IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 4, April 2024

DOI: 10.17148/IARJSET.2024.11453

The Factors affecting the Perception of Generation Z users toward Voice Assistants

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Abstract: This research investigates the factors influencing the perception of Generation Z users towards voice assistants, recognizing their growing prominence in everyday life. Employing exploratory factor analysis on data gathered from 228 Generation Z users, six key factors emerged: Utilitarian benefits, Symbolic benefits, Functional Awry, Hedonic benefits, Perceived Risk, and Human-like voice. The study underscores the multifaceted nature of Generation Z's attitudes toward voice assistants, encompassing both practical and emotional dimensions. Findings reveal that while Generation Z values the utilitarian advantages offered by voice assistants, they also consider symbolic aspects and potential risks associated with their use. These insights carry significant implications for marketers and designers aiming to cater to Generation Z's preferences and concerns regarding voice assistants. Furthermore, this study leads to future research of delving deeper into understanding the evolving dynamics between Generation Z and voice assistant technologies, particularly as they are being integrated into various realms of daily life.

Keywords:-Voice assistants, utilitarian benefits, symbolic benefits, functional awry, hedonic benefits, perceived risk.

I. INTRODUCTION

With the advent of "logic Theorist" artificial intelligence showcased its potential to imitate human intelligence and its expertise led to the presence of artificial intelligence in diverse fields of healthcare, automated vehicles, tourism, and more specifically in the form of conversational voice bots[1]. The voice bots or virtual assistants are artificial intelligence-enabled software that understands verbal commands, interprets them, and responds in synthetic human voice[2]. These voice assistant works with the technology of natural language processing (NLP) to interpret commands in human language. These voice-enabled AI software make use of algorithms to simulate human understanding of problems and generate personalized responses. Google Assistant, Siri, Copilot, and Alexa are some large players in the market of voice assistants. These are easily available either over smartphones or installed by companies as inbuilt feature of many digital devices[3].

As compared to search engines voice assistants provide an improved search experience with a multitasking facility. Advanced features of voice assistants have made them popular among all age groups. People use it for setting up alarms, playing music, placing calls or messages, writing emails, and managing their day-to-day activities[4]. Generation Z users are technology freaks they thrive upon innovative experiences and have a more optimistic attitude toward such technical innovations. Generation Z seems to have decided the fate of the voice assistant market as they are the most populous generation in the world. However, the factors that influence the adoption of Voice assistants among Gen Z are at a nascent stage[5]. This study will explore the factors that affect the perception of Generation Z users toward voice assistants so that users can be equipped with more technologically viable improved solutions while allowing companies to capitalize on the value proposition.

II. LITERATURE REVIEW

The following studies have been reviewed to lay the foundation for this study:

Author(s)	Theoretical perspective	Methodology	Results	Context	Sample
Nasirian et al., 2017[6]	Uses & Gratification Theory (U&GT)	PLS-SEM	Adoption of voice assistant technology depends upon individual trust which is influenced by the interaction quality of the device.	N/A	Students (N=104)

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Poushneh (2020)[7]	Flow Theory	Exploratory Factor Analysis	Factors like Functional intelligence, Aesthetic appeal, Protective quality,Sincerity, Creativity, Sociability, and Emotional intelligence were identified as important personality traits.	Cortana, Google Assistant, &Alexa	Voice assistant users N=257
Cho, 2019[8]	N/A	Experimental study design, and regression models	Instead of text, it is avoice-like feature that enhances the social presence perception that leads to the generation of positive attitudes toward voice assistant	Smartphone vs smart speaker (Google Assistant)	Under graduate students (N=53)
Cho et al., 2019[9]	N/A	Experiment and regression models	A voice-like feature of voice assistants increases the human-like perception of voice assistants in utilitarian task completion.	Laptop vs. smartphone (Cortana)	Under graduate students (N=82)
McLean and OseiFrimpong (2019)[10]	Uses & Gratification Theory (U&GT)	Structural Equation Modelling	Utilitarian and symbolic and Social rewards except hedonic rewards are the main motivators for in-home Voice assistants.	Smart speaker (Alexa)	Market research firm's panel (N=724)
Moriuchi (2019)[11]	Technology Acceptance Model (TAM)	Data collected through an online survey and analysed by employing SEM	In transactional and non-transactional activities perceived ease of use of VA has a positive effect on VA attitude and VA engagement.	Website (Google Assistant)	Participants recruited by MTurk (N=368)
Fernandes and Oliveira (2021)[12]	Service Robot Acceptance Model (sRAM)	Data collected through aCross-sectional survey and analysed with PLS-SEM	The perceived usefulness of voice assistant impacts their acceptance positively. Whereas, the perceived humanness does not influenceacceptance of voice assistant.	N/A	Millennials (N=238)
Patrizi et al.(2021)[13]	Uses & Gratification Theory (U&GT)	EFA and cluster analysis	The four factors “utilitarian, hedonic, symbolic, human-like voice and human-like presence were found significant.	N/A	Millennials (N=337)
Al Shamsi et al. (2022)[14]	Technology Acceptance Model (TAM)	PLS-SEM	The present study advocated enjoyment, trust, and perceived ease of use as important enough to impact the perceived usefulness of voice assistant technology.	N/A	300 university students
Ashrafi & Easmin (2023)[15]	Theory of Parasocial Relationship (PSR) &Human-Computer Interaction (HCI)	PLS-SEM	It was found that functional attributes social cognition, and electronic word of mouth shape users’ attitudes and trust respectively	N/A	295 participants

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Menon & Shilpa (2023)[16]	Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) mode	Semi-structured interviews and interpretive qualitative research method	The present study concludes that seven variables (performance & effort expectations, facilitating &hedonic motivations, social influence, habit, and privacy concerns) are significant driving factors in the usage of smart speaker	smart speakers	36 teenagers
Choudhary et al. (2024)[17]	Behavioral Reasoning Theory (BRT)	PLS-SEM	Psychological and functional variables have a significant impact on the adoption of voice assistants.	N/A	1189 Indian consumers
Faruk et al. (2024)[18]	N/A	EFA	The study found that the scales measuring UX extend beyond the traditional VUDA (value, usability,desirability,adaptability) principles and incorporate novel aspects such as anthropomorphism and machine personality	N/A	21 Individual scales

III. RESEARCH METHODOLOGY

Data was collected with the help of online self-administered questionnaires. In total 241 responses were collected out of which 13 (5.4%) respondents were among the category of no users and were thus excluded. So, in total 228 respondents recognized themselves as users of voice assistants so included in the sample of the study.

The questionnaire was comprised of two sections. Section I included general questions related to demographics, Age, gender, income level, qualification, etc.. In contrast, section II comprised 32 statements to measure the Perceptions of Generation Z toward the use of Voice assistants. All the statements were measured on the parameters of a 5-point Likert scale ranging from strongly disagree to strongly agree.

IV. DATA ANALYSIS & RESULTS

General features of respondents

Table 1 describes that femalesconstitute most of the proportion of respondents i.e. 66% approximately with the majority of respondents coming from urban areas. The majority of the respondents are students while most of them arepost-graduates. Around 26% of respondents reported their annual family income above ₹90,000 per annum. This study aims to capture the perception of Zoomers who were born between the years 1996 to 2012 and are represented appropriately throughout the sample size as the majority of respondents are between age intervals of 20-29 years.

Table 1 Demographic profiling of respondents

Variable	Count	%	Variable	Count	%
Gender			**Region**		
Male	77	33.8	Urban	123	53.9
Female	151	66.2	Rural	105	46.1
Occupation			**Qualification**		
Government employee	6	2.6	Secondary (10th)	4	1.8
Home maker	3	1.3	Higher education (12th)	49	21.5
Private sector employee	22	9.6	Graduation	76	33.3
Professional	23	10.1	Post-Graduation	93	40.8
Student	165	72.4	Doctorate	6	2.6
Other	9	3.9			
Age (years)			**Family's Annual income**		

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Below 19	59	25.9	Below ₹30,000	49	21.5
20 - 29	151	66.2	₹ 30,001- ₹ 50,000	56	24.6
30 - 39	10	4.4	₹ 50,001- ₹ 70,000	30	13.2
40 - 49	4	1.8	₹ 70,001- ₹ 90,000	33	14.5
Above 50	4	1.8	Above 90,000	60	26.3

Checking generation Z's perception of voice assistant

Out of 228 respondents, 74% admit to making use of Google Assistant for their task Completion. Table 2 shows Siri user holds 18%, 7% of users use Alexa, and 1 % use Copilot to complete their tasks with the help of voice assistant.

Table 2: Types of applications used

Voice Assistant	Frequency	Percent
Alexa	16	7.0
Copilot	1	.4
Google Assistant	169	74.1
Siri	42	18.4

Use of voice assistant application for task completion

As Table 3 shows most Voice assistant applications are reported to be used for playing songs by 33.8% of respondents. Whereas 31.6% of respondents admit to using voice assistant applications for placing calls or messages. The lowest of 0.9 % of respondents see voice assistant applications to book a ride or cab.

Table 3: Use of voice assistant application for task completion

Usage of voice assistant application	Frequency	Percent
Booking cab	2	0.9
Checking traffic or weather	19	8.3
Ordering food	3	1.3
Placing calls or messages	72	31.6
Playing songs	77	33.8
Other	55	24.1

Perception of Generation Z toward Voice Assistant

To explore the aspects affecting the perception of Generation Z towards the voice assistant technique exploratory factor analysis is employed. In total 32 statements were used to determine the perception of Generation Z users. Before employing factor analysis, the reliability of data is to be checked with the help of Cronbach's Alpha. The Cronbach's Alpha value of our data set is 0.898 which indicates a usable level of internal consistency of our scale. The value is greater than 0.7 which shows that data is consistent and reliable for running the factor analysis (see Table 4).To be certain of the appropriateness of the data collected, the Kaiser-Meyer-Olkin measure of sample adequacy is employed. Kaiser (1974) suggested thata KMO value greater than 0.5 is acceptable[19]. Table 5 indicates that the value of KMO is 0.864, which falls into the range of being great; factor analysis is appropriate for these data.In this study, Principal Component analysis (PCA) used by the Varimax rotation, the original 32 statements were analyzed by the PCA and reduced to six variables with an eigen value of greater than 1, which explained 61.868 percent of the total variance (see Table 6).

Table 4 Reliability Statistics

Cronbach's Alpha	N of Items
.898	32

Table 5 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.864
Bartlett's Test of Sphericity	Approx. Chi-Square	3700.065
	Df	496
	Sig.	.000

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Table 6: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.324	26.012	26.012	8.324	26.012	26.012	5.642	17.632	17.632
2	4.667	14.585	40.597	4.667	14.585	40.597	3.173	9.914	27.547
3	2.458	7.681	48.278	2.458	7.681	48.278	2.974	9.293	36.839
4	1.742	5.444	53.723	1.742	5.444	53.723	2.954	9.232	46.071
5	1.401	4.378	58.100	1.401	4.378	58.100	2.815	8.798	54.869
6	1.206	3.768	61.868	1.206	3.768	61.868	2.240	6.999	61.868
7	.993	3.103	64.971						
8	.853	2.664	67.635						
9	.768	2.401	70.036						
10	.742	2.318	72.354						
11	.711	2.222	74.576						
12	.690	2.156	76.732						
13	.600	1.874	78.606						
14	.589	1.841	80.447						
15	.564	1.763	82.210						
16	.551	1.721	83.931						
17	.498	1.557	85.489						
18	.460	1.437	86.926						
19	.438	1.367	88.293						
20	.432	1.350	89.643						
21	.399	1.247	90.890						
22	.375	1.171	92.061						
23	.360	1.125	93.187						
24	.344	1.074	94.261						
25	.312	.975	95.235						
26	.282	.883	96.118						
27	.269	.841	96.959						
28	.243	.761	97.720						
29	.233	.728	98.448						
30	.186	.582	99.030						
31	.171	.536	99.565						
32	.139	.435	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix

Table No.7 tells us about six factors. Each of the six factors of perception of users for voice assistant in table no 7 is labeledas the highest reliable value used toname different factors impacting perceptions of users. For parsimony, factors having loading beyond 0.50 were consideredimportant. The higher the factor loading, the more its test reflects or measures as perception of Generation Z towards voice assistants.

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Table No: 7 Rotated Component Matrix

	Component					
	1	2	3	4	5	6
My voice assistant saves my time.	.821					
My voice assistant saves my efforts	.768					
My voice assistant is convenient to use	.723					
My voice assistant easily completes my tasks	.703					
I feel my voice assistant is informative	.702					
I feel my voice assistant useful	.666					
My voice assistant gives me relatable recommendations	.648					
My voice assistant completes my tasks as intended	.547					
Using My voice Assistant makes me feel recognizable among my peers		.859				
Using My Voice Assistant makes me feel prestigious than those who don't		.846				
Using My Voice assistant is symbol of status for me		.795				
I love spending free time with my voice assistant		.606				
I hate reformulating commands over my voice assistant			.784			
I find my voice assistant boring sometimes			.675			
My voice assistant misunderstand my Indian accent sometimes			.667			
I switch to texting if my voice assistant generates wrong result			.635			
My voice assistant does fake emotions			.583			
I feel my voice assistant robotic sometimes			.565			
Using my voice assistant is fun experience to me			.	.751		
I find using my voice assistant entertaining				.666		
The process of using my voice assistant is quiet engaging				.653		
I enjoy using my voice assistant				.642		
I find communicating with my voice assistant interesting				.626		
I am concerned of my personal data theft stored with my voice assistant					.796	
I have doubts over sharing my confidential information with my voice assistant					.752	
I am concerned of my identity disclosures over my voice assistant					.733	
I think twice before using voice assistant to perform financial transactions					.715	
My voice assistant has got human accent						.858
My voice assistant sounds like a human						.795
My voice assistant seems to have a natural human voice						.752

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Extraction Method: Principal Component Analysis.

V. DISCUSSION

The Factors that were retrieved fall into four categories: 1) Utilitarian benefits, 2) symbolic advantages, 3) functional incapability, 4) Hedonic benefits, 5) Perceived risk, and 6) Human-like voice (HLV).

Factor 1:- Utilitarian Benefits

It covers usability aspects affecting users' perceptions of voice assistant labeling as utilitarian considerations. Studies highlight the strong influence of perceived ease of use on adoption and continued use of VAs. Usability factors like natural language understanding, accurate response generation, and efficient task completion positively impact user perception. It has factor loading ranging from 0.821 to 0.547 which means utilitarian gratifications significantly affect users' perception. The more utilitarian benefits Gen Zexperiences the more positive perception they will develop for adoption of Voice assistants.

Factor 2:- Symbolic Benefits

It covers factors affecting Users' social identity and image, referred to as symbolic advantages, and these can result from their interactions with technology. The factor loading for symbolic benefits ranged from 0.859 to 0.606. This means symbolic gratifications have a significant effect on users' perception. The more symbolic gratifications Gen Z experiences the more positive perception they will develop towards the use of Voice assistants.

Factor 3:-Functional Awry

Zoomers admit to shifting to texting when their voice assistant gives them the wrong results. Many of the respondents said they hate reformulating commands over voice assistant which turns into behavior of Passive avoidance which means when someone deliberately avoids situations or activities they believe will lead to negative experiences**.** The factor loading for passive avoidance ranges from 0.784 to 0.565. Connectivity problems, glitches, misinterpreted commands, and functional failures lead to frustration and negatively impact user experience and trust in voice assistants.

Factor 4:- Hedonic benefits

Hedonic benefits refer to the enjoyment, pleasure, and emotional satisfaction one gets from a product, service, or experience. They're distinct from utilitarian benefits, which include the "fun factor" or the "feel-good" aspects of something. The factor loading for hedonic factors ranges from 0.751 to 0.626. The playful interaction fosters a sense of connection and enjoyment, particularly for younger Gen Z membersand leads to of positive perception of voice assistants

Factor 5:- Perceived Risk

It refers to the individual's subjective belief about the potential negative consequences of sharing personal information or having it collected by others. The McLean and Osei-Frimpong (2019) four-item scale was used to measure perceived privacy risk (PPR)[10]. The factor loading rangesfrom 0.796 to 0.715. It means Concerns surrounding data privacy and security are significant factors influencing user perception of VAs. Transparency, control over data, and robust security measures are critical for building trust and fostering positive user perception.

Factor 6:- Human-like voice

The accent and quality of voice-like dimensions are used to measure the quality of the voice assistant to have a human-like voice. This factor has loading ranges of 0.858 to 0.752. Human-like features (e.g., voice tone) can foster emotional connection, and increase perceived trustworthiness.

Limitation of the Study:-

We have studied the Perception of Generation Z usersof voice assistants in general. The preference for specific Voice assistants has not been analyzed. The majority of the respondents were students. Thus, the possible extrapolation of the results obtained must be taken with caution. It should also be remembered that the sample is gender-biased, with a higher proportion of women. The universe of respondents has the majority of women (66%). This is an unintended bias, as our sample is unintentional.

VI. FUTURE RESEARCH

Once the various aspects of the users' preferences for Voice assistant are determined then it would be necessary to determine the impact of demographics on these aspects. An in-depth exploration of motivations affecting users' perception needs to be touched. The identification of broad categories of needs and a deeper understanding of specific U&G factors driving Gen Z's voice assistant is yet could unfold significant insights. Moreover,the development of ethical and responsible voice assistants that address Gen Z's concerns needs special attention.

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VII. CONCLUSION

The generation of Zoomers is the first generation of digital natives; they are born in the age of technology and are more open to adopting new solutions. But this generation is more opinionated than previous ones so their perception of voice assistants is not limited to convenience only; they are equally concerned with functionality, privacy, and ethical considerations. Exploratory factor analysis helps to identify six Factors of Gen Z's perception, labeled as symbolic advantages, utilitarian, hedonistic rewards, human-like voice, functional awry, and perceived risk. are identified as affecting users' perception in the cluster of generational Z. Because of multitasking and Distracted life Zoomers want their voice assistant to be functionally excellent, humorous, Ludic, and ethically honest. These dynamics will allow developers and designers to create VAs that are not only technologically advanced but also user-centric, and trustful, ensuring long-term adoption and societal impact. This generation of tech-savvy peers wants responsible and user-centered technologiesthat empower and benefit them while safeguarding their privacy and well-being.

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