Gen Z and Voice-Based Shopping: A TAM-Based Assessment of Digital Literacy and Innovativeness

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Abstract

This study investigates the influence of digital literacy and personal innovativeness on Gen Z consumers' intention to adopt voice commerce, using an extended Technology Acceptance Model (TAM). Data were collected from 289 Gen Z respondents in India via an online survey. Structural equation modeling was employed to test the hypothesized relationships. Results show that both digital literacy and personal innovativeness significantly influence perceived ease of use and perceived usefulness, which in turn predict usage intention. The model explains 62% of the variance in usage intention, confirming strong predictive power. This study contributes theoretically by extending TAM with user-centric antecedents and offers practical insights for developers, marketers, and educators to enhance voice commerce adoption through skill-building and user segmentation.

Keywords: Voice commerce, Digital Literacy, Personal innovativeness, Gen Z

1. Introduction

Voice-assisted retail, commonly known as voice commerce**,** represents a transformative shift in consumer behavior, enabling hands-free, conversational transactions through AI-powered platforms like Amazon Alexa, Google Assistant, and Apple Siri (Karaus et al., 2019). Driven by advancements in natural language processing and artificial intelligence, voice interfaces are transforming online purchasing into a hands-free, conversational process (Saragih & Mulyadi, 2025). Unlike traditional e-commerce that relies on manual input, voice commerce allows hands-free, conversational interaction, offering a user experience aligned with multitasking lifestyles (Stephanidis & Salvendy, 2024). This evolution is not merely technological but behavioral, as consumers increasingly seek more intuitive, hands-free, and seamless modes of interaction.

Among these shifts, Generation Z stands out as a driving force behind the adoption of such interfaces.

Born between approximately 1995 and 2012, Gen Z is often described as "digital natives," immersed in smartphones, social media, and AI-assisted services from a young age (Puiu et al., 2022). A 2024 intelligence study reports that 30.4% of Gen Z consumers shop by voice weekly, significantly higher than Millennials (27.6%), Gen X (14.9%), or Baby Boomers (6.8%) (PYMNTS, 2024). Their consumption patterns emphasize convenience, speed, personalization, and seamless integration with daily life (Garai-Fodor, 2021). This behavioral alignment makes voice commerce especially suitable for a generation that values rapid, intuitive, and intelligent user experiences (Wajda et al., 2022).

While the demographic profile of Gen Z suggests high potential for voice commerce adoption, there remains limited empirical research on the specific individual-level enablers that drive this adoption**.** Existing studies often focus on technological features such as accuracy, trust, and privacy, or broad behavioral constructs such as satisfaction or loyalty (Liu et al., 2021; Pal et al., 2022; Sharma & Sharma, 2025). The literature is sparse when it comes to exploring how specific personal capabilities and traits influence voice commerce adoption, especially in the context of this emerging consumer cohort. This study aims to fill that gap by proposing and testing a conceptual model that positions digital literacy and personal innovativeness as key antecedents to perceived ease of use (PE) and perceived usefulness (PU), the two central constructs of the Technology Acceptance Model (TAM) (Davis, 1989). These perceptions, in turn, influence Gen Z's intention to adopt voice commerce. While TAM has been extensively applied in e-commerce and mobile adoption studies, its integration with capability-based variables such as digital literacy remains underexplored in the voice commerce context (Fayad & Paper, 2015; Fedorko et al., 2018; Fakhar et al., 2023; Wistedt, 2024). Likewise, the role of personal innovativeness has been under-investigated in relation to voice-based interfaces.

Building on these insights, this study investigates:
RQ1: How does digital literacy influence Gen Z's PE and PU regarding voice commerce?
RQ2: How does personal innovativeness shape these perceptions?

RQ3: To what extent do PE and PU mediate the effects of digital literacy and innovativeness on Gen Z's intention to adopt voice commerce?

This study addresses a timely and under-researched area by investigating how individual-level competencies and psychological traits shape Gen Z's engagement with voice commerce. By integrating digital literacy and innovativeness into a TAM-based model, it moves beyond device-centric or platform-centric perspectives and places the user's cognitive and behavioral readiness at the center of adoption analysis. In doing so, it offers both theoretical advancement and practical guidance for understanding the future trajectory of voice commerce adoption.

2. Theoretical Framework and Hypotheses Development

This study draws upon the Technology Acceptance Model (TAM) as the core theoretical foundation to explain Generation Z's intention to adopt voice commerce. Developed by Davis (1989), TAM posits that two primary factors**,** perceived ease of use and perceived usefulness**,** determine a user's behavioral intention to adopt new technologies. These constructs are widely validated across domains such as mobile payments, AI assistants, and e-commerce platforms (Venkatesh & Bala, 2008; Alalwan et al., 2017). Building on this foundation, the current study incorporates two user-centric antecedents—digital literacy and personal innovativeness—as exogenous variables influencing PE and PU. This approach allows for a user-focused understanding of how capability and disposition shape technology adoption in the context of voice commerce.

2.1. Digital Literacy (DL)

Digital literacy refers to one's ability to locate, evaluate, and effectively use digital tools, including navigating and producing online content. In e-commerce contexts, higher digital literacy consistently enhances users' perceptions of system usability and value (Nazzal et al., 2021). Studies in developing economies have demonstrated that higher digital literacy significantly increases users' confidence in navigating online shopping environments, which in turn enhances perceived ease and usefulness (Mahmood et al., 2022; Nguyen et al., 2024; Sun et al., 2025).

For instance, previous studies report significant positive effects of digital literacy on both PE and PU, which in turn increase online purchase intentions (Nazzal et al., 2021; Mailizar et al., 2022; Maulani et al., 2023). In the voice commerce context, where interaction is non-visual and command-based, these skills are especially relevant. Users with higher digital literacy are more likely to issue clear verbal commands, adapt to system errors, and utilize advanced features, thereby perceiving the technology as easier to use and more beneficial (Carolus et al., 2023; Zhang & Zhang, 2024). Therefore, the following hypotheses have been proposed:

H1a: Digital literacy positively influences perceived ease of use of voice commerce.

H1b: Digital literacy positively influences perceived usefulness of voice commerce.

2.2. Personal Innovativeness (PI)

Personal innovativeness is defined as an individual's willingness to experiment with and adopt new technologies (Agarwal & Prasad, 1998). Innovators are more inclined to learn, explore, and adapt to novel interfaces, forming quicker beliefs in ease and functionality (Ashraf et al., 2014; Nagy & Hajdú, 2021). In mobile commerce studies, high innovativeness leads to favorable PE and PU, thus accelerating adoption (Sekri et al., 2024; Yang et al., 2025). Previous studies indicate that innovative individuals are more likely to embrace digital payments, mobile services, and AI-driven tools (Sheth et al., 2022; Akhtar et al., 2025). In the context of voice commerce, innovative users are expected to engage more actively with the technology, tolerate limitations, and explore its potential. This openness typically leads to favorable evaluations of system ease and usefulness. Hence, the following hypotheses have been proposed:

H2a: Personal innovativeness positively influences perceived ease of use of voice commerce.

H2b: Personal innovativeness positively influences perceived usefulness of voice commerce.

2.3. Perceived Ease of Use (PE)

PE, defined as the extent to which a system is effortless, is a central predictor of adoption intention in TAM (Davis, 1989). Perceived ease of use is a central construct in TAM and has consistently been found to predict behavioral intention across technology contexts (Davis, 1989;

Venkatesh et al., 2003). In studies on smart assistants (e.g., Alexa, Siri), users who find the systems easy to interact with report higher satisfaction and stronger usage intentions (Hoy, 2018; Maedche et al., 2019). PE has also been found to positively influence usage intention. If a system is easy to use, users are more likely to find it beneficial (Venkatesh & Bala, 2008). For Gen Z, who expect immediate, seamless, and frictionless experiences across digital platforms (Djafarova & Bowes, 2021), the ease with which voice interfaces respond to their queries significantly shapes their perceptions of the technology.

In the voice commerce environment, where user-system interaction relies on speech rather than touch or visuals, ease of use becomes critical to user satisfaction and continued use. When Gen Z consumers find voice commerce intuitive and effortless, they are more likely to form a favorable intention toward adoption. Accordingly:

H3: Perceived ease of use positively influences Gen Z's intention to use voice commerce.

2.4. Perceived Usefulness (PU)

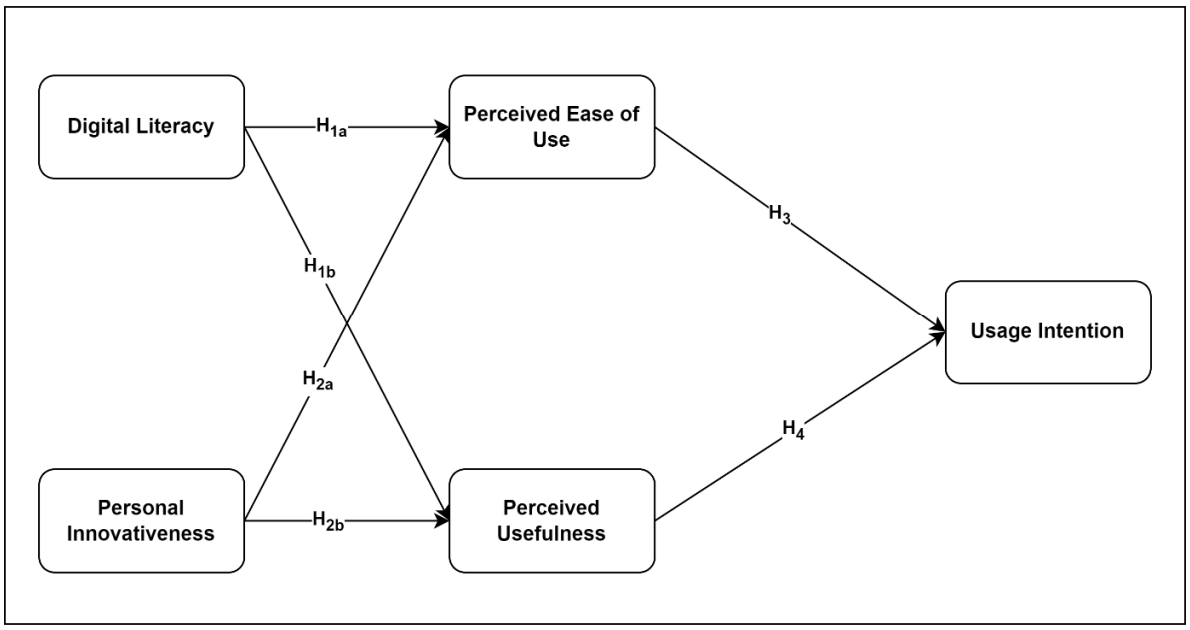
Perceived Usefulness is defined as "the degree to which a person believes that using a particular system would enhance their job performance" (Davis, 1989). In consumer technology adoption, PU extends to how a system improves the convenience, effectiveness, or satisfaction of everyday activities (Alalwan et al., 2018). Prior research has shown that PU is consistently one of the strongest predictors of usage intention (Eraslan Yalcin & Kutlu, 2019; Wang & Shin, 2022). For instance, in studies on AI-powered shopping assistants, users who believe the system helps them save time and make better purchase decisions are significantly more inclined to adopt the technology (Nagy & Hajdú, 2021). In the domain of smart homes and voice banking, PU has been linked to increased loyalty and continued usage (Song et al., 2022).

Numerous studies across online banking, m-commerce, and smart technologies have confirmed that PU significantly drives usage intention (Alalwan et al., 2018; Kang & Hwang, 2022; Al-Adwan et al., 2025). In the case of voice commerce, perceived usefulness may derive from convenience, speed, hands-free multitasking, and personalized assistance. Therefore, the following hypothesis has been proposed:

H4: Perceived usefulness positively influences Gen Z's intention to use voice commerce.

The hypotheses can be presented as shown in Figure 1:

Figure 1: ***Conceptual Framework***



Source: Author's own elaboration

3. Methodology

This study adopts a quantitative, cross-sectional research design using a structured questionnaire to empirically test the proposed relationships among digital literacy (DL), personal innovativeness (PI), perceived ease of use (PE), perceived usefulness (PU), and voice commerce usage intention (UI). The conceptual framework is grounded in the Technology Acceptance Model (TAM), extended with user-centric antecedents. The target population comprises Generation Z consumers (born 1995–2012) with prior exposure to voice-enabled devices such as Amazon Alexa, Google Assistant, or Apple Siri. A purposive sampling approach was used to reach digitally active Gen Z users in India through university mailing lists, social media, and online student communities.

3.1. Data Collection

Data were collected through an online survey distributed via social media platforms, university networks, and digital forums between January and February 2025. To ensure quality, respondents were screened using a filter question to confirm whether they had ever used a voice assistant for commercial purposes (e.g., searching, comparing, or purchasing products). A minimum sample size of 300 responses was targeted based on structural equation modeling (SEM) requirements for medium model complexity (Hair Jr et al., 2017). A total of 289 valid responses were retained after data cleaning, which included checks for completeness, response time, and straight-lining.

3.2. Measurement Instruments

All constructs were measured using validated multi-item Likert scales (1 = Strongly Disagree, 5 = Strongly Agree) adapted from prior studies, with minor wording adjustments to reflect the voice commerce context. For digital Literacy, 4 items were adapted from Avinç and Doğan (2024) and Zan et al. (2021), covering information navigation, system handling, and content judgment. For personal innovativeness, 4 items based on Agarwal and Prasad (1998), assessing willingness to try new technologies. For perceived ease of use & perceived usefulness, each measured using 3 items adapted from Davis (1989) and Venkatesh and Bala (2008). For usage intention, 3 items measuring future willingness to use voice commerce were adapted from Pal et al. (2020).

3.3. Data Analysis

The data was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 4.0, chosen for its suitability with non-normal data and exploratory models. The analysis will proceed in two stages:

1. Measurement Model Evaluation: Assessing reliability (Factor Loading, Cronbach's alpha, composite reliability), convergent validity (average variance extracted), and discriminant validity (Fornell & Larcker criterion).
2. Structural Model Testing: Evaluating path coefficients and R^2 values.

4. Findings

4.1. *Respondents' Profile*

The sample comprised 289 valid responses from Gen Z participants, with a balanced gender split (Male: 52.2%, Female: 47.8%). The majority (58%) were aged between 22–25 years, and 59% held postgraduate-level education. A substantial proportion reported frequent use of voice assistants, 22% used them daily, and 49% weekly, indicating that respondents were familiar with the core technology being studied. For detailed information, see Table 1:

Table 1: ***Respondents' Profile (n=289)***

Variable	Sub Variable	Frequency	Percentage
Gender	Male	150	51.9%
	Female	139	48.1%
Age	18-21 years	104	36.0%
	22-25 years	168	58.1%
	<26 years	17	5.9%
Education	Undergraduate	119	41.2%
	Postgraduate	170	58.8%
Voice assistant usage frequency	Daily	63	21.8%
	Weakly	142	49.1%
	Occasionally	84	29.1%

Source: Primary Data

4.2. Descriptive Statistics

The descriptive analysis presented in Table 2 shows that all constructs had moderate to high mean values, indicating generally favorable perceptions. The constructs measured showed overall positive perceptions. The mean score for digital literacy (M = 3.87) and personal innovativeness (M = 3.76) were high, reflecting the digital fluency and open-mindedness often attributed to Gen Z consumers. Perceived usefulness (PU) and perceived ease of use (PE) also scored high (4.01 and 3.93, respectively), indicating that voice assistants are generally viewed as functional and user-friendly by this cohort. Meanwhile, the mean score for usage intention (UI) was 4.10, suggesting that most Gen Z participants are likely to continue using voice commerce in

the future. These values suggest that respondents are moderately digitally literate, somewhat innovative, and positively inclined toward voice commerce adoption.

Table 2: ***Descriptive Statistics***

Variable	Mean	Std. Deviation
Digital Literacy	3.87	0.61
Personal Innovativeness	3.76	0.58
Perceived Ease of Use	3.93	0.66
Perceived Usefulness	4.01	0.69
Usage Intention	4.1	0.63

Source: Primary Data

4.3. Measurement Model

The reliability and validity of all measurement constructs were established through composite reliability (CR), average variance extracted (AVE), and Cronbach's alpha. Table 3 reports the construct reliability and validity indicators. All CR values exceeded the recommended threshold of 0.70, with values ranging from 0.86 to 0.91, indicating high internal consistency (Hair Jr et al., 2017). AVE values ranged from 0.59 to 0.72, demonstrating adequate convergent validity, i.e., each construct explained more than 50% of its variance (Fornell & Larcker, 1981). Similarly, the value of Cronbach's alpha exceeded the recommended threshold of 0.70, with values ranging from 0.86 to 0.91, indicating the internal consistency of the scale is high (Nunnally, 1978). Discriminant validity was also confirmed using the Fornell-Larcker criterion, where square root of average variance extracted for each construct is greater than the correlation with that construct and all other constructs in the model. Table 4 confirms the discriminant Validity (Fornell & Larcker, 1981). These results affirm that the measurement model is both reliable and valid, enabling robust interpretation of structural relationships.

Table 3: ***Measurement Model***

Variable	Items	Factor Loading	CR	AVE	Cronbach Alpha
Digital Literacy			0.88	0.59	0.83
	DL1	0.75			

	DL2	0.72			
	DL3	0.78			
	DL4	0.73			
Personal Innovativeness			0.86	0.61	0.80
	PI1	0.81			
	PI2	0.76			
	PI3	0.74			
	PI4	0.79			
Perceived Ease of Use			0.90	0.68	0.86
	PE1	0.85			
	PE2	0.80			
	PE3	0.81			
Perceived Usefulness			0.91	0.72	0.88
	PU1	0.86			
	PU2	0.88			
	PU3	0.83			
Usage Intention			0.89	0.66	0.85
	UI1	0.79			
	UI2	0.77			
	UI3	0.83			

Source: Primary Data

Table 4: *Discriminant Validity*

Variable	DL	PI	PE	PU	UI
DL	***0.77***				
PI	0.52	***0.78***			
PE	0.50	0.53	***0.82***		
PU	0.48	0.50	0.60	***0.85***	
UI	0.46	0.48	0.55	0.63	***0.81***

Source: Primary Data

4.4. Hypotheses Testing

With evidence of reliability and validity established in the measurement model, the study proceeded to test the hypothesized links between constructs. The quality of the model was evaluated using the standardized path coefficients and their statistical significance (Hair et al., 2014). Structural Equation Modeling (SEM) path analysis was employed to evaluate the proposed hypotheses. To evaluate the validity of the model, both R square values and structural pathways are examined.

Table 5: ***Hypotheses Testing***

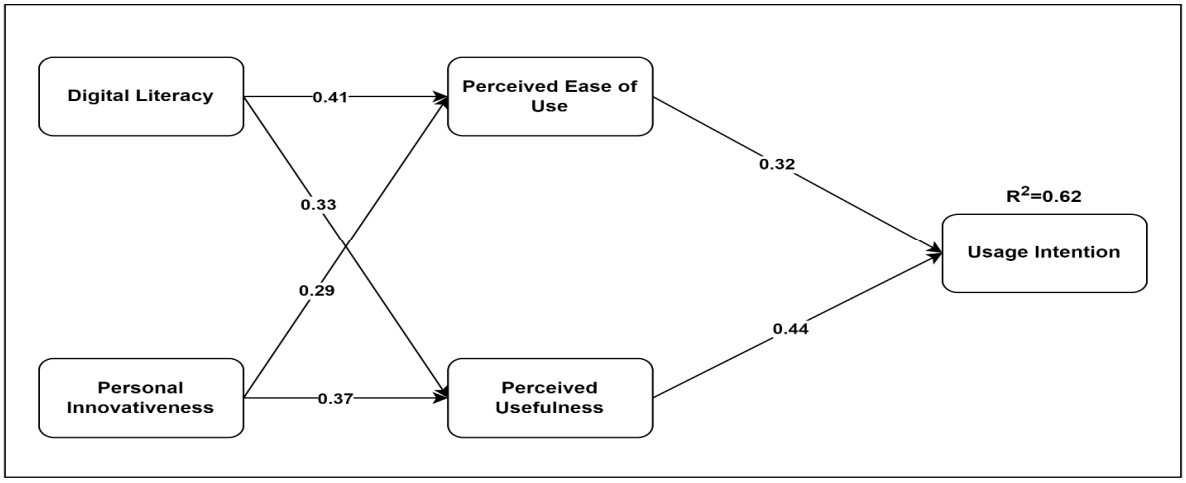
Hypothesis	Path	β (Beta)	p-value	Supported
H1a	DL → PE	0.41	0.000	Yes
H1b	DL → PU	0.33	0.001	Yes
H2a	PI → PE	0.29	0.002	Yes
H2b	PI → PU	0.37	0.000	Yes
H3	PE → UI	0.32	0.003	Yes
H4	PU → UI	0.44	0.000	Yes

Source: Primary Data

Note: All the hypotheses are supported at 1% level of significance

Results from Table 5 depict that all the hypotheses were supported. Digital literacy significantly influenced both PE (β = 0.41, p < 0.001) and PU (β = 0.33, p = 0.001)**.** Thus supported the H1a and H1b. Personal innovativeness also significantly predicted PE (β = 0.29, p = 0.002) and PU (β = 0.37, p < 0.001). Thus supported the H2a and H2b. Similarly, PE (β = 0.32, p = 0.003) and PU (β = 0.44, p < 0.001) both had significant and positive effects on usage intention. Thus supported the H3 and H4. R square value of 0.62 (Figure 2) shows that these constructs explained approximately 62% of variance in the dependent variable. These results demonstrate that this model is effective in explaining Gen Z's intention to adopt voice commerce technology.

Figure 2: ***PLS SEM Results***



Source: PLS SEM Results

5. Discussion and Conclusion

This research aimed to investigate the usage intention of voice commerce among Gen Z, utilizing the Technology Acceptance Model (TAM) while exploring the roles of digital literacy and personal innovativeness. Our findings confirm that digital literacy significantly influences perceived ease of use ($\beta = 0.41$) and perceived usefulness ($\beta = 0.33$), both at $p < 0.01$. This aligns with prior empirical studies such as Nazzal et al. (2021), who found similar effects within e-commerce adoption, and Israr et al. (2024), who observed a strong relationship between digital literacy and both TAM constructs in Pakistani shoppers. In voice commerce, which operates through non-visual, conversational interfaces, digital literacy equips users with cognitive skills to form effective commands, evaluate system feedback, and self-correct, making the experience feel both effortless and valuable. Similarly, results demonstrate that personal innovativeness positively predicts PE ($\beta = 0.29$) and PU ($\beta = 0.37$), both significant at $p < 0.01$. This supports findings by Thakur and Srivastava (2014), who reported innovativeness as a key predictor of mobile payments adoption in India, and the study that linked innovativeness to financial technology use (Singh et al., 2020). For voice commerce, innovative Gen Z consumers are more receptive to exploring unfamiliar voice interfaces despite inherent imperfections, thus forming stronger positive attitudes. Consistent with TAM, perceived ease of use and perceived usefulness are significant predictors of usage intention, with $\beta = 0.32$ ($p = 0.003$) and $\beta = 0.44$ ($p < 0.001$), respectively. These findings echo diverse technology adoption studies, ranging from mobile wallets to e-banking, underscoring PU's generally stronger role (Sarmah et al., 2021; Salah & Ayyash, 2024; Kaulu et al., 2024). Importantly, they affirm that Gen Z values both the effortlessness and practicality of voice commerce when forming their intentions.

5.1. Theoretical Implications

This study extends the TAM by integrating two user-centric antecedents, digital literacy and personal innovativeness, into the model of voice commerce adoption. Traditionally, TAM emphasizes system attributes like ease of use and usefulness as predictors of behavioral intention. By incorporating these individual-level constructs, the study broadens TAM's explanatory scope, addressing calls for recognizing digital capabilities and personal traits as critical factors in

technology acceptance (Israr et al., 2024). In doing so, the study not only validates TAM in a novel context but also demonstrates its adaptability to emerging, AI-driven interfaces.

Moreover, focusing on Gen Z highlights important intra-generational differences. Although labeled as "digital natives," the results show substantial variability among Gen Z in both digital competencies and technological innovativeness. This nuance challenges the assumption of uniform readiness and underscores the need for more individualized theoretical models that consider diversity in skill levels and openness to adoption (Isma et al., 2025). Thus, the study contributes methodologically by advocating for refined segmentations within generational cohorts.

5.2. Practical Implications

The study offers actionable insights for technology designers. Developers of voice-commerce platforms should embed guided onboarding, voice-feedback tutorials, and error-handling prompts to accommodate varying levels of digital literacy. Doing so can increase both PE and PU, as cognitively prepared users are more likely to perceive voice interfaces as effortless and beneficial. For marketers and product managers, our findings suggest that campaigns targeting Gen Z ought to segment audiences based on innovativeness. Early-adopter messaging, beta trials, and novelty campaigns may resonate strongly with personality-driven innovators. Conversely, messaging focused on ease, problem-solving tutorials, and testimonials may appeal to those high in digital literacy who prefer utility and clarity (Thakur & Srivastava, 2014). Educational institutions and policymakers also have a role to play. Integrating voice-centric digital literacy modules into curricula can bridge skill gaps, enabling broader adoption of AI interfaces. Vocational training programs that include hands-free interface design and voice-command exercises are likely to empower a generation better equipped for emerging digital futures.

Finally, businesses and service providers can leverage the study's insights to develop tiered user experiences. By identifying users with higher digital literacy, platforms could offer advanced voice-command options, voice-based reordering, and integrations with smart ecosystems. Meanwhile, streamlined basic voice functionality can cater to users with lower proficiency, thus ensuring inclusive adoption.

5.3. Limitations and Future Research Directions

Despite its contributions, this study has certain limitations that warrant consideration. First, the use of a cross-sectional survey limits the ability to infer causal relationships among variables. Future studies should consider longitudinal or experimental designs to capture changes in user behavior over time, especially as voice commerce technologies evolve. Second, the data were collected from a single generational cohort (Gen Z) in India, which may restrict the generalizability of findings. Comparative studies across generations or cultures would help uncover contextual differences in voice technology adoption. Third, the reliance on self-reported measures may introduce social desirability or recall bias. Integrating behavioral data (e.g., actual usage logs or voice command history) could enhance the robustness of future models. Additionally, while the study focused on digital literacy and personal innovativeness, other psychological or contextual factors—such as trust, privacy concerns, or device familiarity—might further enrich the model. Finally, as voice interfaces increasingly integrate with AI and IoT ecosystems, future research should examine how system intelligence or contextual personalization influences user acceptance and satisfaction.

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