Generational Shifts in Physician Engagement in India: Digital Adaptation, Evidence Orientation, and Ethical Preferences

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ABSTRACT

This study examines generational shifts in physician engagement in India by comparing Generation Z and Generation Y doctors under the age of 45 across digital adaptation (CDA), real-world evidence efficacy (EGE), personalized engagement (PEP), and ethics-oriented engagement (EBE). Physicians are conceptualized as professional consumers of information that navigates digital and clinical environments when engaging in engagement preferences. Survey responses from 350 clinicians were analyzed using cohort comparison tests and a structural model (PLS-SEM, 5,000 bootstraps). The results show that Generation Y places greater emphasis on ethics-oriented engagement (d ≈ 0.35, p < 0.001) and demonstrates higher digital adaptation (d ≈ 0.25, p < 0.01) than Generation Z, while both cohorts report comparable evidence orientations and similar levels of personalized engagement. Despite Gen Z's enthusiasm for digital and personalized formats, Gen Y reported a higher realized digital use in practice (p < 0.02). In the structural model, digital adaptation (β = 0.358, p < 0.001) and evidence orientation (β = 0.197, p < 0.001) increased personalized engagement, with significant amplification when both were high (interaction β = 0.158, p = 0.003). Digital adaptation also modestly predicts ethic-oriented engagement (β = 0.237, p < 0.001). Overall, engagement was strongest when digital fluency and credible real-world outcomes were presented together, whereas ethics-oriented engagement was more salient for Generation Y. These insights support cohort-aligned communication and brand-building strategies in India's credence-intensive pharmaceutical markets.

Keywords: Generation Z, Generation Y, Physician Engagement, Digital Adaptation, Real-World Evidence, Ethical Marketing, India.

1. INTRODUCTION

India's healthcare landscape is undergoing a rapid digital transformation, reshaping how physicians engage with technology, patients, and the pharmaceutical industry. Tools such as electronic medical records, teleconsultation platforms, and clinical decision aids have gained momentum, particularly after the COVID19 pandemic (Slepian et al., 2024; Khrystenko et al., 2022). However, the way these technologies are embraced varies significantly across generational cohorts (Lyons & Kuron, 2014; Shatto & Erwin, 2017; Undale et al., 2023). Generation Y doctors (born in 1981–1996) began their careers during the transitional phase, moving from analog to digital systems. Their engagement is often structured, reflective, and shaped by gradual adoption of technology (Lyons & Kuron, 2014). By contrast, Generation Z physicians (born after 1996) are digital natives raised in a mobile-first environment. Clinical and professional expectations are informed by personalization, speed, and interactivity (Maloni et al., 2019; Dimattio et al., 2020).Research has shown that Gen Z professionals prefer autonomy, gamified learning formats, and digital fluency over hierarchical, one-size-fits-all models (Shatto & Erwin, 2017; Chandra & Sinha, 2021). However, pharmaceutical engagement in India remains largely uniform, centered on physical detailing, printed communication, and generic content (Agrawal, 2022). This divergence suggests a critical need to examine generational expectations in the context of medical marketing. This study draws on Generational Cohort Theory (Strauss & Howe, 1991) and the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003) to compare Gen Z and Gen Y physicians in India across the four domains. This study investigated the following research questions:

RQ1: Do Gen Z and Gen Y doctors differ in their preferences for digital, personalized, and phygital pharmaceutical engagement?

RQ2: Are there generational differences in digital interactions with patients?

RQ3: How do these groups compare ethical, sustainable, and cause-driven pharmaceutical expectations?

RQ4: Does generational identity influence perceptions of real-world evidence regarding clinical decisions?

By addressing these questions, this study provides timely insights for pharmaceutical marketers, educators, and health policy stakeholders aiming to design generation-sensitive engagement strategies that align with India's evolving digital maturity.

2. LITERATURE REVIEW

Generational Cohort Theory posits that shared socio-cultural experiences during youth shape values and behaviors later in life (Strauss & Howe, 1991). Generation Y (born 1981–1996) entered medicine during the digital transition, balancing traditional communication with the adaptive use of emerging tools (Lyons & Kuron, 2014). Generation Z (born after 1996), raised in a technology-saturated world, favors immediacy, personalization, and interactive formats (Maloni et al., 2019; Shatto & Erwin, 2017). Gen Z professionals typically value autonomy, ethical congruence, and digital fluency at work (Twenge et al., 2010; Mencl & Lester, 2014). The Unified Theory of Acceptance and Use of Technology (UTAUT) explains how digital uptake varies across cohorts (Venkatesh et al., 2003). Indian clinicians widely use EHRs, telemedicine, and messaging platforms, but Gen Z tends to prefer mobile-first asynchronous channels, especially when engaging with pharma, patients, or peers (Undale et al., 2023; Slepian et al., 2024). They often disengage from static, non-interactive formats such as printed detailing or one-way webinars (Dimattio et al., 2020). By contrast, Gen Y integrates these new tools with established, more structured communication routines (Chandra & Sinha, 2021).

Beyond digital fluency, Gen Z members demonstrate a stronger inclination toward ethical, transparent, and sustainability-focused pharmaceutical practices (Pandey et al., 2020; Singkeruang & Srisuruk, 2024). They resonate more with value-driven narratives and companies engaging in social causes. While ethical standards are broadly shared across cohorts, cultural factors, such as mentor modeling and stability seeking, which are more prevalent in Indian medical education, may shape how these values manifest in practice (Khrystenko et al., 2022).

In terms of consumer behavior, the four engagement constructs align with established psychological mechanisms that explain how individuals process marketing information and act on it. Real-world evidence functions as a central route cue in the Elaboration Likelihood Model, increasing message diagnosticity and persuasion when credibility is high (Petty & Cacioppo, 1986). Digital adaptation reflects perceived technological affordances, where higher digital fluency reduces friction and expands perceived action possibilities in technology-mediated environments (Gibson, 1979). Perceived personalization corresponds to the determinants of self-relevance in message processing, where tailored content heightens attention and engagement by matching personal goals and contexts (Petty, Cacioppo, & Strathman, 2005). Ethics oriented engagement aligns with moral identity congruence, in which consumers prefer brands whose behaviors fit their internalized moral traits and identity signals (Aquino & Reed, 2002). Accordingly, we frame CDA as digital fluency versus friction, EGE as the credibility of credence claims signaled through real world evidence, PEP as personalized engagement preference reflecting perceived personalization and self relevance, and EBE as moral identity congruence. This bridge positions the constructs within mainstream consumer theory and clarifies how digital fluency, evidence credibility, personalization, and moral identity jointly shape engagement across generational cohorts.

Box 1. Gap in Literature

> *Prior studies describe Gen Z and Gen Y separately, but none compare both cohorts within the Indian medical context using a unified, theory grounded framework. No empirical work has jointly examined digital engagement, evidence orientation, personalization, and ethics oriented expectations across generations.*

To synthesize these theoretical streams and position our constructs within a unified explanatory pathway, we present an integrative mechanism linking generational cohort differences to digital adaptation, evidence orientation, engagement preferences, and downstream brand outcomes.

Figure 1. Integrative Mechanism Linking Generational Cohorts to Brand Outcomes

Note. This figure summarizes the conceptual mechanism linking generational cohort differences to digital adaptation, evidence orientation, engagement preferences, and downstream brand outcomes.
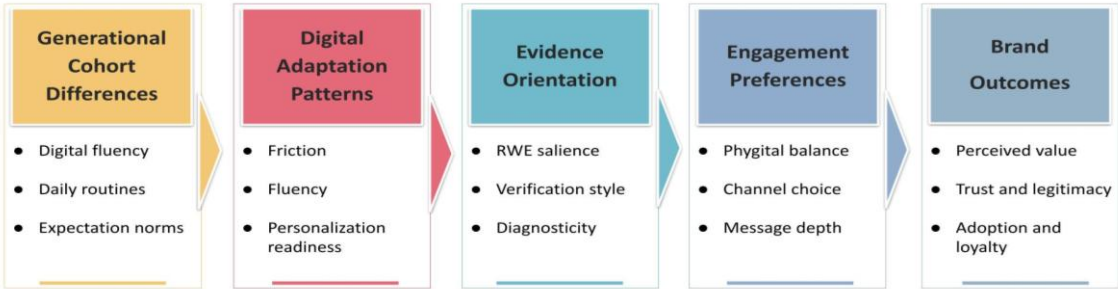
3. METHODS

3.1 Study Design and Participants

A cross-sectional, observational study was conducted across India in 2024 among practicing physicians aged < 45 years. Participants included licensed MBBS and postgraduate doctors (MD, DNB, etc.) actively engaged in clinical practice. Interns, non-practicing doctors, and incomplete responses were excluded.Of 440 invited clinicians, 350 valid responses were analyzed: 225 from Gen Y and 125 from Gen Z doctors. Stratified purposive sampling ensured diversity in the region, specialties, and qualifications. Data were collected using a structured, self-administered, online questionnaire.

3.2 Measures and Constructs

The survey was informed by an earlier mixed-methods study on Gen Z doctors, in which a cross-functional pharma panel identified key constructs via structured discussions. The findings were validated through a survey of 110 Gen Z physicians and were published in a prior study (Anthuvan et al., 2024). This framework guided the present instrument, which was adapted for the Gen Y comparison.

The final tool assessed four engagement constructs using nine items rated on a 5 point Likert scale. These constructs were Pharma Engagement Preference, Clinical Digital Adaptation, Evidence-Based Decision Priority, and Ethical and Green Pharma Expectations (see Table 1). The Cronbach's alpha values ranged from 0.74 0.81. Items were derived from validated sources (Lyons & Kuron, 2014; Venkatesh et al., 2003) and validated content (CVI > 0.85) through expert reviews.

Table 1. Engagement Constructs

Construct (DV Cluster)	DV Indicator (Observed Variable)	Item No
Pharma Engagement Preference	Preference for digital interactions	Q1
	Engagementwith personalized content	Q2
	Preference for phygital approaches	Q3
Clinical Digital Adaptation	Preference for digital patient interactions	Q4
Evidence-Based Decision Priority	Valuedata-driven insights	Q5
	Find real-world evidence helpful	Q6
Ethical & Green Pharma Expectations	Value ethical marketing	Q7
	Support for sustainability	Q8
	Influence of social causes	Q9

3.3 Moderators and Demographics

The generation cohort (Gen Y vs. Gen Z) served as the primary independent variable. Moderators included practice setting (private vs. institutional) and state-level digital maturity classified using the ICRIER 2024 benchmarks. Age, sex, and medical specialty were included as the control variables. See Table 2 for the coding details.

Table 2. Variable Classification

Variable	Type	Coding/Classification
Practice Setting	Moderator	1 = Government/Institutional 0 = Private/Clinic-based
State Digital Maturity	Moderator	High vs. Emerging (ICRIER classification)
Age	Demographic	Completed years
Gender	Demographic	Male/Female
Specialty	Demographic	General Physician (MBBS) / Specialists (MD, DNB, etc.)
Generation Cohort	Independent	Gen Y (1981–1996) Gen Z (1997 onwards)

3.4 Statistical Analysis

Descriptive and inferential analyses were performed using SPSS and R. Between-group differences were analyzed using Welch's t-test, with Cohen's d for effect sizes. Two-way ANOVA was used to test the interaction effects of the moderators. Multiple regression models adjusted for demographic covariates. Ordinal variables, such as the frequency of digital engagement, were evaluated using the Mann–Whitney U test. Statistical significance was set at $p < 0.05$. The conceptual model (Figure 2) illustrates the study framework, highlighting the role of generation, moderators, and control variables in influencing physician engagement.
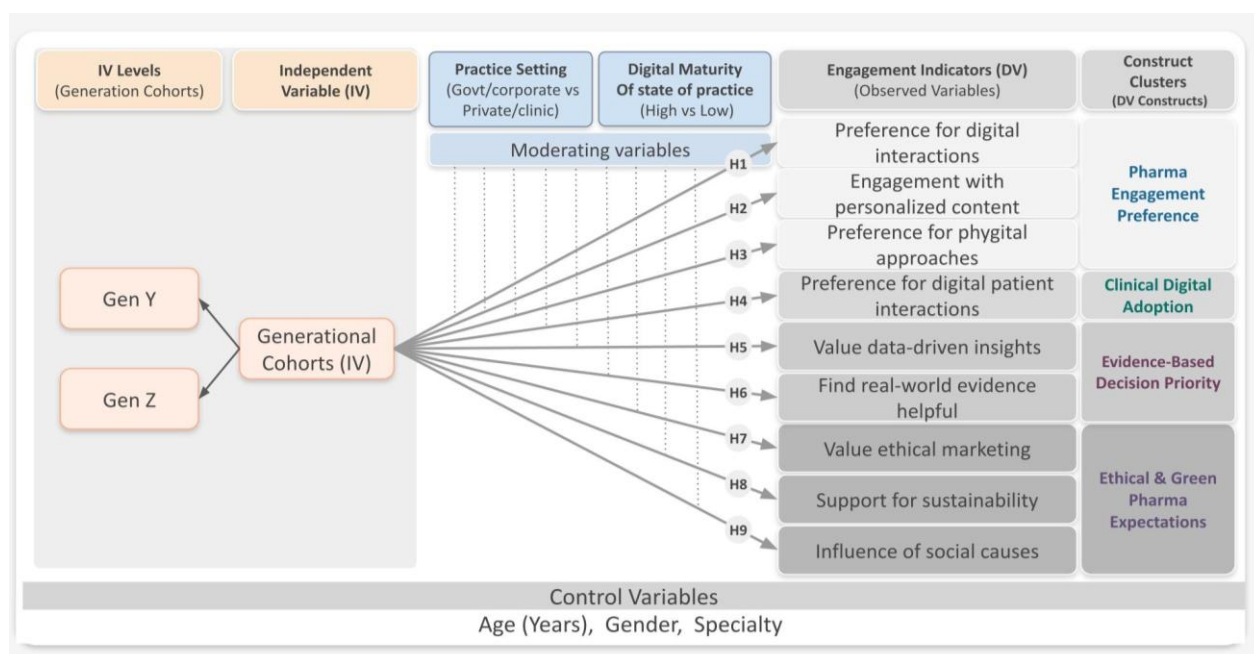
Figure 2. Conceptual Model of Generational Effects on Physician Engagement
Note: Visualizes generational cohort as the main predictor, four engagement constructs as dependent variables, and practice setting/digital maturity as moderators. Age, gender, and specialty are treated as controls.

3.5 Ethics

This academic, non-interventional study involved only professional respondents. No clinical, patient-related, or personal identifiable data were collected. As per the standard academic practice in India for survey-based research with professionals, formal ethics approval was not required.

4. RESULTS AND FINDINGS

4.1 Sample Characteristics

Out of 440 invited participants, 350 valid responses were analyzed 64.3 % from Gen Y and 35.7% from Gen Z. respondents represented a mix of genders, clinical specializations, practice settings, and regional digital maturity levels (Table 3).

Table 3. Respondent Profile

Variable	Gen Y (n = 225)	Gen Z (n = 125)	Total (N = 350)
Gender: Male	120	70	190
Gender: Female	105	55	160
General Physicians (MBBS)	90	50	140
Specialists (MD/DNB)	135	75	210
Private Practice	160	95	255
Government Practice	65	30	95
High Digital Maturity	145	65	210
Emerging Digital Maturity	80	60	140

4.2 Generational Main Effects on Engagement Constructs

As detailed in Table 4, Gen Z scored significantly higher on six of the nine indicators, particularly digital pharmaceutical interactions, phygital preferences, and evidence orientation. The most notable differences were in clinical digital adaptation and evaluation of real-world evidence (RWE). However, both generations showed comparable attitudes toward ethical, sustainable, and cause-driven pharmaceutical expectations.

Table 4. Generational Main Effects

DV Indicator	Construct	Gen Z Mean	Gen Y Mean	p-value	Effect Size (Cohen's d)	Significant
Digital pharma interaction	Pharma Engagement	4.02	3.79	0.033	0.34	Yes
Personalized content	Pharma Engagement	4.01	3.87	0.046	0.23	Yes
Phygital interaction preference	Pharma Engagement	4.12	3.89	0.009	0.37	Yes

Digital patient interaction	Clinical Digital Adaptation	4.25	3.91	0.0016	0.51	Yes
Value of data-driven insights	Evidence-Based Decision Priority	4.34	4.01	<0.001	0.54	Yes
Helpfulness of real-world evidence	Evidence-Based Decision Priority	4.32	3.93	<0.001	0.51	Yes
Value placed on ethical marketing	Ethical & Green Expectations	4.16	4.1	0.5079	0.09	No
Support for sustainability	Ethical & Green Expectations	4.19	4.04	0.061	0.23	No
Influence of social causes	Ethical & Green Expectations	4.07	3.98	0.294	0.14	No

Note: Measured on 5-point Likert scale; $p < 0.05$ considered significant.

4.3 Moderation by Practice Setting and Digital Maturity

The practice environment and regional digital readiness had several generational effects (Table 5). Gen-Z doctors in private practice reported a stronger alignment with RWE, ethical marketing, and sustainability. In states of high digital maturity, they also showed greater adoption of digital tools and stronger evidence orientation. These interactions suggest that generational differences are context-sensitive and are shaped by institutional autonomy and technological infrastructure.

Table 5. Moderator Effects

Moderator	DV Indicator (Construct)	Interaction F (p-value)	Interpretation
Practice Setting	RWE Usefulness (Evidence Priority)	F = 4.077 (p = 0.044)	Gen Z in private practice value RWE more
	Ethical Marketing (Ethical Expectations)	F = 4.382 (p = 0.0362)	Private Gen Z doctors show stronger ethics lean
	Sustainability (Ethical Expectations)	F = 4.195 (p = 0.0409)	Gen Z in private setups prefer sustainability
Digital Maturity	Digital Patient Interaction (Digital Use)	F = 5.267 (p = 0.022)	Gen Z in mature states prefer digital tools
	RWE Usefulness (Evidence Priority)	F = 7.887 (p = 0.005)	Gen Z in mature states see higher RWE value

Note: Only significant findings are shown. Interaction effects were computed via two-way ANOVA.

4.4 Frequency of Digital Engagement

Despite Gen Z's preference for digital formats, Gen Y reported a higher frequency of use for both digital patient consultations and pharmaceutical interactions (Table 6). Gen Y's consistency may stem from longer industry exposure and routine digital integration, while Gen Z appears more selective, favoring asynchronous tools, such as apps and curated content.

Table 6. Digital Engagement Frequency Preferences

Domain	Gen Y (Median [IQR])	Gen Z (Median [IQR])	p-value	Trend
Digital Consultations with Patients	5 [3–7]	5 [2–6]	0.0057	Gen Y > Gen Z (usage)
Digital Pharma Interactions	5 [3–6]	4 [3–5]	0.0149	Gen Y > Gen Z (frequency)

Interpretation: Gen Z is digitally fluent yet discerning; Gen Y is digitally consistent due to embedded habits and longer tenure.

4.5 Structural Effects of Digital Adaptation and Real-World Evidence on Personalized Engagement

The structural model indicated that physicians' digital adaptation (CDA) is a strong positive predictor of personalized engagement with pharmaceutical content (PEP). Real-world evidence efficacy (EGE) also showed an independent positive association with PEP. Importantly, the interaction between CDA and EGE was significant, indicating that the positive effect of digital adaptation on personalized engagement was amplified when physicians placed greater value on real-world evidence. Together, these findings suggest that

personalization strategies in pharmaceutical communication are the most effective when digital readiness and evidence orientation coexist.

Personalization works best when easy digital pathways are paired with concrete and credible real-world outcomes.

Table 7. Structural Path Estimates for Personalized Engagement (PEP)

Path	β	95% CI	p-value
CDA → PEP	0.358	[0.244, 0.466]	< 0.001
EGE → PEP	0.197	[0.095, 0.294]	< 0.001
CDA × EGE → PEP	0.158	[0.055, 0.303]	0.003

Note: Standardized path coefficients (β) were estimated using bootstrapped PLS-SEM with 5,000 resamples. Confidence intervals are bias-corrected. CDA = Consumer Digital Adaptation; EGE = Efficacy/Generalized Efficacy (real-world evidence orientation); PEP = Physician Engagement with Personalized content. CDA × EGE represents the interaction between digital adaptation and real-world evidence efficacy. All reported paths are statistically significant at p < 0.01.

4.6 Structural Effects of Digital Adaptation on Ethics-Oriented Engagement

Digital adaptation also exhibits a positive but comparatively weaker structural association with ethics-oriented engagement (EBE). While physicians with higher digital adaptation demonstrate a slightly stronger alignment with ethical and sustainability-linked pharmaceutical engagement, the overall explanatory power of this relationship is modest. This indicates that ethical engagement is only partially shaped by digital capability, and is likely influenced by broader professional norms, institutional culture, and value-based drivers beyond digital readiness alone. Ethical engagement must be strengthened through value-led communication and institutional alignment, not through digital enablement alone.

Table 8. Structural Path Estimates for Ethics-Oriented Engagement (EBE)

Path	β	95% CI	p-value
CDA → EBE	0.237	[0.123, 0.351]	< 0.001

Note: Standardized path coefficients (β) were estimated using bootstrapped PLS-SEM with 5,000 resamples. Confidence intervals are bias-corrected. CDA = Consumer Digital Adaptation; EBE = Ethics-Oriented Engagement. The final structural specification includes CDA as the sole predictor of EBE.

The explanatory power of the structural model further supports this effect pattern. The model accounted for a moderate proportion of variance in personalized engagement (PEP: R^2 = 0.223, 95% CI [0.155, 0.314]), but only a modest proportion of variance in ethics-oriented engagement (EBE: R^2 = 0.056, 95% CI [0.015, 0.119]). These results reinforce the view that, while digital capability plays a meaningful role in shaping personalized engagement outcomes, ethics-oriented engagement is influenced predominantly by non-digital, value-driven, and institutional determinants.

4.7 Combined Structural Effects

Digital adaptation and evidence orientation each showed independent positive effects on personalized engagement, with significant paths from CDA to PEP (β = 0.358, 95 % CI [0.244, 0.466], p < 0.001) and from EGE to PEP (β = 0.197, 95 % CI [0.095, 0.294], p < 0.001). Their interactions further amplified personalization outcomes when both capabilities were high (β = 0.158, 95 % CI [0.055, 0.303], p = 0.003). Ethics oriented engagement showed a smaller but significant association with digital adaptation (β = 0.237, 95 % CI [0.123, 0.351], p < 0.001). The explained variance was moderate for personalized engagement (R squared = 0.223) and modest for ethics-oriented engagement (R squared = 0.056). Together, these estimates indicate that the structural paths for personalization and ethics engagement function independently in terms of magnitude and variance.

5. DISCUSSION

This study shows clear generational differences in how Indian physicians engage with digital tools, pharmaceutical communication, and clinical evidence. Generation Z prefers mobile ready, phygital, and personalized formats, especially in private and digitally mature environments, while Generation Y continues to follow more structured routines shaped by longer professional exposure. The four engagement constructs align with core consumer behavior mechanisms. Digital adaptation reflects fluency versus friction, real world evidence operates as a credibility cue, personalization connects to perceived relevance, and ethics oriented engagement reflects value congruence. The structural

results show that personalization strengthens when digital fluency and evidence orientation operate together, whereas ethics oriented engagement follows a distinct value based path.

These findings point to a shift away from uniform, print heavy approaches toward concise, interactive, and evidence supported formats that fit generational needs. Personalization works best when easy digital pathways pair with credible real world outcomes. Gen Z benefits from simplified entry points and asynchronous access, while Gen Y responds well to deeper, workflow compatible content. Ethical communication should rely on institutional commitments rather than channel design because its link with digital capability is modest. Prior evidence reinforces these patterns, including Gen Z's preference for immediacy, mobile first usability, and proof oriented formats as shown across mixed methods validation and empirical studies (Anthuvan, Maheshwari, and Kulkarni, 2025; Anthuvan and Maheshwari, 2025; Anthuvan, Maheshwari, and Dantu, 2024), alongside broader work illustrating digital acceleration and evidence centric engagement in India (Anthuvan, 2024; Anthuvan and Maheshwari, 2024; Anthuvan, Maheshwari, and B., 2026; Anthuvan, Kumar, Maheshwari, and Naresh, 2026).

These mechanisms also align with established brand equity pathways. Personalized engagement enhances relevance (Aaker, 1996; Keller, 2001), ethics oriented engagement strengthens trust through moral congruence (Mayer, Davis, and Schoorman, 1995; Bhattacharya and Sen, 2004), and real world evidence reduces uncertainty through credible diagnostic cues (Erdem and Swait, 1998; Petty and Cacioppo, 1986). The results are most applicable to urban and mixed practice environments where digital infrastructure is present and have parallels in other credence driven sectors such as fintech, insuretech, and healthtech. Consumer research further shows that Gen Z favors transparency, verifiable information, and interactive digital content, which strengthens the interpretation that their broader preference architecture extends into professional settings (Sánchez-Chaparro et al., 2024; Kara and Min, 2023; Confetto et al., 2023; Surmacz et al., 2024; Theocharis and Tsekouropoulos, 2025).

6. MANAGERIAL IMPLICATIONS
We translated the findings into three A/B testable interventions that can be implemented in practice. First, real-world evidence proof injection can be tested by comparing standard content with versions that add a brief outcome vignette at the decision point, measuring the click-through rate, time on detail, and follow-up requests, consistent with the combined influence of digital adaptation and evidence orientation on personalization engagement. Second, Gen Z microcopy simplification can be evaluated by reducing steps, adding defaults, and using shorter action-oriented labels in

mobile first flows, measuring onboarding completion, time to completion, and bounce rate to address lower digital adaptation. Third, value-framing variants for ethics communication can be tested by comparing outcomes first, institution first, and community first framing while holding channels constant, measuring repeat engagement, perceived trust, and content savings, reflecting the modest link between ethics-oriented engagement and digital capability. These interventions convert structural results into practical, testable levers for refining engagement strategies.

7. LIMITATIONS
This study focuses on Indian physicians under 45 and is most applicable to urban or mixed practice settings with basic digital infrastructure; generalizability is more constrained in rural-only markets, fully public systems with protocol-driven decisions, and OTC or FMCG categories, where consumer self-selection and retail effects dominate. Measures are self-reported and cross-sectional, which may introduce common method bias and limit causal inference despite triangulation across cohort comparisons and structural modeling. The PLS model explains a moderate share of variance for personalized engagement and a modest share of ethics-oriented engagement, suggesting additional unobserved influences, such as institutional policies, peer norms, or local market conditions. Although sampling spanned multiple specialties and regions, coverage and non-response biases may persist and some digital use patterns may reflect institutional affordances rather than intrinsic preferences. As a robustness check, the results are replicated under alternative PLS specifications, and after excluding potential outliers, all substantive conclusions remain unchanged.

8. FUTURE RESEARCH AGENDA
Future research can extend these findings through randomized experiments that vary personalization depth, timing, and real- world evidence salience to establish causal thresholds for personalized engagement. The longitudinal tracking of repeated interactions can clarify how personalization, evidence orientation, and ethics alignment contribute to brand equity over time. AI-enabled RWE personalization, matched to specialty, patient mix, and prior interactions, warrants evaluation against static formats with safeguards for transparency and bias. Cross-national replication across mixed public and private systems with different digital maturity levels would test the boundary conditions and identify which mechanisms generalize beyond India. These avenues would strengthen causal inference, establish a temporal. precedence for brand building, and assess scalability across diverse contexts.

9. CONCLUSION
This study reveals clear generational differences in physician engagement across digital tools, pharmaceutical

communication, and evidence orientation. Generation Z doctors show a stronger affinity for phygital formats, mobile enabled tools, and real world data, especially in private and digitally mature settings, whereas Generation Y physicians lean toward structured and professionally validated formats. Ethical expectations appear consistent across cohorts. These findings underscore the importance of tailoring engagement strategies by generational profile and practice context. Digital campaigns, CME formats, and evidence dissemination must evolve to reflect these preferences to sustain trust and clinical relevance. Future longitudinal studies are warranted to examine how these generational behaviors evolve over time and to clarify their influence on prescribing patterns, clinical decision making, health outcomes, and digital health adoption at scale

ACKNOWLEDGEMENTS

DECLARATION OF CONFLICTING INTERESTS

The authors declare that there is no conflict of interest.

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