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DECODING CONSUMER ATTITUDE TOWARDS SMART WEARABLE HEALTH DEVICES: AN INTEGRATED MODEL OF HEALTH, KNOWLEDGE, VALUE, AND CONSUMER CHARACTERISTICS

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Abstract
The rapid diffusion of digital health technologies has made smart wearable health devices like smartwatches, fitness bands, and related body-worn sensors an increasingly prominent category of consumer technology. This study develops and empirically tests an integrated model in which health consciousness, awareness, perceived benefits, consumer innovativeness, price sensitivity and objective knowledge are hypothesised to predict consumer attitude towards smart wearable health devices. Primary data were collected from 500 consumers in Delhi NCR using a structured, self-administered questionnaire and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) in SmartPLS 4. The measurement model demonstrated satisfactory reliability and validity, and the structural model explained 61.8 per cent of the variance in consumer attitude (R^2 = .618; Q^2predict = .604). Health consciousness (β = .385), perceived benefits (β = .234), objective knowledge (β = .230) and awareness (β = .140) were found to exert significant positive effects on attitude, whereas consumer innovativeness (β = −.034) and price sensitivity (β = −.035) did not reach statistical significance. The findings suggest that health-related motivation and informed understanding of device functionality matter more to consumer evaluation than novelty-seeking or cost considerations.

Keywords: *Smart Wearable Health Devices; Attitude; Health Consciousness; Perceived Benefits; Objective Knowledge; PLS-SEM*

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1. Introduction

Digital technologies have rapidly evolved the healthcare and consumer-technology landscape, with smart wearable health devices being a significant part of this evolution. Wearable health technologies are anything from smartwatches to fitness trackers, smart bands and other wearable devices that can collect information about health and activity levels including heart rate, activity, sleep patterns, and blood pressure, allowing consumers to track aspects of their health in real time.

Smart wearable health devices have increasingly attracted attention because they allow consumers to participate more actively in their own health management. Unlike conventional healthcare technologies that are typically accessed through healthcare professionals or institutions, wearable devices allow individuals to obtain health-related information continuously and conveniently. Prior research suggests that wearable healthcare technology can support health monitoring, encourage healthier behaviours, and provide information that assists individuals in managing their physical activity and wellbeing.

Even though these potential benefits exist, the diffusion and acceptance of WHTs can not only be understood by their technology. Consumers' decision about their attitudes towards such devices could be influenced by the relevance of technology to their health, the benefits they believe they will gain from the use of such a device, their knowledge of the technology and their openness to innovative products. Cheung et al. (2019) proposed wearable healthcare technology contains health-related, technological, and consumer-related characteristics, implying that the former attributes should be added to the technological factors to account for reactions to this technology.

This is especially the case when it comes to health consciousness. People with a higher health-related value might be more open to technologies allowing for ongoing health monitoring. Health consciousness was a significant factor in the intention to use wearable fitness devices (Yang et al., 2022) and beliefs about health were found to be important in consumers' assessment of wearable health related technology (Cheung et al., 2019).

Benefits also are important in the technology evaluation process, and perceived benefits are an important factor. Smart wearable health devices offer advantages of convenience, constant monitoring, health information, tracking and supporting physical activity, and helping to establish healthier habits. Perceived usefulness is one of the key factors in Davis's (1989) Technology Acceptance Model and has been shown to be relevant in many wearable-health studies.

Consumer awareness and knowledge can also impact consumer response to wearable health technologies. Consumer knowledgeable about the characteristics of these products is needed for informed evaluations, as they incorporate technological and health-related functions. Cheung et al. (2019) highlighted inadequate consumer knowledge as an important research concern, and Lee and Lee (2018) found that intention to adopt wearable fitness trackers was stronger among consumers who were already aware of such devices.

Another factor that may be relevant is consumer innovativeness as wearable health devices are considered innovative technology products, and innovative consumers are more inclined to experiment with such products. Consumer innovativeness has been identified as an important determinant in wearable health care technology adoption intention (Cheung et al., 2019) and a positive influence on personal innovativeness on wearable fitness-tracker adoption (Lee and Lee, 2018).

At the same time, economic considerations cannot be ignored. Wearable health devices may involve relatively high acquisition costs, particularly for technologically advanced products, and research on wearable fitness devices has therefore examined perceived cost and price sensitivity as determinants of technology adoption. Yang et al. (2022) found perceived cost to be significant in explaining intention to use wearable fitness devices, and more recent wearable-technology research has continued to consider price sensitivity in explaining consumer responses to smart wearable products.

Although prior research has investigated individual determinants of wearable technology adoption, there remains scope for a more integrated consumer-behaviour perspective on attitude formation. Much of the existing literature focuses on behavioural intention or actual use and frequently relies on technology-acceptance constructs such as usefulness, ease of use, compatibility and cost. The present study addresses this gap by integrating health consciousness, awareness, perceived benefits, innovativeness, price sensitivity and objective knowledge as antecedents of consumer attitude towards smart wearable health devices.

2. Literature Review and Hypothesis Development

2.1 Smart Wearable Health Devices and Consumer Attitude

Smart wearable health devices represent a convergence of consumer electronics, healthcare and information technology. These devices enable users to continuously collect and monitor health-related information and can support activities such as exercise tracking, sleep monitoring and physiological monitoring.

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From a consumer-behaviour perspective, attitude represents an individual's favourable or unfavourable evaluation of a particular product or technology. Ajzen's (1991) Theory of Planned Behavior positions attitude as a central determinant of behavioural intention, while technology-acceptance research has repeatedly demonstrated that consumers' evaluations of technological products influence subsequent acceptance and use. However, attitude towards a wearable health device may be shaped by multiple consumer-level and product-related factors. Accordingly, this study proposes an integrated framework in which health consciousness, awareness, perceived benefits, innovativeness, price sensitivity and objective knowledge explain consumer attitude towards smart wearable health devices.

2.2 Health Consciousness and Consumer Attitude

Health consciousness refers to the degree to which individuals are concerned about their health and are willing to engage in behaviours that maintain or improve it. This construct is particularly relevant to wearable health devices because the primary value proposition of such devices is associated with health monitoring and self-management. Health-conscious consumers are more likely to seek information about their physical condition and may therefore appreciate technologies that provide continuous health-related feedback.

Yang et al. (2022) found that health consciousness significantly influenced consumers' intention to use wearable fitness devices, demonstrating that consumers' personal health orientation is relevant to the evaluation and acceptance of wearable technology. Similarly, Cheung et al. (2019) incorporated health beliefs into their wearable healthcare technology model and demonstrated that health-related beliefs influenced perceived usefulness. Consumers who are more health conscious are therefore expected to develop more favourable attitudes towards smart wearable health devices.

H1: Health consciousness has a significant positive effect on consumer attitude towards smart wearable health devices.

2.3 Awareness and Consumer Attitude

Awareness refers to the degree to which consumers are familiar with the existence, functions and applications of a product or technology. Awareness is especially important for emerging technologies because consumers cannot fully evaluate a product if they have limited familiarity with it, and wearable health devices involve multiple technological functions about which consumers may differ considerably in their understanding.

Lee and Lee (2018) explicitly compared consumers who were aware of wearable fitness trackers with those who were unaware of them and found that adoption intention was stronger among respondents who were already aware of such devices. More recent research on AI-integrated wearable health devices also identifies awareness and familiarity with device functions as important elements in consumer evaluation and adoption. Greater awareness is therefore expected to facilitate more informed and favourable evaluations of smart wearable health devices.

H2: Awareness has a significant positive effect on consumer attitude towards smart wearable health devices.

2.4 Perceived Benefits and Consumer Attitude

Perceived benefits are the benefits consumers think they can gain from a specific product or technology. Wearable smart health devices could offer a number of advantages, such as monitoring health levels, tracking physical activity, being convenient, receiving personalised feedback, obtaining health information, and supporting healthier lifestyles.

Cheung et al. (2019) pointed out that wearable healthcare technology can deliver health information and influence behaviour change and Davis' (1989) TAM model identified perceived usefulness as an important factor in technology acceptance. In the same way, Yang et al. (2022) determined that perceived usefulness is also an important factor influencing intention to use wearable fitness devices. They expect to be more favorable about a wearable health device if they think it offers them some benefit in monitoring and managing their health.

H3: Perceived benefits have a significant positive effect on consumer attitude towards smart wearable health devices.

2.5 Consumer Innovativeness and Consumer Attitude

Consumer innovativeness is the extent to which a consumer is willing to try and adopt a new product, idea or technology. Smart wearable health devices are new consumer technologies that integrate digital connectivity with health monitoring; innovative consumers are willing to try new technologies and are not afraid of the uncertainty surrounding new products.

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Cheung et al. (2019) created the concept of consumer innovativeness as another factor that could influence the adoption intention of wearable healthcare technology, and showed that consumer innovativeness was significantly associated with the adoption intention, stating that innovative consumers are more likely to perceive the merits of new technology and to deal with the uncertainty surrounding technological innovation. The positive relationship between personal innovativeness and intention to adopt wearable fitness trackers was also reported by Lee and Lee (2018), and Ulusoy et al. (2025) found a positive relationship between consumer innovativeness and intention to use smart wearable devices in the healthcare sector. Consequently, the innovative consumers are expected to view smart wearable health devices in a more positive light, based on this.

H4: Consumer innovativeness has a significant effect on consumer attitude towards smart wearable health devices.

2.6 Price Sensitivity and Consumer Attitude

Price sensitivity refers to the degree to which consumers respond to price differences and regard price as an important consideration in their purchase evaluations. Smart wearable health devices can vary considerably in price depending on technological sophistication, health-monitoring capabilities, brand and features, and consumers may therefore evaluate such devices partly in terms of whether the expected benefits justify the financial cost.

Yang et al. (2022) incorporated perceived cost into their model of wearable fitness-device adoption. They found that it significantly influenced intention to use. In contrast, Lee and Lee (2018) found perceived expensiveness to be insignificant in their wearable fitness-tracker adoption model, indicating that price-related effects may vary across consumer contexts. More recent research on smart glasses another category of wearable technology found that price sensitivity can influence consumer evaluations within a value–attitude–behaviour framework, although its effect depends on the specific relationship examined (Ciunova-Shuleska et al., 2025). Consumers with greater price sensitivity are therefore expected to evaluate smart wearable health devices less favourably when the perceived price exceeds the benefits they expect to receive.

H5: Price sensitivity has a significant effect on consumer attitude towards smart wearable health devices.

2.7 Objective Knowledge and Consumer Attitude

Objective knowledge refers to the actual factual knowledge possessed by consumers, as distinct from their subjective perception of how knowledgeable they are. Knowledge is particularly important for wearable health devices because consumers must understand the functions, applications and limitations of such technologies to evaluate them effectively.

Cheung et al. (2019) identified inadequate consumer knowledge as an important issue in wearable healthcare technology adoption research and used screening questions to assess respondents' familiarity and experience with such technology. Objective knowledge may reduce uncertainty and help consumers make more informed evaluations, since consumers possessing greater factual knowledge about wearable health devices may better understand their health-monitoring benefits and technological capabilities. This construct also provides a useful extension to existing wearable-technology research, much of which focuses on perceived usefulness, health beliefs, awareness or subjective perceptions rather than directly testing objective consumer knowledge.

H6: Objective knowledge has a significant positive effect on consumer attitude towards smart wearable health devices.

3. Research Gap

Previous work on wearable health technology has generally centered on technology acceptance and intention to adopt with constructs like perceived usefulness, ease of use, compatibility, cost, health belief, privacy and innovativeness. Cheung et al. (2019) incorporated health traits, tech and consumers' characteristics to explain the intention to adopt, whereas Yang et al. (2022) investigated the construct of health consciousness, health motivation, perceived cost, compatibility, usefulness, and tech accuracy with regard to WFD adoption. There are, however, three gaps.

First, many of the works emphasize intention to adopt or use instead of elaborating on consumer attitude as the main outcome.

Second, most of the current research studies focus on technological attributes or health related variables separately or within a set of pre-developed technology-acceptance models in isolation. A model combining health consciousness, awareness, perceived benefits and innovativeness and price sensitivity offers a wider frame of consumer-marketing attitude formation.

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Third, objective knowledge has received comparatively limited attention as a direct antecedent of consumer attitude towards wearable health devices. This is important because actual knowledge is conceptually distinct from awareness or perceived knowledge, yet is rarely modelled as a factual, quiz-based construct in this literature.
The present study contributes to the literature by examining these six consumer-level antecedents within a single, integrated framework and by testing that framework using primary survey data analysed through PLS-SEM.

4. Research Objectives

- To examine the effect of health consciousness on consumer attitude towards smart wearable health devices.
- To investigate the effect of awareness on consumer attitude towards smart wearable health devices.
- To determine the influence of perceived benefits on consumer attitude towards smart wearable health devices.
- To examine the effect of consumer innovativeness on consumer attitude towards smart wearable health devices.
- To investigate whether price sensitivity influences consumer attitude towards smart wearable health devices.
- To examine the effect of objective knowledge on consumer attitude towards smart wearable health devices.

5. Theoretical Framework

The study is primarily grounded in the Technology Acceptance Model (TAM; Davis, 1989), which identifies perceived usefulness and perceived ease of use as fundamental determinants of technology acceptance. Within the present model, perceived benefits operationalise the usefulness/value logic central to TAM, extending it to the wearable health-device context.
The Theory of Planned Behavior (TPB; Ajzen, 1991) provides complementary theoretical support. TPB positions attitude as a central component in the formation of behavioural intention, and because the present study focuses on attitude formation rather than intention or use, TPB is useful for theoretically justifying attitude as the dependent variable.
Accordingly, the study is positioned as being primarily grounded in the Technology Acceptance Model, with the Theory of Planned Behavior providing complementary theoretical support for examining attitude as a central consumer evaluation of smart wearable health devices. Health consciousness, awareness, objective knowledge, innovativeness and price sensitivity are treated as consumer- and product-level antecedents that extend this core framework to the specific context of health-oriented wearable technology.

6. Research Methodology

6.1 Research Design

In the present study, a quantitative research design with cross-sectional research approach was used in order to see the factors that affect consumers' attitude towards the smart wearable health devices. Primary data has been gathered from the consumers through a structured questionnaire. The study was quantitative as it is intended to test the hypothesized relationships between health consciousness, health awareness, perceived benefits, innovativeness, price sensitivity, objective knowledge and consumer attitude empirically. The conceptual model is based on the Technology Acceptance Model (TAM) of Davis (1989) with a modification of attitude component from the Theory of Planned Behavior (TPB) of Ajzen (1991).

6.2 Research Context

The study is based on smart wearable health devices like smartwatch, fitness band, etc. which offer health and fitness monitoring capabilities. The study specifically focuses on consumer attitude instead of actual purchase or usage intention, and hence, the study identifies the psychological and consumer related factors that helps to shape a positive or negative attitude towards these devices.

6.3 Population and Sampling

The target population in Delhi NCR included: Smart wearable health device aware adult consumers (current and non-users). A non-probability purposive sampling technique was used as it requires the respondents to

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have some basic awareness of smart wearable health devices to give meaningful answers to the perceived benefits, awareness, knowledge and attitude.
The respondents had to meet the following criteria: (i) age of 18 years or older, (ii) experience of basic level of awareness about the smart wearable health devices and, (iii) capacity to understand and respond to the questionnaire. Both users and potential users were eligible as the intent of the study is to gain a better understanding of consumer attitude in general, and not just that of existing users.

6.4 Data Collection Procedure

The primary data was obtained through a paper-based, structured and self-administered questionnaire, which was sent electronically to 500 respondents. In order to give the respondents a basic understanding about the context of the research, they were given a short description of smart wearable health devices before they were asked the substantive questions. The responses were anonymous and voluntary, and participants were assured that their answers would be kept confidential and only used for research. The questionnaire was designed into two broad categories – the first section was designed to gather demographic and profile information of the respondents, and the second section was designed to measure the constructs components of the conceptual model.

6.5 Questionnaires and Measurement Program.

The instrument was not created from scratch, but rather adapted from scales used in previous studies and applied to the context of smart wearable health-device applications. The health-consciousness literature from Gould (1988) and later used in consumer research such as that of Menon and Chavadi (2022) were used to develop health consciousness items. The field of personal-innovativeness from Agarwal and Prasad (1998) which was later used in technology-adoption research was adapted for consumer innovativeness. The measure of price sensitivity was determined using existing consumer price-perception research, particularly Lichtenstein et al. (1993). The items used for perceived-benefit and attitude were adapted from previous researches of wearing health and technology acceptance such as Cheung et al., (2019), Lee and Lee (2018) and Yang et al. (2022), and Davis (1989). Based on the literature review by Lee and Lee (2018), the awareness items were created to reflect the respondents' familiarity with smart wearable health devices. Objective knowledge was operationalised separately through factual, quiz-type knowledge questions relating to the functions and capabilities of smart wearable health devices, scored as correct (1) or incorrect/'do not know' (0), consistent with established objective-knowledge measurement procedures in consumer research (e.g., Park et al., 1994).
All perceptual constructs (health consciousness, Objective knowledge, awareness, perceived benefits, innovativeness, price sensitivity and attitude) were measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

6.6 Measurement of Variables

Construct	Code	No. of Items	Measurement
Health Consciousness	HC	5	5-point Likert
Awareness	AW	3	5-point Likert
Perceived Benefits	PB	7	5-point Likert
Consumer Innovativeness	I	4	5-point Likert
Price Sensitivity	PS	4	5-point Likert
Objective Knowledge	OK	6	5-point Likert
Consumer Attitude	ATT	7	5-point Likert

The dependent variable of the study is consumer attitude (ATT), whereas health consciousness, awareness, perceived benefits, innovativeness, price sensitivity and objective knowledge represent the explanatory (exogenous) variables.

6.7 Construct Operationalisation

Health consciousness refers to the degree to which consumers are concerned about maintaining, monitoring and improving their health. Awareness represents the extent to which consumers are familiar with the existence, features and applications of smart wearable health devices. Perceived benefits refer to the extent to which consumers believe that smart wearable health devices provide useful health, fitness, convenience and monitoring-related benefits. Consumer innovativeness refers to an individual's willingness to experiment with and adopt new technologies and innovative products. Price sensitivity represents the extent to which consumers

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consider price an important factor when evaluating smart wearable health devices. Objective knowledge refers to the actual factual knowledge possessed by consumers regarding smart wearable health devices and their functionalities. Consumer attitude represents the overall favourable or unfavourable evaluation of smart wearable health devices.

6.8 Data Analysis Technique
The collected data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) in SmartPLS 4. PLS-SEM was selected because the study examines relationships among multiple latent constructs and is well suited to predictive research involving a relatively complex conceptual model with both reflective measurement and a moderate sample size. Consistent with recommended two-stage practice, the measurement model was first assessed for reliability and validity, followed by assessment of the structural model to test the hypothesised relationships (Hair et al., 2019, 2021).
The measurement model was evaluated using outer loadings, Cronbach's alpha, composite reliability (rho_c and rho_a), average variance extracted (AVE), and discriminant validity via the Fornell-Larcker criterion (Fornell & Larcker, 1981) and the heterotrait–monotrait (HTMT) ratio (Henseler et al., 2009, 2015). The structural model was evaluated using path coefficients (β), t-statistics and p-values obtained through bootstrapping with 5,000 sub-samples (Efron & Tibshirani, 1986), the coefficient of determination (R^2), effect size (f^2; Cohen, 1988), and predictive relevance (Q^2predict; Geisser, 1974; Stone, 1974).

6.9 Structural Model Specification
The proposed structural model can be represented as:
$ATT = \beta0 + \beta1HC + \beta2AW + \beta3PB + \beta4I + \beta5PS + \beta6OK + \varepsilon$
where ATT = Consumer Attitude; HC = Health Consciousness; AW = Awareness; PB = Perceived Benefits; I = Consumer Innovativeness; PS = Price Sensitivity; OK = Objective Knowledge; and ε = error term.

6.10 Ethical Considerations
There was volunteer participation in the study. No personal data was sought and respondents were told of the academic nature of the study. Participants in the study could withdraw at any time and the information gathered was anonymised and used only for academic research purposes.

6.11 Hypothesis Testing Criterion
The hypotheses were tested at the 5 per cent level of significance. Based on conventional practice in PLS-SEM Marketing Research (Hair et al., 2014), the t-value exceeding 1.96 was considered to be statistically significant for a two-tailed test.

7. Data Analysis and Results
The analysis was conducted in the typical PLS-SEM sequence, namely, the measurement model was examined first followed by the structural model. Assessment of the structural model was done with bootstrapping (Efron & Tibshirani, 1986), which was divided into sub-samples of 5,000.

7.1 Collinearity Assessment
Collinearity can occur when the estimates of the regression coefficients are unstable because two or more predictor variables are highly correlated. In line with Hair et al. (2019, 2021) and Henseler et al. (2009) a Variance Inflation Factor (VIF) greater than 5 can be considered as a concern of collinearity. As it can be observed in Tables 1 and 2, the outer and inner VIF values are below this threshold, indicating that there are no significant concerns with material collinearity among the indicators and/or the latent constructs.

Table 1: Outer VIF Values

Item	VIF	Item	VIF	Item	VIF	Item	VIF
HC1	1.592	AW1	1.464	PB1	1.586	PS1	1.574
HC2	1.559	AW2	1.687	PB2	1.838	PS2	1.731
HC3	1.614	AW3	1.606	PB3	1.818	PS3	1.839
HC4	1.354	Att1	1.567	PB4	2.070	PS4	1.789
HC5	1.659	Att2	1.677	PB5	2.264	I1	1.873
OK1	1.950	Att3	1.810	PB6	2.130	I2	1.779
OK2	1.796	Att4	1.802	PB7	2.234	I3	1.499

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OK3	2.200	Att5	1.758	OK5	1.912	I4	1.692
OK4	2.158	Att6	1.826	OK6	2.038		
		Att7	1.926				

All outer VIF values remain below the conservative threshold of 5 (and indeed below 3), indicating no problematic collinearity among indicators.

Table 2: Inner VIF Values

Predictor Construct	VIF	Issue of Collinearity (VIF < 5)
AW → Attitude	1.984	No
HC → Attitude	2.019	No
I → Attitude	1.588	No
OK → Attitude	2.392	No
PB → Attitude	2.214	No
PS → Attitude	2.222	No

7.2 Measurement Model Assessment

The measurement model was assessed based on the criteria of Hair et al. (2011, 2013, 2021) and Fornell and Larcker (1981). The first step was to check the reliability of the indicators: loadings greater than .70 are considered adequate and indicators with loadings under .40 are considered for deletion to increase AVE (Hair et al., 2011). Then internal consistency reliability was examined using composite reliability (criterion higher than .70 is acceptable) and convergent validity through AVE (criterion higher than .50 is acceptable). Finally, discriminant validity was examined using the Fornell–Larcker Criterion and the HTMT ratio.

Table 3: Reliability and Convergent Validity

Construct	Cronbach's Alpha	Composite Reliability (rho_c)	Composite Reliability (rho_a)	AVE
Awareness (AW)	0.768	0.866	0.771	0.682
Attitude (ATT)	0.866	0.897	0.867	0.555
Health Consciousness (HC)	0.794	0.859	0.795	0.549
Innovativeness (I)	0.814	0.877	0.823	0.640
Objective Knowledge (OK)	0.884	0.912	0.885	0.634
Perceived Benefits (PB)	0.890	0.914	0.891	0.603
Price Sensitivity (PS)	0.822	0.882	0.824	0.652

Cronbach's alpha values ranged from .768 to .890, which is greater than the commonly used cutoff of .60 – .70 (Hair et al., 2010). The internal consistency reliability of the constructs ranged from .859 to .914, indicating good internal consistency reliability in accordance with the recommended threshold of .70 (Henseler et al., 2009; Wong, 2013). The convergent validity of the constructs was supported as AVE values of all the constructs were above 0.50, which is the minimum acceptable standard suggested by Fornell and Larcker (1981) and Hair et al. (2014); an AVE value greater than 0.50 means that the average of the indicators is greater than 50% of the variance explained by the construct.

Table 4: Discriminant Validity — Fornell–Larcker Criterion

	AW	ATT	HC	I	OK	PB	PS
AW	0.826						
ATT	0.571	0.745					
HC	0.610	0.701	0.741				
I	0.496	0.392	0.404	0.800			
OK	0.517	0.644	0.566	0.495	0.796		
PB	0.492	0.649	0.576	0.455	0.697	0.776	
PS	0.606	0.529	0.580	0.546	0.619	0.564	0.808

Note. Diagonal values (bold in the original SmartPLS output) represent the square root of AVE for each construct; off-diagonal values represent inter-construct correlations.

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For every construct, the square root of AVE on the diagonal exceeds its correlations with all other constructs (e.g., √AVE for AW = .826, exceeding its highest correlation of .610 with HC), satisfying the Fornell–Larcker criterion and supporting discriminant validity across the model.

Table 5: Discriminant Validity — HTMT Ratio

	AW	ATT	HC	I	OK	PB	PS
AW							
ATT	0.696						
HC	0.779	0.840					
I	0.614	0.458	0.489				
OK	0.629	0.734	0.672	0.577			
PB	0.596	0.737	0.680	0.526	0.785		
PS	0.769	0.624	0.713	0.659	0.725	0.657	

All HTMT values fall below the conservative threshold of .90 recommended by Henseler et al. (2015), further supporting discriminant validity between the seven constructs in the model.

7.3 Structural Model and Hypothesis Testing

Having established the adequacy of the measurement model, the structural model was assessed to test the hypothesised relationships. The path coefficient (β) indicates the strength and direction of the relationship between an exogenous construct and consumer attitude, ranging from −1 to +1, with values closer to the extremes indicating stronger relationships (Hair et al., 2013). The significance of each path was assessed via bootstrapping with 5,000 sub-samples without sign changes (Hair et al., 2013), and a t-value above 1.96 ($p < .05$, two-tailed) was taken as the threshold for statistical significance.

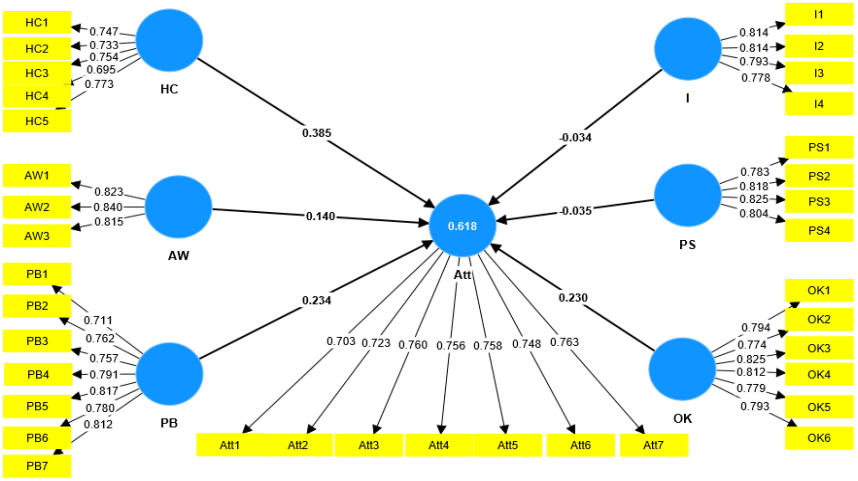


Figure 1. PLS-SEM structural model — standardised path coefficients and outer loadings.

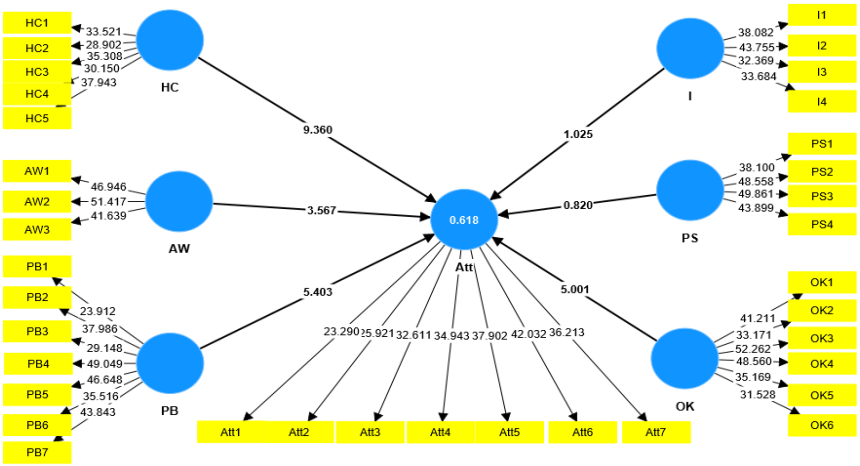


Figure 2. Bootstrapping results (5,000 sub-samples) — t-statistics for outer loadings and path coefficients.

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Table 6: Structural Path Estimates and Hypothesis Testing

Hyp.	Path	β	SD	t-value	p-value	Decision
H1	HC → ATT	0.385	0.041	9.360	0.000***	Supported
H2	AW → ATT	0.140	0.039	3.567	0.000***	Supported
H3	PB → ATT	0.234	0.043	5.403	0.000***	Supported
H4	I → ATT	−0.034	0.033	1.025	0.306	Not Supported
H5	PS → ATT	−0.035	0.043	0.820	0.412	Not Supported
H6	OK → ATT	0.230	0.046	5.001	0.000***	Supported

*Note. *** $p < .001$; SD = standard deviation (STDEV) of the bootstrap distribution.*

As shown in Table 6, four of the six hypothesised relationships were statistically supported. Health consciousness exerted the strongest effect on consumer attitude ($\beta = .385$, $t = 9.360$, $p < .001$), followed by perceived benefits ($\beta = .234$, $t = 5.403$, $p < .001$), objective knowledge ($\beta = .230$, $t = 5.001$, $p < .001$) and awareness ($\beta = .140$, $t = 3.567$, $p < .001$). Consumer innovativeness ($\beta = -.034$, $t = 1.025$, $p = .306$) and price sensitivity ($\beta = -.035$, $t = 0.820$, $p = .412$) did not have a statistically significant effect on consumer attitude; although the coefficient for price sensitivity was in the hypothesised negative direction, it did not reach conventional levels of statistical significance.

Table 7: Coefficient of Determination (R^2)

Endogenous Construct	R^2	R^2 Adjusted	Interpretation
Attitude (ATT)	0.618	0.614	Moderate

The model explains 61.8 per cent of the variance in consumer attitude ($R^2 = .618$; adjusted $R^2 = .614$). Following Chin's (1998) benchmarks for PLS-SEM (approximately .19, .33 and .67 for weak, moderate and substantial R^2, respectively), and consistent with Hair et al.'s (2011) categorisation of .25, .50 and .75 as weak, moderate and substantial for endogenous latent variables, the obtained R^2 value indicates a moderate-to-substantial level of explanatory power for a six-predictor consumer-attitude model.

Table 8: f^2 Effect Sizes

Path	f^2	Effect Size
AW → ATT	0.026	Small
HC → ATT	0.192	Medium
I → ATT	0.002	No effect
OK → ATT	0.058	Small
PB → ATT	0.065	Small
PS → ATT	0.001	No effect

Following Cohen's (1988) benchmarks ($f^2 \geq .02$ small, $\geq .15$ medium, $\geq .35$ large), health consciousness produced a medium effect size, awareness, perceived benefits and objective knowledge produced small effect sizes, and innovativeness and price sensitivity produced negligible effect sizes on consumer attitude — consistent with their non-significant path coefficients.

Table 9: Predictive Relevance (Q^2predict)

Endogenous Construct	Q^2predict	RMSE	MAE
Attitude (ATT)	0.604	0.632	0.448

Consistent with the Stone–Geisser criterion (Geisser, 1974; Stone, 1974), a Q^2predict value greater than zero indicates that the model possesses predictive relevance for the endogenous construct. The obtained Q^2predict value of .604 for consumer attitude indicates strong out-of-sample predictive relevance for the proposed model.

8. Discussion of Findings

The results provide broad support for the proposed integrated model of consumer attitude towards smart wearable health devices, while also highlighting two relationships that did not hold in the present sample.

Health consciousness emerged as the strongest predictor of attitude ($\beta = .385$), consistent with Yang et al. (2022) and Cheung et al. (2019), and reinforcing the theoretical expectation that consumers who are more concerned with maintaining and monitoring their health respond most favourably to a technology whose central value proposition is health-related self-management.

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Perceived benefits (β = .234) and objective knowledge (β = .230) exerted comparable, statistically significant positive effects. The perceived-benefits result is consistent with the usefulness logic of the Technology Acceptance Model (Davis, 1989) and with prior wearable-technology findings (Yang et al., 2022). The significant effect of objective knowledge is notable because this construct has received comparatively limited attention in prior wearable-technology research, which has more often relied on awareness or subjective knowledge; the present finding suggests that consumers' actual factual understanding of what these devices can and cannot do meaningfully shapes how favourably they are evaluated, independent of general awareness. Awareness also had a significant, if comparatively modest, positive effect on attitude (β = .140), consistent with Lee and Lee (2018), who found stronger adoption intention among consumers already aware of wearable fitness trackers. The comparatively smaller effect size of awareness relative to health consciousness, perceived benefits and objective knowledge suggests that simply knowing a product category exists contributes less to favourable evaluation than understanding its personal relevance (health consciousness), its functional value (perceived benefits) or its actual capabilities (objective knowledge).

Consumer innovativeness did not have a statistically significant effect on attitude (β = −.034, t = 1.025), which contrasts with Cheung et al. (2019), Lee and Lee (2018) and Ulusoy et al. (2025), each of which reported a positive innovativeness effect on adoption-related outcomes. The second possibility may be that the attitude of smart wearable health devices is more functional and health-related than novelty-seeking, which may reduce the significance of innovativeness as a factor influencing attitude, as compared to previous wearable-technology research. It is also possible that innovativeness is more important for behavioural intention or for early adoption behaviour than it is for the development of attitude.

Likewise, price sensitivity was not statistically significant (β = −.035, t = 0.820) but the coefficient was the hypothesised negative direction. The result is consistent with that of Lee and Lee (2018), who also determined that perceived expensiveness to be non-significant in an evaluation of a wearable fitness-tracker, and is generally in agreement with Ciunova-Shuleska et al. (2025), who used the specific relationship to determine that perceived expensiveness is a non-significant influence on evaluation of wearables. One possible reason for this is that in an attitude-formation setting (versus a purchase-intention or actual-purchase setting) costs are not as salient as they would be when the concrete purchase decision is made; consumers may have a general positive or negative attitude toward the technology that is unrelated to the price they are willing to pay for it.

Overall, the pattern of results indicates significant influence of attitude factors (health consciousness, health awareness, perceived benefits, and objective knowledge) but not of attitude factors (innovativeness and price sensitivity) on consumer attitude towards smart wearable health devices in this sample, suggesting that the attitude of the consumers in this case is explained mainly by health-related motivation and knowledge about the health devices, and not by generalised novelty-seeking and cost sensitivity.

9. Theoretical and Managerial Implications

9.1 Theoretical Implications

This study has three contributions to the wearable-technology literature. First, it moves the focus away from behavioural intention to consumer attitude as the main outcome variable, complementing the main focus of literature on behavioural intention. Second, it incorporates health-related (health consciousness), technology-acceptance (perceived benefits), consumer-trait (innovativeness, price sensitivity) and knowledge-based (awareness, objective knowledge) antecedents into a model based on TAM and TPB, expanding the boundary conditions for which such models have applied. Third, the study explicitly distinguishes between objective and subjective/perceived knowledge, in addition to separating objective and awareness, and shows that objective knowledge has a separate explanatory power on attitude formation, as called for in the consumer-knowledge field.

9.2 Managerial Implications

The results indicate that for manufacturers and marketers of smart wearable health devices, a communication strategy that focuses on the health relevance of their products is likely to prove most effective in influencing positive consumer attitudes not on a novelty or technological sophistication. Given that health consciousness is the most significant factor influencing attitude, consumer segments interested in health monitoring and self-management should be strongly targeted with marketing messages relating the device's features directly to such monitoring and self-management.

The fact that objective knowledge is very influential suggests that there are more chances to create positive attitudes than with mere awareness campaigns, where the focus is on informing consumers that a product category exists, rather than informing them about what the product actually does. In-store demonstrations, explainer content or on-boarding experiences that make consumers aware of what they are measuring can have

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a greater impact than awareness campaigns alone. The same applies to perceived benefits: when these have a big impact, it is important to talk about actual functional benefit, as opposed to vague statements about usefulness.

For this sample, the lack of significant impact from innovativeness and price sensitivity indicates that marketers might not learn a lot from tactics that focus mostly on positioning these devices as 'newest and greatest' or from 'pricey' promotions, and should rather focus on 'health-relevant' and 'knowledge-building' strategies. This does not mean that price is not important in the final decision to buy but that it seems to play a less important role in affecting the general attitude than in affecting the intention or ability to buy.

10. Limitations and Directions for Future Research

Several limitations should be noted in any survey-based study, including the present one. First, the cross-sectional design captures attitudes at one moment in time only, which does not permit inferences of causality with regard to the antecedents of attitude, whereas experimental or longitudinal designs would. Second, the non-probability purposive sampling, which is suitable for the baseline awareness of the consumers, may be subject to some limitations in the generalisability of the findings to the wider population of consumers, which may need to be addressed in future studies by using probability-based sampling methods. Expansion of the current model with mediating factors (e.g., attitude between these antecedents and behavioural intention or actual adoption) and moderating factors (e.g., age, previous device ownership, and perceived risk) could be investigated in future studies.

11. Conclusion

The present study proposed and empirically tested the integrated model of the attitude of the consumer towards the smart wearable health devices, with the health consciousness, awareness, perceived benefits, consumer innovativeness, price sensitivity and objective knowledge as antecedents. The model obtained by PLS-SEM accounted for 61.8 per cent of the variance in consumer attitude, while the objective knowledge and awareness, exposure to health message on television and in the media, consumer innovativeness and price sensitivity were not statistically significant but appeared as significant positive predictors. The results indicate that, in the setting studied, positive consumer attitudes towards smart wearable health devices are created mainly based on health-related motivation and on generalised knowledge about the functioning of the device, and not on generalised innovativeness and price sensitivity. The paper presents a theoretically-based and empirically-supported framework that enriches and extends the Technology Acceptance Model and the attitudinal component of the Theory of Planned Behavior to the smart wearable health-device context, and provides practical tips for companies that want to shape consumer attitudes positively, using health-related, benefit-oriented and knowledge-enhancing approaches.

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