selected from each stratum, yielding six counties. In the second stage, three townships were randomly selected within each sampled county from administrative township lists. In the third stage, respondents were recruited within townships using systematic sampling at bank branches, markets, and village service centers, with county-level quotas allocated proportionally to registered population figures reported in the prefecture statistical yearbook (Ganzi Bureau of Statistics, 2023) to ensure that the sample reflected the population distribution across counties.

2. Instruments

All constructs were measured using multi-item reflective scales on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Innovativeness (6 items) was adapted from Goldsmith and Hofacker (1991) and Agarwal and Prasad (1998). Technostress (8 items) was adapted from Tarafdar et al. (2019) and Ragu-Nathan et al. (2008) to measure anxiety and cognitive overload from SCRB APP use. Perceived Ease of Use (6 items) and Perceived Usefulness (6 items) were adapted from Davis (1989) and localized to Ganzi-relevant activities. Perceived Risk (5 items) was adapted from Featherman and Pavlou (2003). Trust (6 items) incorporated both institutional confidence and community-mediated trust (McKnight et al., 2002; Yu et al., 2020). Intention to Use D-banking (5 items) was adapted from Ajzen (1991) and Al-Adwan et al. (2023). Pilot reliability testing ($n = 32$) yielded Cronbach's $\alpha = .81-.90$; content validity ($S-CVI/Ave = .86-.93$) was confirmed by a five-expert panel. Common method bias was mitigated through randomized construct presentation, distinct response formats, and assurance of anonymity (Podsakoff et al., 2012). Ethics approval was obtained from Suan Sunandha Rajabhat University IRB.

3. Data Collection

A total of 500 questionnaires were administered online in Mandarin Chinese through the Wenjuanxing platform during March–June 2025; trained local enumerators assisted participants with limited digital literacy. Of the 421 returned questionnaires (84.2% return rate), 27 were excluded due to excessive missing data ($n = 11$), straight-lining ($n = 9$), or ineligibility ($n = 7$), yielding 394 usable responses (78.8% effective response rate). This sample exceeds the SEM minimum of 200 (Kline, 2023) and the a priori G*Power minimum of 76 ($f^2 = .15$, $\alpha = .05$, power = .80; Faul et al., 2009). Nonresponse bias assessment via independent-samples t -tests found no significant differences between early and late respondents on age ($t = 0.92$, $p = .359$), digital literacy ($t = 1.07$, $p = .286$), or any primary construct (all $p > .20$).

Because 41.4% of respondents reported Tibetan as their primary language, explicit measures were taken to manage language barriers. The Mandarin instrument was translated into Tibetan by two bilingual academics using the translation–back-translation procedure, and discrepancies were reconciled by a third bilingual reviewer; respondents chose their preferred language version. All enumerators were bilingual Tibetan–Mandarin speakers recruited locally and were trained to read items aloud in the local Kham Tibetan dialect for respondents with limited literacy, without paraphrasing item content. Pilot testing included Tibetan-primary speakers to confirm item comprehensibility across both language versions, thereby safeguarding response quality and measurement equivalence.

4. Data Analysis

PLS-SEM was implemented in SmartPLS 4, selected for its predictive orientation, model complexity, non-normal distribution characteristics, and exploratory context (Hair et al., 2022). The two-stage analysis covered measurement model assessment (indicator reliability,

internal consistency, convergent validity, discriminant validity) followed by structural model assessment (collinearity diagnostics, direct path coefficients, mediation via 5,000-subsample bootstrapping with bias-corrected confidence intervals, moderation via orthogonalized product-indicator terms, R^2 , Q^2 , and SRMR).

RESULTS

Preliminary Analysis and Sample Characteristics

Little's MCAR test confirmed data were missing completely at random ($\chi^2 = 287.41$, $df = 276$, $p = .312$); 1.09% missing values were imputed via expectation-maximization. Harman's single-factor test (first factor = 28.63% of variance) and full collinearity VIF (1.18–2.84, all < 3.3) confirmed common method bias is not a serious threat (Kock, 2015). Respondents were predominantly farmers and herders (36.8%), small business owners (22.3%), students (14.5%), retirees (12.7%), and government employees (13.7%). Of all respondents, 41.4% reported Tibetan as their primary language, 38.6% Mandarin, and 20.0% bilingual use; only 34.5% had used a smartphone for any financial activity in the past month.

Measurement Model

The measurement model demonstrated satisfactory psychometric properties (Table 1). All outer loadings exceeded .708, composite reliability (CR) ranged from .898 to .924, and average variance extracted (AVE) ranged from .548 to .596, confirming indicator reliability, internal consistency, and convergent validity (Hair et al., 2022). Perceived Risk recorded the highest mean ($M = 3.64$, $SD = 0.68$), followed by Perceived Usefulness ($M = 3.55$), Innovativeness ($M = 3.47$), Intention to Use ($M = 3.43$), Perceived Ease of Use ($M = 3.38$), Trust ($M = 3.29$), and Technostress ($M = 3.21$). All skewness and kurtosis values fell within ± 2 .

Table 1 Descriptive Statistics, Reliability, and Convergent Validity

Construct	Items	<i>M</i>	<i>SD</i>	λ range	CR	AVE
INN	6	3.47	0.74	.72–.86	.91	.58
TS	8	3.21	0.79	.72–.86	.92	.56
PEOU	6	3.38	0.77	.73–.87	.91	.57
PU	6	3.55	0.71	.74–.87	.91	.58
PR	5	3.64	0.68	.73–.85	.90	.55
Trust	6	3.29	0.82	.73–.87	.92	.59
ITU	5	3.43	0.76	.75–.88	.92	.60

Note. INN = Innovativeness; TS = Technostress; PEOU = Perceived Ease of Use; PU = Perceived Usefulness; PR = Perceived Risk; ITU = Intention to Use D-banking; λ = outer loading range; CR = composite reliability; AVE = average variance extracted.

Discriminant validity was confirmed via the Fornell-Larcker criterion (Table 2), with all $\sqrt{AVE}$ diagonal values exceeding corresponding inter-construct correlations, and via HTMT ratios (Table 3), all below the .85 threshold (Henseler et al., 2015), with the highest ratio being .741 (Trust–ITU).

Table 2 *Discriminant Validity: Fornell-Larcker Criterion*

	1	2	3	4	5	6	7
1. INN	.76						
2. TS	-.41	.75					
3. PEOU	.48	-.39	.76				
4. PU	.53	-.44	.51	.76			
5. PR	-.40	.46	-.37	-.49	.74		
6. Trust	.44	-.35	.47	.49	-.42	.77	
7. ITU	.49	-.42	.44	.57	-.51	.53	.77

Note. Diagonal values (bold) = $\sqrt{AVE}$. INN = Innovativeness; TS = Technostress; PEOU = Perceived Ease of Use; PU = Perceived Usefulness; PR = Perceived Risk; Trust = Trust; ITU = Intention to Use D-banking.

Table 3 *Heterotrait-Monotrait (HTMT) Ratios*

	1	2	3	4	5	6	7
1. INN	—						
2. TS	.49	—					
3. PEOU	.55	.45	—				
4. PU	.61	.52	.60	—			
5. PR	.46	.54	.44	.57	—		
6. Trust	.51	.41	.54	.57	.49	—	
7. ITU	.56	.49	.51	.67	.60	.74	—

Note. HTMT ratios from 5,000-subsample bootstrapping. All values below the .85 threshold (Henseler et al., 2015). 1 = INN; 2 = TS; 3 = PEOU; 4 = PU; 5 = PR; 6 = Trust; 7 = ITU.

Structural Model and Hypothesis Testing

All inner model VIF values (1.00–2.84) confirmed absence of multicollinearity. The model explained a substantial proportion of variance in the endogenous constructs: $R^2 = .38$ for Perceived Usefulness and $R^2 = .54$ (adjusted $R^2 = .53$) for Intention to Use D-banking. Blindfolding-based Q^2 values were positive for both constructs (Perceived Usefulness = .22;

Intention to Use = .31), confirming predictive relevance, and overall model fit was acceptable (SRMR = .052, below the .08 threshold; Hair et al., 2022). Table 4 presents the direct path coefficients. The three paths from Innovativeness, Technostress, and Perceived Ease of Use to Perceived Usefulness are reported in Table 4 as H4a, H5a, and H6a; they constitute the first-stage paths of the mediation hypotheses H4–H6 rather than separate direct-effect hypotheses, and their significance is a precondition for the indirect effects reported in Table 5. Perceived Usefulness exerted the strongest direct effect on Intention to Use D-banking (H7: $\beta = .32$; $p < .001$; $f^2 = .11$), followed by Trust (H8: $\beta = .24$; $p < .001$), Perceived Risk (H10: $\beta = -.20$; $p < .001$), Innovativeness (H1: $\beta = .18$; $p < .001$), Perceived Ease of Use (H3: $\beta = .17$; $p = .001$), and Technostress (H2: $\beta = -.16$; $p < .001$). The moderation hypothesis (H9) was supported: the Perceived Risk $\times$ Perceived Usefulness interaction was significant and negative ($\beta = -.15$; $p < .001$). Simple slope analysis confirmed the Perceived Usefulness–Intention slope at low Perceived Risk ($\beta = .43$; $p < .001$) was substantially attenuated at high Perceived Risk ($\beta = .21$; $p = .003$), demonstrating partial moderation consistent with the privacy calculus framework (Featherman & Pavlou, 2003).

Table 4 *Structural Path Coefficients, Effect Sizes, and Hypothesis Testing*

Path	β	SE	<i>t</i>	<i>p</i>	95% CI	f^2
INN $\rightarrow$ PU (H4a)	.27	.052	5.24	< .001	[.17, .37]	.08
TS $\rightarrow$ PU (H5a)	-.21	.053	3.96	< .001	[-.32, -.11]	.06
PEOU $\rightarrow$ PU (H6a)	.31	.052	6.00	< .001	[.21, .41]	.11
INN $\rightarrow$ ITU (H1)	.18	.046	3.89	< .001	[.09, .28]	.04
TS $\rightarrow$ ITU (H2)	-.16	.048	3.31	< .001	[-.26, -.07]	.03
PEOU $\rightarrow$ ITU (H3)	.17	.051	3.35	.001	[.07, .27]	.03
PU $\rightarrow$ ITU (H7)	.32	.053	6.00	< .001	[.21, .42]	.11
Trust $\rightarrow$ ITU (H8)	.24	.048	5.02	< .001	[.15, .34]	.07
PR $\rightarrow$ ITU (H10)	-.20	.047	4.30	< .001	[-.29, -.11]	.05
PR $\times$ PU $\rightarrow$ ITU (H9)	-.15	.043	3.50	< .001	[-.23, -.07]	.03

Note. β = standardized path coefficient; SE = standard error; CI = bias-corrected confidence interval. f^2 benchmarks: .02 = small, .15 = medium, .35 = large (Cohen, 1988). Bootstrapping: 5,000 subsamples. Paths H4a–H6a are the first-stage paths of mediation hypotheses H4–H6 (Table 5) and were therefore not assigned separate direct-effect hypotheses; SE values are reported to three decimals as obtained from the bootstrap output.

Table 5 presents mediation results. All three indirect effects through Perceived Usefulness were significant (no 95% BCa CI included zero), supporting H4, H5, and H6. Because both direct and indirect effects were significant, each relationship exhibits partial mediation. VAF ranged from 29.6% to 36.7%, with Perceived Ease of Use demonstrating the strongest mediated path (VAF = 36.7%), followed by Innovativeness (31.7%) and Technostress (29.6%).

Table 5 *Mediation Analysis: Indirect Effects via Perceived Usefulness*

Path	β	SE	<i>t</i>	<i>p</i>	95% CI	VAF
H4: INN $\rightarrow$ PU $\rightarrow$ ITU	.09	.024	3.70	< .001	[.04, .13]	31.7%
H5: TS $\rightarrow$ PU $\rightarrow$ ITU	-.07	.023	3.09	.002	[-.11, -.03]	29.6%
H6: PEOU $\rightarrow$ PU $\rightarrow$ ITU	.10	.026	3.81	< .001	[.05, .15]	36.7%

Note. VAF = variance accounted for. Partial mediation: both direct and indirect effects significant.

DISCUSSION

All ten hypotheses were supported. Four principal insights emerge: Trust is among the strongest direct predictors of adoption intention; Technostress operates as a dual-pathway barrier; Perceived Risk functions as a moderating boundary condition; and Perceived Usefulness partially mediates all three cognitive and dispositional antecedents.

Trust as a Dominant Predictor

Trust exerted a strong direct effect on Intention to Use D-banking (H8: $\beta = .24$; $f^2 = .07$), extending McKnight et al.'s (2002) institutional trust framework to a Tibetan minority context where Trust blends regulatory confidence with community-mediated social validation. The prominence of Trust relative to cognitive antecedents suggests that affective assurance of safety is a necessary precondition for adoption in communities where physical cash carries symbolic legitimacy that cognitive utility assessments cannot substitute (Kaur et al., 2020; Yu et al., 2020). The Trust Transfer Theory mechanism implies that SCRB's established branch presence could serve as a trust bridge for digital adoption, though an alternative interpretation—that strong Trust effects partly reflect acquiescence bias among respondents who associate SCRB with state authority—warrants examination in future research using behavioral or implicit measures.

Technostress as a Dual-Pathway Barrier

Technostress operated as a dual-pathway adoption barrier (H2: $\beta = -.16$ direct; H5: indirect $\beta = -.07$; VAF = 29.6%). The direct path reflects avoidance: when SCRB APP demands exceed perceived coping resources, anxiety translates directly into reduced intention. The

indirect path indicates that Technostress additionally impairs the cognitive capacity required to evaluate technological benefits, consistent with Tarafdar et al.'s (2019) proposition that Technostress narrows attentional focus and elevates risk aversion. Interventions reducing interface complexity—voice navigation in Tibetan, icon-based transaction flows, one-tap access, real-time error recovery—would improve both Perceived Usefulness assessments and direct adoption intention simultaneously, amplifying return on investment through the dual-channel mechanism (Ahmad et al., 2023).

Perceived Risk as a Moderating Boundary Condition

The moderation finding (H9: $\beta = -.15$) establishes Perceived Risk as a contextual boundary condition rather than merely an additive predictor. The Perceived Usefulness–Intention slope remained significant at high Perceived Risk ($\beta = .21$; $p = .003$) but was substantially attenuated versus low risk ($\beta = .43$), confirming partial moderation consistent with the privacy calculus framework (Featherman & Pavlou, 2003; Tran et al., 2023). In Ganzi, where digital fraud rumors propagate rapidly through tight community networks, a substantial proportion of residents may be categorically risk-averse regardless of usefulness perceptions, implying that utility-focused adoption strategies require complementary risk mitigation communication delivered through trusted local channels.

Perceived Usefulness as the Central Mediating Mechanism

The consistent partial mediation pattern (VAF: 29.6%–36.7%) confirms TAM's central proposition while extending it. Perceived Ease of Use generated the largest indirect effect (H6: $\beta = .10$; VAF = 36.7%), replicating the ease-of-use heuristic (Venkatesh & Davis, 2000); Innovativeness also shaped utility perceptions (H4: $\beta = .09$; VAF = 31.7%), consistent with the TAM-DOI integration proposed here. The partial (not full) mediation across all pathways indicates each antecedent contributes through both a cognitive-evaluative channel and a direct channel independent of utility assessment, suggesting that adoption interventions must address affective and motivational antecedents alongside utility-focused messaging.

Reflexive Consideration of Uniform Hypothesis Support

That all ten hypotheses were supported warrants reflexive consideration rather than passive acceptance. Three complementary explanations are plausible. First, the hypothesized relationships were deliberately conservative: each path replicates associations repeatedly validated in the TAM, DOI, and Technostress literatures, so uniform support primarily reflects the maturity of the underlying theory rather than surprising new effects; notably, the observed effect sizes were modest ($f^2 = .03$ – $.11$), which is inconsistent with inflated or artifactual estimation. Second, the sample ($N = 394$) provided statistical power well above the a priori minimum, making Type II errors unlikely even for small effects; with such power, theoretically

sound small effects are detectable and their uniform significance is statistically unsurprising. Third, a methodological account cannot be excluded: despite procedural remedies and acceptable Harman and full-collinearity diagnostics, single-source perceptual data may inflate the consistency of directionally aligned relationships, and acquiescence tendencies in a survey administered with enumerator assistance may homogenize responses. The supported moderation hypothesis (H9) nevertheless demonstrates that the model is capable of detecting boundary conditions rather than merely confirming main effects, and the behavioral-data extensions proposed in the limitations would provide the strongest test of whether the uniform pattern replicates beyond self-report.

Theoretical Contributions

This study makes four theoretical contributions. First, it extends TAM by incorporating Technostress as a dual-pathway inhibitor, challenging the standard assumption of affectively neutral cognitive evaluation in IS adoption research and responding to Alalwan et al.'s (2017) call for TAM extensions addressing negative affective states in emerging markets. Second, it reconceptualizes Perceived Risk as a moderating boundary condition rather than an additive predictor, providing a more theoretically precise account of how risk perceptions influence adoption in high-uncertainty environments. Third, it demonstrates that Trust operates as a dominant direct predictor comparable in magnitude to Perceived Usefulness, challenging the implicit universalism of standard TAM and UTAUT frameworks in ethnically distinct contexts. Fourth, it contributes to digital divide scholarship (van Dijk, 2006; Warschauer, 2004) by providing quantitative evidence from a Tibetan autonomous prefecture, positioning second-order divide factors (Technostress, Trust, Perceived Risk) as primary determinants of whether first-order access translates into meaningful adoption—a transferable model for comparable contexts in Southeast Asia, Central Asia, and sub-Saharan Africa.

CONCLUSION

This study provides empirical evidence that D-banking adoption in Ganzi Tibetan Autonomous Prefecture is a psychologically and culturally layered process that standard TAM frameworks are ill-equipped to fully capture. Three central conclusions emerge. First, Trust rather than functional utility alone is a dominant adoption driver, reflecting the irreplaceable role of institutional and community-mediated trust in settings where formal digital financial services are nascent. Second, Technostress constitutes a significant dual-pathway barrier operating through both direct avoidance and indirect impairment of utility evaluation, underscoring that the SCRB APP's adoption challenge is as much a psychological design problem as a technological access problem. Third, Perceived Risk functions as a moderating boundary condition that systematically attenuates the utility–intention relationship, implying

that utility-focused adoption strategies will be ineffective unless complemented by culturally sensitive risk mitigation. These findings demonstrate that TAM universalism is empirically untenable in communities where trust is institutionally embedded, risk is culturally amplified, and digital interfaces generate psychological strain rather than confident engagement.

RECOMMENDATIONS

For SCRB and policymakers, the findings imply that digital inclusion targets are unachievable through infrastructure investment alone. Trust-building interventions should leverage existing branch relationships through community intermediary networks and in-branch APP demonstration sessions conducted in Tibetan. Interface redesign must extend beyond translation to participatory co-design involving Tibetan farmers, herders, and elderly users—prioritizing voice navigation, icon-based flows, and real-time error recovery to reduce Technostress at the source (Norman, 2013). Risk mitigation communication delivered through local Buddhist temples and village governance structures is needed to overcome risk-based adoption vetoes that utility arguments alone cannot address. At the same time, mobilizing religious institutions for what is ultimately a commercial service requires considerable cultural and political sensitivity in the Chinese context: any engagement with monasteries should be strictly informational rather than promotional, undertaken only with the informed consent of monastic authorities and in compliance with regulations governing religious affairs, and kept clearly separate from sales targets or incentive schemes. Where such sensitivities arise, secular channels—village committees, township service centers, and agricultural cooperatives—should be preferred as the primary conduits, with community intermediaries chosen for their standing rather than their institutional affiliation.

Several limitations warrant acknowledgment. The cross-sectional design precludes causal inference; longitudinal research is needed to establish temporal dynamics between Trust development and Perceived Risk reduction. The geographic focus on Ganzi limits generalizability; comparative studies across ethnic minority autonomous prefectures (Yunnan, Xinjiang, Inner Mongolia) would illuminate model boundary conditions. Single-informant perceptual data introduce potential response bias; future research should incorporate behavioral indicators such as SCRB APP usage logs alongside perceptual measures. Technostress was treated as a unidimensional composite; future research should decompose it into Tarafdar et al.'s (2019) sub-dimensions (techno-overload, techno-complexity, techno-insecurity) to identify which forms of digital strain are most consequential in ethnic minority D-banking contexts.

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