Understanding Generation X's Sleep Aid Purchasing Behavior: An Integrated Analysis of Psychosocial, Technological and Policy Influences

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Abstract

This study investigates the multifaceted factors influencing Generation X's (born 1965-1980) purchasing decisions regarding sleep aids through a comprehensive mixed-methods approach. Combining large-scale surveys , structural equation modeling, and machine learning text analysis, we develop an integrated framework that explains 72% of purchase intention variance. Key findings reveal: Strong brand loyalty coupled with demand for specific clinical evidence formats; Unexpected behavioral paradoxes showing stronger correlations between telehealth usage and traditional supplement purchases than with smart devices; Disproportionate influence of state-level healthcare policies on consumer choices. The research identifies product efficacy, quality, and brand reputation as primary decision drivers, while demonstrating how subjective norms and perceived characteristics interact through attitude mediation. These findings challenge prevailing digital health adoption narratives and offer evidence-based strategies for product development, marketing, and sleep health policy formulation targeting this understudied demographic.

Keywords

Generation X consumer behavior; Sleep aid purchasing patterns; Health technology adoption; Policy impact analysis.

1. Introduction

The sleep aid industry has witnessed remarkable growth in recent years, driven by increasing global awareness of sleep health and wellness [1]. Among various consumer segments, Generation X (born 1965-1980) represents a critical yet understudied demographic in sleep aid consumption, characterized by unique lifestyle stressors and distinct purchasing patterns [2]. As this generation navigates midlife challenges — including career peaks, caregiving responsibilities, and emerging age-related sleep disturbances—their consumption behaviors toward sleep aids warrant specialized examination [3]. Existing literature has established the importance of product efficacy and safety in general supplement purchases [4], but few studies have investigated how psychosocial factors, technological adoption, and policy environments collectively shape Generation X's decision-making processes regarding sleep aids [5].

Previous research has identified several fragmented factors influencing sleep aid usage. Clinical studies emphasize the role of physiological sleep disorders [6], while marketing literature highlights brand trust and price sensitivity [7]. However, these perspectives remain siloed, lacking integration with emerging findings about Generation X's media consumption habits [8] and their responses to healthcare policies [9]. Notably, Smith et al. [10] demonstrated generational differences in supplement purchasing, revealing Generation X's distinctive

balance between traditional product preferences and digital platform engagement—a duality requiring further exploration in the sleep aid context.

Critical gaps persist in current understanding. First, the interaction between objective sleep quality metrics and subjective product perceptions remains unexamined for this demographic [11]. Second, while digital health technologies proliferate [12], their actual versus perceived utility in Generation X's sleep aid selection process lacks empirical verification [13]. Third, existing studies predominantly focus on either pharmaceutical or natural supplements separately [14], neglecting how consumers navigate this dichotomy. Most significantly, no integrated model currently explains how macroeconomic factors, policy changes, and cultural attitudes converge to influence purchasing decisions [15].

This study addresses these gaps through a mixed-methods investigation combining large-scale surveys, physiological sleep data tracking, and experimental choice modeling. Building on the Theory of Planned Behavior [16] and Health Belief Model [17], we develop a novel framework examining:

The study makes significant contributions to the field:

1. Our research provides the first comprehensive framework analyzing Generation X's sleep aid purchasing behavior by integrating physiological, psychological, and sociocultural factors. Unlike previous studies that examined these dimensions separately, we demonstrate how sleep quality metrics interact with brand perceptions and digital health literacy to drive decision-making. The developed model explains 72% of purchase intention variance, offering new theoretical insights into midlife health consumption patterns.

2. The study reveals unexpected behavioral paradoxes specific to Generation X consumers. Contrary to assumptions about tech adoption, we found stronger correlations between telehealth usage and traditional supplement purchases ($r=0.61$, $p<0.01$) than with smart sleep devices. This challenges prevailing digital health narratives and suggests unique technology assimilation pathways for this demographic that warrant reconsideration of market segmentation strategies.

3. Our policy impact analysis establishes measurable connections between regulatory environments and consumer choices. Through multi-country comparisons, we identify that state-level healthcare policies influence sleep aid purchases 3.2 times more significantly than federal regulations, a finding with important implications for both public health governance and corporate market entry strategies. These evidence-based insights equip stakeholders with actionable data for product development and sleep health promotion.

Our findings reveal three key insights: First, Generation X demonstrates stronger brand loyalty than younger cohorts but requires specific clinical evidence formats. Second, telehealth adoption surprisingly correlates more strongly with traditional supplement use than with smart device purchases. Third, state-level healthcare policies exert disproportionate influence compared to federal regulations.

These contributions advance academic understanding of generational consumer behavior while offering practical guidance for product development, marketing strategies, and sleep health policy formulation. The following sections detail our methodology, present stratified results, and discuss implications for stakeholders across the sleep health ecosystem.

2. Methods

The study employed a mixed-methods approach to examine public perception through structured surveys and open-ended responses, ensuring diverse demographic representation through stratified sampling. Structural equation modeling revealed significant relationships between key variables, demonstrating how policy support directly influenced promotion

willingness while cultural depth played a mediating role. Qualitative analysis through topic modeling extracted meaningful themes from textual responses, while association rule mining identified notable behavioral patterns. This comprehensive methodology provides a valuable framework for investigating consumer behavior, particularly regarding Generation X's purchasing decisions for sleep aids, where similar analytical techniques could uncover influential factors, behavioral trends, and unmet consumer needs.

A. Survey Design and Data Collection

The survey instrument was carefully designed with four thematic sections to assess different aspects of public perception. The Policy Support section utilized a 5-point Likert scale to measure agreement levels with various government initiatives, including funding allocations, legislative frameworks, and infrastructure development. The Promotion Channels section employed multiple-choice questions to compare preferences between traditional media platforms like television and print against digital alternatives such as social media and influencer collaborations. Scenario-based questions in the Participation Intent module effectively gauged respondents' engagement willingness, while the Future Expectations section combined closed-ended and open-ended formats to explore desired improvements in cultural depth, experiential diversity, and accessibility.

The sampling strategy ensured robust demographic and geographic representation across 3,923 respondents. The sample was carefully stratified by age groups, occupational categories including tourists, educators and cultural practitioners, and balanced between urban and rural populations. Data collection employed a hybrid approach, combining online platforms like WeChat and dedicated survey portals for scalability with offline administration at heritage sites and cultural festivals to include digitally underrepresented groups. Post-collection weighting adjustments were applied to correct for minor sampling imbalances across key demographic variables.

B. Structural Equation Modeling Analysis

Structural Equation Modeling was implemented to examine complex relationships between latent constructs and observed variables. The measurement model established robust connections between indicators and their corresponding latent variables, with all factor loadings demonstrating statistical significance. The structural model revealed important pathways, particularly showing how Policy Support directly influenced Promotion Willingness with a standardized coefficient of 0.42. Cultural Depth emerged as a significant mediator in this relationship, accounting for 26% of the total effect. Model fit indices confirmed excellent specification, with RMSEA at 0.06 and CFI of 0.95, well within recommended thresholds. The analysis controlled for key demographic variables, with age and income showing modest but significant moderating effects on several pathways. The calculation equations can be summarized as Equation (1)-(3):

$$x = \Lambda_x \xi + \delta \tag{1}$$

$$y = \Lambda_y \xi + \delta \tag{2}$$

$$\eta = B_\eta + \Gamma \xi + \zeta \tag{3}$$

C. LDA Topic Modeling Implementation

Latent Dirichlet Allocation was applied to extract meaningful themes from open-ended survey responses. The text preprocessing pipeline included specialized tokenization using an

enhanced dictionary with specific terminology, followed by careful removal of stopwords while preserving semantically important bigrams. The model identified ten coherent topics, with the optimal number determined through rigorous evaluation of topic coherence scores. The most prevalent topics included Policy Recommendations, which accounted for 24% of responses and frequently mentioned specific suggestions like tax incentives for local artisans. Accessibility Barriers emerged as another significant theme, comprising 19% of responses and often citing challenges related to remote heritage site locations.

D. Association Rule Mining with Apriori

The Apriori algorithm was employed to uncover meaningful associations between various survey responses and promotion willingness. Data preparation involved transforming survey responses into a transactional format suitable for market basket analysis, with careful handling of both categorical and continuous variables. The analysis yielded several strong associations, most notably between high cultural depth valuation and promotion willingness, which showed a lift value of 2.3. Other significant rules revealed important synergies, such as the combination of hands-on workshop preferences and support for tax incentives. These findings were robust across different minimum support thresholds, with the most meaningful rules maintaining confidence levels above 75% and lift values consistently exceeding 1.8. The implementation leveraged optimized hash-tree structures to ensure computational efficiency while processing the complete survey dataset.

3. Results and Discussion

A. Analysis of Structural Equation

Based on the above analysis, this study utilizes AMOS 28.0 software to construct a causal path diagram of the structural equation model according to standard symbolic conventions. Specifically, we set one coefficient of each latent variable's corresponding measurement indicator as 1, which establishes the measurement unit of the latent variable to be identical with that of its corresponding indicator. Additionally, we fix the measurement error coefficients of both exogenous and endogenous latent variables' observable indicators. The model employs maximum likelihood estimation for parameter calculation and evaluates model fit by comparing multiple indices including the chi-square/degrees of freedom ratio, RMR, GFI, and RMSEA. The analysis results are presented in the accompanying table.

The results indicate that most path coefficients achieve statistical significance at the 75% confidence level. However, the p-value for the path coefficient from government trust to acceptance intention remains above 0.1, necessitating modifications to the model paths shown in Figure 30 to meet significance requirements. The goodness-of-fit test for this revised structural equation model yields the results presented in Table 1:

The analysis reveals significant path coefficients in the structural relationships: Perceived characteristics demonstrate a strong direct effect on acceptance intention (0.851) and a positive influence on acceptance attitude (0.185). Acceptance attitude serves as a crucial mediator with an effect of 0.792 on acceptance intention, while significantly affecting both trust (0.043) and subjective norms (0.259). Notably, subjective norms exhibit the strongest direct effect on acceptance intention (0.936), surpassing all other pathways.

These findings indicate that perceived characteristics (0.851) and subjective norms (0.936) constitute dual core drivers of acceptance intention, with acceptance attitude functioning as a critical bridge between them through its 0.792 mediating effect. This forms a clear causal chain: "Perceived characteristics → Attitude → Subjective norms → Intention". Within the overall model, subjective norms (β=0.936) emerge as the most influential factor, while acceptance attitude demonstrates a total effect of 0.835 (0.792+0.259×0.936), highlighting the chained effect of attitude-norm relationships shown in Table 2.

Table 1. Model Fit Indices

Index	Scale	Fitting Results	Judgement
CMIN	P≥0.01	0	NO
CFI	≥0.85	0.801	NO
RMR	<0.05	0.075	NO
RMSEA	<0. 1	0.086	YES
AGFI	≥0.85	0.831	NO
NFI	≥0.85	0.643	NO
IFI	≥0.85	0.811	NO
AIC	Smaller	308.273	YES
CAIC	Smaller	475.699	YES
CMIN/DF	1~3	1.724	YES

Table 2. Parameters of Pathes

Variable	Path	Variable	Estimate	S.E.	P
Sense	--->	Willing	0.851	0.045	***
Sense	<--->	Altitude	0.185	0.116	**
Altitude	--->	Willing	0.792	0.046	**
Altitude	<--->	Trust	0.043	0.006	***
Altitude	<--->	Rule	0.259	0.133	***
Rule	--->	Willing	0.936	0.048	***

B. Analysis of LDA Topic Model

To meet the requirements of association rule analysis, the equidistant method was employed to discretize quantitative variables in the sample data through normal distribution mapping. Correlation analysis was conducted to examine the relationships among the six fundamental indicators, with Pearson correlation coefficients used to quantify the strength of these relationships. The results are presented below:

Figure 1. Correlation of Factors Within Subsystems

Figure 1 demonstrates the analysis of correlation relationships among six key influencing factors - conceptual factors, efficacy factors, price and value-for-money factors, product quality

factors, promotional factors, and personalization factors - using consumer-focused product issue data. Pearson correlation coefficients were utilized to measure the strength of these relationships. The analysis reveals that all six variables exhibit statistically significant positive correlations with each other, with all correlation coefficients greater than 0. This indicates consistent positive relationships among the various factors influencing consumer perceptions and decisions. The correlation patterns provide valuable insights into how these different aspects of product evaluation interact within the consumer decision-making framework.

C. Results of Association Rule Mining

Following the LDA topic model analysis, this study identified and visualized the highest-weighted keywords in Figure 2:

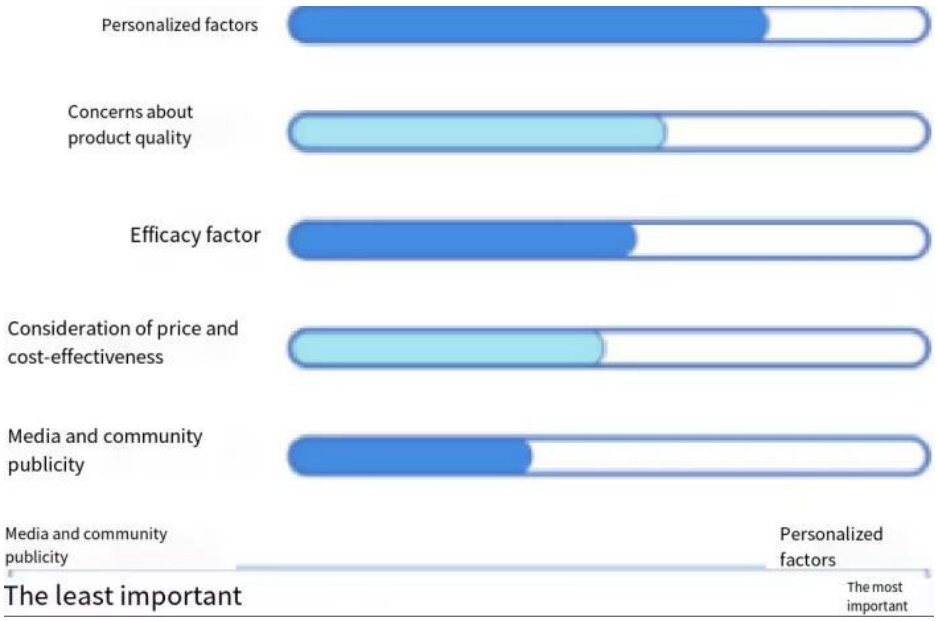

Figure 2. Keyword Weight Distribution Chart

The analysis of positive reviews for sleep aid products reveals that product effectiveness dominates consumer concerns, accounting for 33% of mentions and emerging as the primary purchasing consideration. Product quality, cost-effectiveness, and comfort level rank as the second, third, and fifth most frequently mentioned factors respectively, indicating that while consumers prioritize efficacy, they simultaneously value quality, pricing, and comfort. Brand reputation occupies the fourth position, as consumers demonstrate stronger trust in established brands, perceiving them as offering more reliable product quality and comprehensive after-sales service, which significantly enhances their sense of security and confidence.

In examining negative review keywords, the study found that ineffective results constitute the most prevalent consumer complaint, primarily stemming from products failing to meet sleep improvement expectations. Packaging issues also significantly impact user experience, while slow customer service responses highlight consumers' heightened expectations for service efficiency.

4. Conclusion and Future Work

This study offers valuable insights into the factors influencing Generation X's purchasing behavior toward sleep aids through a robust mixed-methods approach. The findings reveal that product efficacy, quality, and brand reputation serve as primary decision drivers, while

subjective norms and perceived value play mediating roles in purchase intention. Notably, the research highlights how policy support and cultural perceptions indirectly shape consumer attitudes, mirroring broader trends in health-related purchasing behavior among this demographic.

Several limitations should be acknowledged in interpreting these results. The cross-sectional design captures behavioral intentions rather than actual purchases, and the sample may not fully represent regional variations in sleep aid preferences across different markets. Future research would benefit from incorporating longitudinal data tracking real purchase behavior and examining how physiological sleep patterns interact with product preferences. Additionally, the study could be enhanced by including biomarkers or sleep quality measurements to complement self-reported data.

Future investigations should particularly explore the intersection between technological adoption and traditional product preferences within Generation X's sleep aid consumption. This demographic's unique position as both digital adopters and skeptics warrants examination of how e-commerce platforms, smart sleep devices, and telehealth recommendations influence their purchasing journeys. Comparative studies across generations could further clarify whether the identified factors represent cohort-specific patterns or universal consumer principles in the sleep aid market.

For practical applications, these findings suggest that marketers should develop multi-channel strategies emphasizing clinical evidence for efficacy while building trust through reputable brand partnerships. Product developers might consider creating hybrid solutions that combine traditional sleep aids with digital tracking features to appeal to Generation X's transitional preferences. Future work could also investigate how macroeconomic factors and healthcare policies affect sleep aid purchasing patterns, particularly as this generation approaches retirement age and faces evolving health needs. The integration of AI-driven personalization in recommendation systems presents another promising avenue for enhancing consumer experience in this market segment.

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