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Assessment and Feedback: Student Template

Student ID Number(s): 2659883

Programme: MSc Business Analytics (FT)

Module: Marketing Analytics and Behavioural Science

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Assignment Title: Case Analysis – Individual Assignment

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Section Two: In this assignment, I have attempted to act on previous feedback in the following ways : • Analysis • Approach • Quality of work
Section Three: Feedback on the following aspects of this assignment (i.e. content/style/approach) would be particularly helpful to me: • Presentation • Interpretations • Structure

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Introduction

The wearable technology now holds out a big promise to the healthcare sector in their search to control big data in a unique way. Data for the present study was collected from an online platform Kaggle. This was a better way of carrying out a survey over conventional methods, given its efficiency, high response rate, and easy administration. The research aimed at getting an insight into the complex interplay of consumers with wearable healthcare devices across age and gender demographics, along with other variables like region and usage.

Key survey items included in the following four domains: Healthcare Sector with Wearable Technology, Product Innovation, Customer Service Quality, and Performance and Improvement in Lifestyle. The questionnaire collected fine details of feedback on each variable from the strongly arguing mode to the strongly agreeing mode, using a five-point Likert scale. This provides data into the perceptions of the respondents through the attitudes towards the cost, benefits, and quality of customer service entailed by the personalization of wearable healthcare devices.

Indicators of central tendency and variance most pointed to the fact that respondents have consensus in regard to the customization, cost, benefits, and usability of these devices, with the Usability and Rewards categories registering the highest levels of satisfaction. On the other hand, physical features like height and weight produced a wider range of responses, probably due to the natural diversity of the sample.

Data Dictionary

Variable	Data type	Description	Allowed values	Units of measurement
Gender	Nominal	Gender of Respondent	Male, Female, Other, prefer not to say	N/A
Age	Categorical	Age of Respondent	Below 18, 18-15, 26-30, 31-45, 46-60, Above 60	Years (Interval)
Height	Discrete	Height of Respondent	Whole number > 0	in cms
Weight	Discrete	Weight of Respondent	Whole number > 0	in kilograms
Region	Nominal	Region of Respondent	North, South, East, West	N/A
Usage	Categorical	Usage of Respondent	0-1, 1-3, 3-5, 5 or more	N/A
WT1	Ordinal	I can customize wearable healthcare devices	1 - 5	5-point Likert scale
WT2	Ordinal	I think the purchasing cost of wearable healthcare devices is reasonable	1 - 5	5-point Likert scale
WT3	Ordinal	Wearable healthcare devices are a beneficial tool in my life	1 - 5	5-point Likert scale
WT4	Ordinal	I strongly support the use of wearable healthcare devices	1 - 5	5-point Likert scale
PI1	Ordinal	It is easy to connect the wearable to its mobile app	1 - 5	5-point Likert scale
PI2	Ordinal	The mobile app gives useful information about my health	1 - 5	5-point Likert scale
PI3	Ordinal	The overview of my heath in the mobile app is easy to understand	1 - 5	5-point Likert scale
PI4	Ordinal	I would use the app every day	1 - 5	5-point Likert scale
CSQ1	Ordinal	Talking to the individual to overcome motivational issues affects the health of the user	1 - 5	5-point Likert scale
CSQ2	Ordinal	Better Customer Service will improve the understanding of their users' health	1 - 5	5-point Likert scale
CSQ3	Ordinal	Better Customer Service will allow a better analysis of the users' health	1 - 5	5-point Likert scale
PIL1	Ordinal	Establishing specific goals to be achieved affects the behavior	1 - 5	5-point Likert scale
PIL2	Ordinal	Rewarding users for successful performance affects their behavior	1 - 5	5-point Likert scale
PIL3	Ordinal	Comparing the user's performance to their friends' will help them better their performance	1 - 5	5-point Likert scale

Table 1:Data Dictionary

Measures of Central tendency and Variance.

Variable	*Mean*	*Median*	*Mode*	*Standard Dev*	*Range*
Height	172.5882	171	170	8.347877504	33
Weight	64.92	63	60	13.11540077	60
Customization	3.571429	4	4	0.800696561	4
Cost	3.955	4	5	1.028720726	4
Benefit	4.025	4	4	0.870727184	4
Usability	4.12	4	5	0.865648158	4
Connectivity	4.115	4	4	0.827768691	4
Information	4.095	4	5	0.927510853	4
Ease of usage	4.155	4	4	0.827282893	4
Daily usage	3.474359	3	3	3	4
Issues	3.6	4	4	0.739483227	4
Understandability	4.145	4	5	0.947875169	4
Analysis of health	4.075	4	4	0.844357566	4
Goals achieved	4	4	4	0.644658371	4
Rewards	4.24	4	5	0.828148022	4
Comparison	4.135	4	5	0.872111168	4

Table 2: Measures of Central tendency and Variance.

The data provided herein puts into statistical perspective some aspects of the wearable healthcare devices based on the perception of the respondent. Mean values that are close to the median across most variables, which are relatively symmetric data distribution, indicate that most of the respondents had similar views. More specifically, the variables of customization, cost, benefit, and usability display low standard deviations with a close range, reflecting there is general consensus or uniformity in perceptions. Particularly, the Usability and Rewards categories high modes show many respondents either being very satisfied or finding substantial benefit in these aspects. The more objective measurements, such as Height and Weight, reflected greater variability in standard deviation and range. This, therefore, indicated that the natural diversity in the human physical characteristic of the actual population was being reflected. This contrasts the subjective perceptions of the attribute of the device, which are less varied and point out focused areas of satisfaction as well as possible areas for improvement in the user's experience. In general, these are vital statistics for understanding user experience and guiding enhancements in device design and functionality with the main focus of meeting user expectations and enhancing user satisfaction effectively.

Visualizations:

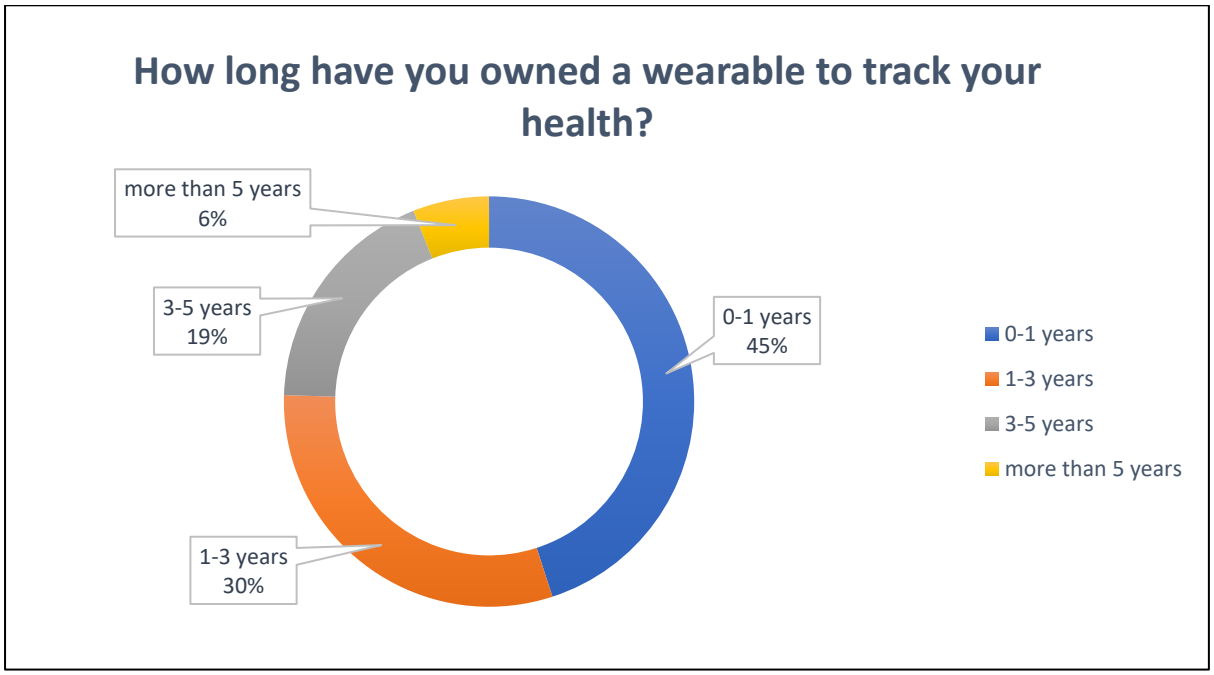

Figure 1: Wearable ownership

This is a donut chart that portrays the ownership duration of the health-tracking wearable device amongst the group of users. Most of the respondents, 45%, have owned for 0-1 year, indicating recent usage surge. 30% of them own for 1-3 years, 19% for 3-5 years, and only 6% are owning it for more than 5 years, which indicates slow penetration of the market over a long period of time.

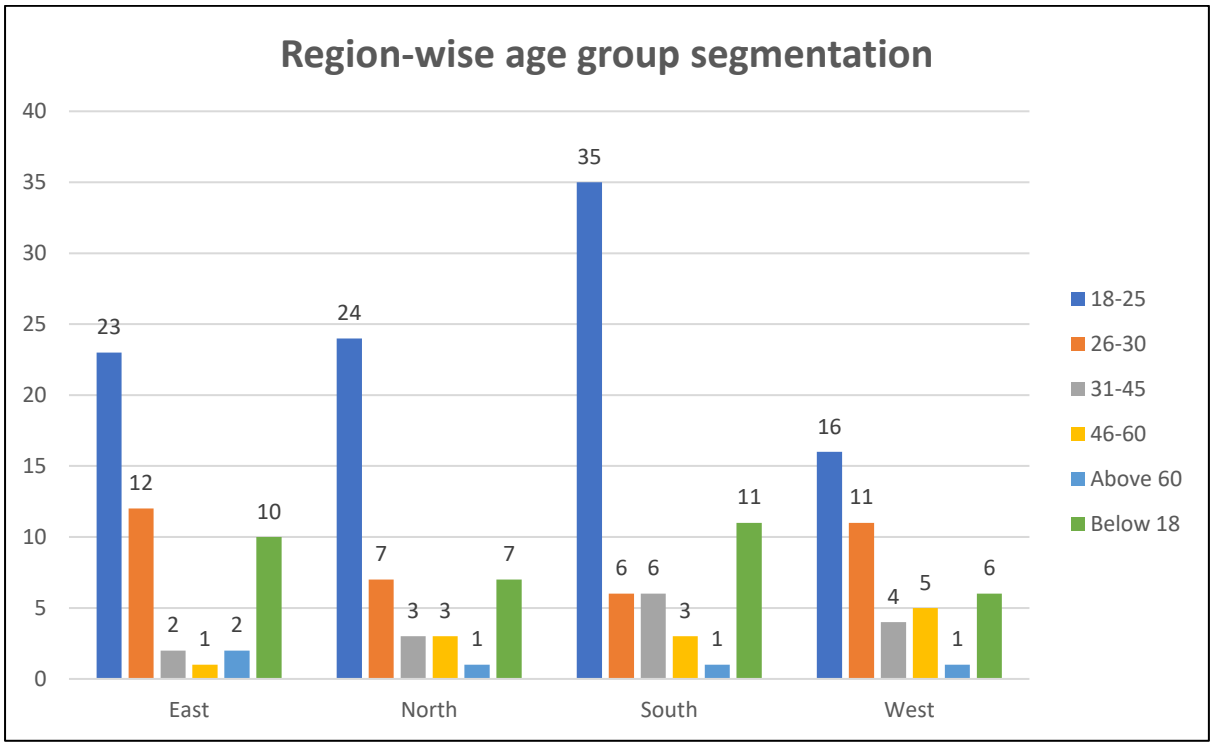

Figure 2: Age segmentation region-wise

From this graph, the population age distribution indicates four geographical regional populations. People aged 18-25 are the most represented in the North, forming 35%. The South has a more balanced distribution of its people along the age groups, while the East and West show less representation of people above 60. The young generation, below 18, has the least representation in all regions.

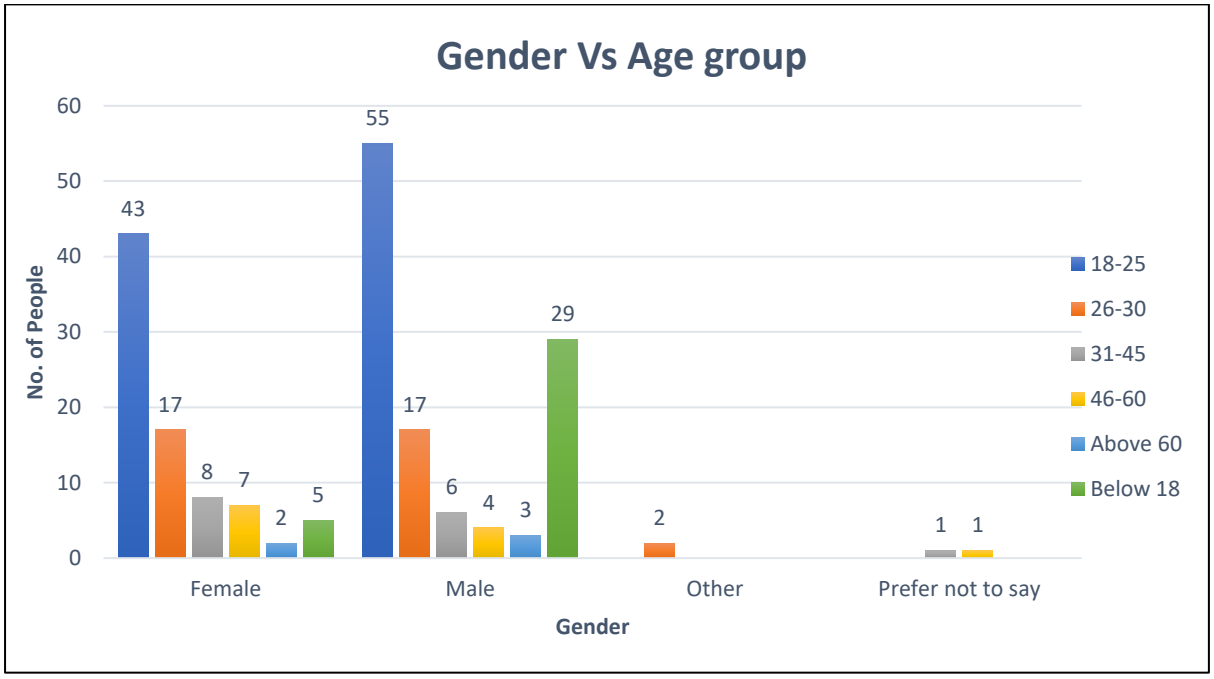

Figure 3: Gender vs Age

This bar chart shows the number of people across different age groups and gender. It indicates that the highest number of males, 55, falls under the 18-25 age group, while females are highly represented in the 26-30 age group, with 17 individuals. Counts are much smaller in the categories of Other and Prefer not to say.

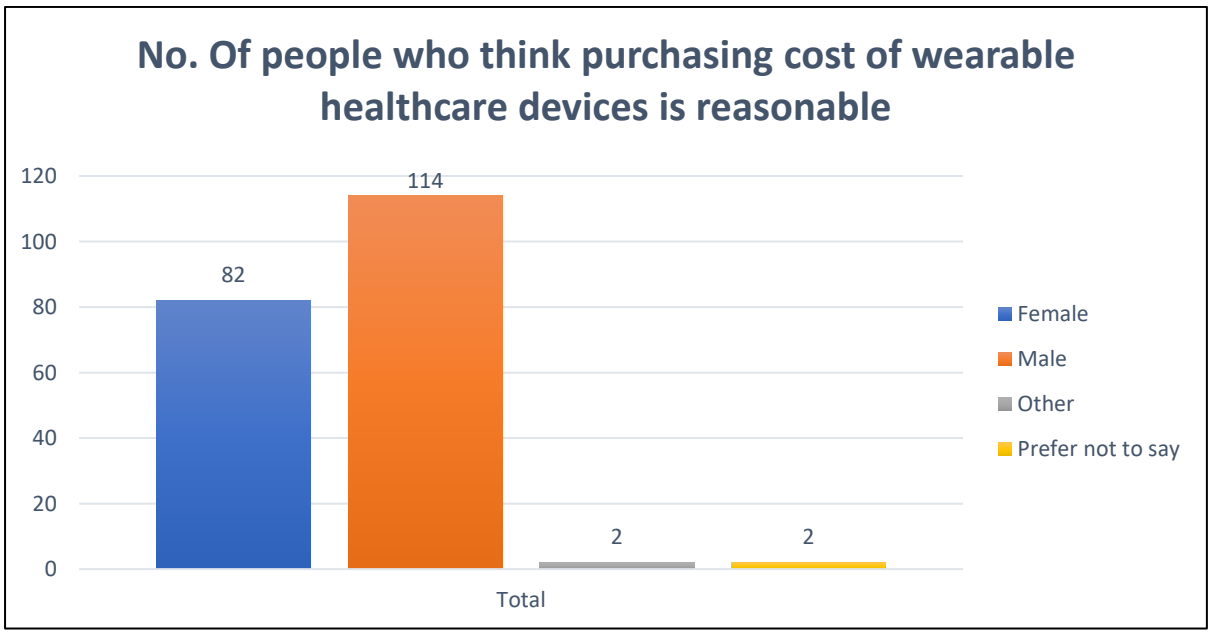

Figure 4: Reasonability

The bar chart represents the number of people by whom the cost of wearable health care devices is reasonable. Males take the highest number at 114, considering the cost to be reasonable, while females follow closely at 82. Those that indicated "Other" or "Prefer not to say" were at a minimal two for both, with large gender disparity in the group that considers the cost reasonable.

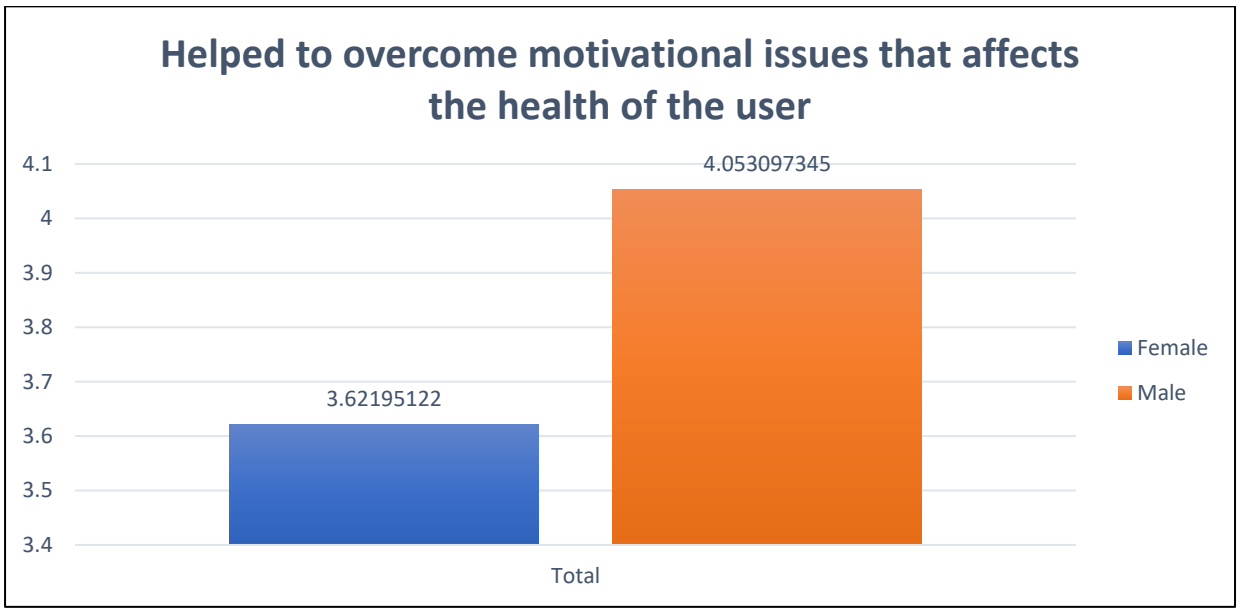

Figure 5: User Health

The bar graph presents the average ratings for how wearable devices helped users overcome motivational issues, segmented by gender. On average, males rated this benefit higher (approximately 4.05) than females (around 3.62), suggesting that males may observe more motivational health benefits from wearable devices than females.

T-test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance		Mean	Std. Error	95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Difference	Difference	Lower	Upper
Customer Service Quality [Talking to the individual to overcome motivational issues affects the health of the user]	Equal variances assumed	1.155	.284	3.195	193	<.001	.002	.43115	.13493	.16502	.69727
	Equal variances not assumed			3.163	167.998	<.001	.002	.43115	.13630	.16206	.70023
Customer Service Quality [Better Customer Service will improve the understanding of their users' health]	Equal variances assumed	1.164	.282	4.700	194	<.001	<.001	.60740	.12922	.35254	.86226
	Equal variances not assumed			4.717	176.870	<.001	<.001	.60740	.12876	.35330	.86151
Customer Service Quality [Better Customer Service will allow a better analysis of the users' health]	Equal variances assumed	.213	.645	2.024	194	.022	.044	.24519	.12116	.00623	.48415
	Equal variances not assumed			1.994	164.960	.024	.048	.24519	.12295	.00243	.48794

Figure 6: Independent Samples Test

We get to study whether there is a difference in perception between men and women regarding the quality of customer service in health-related wearable devices. The three things being compared are: how speaking with someone affects motivation, whether better customer service allows one to understand his or her health better, or good customer service permits people to analyze their health better.

The hypothesis:

- The null hypothesis (no difference) suggests that men and women give similar ratings to customer service quality.
- The alternative hypothesis (there is a difference) suggests that men and women rate customer service quality differently.

This would, therefore, be the alternative hypothesis, that there is a difference in the way customer service quality is rated between men and women.

T-Test for Equality of Means

This is the time to test whether men and women really evaluate items differently. - With a p-value of lesser than 0.05, what we believe is our null hypothesis does not hold, and therefore, it's rejected in favour of the alternative hypothesis, which says there indeed is a significant difference in ratings of the male gender against the female gender.

The Mean Differences let us know the average difference in ratings that exist between males and females and because these differences are all positive, it gives the impression that men gave higher ratings for the quality of customer services than women. Hence, in general men might think a bit more highly of the customer service quality than women do based on the aspects we looked at.

Factor Analysis

This analysis was done with the help of SPSS to reduce the dimensions of the data by identifying the several factors that explains us the correlations among the different observed variables. This simplified the data by presenting the actual variables which are smaller number of the factors. These factors will be used as different input for the cluster analysis later.

Below are the results of the factor analysis:

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.921
Bartlett's Test of Sphericity	Approx. Chi-Square	2039.413
	df	91
	Sig.	<.001

Figure 7: KMO Test

The KMO test measures the suitability of our data for the factor analysis. The range for this is 0 to 1. Where higher values indicate better suitability. In this case the KMO of Sampling is .921, which is remarkably high, this indicates that the variables are suitable for factor analysis. The Bartlett's Test of Sphericity has a chi-square value of 2039.413 with a significance level of less than .001, which is highly significant.

This suggests that the variables are correlated well enough to provide a reasonable basis for factor analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.286	59.185	59.185	8.286	59.185	59.185	5.211	37.218	37.218
2	1.112	7.945	67.130	1.112	7.945	67.130	4.188	29.912	67.130
3	.737	5.268	72.398						
4	.670	4.787	77.185						
5	.567	4.048	81.234						
6	.444	3.175	84.408						
7	.414	2.961	87.369						
8	.396	2.827	90.196						
9	.302	2.157	92.353						
10	.277	1.977	94.330						
11	.247	1.762	96.091						
12	.222	1.586	97.677						
13	.183	1.307	98.984						
14	.142	1.016	100.000						

Extraction Method: Principal Component Analysis.

Figure 8: Total variance

The total variance explained result helps us to understand the different n number of factors so that we will get to know how much of variance is explained from the data. The initial eigenvalues shows that the first component has the majority of variance (59.185%). The cumulative percentage of second component is 67.130%. This suggests that most of the variability of the data can be explained by these two variables.

Rotated Component Matrix[a]

	Component 1	Component 2
WT2	.827	
PI2	.792	
PIL3	.781	
CSQ2	.731	
CSQ1	.696	
CSQ3	.666	
WT1	.613	
PIL1	.570	
WT4		.908
PI4		.803
PI3		.720
PIL2		.618
WT3		.615
PI1		.575

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 3 iterations.

Figure 9: Rotated Component Matrix

Finally, the rotated component matrix provides us the different information about the various relationships between the variables and the components those are extracted.

Here two components are observed:

Component 1 named as "**Perceived Value and Service Quality**"; it captures the views around the financial and functional aspects of wearable health care devices. This component clearly depicts the importance of the cost of buying wearable devices to health, as brought out in the feature "I think the purchasing cost of wearable healthcare devices is reasonable" (WT2), describing pricing as the underlying factor that will influence consumers. It reflects an aspect of customer service value addition captured in features signalling an aspect of the want of better comprehension and analysis of users' health through improved service (CSQ2 and CSQ3). Also, the attribute of customization with the devices (WT1), and the understandability of health overviews as presented by attached mobile apps (PIL3), are attributes in this component, meaning the ability for presentation according to the user's choice and needs.

Component 2 named as "**User Engagement and Support**" that is the daily-use component of and interaction with wearable healthcare devices and their applications. This component is strongly founded by the support of these devices, WT4, that is a testament to the perceived benefits these devices have in everyday life. The emphasis here is in daily use and engagement: "I would use the app every day" (PI4); in such a case, it points toward the role played by these gadgets in day-to-day practice of health by the users. The high loadings were indicated by the need of easy connectivity with mobile apps (PIL2) and the potential of personalized communication to overcome motivational barriers (PI3), which signals that friendly interfaces and supportive interactions should be especially evident to foster user engagement.

Conclusively, this research reveals a consumer base that is price-sensitive, looks for desired options in customization, and seeks a service orientation in wearable health devices to support active daily engagement made possible through easy-to-operate technology. These perspectives can help shape product development and marketing strategies to better reflect the tendencies and behaviours identified among consumers.

Clustering Analysis

Final Cluster Centers

	Cluster 1	Cluster 2
REGR factor score 1 for analysis 1	.64524	-1.02728
REGR factor score 2 for analysis 1	.04126	-.06568

Cluster 1 is characterized by Component 1 (0.64524) that records a very high score on the positive factor "Perceived Value and Service Quality" with a positive but smaller score on Component 2 (0.04126), the factor "User Engagement and Support.". This indicates that the cluster 1 respondents value highly their perception of the purchase cost of the device being reasonable, value the ability to customize the device, and have a high perception of the quality of customer service. Further, they demonstrate a positive orientation for engagement and support, albeit to a lesser extent.

Cluster 2 shows a negative score of both components (-1.02728 for Component 1, -0.06568 for Component 2), which points to the fact that this cluster represents respondents who, in general, are less convinced about the cost-effectiveness and quality of service with respect to wearables in healthcare and less engaged with it compared to Cluster 1.

ANOVA

	Cluster Mean Square	Cluster df	Error Mean Square	Error df	F	Sig.
REGR factor score 1 for analysis 1	130.579	1	.335	195	389.219	<.001
REGR factor score 2 for analysis 1	.534	1	1.002	195	.533	.466

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Statistically, this has support in the ANOVA table indicating difference in scores on Component 1 between the clusters is highly significant (p <.001). The mean square (130.579) for Cluster 1 is much larger than the other group, reinforcing that this component is a strong differentiator between the groups. The only differences not significant are the Component 2 scores (p =.466), thus revealing that attitudes in regard to user engagement do not change as significantly from one cluster to another.

Number of Cases in each Cluster

Cluster	1	121.000
	2	76.000
Valid		197.000
Missing		3.000

The "Number of Cases in Each Cluster" finally demonstrates that there were 121 respondents in the first cluster. In other words, the clustering reveals that the market has two hugely different segments: one with high value appreciation for service quality in wearable healthcare devices and a moderate engagement; the other being more critical on both fronts than the first segment and hence less engaging. These could in fact prove to be quite valuable insights in the light of targeted marketing strategies, product development, and improvement in customer support services.