Validating a Brand Equity Model for Smart Wearable Brands

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Abstract

Smart wearable devices enable consumers to monitor their health and activity levels. They can track blood-oxygen levels, temperature, and heart rate data, gaining further significance during and after the Covid-19 pandemic. The rising popularity of these devices has led to intensified competition among smart wearable brands, necessitating strategic differentiation.

South Africa is a prominent market for smart wearable brands. Brand equity perceptions can be a key differentiating factor in this competitive landscape. There is limited academic research regarding the brand equity of smart wearable brands, particularly in the South African context. This study aims to validate a consumer-based brand equity model for smart wearable devices among South African consumers. Data were collected from 487 South African respondents aged 18-56 using a computer-administered online survey guided by a descriptive research design.

The findings have several theoretical and managerial implications. This study was the first to validate a smart wearable brand equity model comprising the four specific consumer-based brand equity factors: brand awareness, brand associations, quality perceptions and brand loyalty. These results enable smart wearable brands to rethink and optimise their branding strategy and identify areas of improvement to boost their consumer-based brand equity in South Africa and beyond.

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1. Introduction

1.1. Background

Branding plays a critical role in the success of any business by establishing an identity, values, and emotional connections with consumers (Sankar & Sankarnath, 2021; Chung *et al*., 2013). Branding communicates a promise while signifying brand values in their minds (Kapferer, 2012). This promise and a positive brand reputation established through consistent consumer interactions significantly influence consumer loyalty, trust, and attachment to the brand. Consumers often perceive brand reputation as a basis for quality assurance, sustained through various touchpoints with consumers (Dranove & Jin, 2010). Consequently, shaping consumers' brand loyalty, trust, and attachment significantly influences their decision-making process. Branding is essential to stand out amongst the competition within product categories saturated with many competing brands, particularly within the smart wearable device market.

Smart wearable devices, or fitness trackers or activity trackers, are any body-attachable device, including clothing items, capable of measuring movement and fitness-related metrics and providing real-time feedback via smart devices like smartphones or desktop applications (Muller, 2019). Smart wearable devices can generate health-related and activity data, including heart rate, step count, distance, calories burned, floors climbed, active minutes, and sleep patterns (Walker-Todd, 2021). Examples include fitness watches, bands, head/arm/chest HR straps, smart clothing (e.g., socks, shoes, shirts, pants), smart jewellery (e.g., necklaces, rings), clip-on pedometers, and head/earphones. Recent data suggest the market will generate close to 48.2 billion USD by 2023 (Statista, 2021).

1.2. Problem Statement

South Africa is positioned as a prominent market for wearable activity-tracking devices and smartwatches (Business Tech, 2018), ranking among the top 150 digital economies in the wearables segment despite its lower penetration rate of 7.24% and 4.3 million active paying users in 2020 (Statista, 2020). With intense global and South African competition, wearable activity-tracking brands must differentiate themselves. These brands must establish strong brand equity to enhance their competitiveness and market position to lay the groundwork for long-term business success and sustainable growth. However, despite the smart wearable device market's substantial size and revenue-generating capacity, there is limited academic research regarding the brand equity of smart wearable device brands, particularly in the South African context. To date, no academic literature has investigated smart wearable device brand equity.

1.3. Research objectives

This study addresses the following research objective: validate a consumer-based brand equity model for smart wearable device brands in the South African context, including determining the significance

of brand awareness, loyalty, association and perceived quality. These findings will assist smart wearable device brands in rethinking and optimising their branding strategy.

This paper provides a literature review on brand equity, including its definition, measurement, and the antecedents of consumer-based brand equity. The research methodology is outlined, followed by a discussion of the findings. The paper concludes with a summary of the insights gained from the study, its limitations, and suggesting future research directions.

2. Literature Review

2.1. Brand equity

Brand equity is an intangible asset or liability contributing to a product or service beyond its functional benefits (Sankar & Sankarnath, 2021; Anabila, 2020; Kotler & Keller, 2012; Lamb *et al*., 2011). In other words, branding is the increase in demand resulting from the influence of the brand's name (Cant & Van Heerden, 2013; Kapferer, 2008). A strong brand effectively cultivates a favourable perception among customers by establishing positive associations, forging emotional connections, fostering perceived quality, and ensuring the brand's reliability (Keller, 2013). Moreover, brand equity facilitates product differentiation and the successful introduction of new products and entry into new markets (Anabila, 2020; Lamb *et al*., 2011).

2.2. Measuring brand equity

Brand equity is a complex phenomenon and the measurement thereof is widely debated, with Aaker's (1996) model being widely accepted (Arya *et al*., 2022; Singh, 2022; Kotler & Keller, 2012; Wood, 2000). Aaker's (1996) model combines firm- and consumer-based perspectives and suggests that market behaviour, brand awareness, perceived quality, brand loyalty and brand associations are the indicators of brand equity. The consumer-based approach focuses on how consumers perceive the brand over time (Kotler & Keller, 2012), while the firm-based approach examines the impact of the brand on a company's financial performance (Aggarwal *et al*., 2013). Schiffman and Kanuk (2014) argue that consumer perceptions of a brand's superiority directly influence its financial value, suggesting that brand equity can be viewed as a consumer-based concept. Market behaviour is the only aspect of Aaker's model that does not rely on direct consumer input and is thus relatively objective and quantifiable (Arya *et al*., 2022; Veloutsou *et al*., 2013; Phipps *et al*., 2010). Consequently, this paper only focuses on the consumer-based brand equity factors.

2.3. Antecedents of consumer-based brand equity

Consumer-based brand equity results from cumulative brand experiences and marketing efforts, shaped by elements like brand awareness, brand loyalty, perceived quality, and brand associations. A higher level of consumer-based brand equity signifies a more favourable and esteemed brand, resulting in increased consumer demand. These antecedents play a vital role in establishing a positive and valuable brand image, ultimately driving higher demand for the brand.

2.3.1. Brand awareness

Brand awareness is the consumer's ability to recall and recognise a brand (Du Toit & Erdis, 2013). It is essential for communication between a company and consumers (Macdonald & Sharp, 2003) and is the foundation of brand equity (Kotler & Keller, 2012). Brand awareness plays a vital role in brand recall and recognition (Saleem *et al*., 2015) and influences consumers' consideration and purchase decisions (Cant & Van Heerden, 2013; Macdonald & Sharp, 2003).

Exposure plays a significant role in establishing brand awareness. Strategic placement of the brand ensures visibility and leads consumers to think about it (Keller, 2013). Repeated exposure fosters recognition and brand awareness, vital for overall brand success (Conradie *et al*., 2014). Furthermore, brand awareness leads to a better comprehension of the brand and its offerings, resulting in improved recall, recognition, and favourable associations (Aaker, 1996). It influences consumers' attitudes and beliefs, fostering repeat patronage (Erdem & Swait, 2004). Brand awareness is foundational to building a positive brand image and lasting impressions (Keller, 2013), with several studies (Hyun *et al*., 2022; Yoo *et al*., 2000; Kim & Hyun, 2011) supporting its positive relationship with consumer-based brand equity.

2.3.2. Perceived quality

Perceived quality refers to consumers' subjective judgment of a brand's performance, reliability, functionality, and superiority compared to competitors (Baalbaki & Guzmán, 2016; Keller, 2013; Chi *et al*., 2009). It significantly influences brand preference and equity (Gill & Dawra, 2010). Companies can use quality positioning to differentiate their brand (Jooste *et al*., 2012), and higher perceived quality often leads to a perception of superiority over competitors (Yoo *et al*., 2000). As part of the Brand Equity Ten (Aaker, 1996), leadership measures gauge the brand's popularity, innovativeness, and status within the product class, affecting consumer willingness to purchase and the ability to command premium prices (Dibb *et al*., 2012). High-quality brands are perceived as more valuable, contributing to higher brand equity.

Perceived quality influences consumer decision-making and brand loyalty, as consumers are willing to pay more for products they perceive as high quality (Šugrová *et al*., 2017). Furthermore, perceived quality affects satisfaction and repeat purchase behaviour and contributes to a brand's image and reputation. Brands consistently perceived as high quality enjoy positive associations, fostering consumer trust and loyalty (Aaker, 1996). Perceived quality is a crucial driver of consumer-based brand equity, as consumers' perceptions of a brand's performance and superiority compared to competitors impact brand preference and equity.

2.3.3. Brand loyalty

Brand loyalty is the consumer's willingness to repeatedly choose and purchase a specific brand (Jooste *et al*., 2012; Lamb *et al*., 2013). It is a central aspect of brand equity (Sankar & Sankarnath, 2021; Aaker, 1996) and a key learning outcome for companies (Schiffman & Kanuk, 2014). Retaining loyal customers is cost-effective compared to acquiring new ones (Jooste *et al*., 2012). Brand loyalty is a crucial marketing and business strategy, representing consumers' emotional and behavioural commitment to a brand (Aaker, 1996). Financially, it enhances customer lifetime value, as loyal customers make repeat purchases, recommend the brand, and contribute to increased sales and reduced marketing costs (Schiffman & Kanuk, 2014). Moreover, brand loyalty positively influences brand image and reputation, improving brand recognition and favourability (Jooste *et al*., 2012).

Brand loyalty consists of two components: attitudinal and behavioural brand loyalty (Schiffman & Kanuk, 2014). Attitudinal loyalty reflects consumers' emotional connection to a brand, while behavioural loyalty involves repeated purchasing behaviour. Consumer satisfaction is a necessary condition for the development of brand loyalty. Meeting or exceeding consumer expectations is crucial for creating brand loyalty (Keller, 2013; Funk & Lewis, 2009). However, there is often a discrepancy between a consumer's expectations and a company's understanding of those expectations. Companies must strive to close this gap to ensure consumer satisfaction and foster brand loyalty. Maintaining the satisfaction of current consumers is crucial for companies to achieve and sustain brand loyalty over time (Aaker, 1996).

2.3.4. Brand association

Brand associations may be defined as all the brand-related thoughts, feelings, and perceptions attached to a brand, shaping consumer attitudes and contributing to brand equity (Kotler & Keller, 2012). Brand associations shape the perceptions and attitudes of consumers towards a particular brand by creating positive associations (Aaker, 1997). Strategic marketing efforts can cultivate specific brand associations, enhancing brand image, identity, and consumer loyalty (Chatzipanagiotou *et al*., 2019). Brand associations' strength, favourability, and uniqueness serve as crucial differential factors contributing to brand equity formation. These attributes of brand associations generate a distinctive response from consumers, thereby elevating the value and worth of a brand and providing a foundational basis for brand equity (Keller, 1993). Hence, the prominence of brand associations in the determination of consumer-based brand equity underscores their essential significance in the marketing of brands.

3. Research Methodology

3.1 Research design, sampling method, and data collection

This study followed a descriptive research design and a cross-sectional approach. The target population comprised a non-probability sample of adult consumers aged 18 to 56, residing in all nine provinces in South Africa. This age inclusion was based on the definition of generational cohorts by Markert (2004), where 18-36 represented the Generation Y cohort and 37–56-year-olds represented the Generation X cohort. As a quantitative study, data were collected from 500 general South African consumers in mid-2022 using a computer-administered survey. During their data gathering process, a reputable research company in South Africa that adheres to ethical standards and POPI Act regulations was used to distribute the survey amongst their panel members. While respondents receive incentives to complete various surveys on this platform, which can be exchanged for store vouchers, the responses are not biased. Specific parameters were set before distribution to ensure data collection from a specific target population.

The following quotas were applicable when the online questionnaire was constructed:

- 500 responses;
- 50 percent gender distribution [male: female];
- Representation from Generation Y [18-36] and Generation X [37-56];
- Respondents had to be aged 18 to 56 years in 2022; and
- Respondents had to be a South African national residing in the country at the time of the survey.

With these criteria, no data that fell outside the study's target population were collected. The data were returned to the researchers in the form of data files immediately after the quota of 500 was reached.

3.2 Research instrument

The electronic, computer-administered research instrument comprised a cover page containing the study's information precisely the scope of the topic, namely wearable activity trackers with their definitions and an illustration to avoid confusion when responding to the items. This was followed by an informed consent statement, ensuring the participants that participation was voluntary and that they could withdraw at any point. The first set of responses aimed at gathering demographic information, followed by the second set that probed respondents about their background regarding wearable activity trackers and brand preferences. Based on their preferred brand, participants had to respond to specific scaled items on a six-point Likert scale, where 1=strongly disagree and 6=strongly agree. These scales were adapted from previously validated research and included brand awareness (4 items), quality perception (6 items), brand association (4 items) and brand loyalty (5 items) (Besharat, 2010; Yoo *et al*., 2000; Cheung *et al*., 2020).

3.3 Data analysis

Data analysis procedures, using Version 28 of IBM's Statistical Package for Social Sciences (SPSS), comprised a Mahalanobis Distance Test to eliminate outliers (Tabachnick & Fidell, 2013), frequency analysis to display the sample profile and background information, principal components analysis (EFA) to determine data factorability and variance explained, Cronbach alpha calculation to establish the factors' internal-consistency and composite reliability, descriptive statistics and a one-sample t-test to determine data significance, Pearson's product-moment correlation analysis and collinearity diagnostics for nomological validity analysis. IBM's Analysis of Moment Structures (AMOS) Version 28.0 was then used to perform confirmatory factor analysis (CFA) using the maximum likelihood method, internal-consistency and composite reliability analysis, convergent and discriminant validity analyses, and model fit assessment to validate the final framework.

The level of statistical significance was set at $p < 0.01$, and since these items were measured on a six-point scale, the test value to execute the one-sample t-test was set at 3.5.

3.4 Ethical considerations

This study adhered to stringent ethical considerations. First, before distributing the survey, ethical clearance was obtained from the institution's Faculty of Economic and Management Sciences Research Ethics Committee (EMS-REC), ethics number NWU-00899-21-A4. Furthermore, the cover page concluded with an informed consent statement, emphasising that this was a minimal-risk study based on voluntary participation and that respondents could withdraw at any point without penalty. The respondents acknowledged the information and were advised that the results would only be reported in aggregate form. The data for this project is stored in an encrypted Microsoft OneDrive folder, and only the two-member team has access to the files.

4 Results and Discussion

Using a research company to collect the data automatically ensures that the intended 500 questionnaires are completed and eliminates the occurrence of missing data or responses. However, following the data cleaning process and performing a Mahalanobis Distance Test to eliminate multivariate outliers (Tabachnick & Fidell, 2013), 487 cases were viable for data analysis. This translates to a 97.4 percent success rate.

The first part of this section reports South African consumers', albeit the samples', wearable activity tracker preferences to provide a context for the framework. Table 1 outlines the respondents' demographic profile, device ownership, brand preference and spending behaviours.

The sample representing this study mainly was aged between 27 and 36 years (41.1%), followed by 18 to 26 years (23.8%), representing 64.9 percent of the Generation Y cohort. Further, 35.1 percent of the Generation X cohort's sample was aged between 37-46 (22.4%) and the least amount by 47 to 56-year-

olds (12.7%). This distribution is appropriate per the wearable technology adoption trends by age, where this market is dominated by the 18-36 age category, namely the Gen Y cohort (Statista, 2020), and increased adoption is projected among older generations. Among the respondents, 48.7 percent were male, and 51.1 percent were female, resulting in an almost equal gender distribution, where all provinces in South Africa were represented. Most of the sample resided in the Gauteng province (49.9%), followed by KZN (15.6%) and WC (15.2%), with the least from the NC (0.8%). The implications for this sample profile are that wearable technology brands can use Gauteng as distribution centres and test markets for new devices, targeting consumers aged 18 to 36 years and proficient in English, Zulu, Sepedi, Xhosa and Afrikaans, respectively.

Previous studies in South Africa revealed an increase in smart wearable ownership from 2017 (Muller, 2019) to 2019 (Hattingh, 2020), from 5.8 percent to 47.8 percent, confirming the growing demand for this technology. This increased demand is further reflected by the 51.5 percent of this current study's sample who owned various smart wearables by mid-2022. In line with prior research (Hattingh & Muller, 2022) and global preferences (Statista, 2022), wrist-based devices are the most preferred type of smart wearable, with 49.3 percent being fitness watches and 14.4 percent fitness bands. Approximately 12 percent of respondents owned smart clothing and jewellery. Notably, clip-on pedometers were used by 5.1 percent of the sample and head/chest/arm HR straps by 5.3 percent. The former statistic is arguably due to the outdated nature of basic step-counters, where the latter is most likely an athlete-based product instead of monitoring general health statistics.

The respondents' brand preferences are the first notable statistic vital in contextualising the brand equity framework resulting from this study. Thus, for brand preference, Samsung clearly dominates the smart wearables market in South Africa, represented by 33.3 percent of this current study's sample and 21.2 percent based on prior research (Hattingh, 2019). Huawei and Apple were preferred by a combined 40.3 percent of the sample. In contrast, dedicated fitness trackers brands like Fitbit and Garmin were only preferred by 17.7 percent, as opposed to 42.4 percent in prior research cited above.

The preference for specific features possibly explains possible reasons for the preferences towards smartwatch brands. That is, where dedicated fitness tracker brands offer more training and outdoor adventure-based capabilities, smartwatches have a delicate balance between basic functionality such as tracking steps and distance, measuring heart-rate data, and tracking sleep while allowing the user to receive smart notifications and make wireless payments. For the remainder of the statistical reporting, it is helpful to reflect on the brand preferences stated in Table 1 since respondents noted their agreement with the scaled items (Table 4) as they reflected on their preferred brand.

Table 1: Sample demographics and smart wearables background overview

Variable	Response	Frequency (*f*)	Percentage (%)
Cohort	Gen Y	316	64.9
	Gen X	171	35.1
Age	18-26	116	23.8
	27-36	200	41.1
	37-46	109	22.4
	47-56	62	12.7
Gender	Male	237	48.7
	Female	249	51.1
	Other	1	0.2
Province	E-Cape	25	5.1
	Free State	14	2.9
	Gauteng	243	49.9
	KZN	76	15.6
	Limpopo	27	5.5
	Mpumalanga	16	3.3
	N-Cape	4	0.8
	North-West	8	1.6
	W-Cape	74	15.2
Ownership	Yes	251	51.5
	No	236	48.5
Type of device*	Fitness watch	240	49.3
	Fitness band	70	14.4
	HR-straps	26	5.3
	Smart clothing	60	12.3
	Smart jewellery	61	12.5
	Clip-on device	25	5.1
Brand preference	Apple	87	17.9
	Fitbit	49	10.1
	Garmin	37	7.6
	Huawei	109	22.4
	Jabra	2	0.4
	Samsung	162	33.3
	Suunto	1	0.2
	TomTom	5	1.0
	Wahoo	1	0.2
	Xiaomi	17	3.5
	Other	9	1.9
Notes for the table: n=487 *n=251			

For this smart wearable brand equity model to have scientific rigour, several statistical analysis techniques were employed to assess the data, starting with principal components analysis to ensure the factorability of the items. Using the varimax rotation, principal components analysis was performed on the 19 items, after which four latent factors were extracted. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's sphericity test returned satisfactory values [KMO = 0.951, chi-square Bartlett test = 6341.038 (df = 171), p = 0.000]. The resulting five factors explain 70.83 percent of the total smart wearable brand equity variance. The factor loading and communality values are outlined in Table 2 and range between

0.569 to 0.784 and 0.535 to 0.830, respectively. Furthermore, the four factors were deemed valid, and subsequent tests were executed, including descriptive statistical analysis and a one-sample t-test.

Table 2 shows the results of the exploratory factor and descriptive statistical analysis combined with a one-sample t-test. All four factors measured on a six-point Likert scale recorded statistically significant ($p < 0.01$) mean values above 3.5. Smart wearables are expected to continue to diffuse throughout the South African population, given the high level of awareness (4.696 ± 0.971). However, smart wearable brands, particularly those less preferred by the sample, should increase consumers' awareness of their devices to increase the trickle-down effect of brand equity. This process starts with ensuring consumers can associate with a smart wearable brand as they integrate it into their daily lives, which seems to be the case among the study participants (4.899 ± 0.914).

Table 2: EFA, descriptive statistics and one-sample t-test results

	EFA		Descriptive statistics			
Latent factors	**Loadings**	**Communalities**	**Mean**	**Std. dev.**	**t-value**	***p***
Awareness	0.535-0.804	0.623-0.784	4.696	± 0.971	27.171	0.001
Association	0.567-0.765	0.569-0.747	4.899	± 0.914	33.778	0.001
Quality perception	0.700-0.753	0.734-0.753	4.961	± 0.869	37.108	0.001
Loyalty	0.590-0.830	0.703-0.756	4.654	± 0.999	25.500	0.001

An element that consumers, particularly in a market saturated with a variety of smart wearable device options at competitive to high price tags, consider essential is the perceived quality of the products associated with their preferred brand. Consumers tend to become loyal to brands that continuously offer quality products and are willing to pay a premium (Chen *et al*., 2021). The results in this study suggest that respondents perceive their preferred brands as manufacturing high-quality smart wearables (4.961 ± 0.869). Although interestingly, the lowest mean score was recorded for the loyalty factor (4.654 ± 0.999). While not a low mean value and still indicative of some loyalty towards their preferred brands, smart wearable brands should spend much more effort retaining customers and gaining loyal brand ambassadors. In sum, brand awareness, association, quality perception and loyalty are statistically significant factors contributing to smart wearable brands' brand equity.

Further analysis included screening for multicollinearity issues using collinearity diagnostics to ensure that excessively high correlation among the latent factors was absent since this would have negative implications for the remainder of the data analysis and reporting. (Hair *et al.*, 2019). This analysis calculated the tolerance values (TV) and the variance inflation factors (VIF) to ensure that the latent factors present were unique and independent. Tolerance values above 0.10 and average VIF below ten are required to confirm the absence of multicollinearity issues in the dataset (Pallant, 2020). After that, a matrix of Pearson's Product-Moment correlation coefficients was generated to confirm the nomological validity of the data, which requires, according to Hair *et al*. (2019), the presence of statistically significant relationships in the theoretically correct direction between the sets of latent factors to be included in the framework. The findings are presented in Table 3.

Table 3: Bivariate correlation analysis and collinearity diagnostic results

Latent factors	AW	ASS	QP	TV	VIF
Awareness (AW)				0.406	2.464
Association (ASS)	0.756*			0.314	3.188
Quality perception (QP)	0.638*	0.733*		0.396	2.525
Loyalty (BL)	0.563*	0.615*	0.643*	0.533	1.878
*Significant at $p < 0.01$					

Table 3 shows statistically significant (p <0.01) positive relationships were achieved between all the pairs of latent factors planned for inclusion in the smart wearable brand equity model, thereby confirming its nomological validity. The relationships between the four latent factors range between r= 0.563-0.756, which constitute these relationships being moderately strong (± 0.41-0.60) to strong (± 0.61-0.80) (Hair *et al*., 2019). Furthermore, the calculated tolerance values range between 0.314 and 0.533 and an average VIF of 2.514, thus confirming the absence of multicollinearity issues.

The scientific rigour of the data had been established up to this point, thereby justifying the execution of confirmatory factor analysis using drafting a measurement model. The maximum likelihood method was selected, where a four-factor model containing the 19 items was specified for testing. The first loading on each of the five latent factors was fixed at 1.0, resulting in 209 distinct sample moments and 72 distinct parameters to be estimated, leaving 137 degrees of freedom (df) based on an overestimated model and a chi-square value of 286.389, with a probability level equalling 0.000. While the chi-square statistic forms the basis for most other goodness-of-fit indices in a model (Hair *et al*., 2019), a statistically significant chi-square value would be indicative of poor model fit since this statistic is sensitive to sample size and the number of observed variables (Malhotra *et al*., 2012). As such, other model fit indices were calculated and reported to confirm model fit.

The model fit indices used to validate the model in this study included the goodness-of-fit index (GFI), incremental-fit index (IFI), Tucker-Lewis index (TLI), standardised root mean square residual (SRMR), and root mean square error of approximation (RMSEA). According to Hair *et al*. (2019), model fit is acceptable when GFI, IFI, and TLI values are above 0.90 and SRMR and RMSEA values are below 0.08. Convergent validity is established by examining the latent factor loading estimates and average variance extracted (AVE) values, which should be 0.50 or higher (Hair *et al*., 2019). Discriminant validity, on the other hand, requires that the square root of the AVE values exceeds the correlation estimates between the relevant latent factors and that the heterotrait-monotrait ratio of correlations (HTMT) values are significantly smaller than 1 (Henseler *et al*., 2016). Reliability was assessed using Cronbach's alpha (α) and composite reliability (CR), with values of 0.70 and above indicating acceptable reliability (Malhotra *et al*., 2012). The validity and reliability analyses were conducted using an AMOS plugin developed by Gaskin *et al*. (2023). A significance level of $p < 0.01$ was used throughout the study to determine statistical significance.

Table 4 outlines the latent factors and items for each of the four factors, the coinciding code in the model (Figure 1), the standardised regression weights, the error variance terms (squared multiple correlations), the Cronbach alpha, composite reliability, AVE, the square root of the AVE values and the relationships between each of the latent factors. The model shown in Figure 1 can conclusively be validated per the measurement model (CFA) findings. That is, the model fit indices met the required thresholds, where the GFI = 0.942, NFI = 0.956, IFI = 0.976, TLI = 0.970, CFI = 0.976, SRMR = 0.0324, RMSEA = 0.047 were computed. The model was also confirmed to be highly reliable, with an overall Cronbach alpha value of 0.949 and alpha and CR values ranging between 0.85-0.90, exceeding the suggested 0.70 (Malhotra *et al*., 2012). As for validity, convergent validity was concluded since all factor loadings and AVE values were above the required 0.50 threshold. This model's discriminant validity was scrutinised in terms of two suggested criteria. First, the AVE squared was required to exceed the correlation estimates between the relevant factors.

In this regard, Table 4 shows that the square root of the AVE for the awareness and association factors is less than the absolute value of its correlation with one another (√AVE:0.77/0.77<Corr:0.88); the square root of the AVE for the association factor is less than the absolute value of its correlation with quality perception (√AVE:0.77<Corr:0.83); and the square root of the AVE for the quality perception factor is less than the absolute value of its correlation with association (√AVE:0.81<Corr:0.83). Consequently, to confirm the discriminant validity of the framework, authors (Henseler *et al*., 2015; Henseler *et al*., 2016) suggest that the HTMT ratios can be computed as an alternative measure to confirm the discriminant validity. The HTMT values are outlined in Table 5.

Table 5: HTMT values of the measurement model

Factors	**AW**	**ASS**	**QP**
Awareness (AW)			
Association (ASS)	0.756		
Quality perception (QP)	0.639	0.734	
Loyalty (BL)	0.575	0.625	0.654

Accordingly, all HTMT ratios fell significantly below 1, ranging between 0.575 and 0.756; thus, discriminant validity can be concluded (Henseler *et al*., 2016). With the model fit, reliability and validity of the measurement model confirmed, Figure 1 illustrates the validated smart wearable brand equity model within the South African context.

Table 4: Estimates for the measurement model

Latent factors and items	**Code**	**SE**	**Err. var.**	**α**	**CR**	**AVE**	**√AVE**
Awareness (AW) **Cheung *et al*., 2020**				0.86	0.85	0.59	*0.77*
"Before owning a smart wearable, I can/could recognise my favourite SW Brand among other competing brands."	BrAw_1	0.789	0.622				
"Before owning a smart wearable, I am/was aware of my favourite SW Brand."	BrAw_2	0.752	0.565				
"Before owning a smart wearable, I am/was familiar with my favourite SW Brand."	BrAw_3	0.714	0.510				
"Before owning a smart wearable, my favourite SW Brand comes/came to mind when I think of wearable activity trackers."	BrAw_4	0.820	0.673				
Association (ASS) **Cheung *et al*., 2020**				0.90	0.90	0.59	*0.77*
"My favourite SW Brand is a unique brand."	BrAss_1	0.718	0.516				
"My favourite SW Brand has a very unique brand image, compared to competing brands."	BrAss_2	0.789	0.622				
"I like the brand image of my favourite SW Brand."	BrAss_3	0.785	0.616				
"Some characteristics of my favourite SW Brand come to my mind quickly."	BrAss_4	0.778	0.605				
"I can quickly recall the symbol or logo of my favourite SW Brand."	BrAss_5	0.804	0.647				
"I have no difficulty imagining my favourite SW Brand in my mind."	BrAss_6	0.732	0.535				
Quality perception (QP) **Besharat, 2010**				0.88	0.88	0.65	*0.81*
"My favourite SW Brand is likely to be extremely reliable in terms of the health metrics it measures."	QuPer_1	0.828	0.686				
"My favourite SW Brand is likely to be exclusive in terms of the health metrics it measures."	QuPer_2	0.783	0.613				
"My favourite SW Brand is likely to be technically advanced in terms of the health metrics it measures."	QuPer_3	0.801	0.642				
"My favourite SW Brand is likely to offer an extremely good support service."	QuPer_4	0.810	0.656				
Brand loyalty (BL) **Yoo *et al*., 2000 & Cheung *et al*., 2020**				0.89	0.88	0.60	0.77
"I consider myself to be loyal to my favourite SW Brand."	BLoy_1	0.888	0.788				
"My favourite SW Brand is always my first choice."	BLoy_2	0.900	0.811				
"I will not buy other brands if my favourite SW Brand is unavailable for purchase."	BLoy_3	0.578	0.334				
"I am willing to buy my favourite SW Brand even if its price is a little higher than that of its competitors."	BLoy_4	0.632	0.400				
"I intend to remain a customer of my favourite SW Brand."	BLoy_5	0.807	0.651				
Correlations: p<0.001	*AW ↔ ASS: 0.876*; *AW ↔ QP: 0.749*; AW ↔ BL: 0.713; *ASS ↔ QP: 0.828*; ASS ↔ BL: 0.732; QP ↔ BL: 0.758						

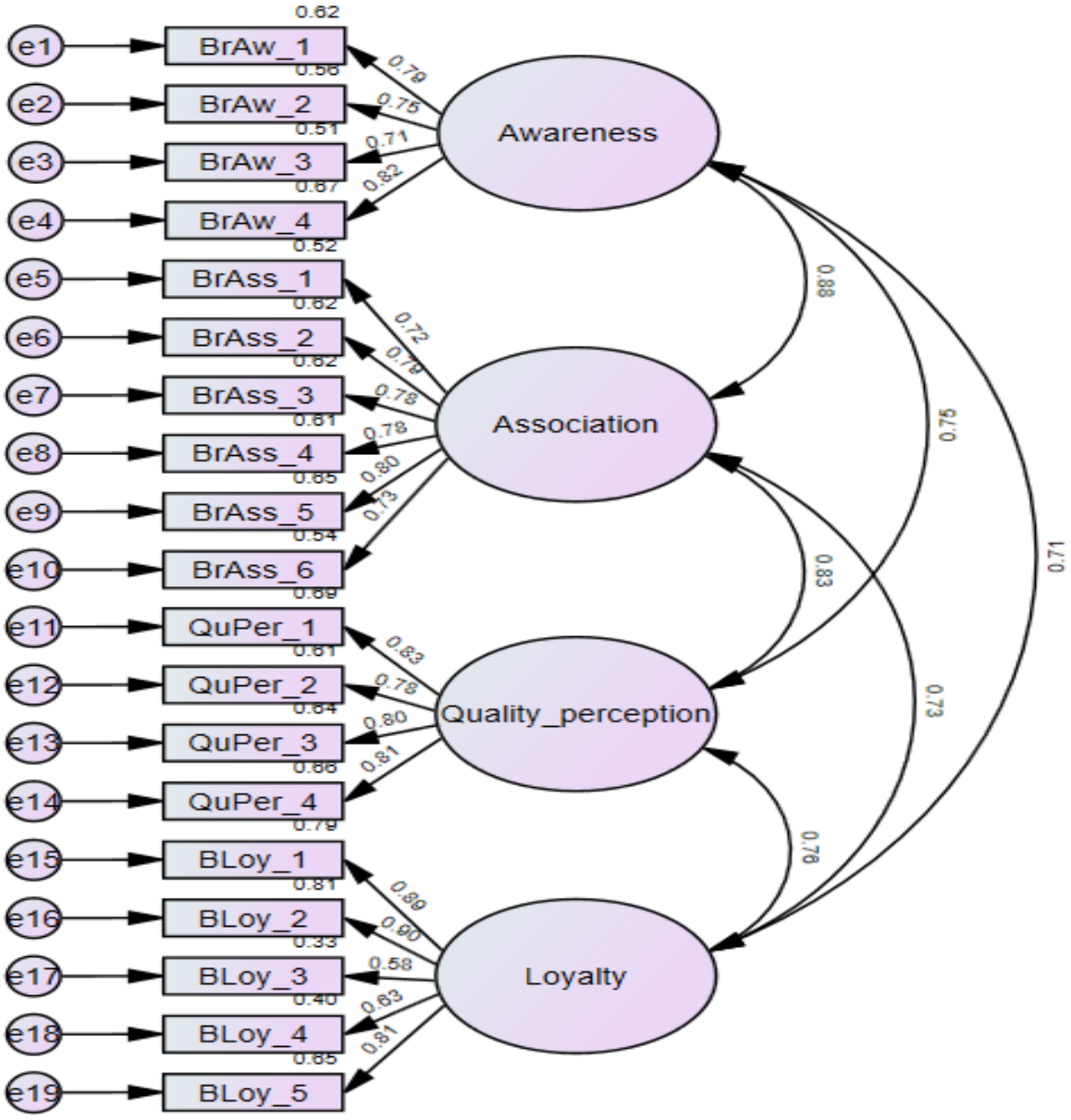

Figure 1: Validated smart wearable brand equity model
Source: Authors' construction.

5. Theoretical and managerial implications

This study was the first to validate a smart wearable brand equity model comprising the four specific consumer-based brand equity factors: awareness, association, quality perceptions and loyalty. This theoretical framework, though validated in the South African context, can nonetheless be applied to an international context, given the applicability of the four variables. Moreover, this framework provides a solid foundation for future expansion and inclusion of other important factors, such as brand trust, reputation and authenticity, that can be used to determine their contribution to consumer-based brand equity. The validated model provides brand managers with valuable information that can be used to develop effective branding strategies, communication campaigns, and customer engagement initiatives.

Additionally, the model can be utilised to conduct regular evaluations of brand health, monitor brand performance over time, and compare against competitors.

Several practical and managerial recommendations for smart wearable stakeholders such as device manufacturers, resellers, marketing professionals and brands are outlined below per the factors.

- Smart wearable brands, manufacturers, resellers and marketing professionals should increase their efforts towards improving South African consumers' awareness of WAT devices, especially after the pandemic. These stakeholders should collaborate with opinion leaders like healthcare personnel (doctors, nurses, pharmacists, athletes and community leaders) with a far wider reach and use them as a trusted promotional vehicle. If these opinion leaders urge consumers to use smart wearable devices to keep track of their health, more South Africans will likely convert. Using influencer marketing to target younger generations could have the same outcome.
- Smart wearable brands with diverse product portfolios should enhance their association with health-monitoring devices to increase consumers' association with their brand and prioritise health. To achieve this, more smart wearable brands should partner with medical aid schemes in South Africa, allowing members to obtain health devices at a lower rate. Further, these brands should adopt a socially responsive, philanthropic strategy and associate themselves with worthy causes, which will increase their brand and device awareness, such as CANSA, the Organ Donor Foundation and Diabetes South Africa.
- Smart wearable brands can build a loyal customer base if they purposefully build relationships with their community of device owners. They should also leverage consumers who have purchased other products in their portfolio since they are likely already loyal, simplifying vertical targeting. Having several community support groups across platforms, such as online forums, social media and their website blogs, will give consumers a feeling of belonging. Brand loyalty will further be driven if the smart wearable brand ensures an equilibrium and efficient B2C and B2B interaction throughout its supply chain and stakeholder network.
- Consumers already perceive smart wearable brands and devices as high quality. However, smart wearable brands and manufacturers should constantly ensure they produce devices consumers perceive as having exclusive features that they can only get from their brand, that these devices are technically advanced in terms of the metrics they can produce and that they offer excellent support services to ensure users get the most out of their experience.

Lastly, in terms of theoretical recommendations, academic researchers can use this foundational smart wearable brand equity model and build a contextual framework for their context. They can add relevant factors such as brand trust, reputation, word-of-mouth communication or brand personality to test their significance in contributing to smart wearable brand equity.

6. Conclusions, Limitations and Future Research

In conclusion, a comprehensive understanding of the drivers of brand equity is crucial for managers to allocate resources and make data-driven decisions effectively. Managers can build and enhance smart wearable brand equity by strategically focusing on the consumer-based brand equity dimensions: brand awareness, brand association, perceived quality, and brand loyalty. The empirically validated model is significant for smart wearable brands looking to enter South Africa or expand into other international markets. By recognising the importance of these drivers, managers can optimise their brand's performance and increase its competitive advantage. Therefore, managers need to prioritise the development and maintenance of brand equity in order to achieve long-term success in the marketplace.

The primary limitation of this study is its reliance on a cross-sectional design, which limits the generalisability of findings beyond the specific context of the South African consumer market. Furthermore, while the study examined consumer-based brand equity dimensions based on Aaker's (1996) framework, there remains scope for exploring additional influential aspects that could impact consumer-based brand equity of smart wearable brands. Future research should explore additional dimensions, such as brand trust, reputation, authenticity, and other socio-cultural factors that could significantly impact consumers' perceptions and loyalty towards smart wearable brands. Furthermore, a longitudinal approach can provide insights into the sequential changes in consumer perceptions and preferences towards smart wearable brands, enhancing the model's applicability and robustness.

References

Aaker, D.A. (1996). Measuring brand equity across products and markets. *California Management Review*, 38(3):102–120.

Aggarwal, S.A., Rao, V.R. & Popli, S. (2013). Measuring consumer-based brand equity for Indian business schools. *Journal of Marketing for Higher Education*, 23(2):175–203.

Anabila, P., (2020). Integrated marketing communications, brand equity, and business performance in micro-finance institutions: An emerging market perspective. *Journal of Marketing Communications*, 26(3):229–242.

Arya, V., Paul, J. & Sethi, D., (2022). Like it or not! Brand communication on social networking sites triggers consumer-based brand equity. *International Journal of Consumer Studies*, 46(4):1381–1398.

Baalbaki, S. & Guzmán, F., (2016). A consumer-perceived consumer-based brand equity scale. *Journal of Brand Management*, *23:229-251.*

Besharat, A. (2010). How co-branding versus brand extensions drive consumers' evaluations of new products: A brand equity approach. *Industrial Marketing Management*, 39:1240–1249.

Cant, M.C. & Van Heerden, C.H. (2013). *Marketing Management, a South African perspective*. Juta.

Chatzipanagiotou, K., Christodoulides, G. & Veloutsou, C. (2019). Managing the consumer-based brand equity process: A cross-cultural perspective. *International Business Review*, *28*(2):328–343.

Chen, L., Halepoto, H., Liu, C., Kumari, N., Yan, X., Du, Q. & Memon, H., 2021. Relationship analysis among apparel brand image, self-congruity, and consumers' purchase intention. *Sustainability*, *13*(22):12770.

Cheung, M.L., Leung, W.K. & Chan, H. 2020. Driving healthcare wearable technology adoption for Generation Z consumers in Hong Kong. Young Consumers, 22(1):10–27.

Cheung, M.L., Pires, G. & Rosenberger, P.J. (2020.) Exploring synergetic effects of social-media communication and distribution strategy on consumer-based Brand equity. *Asian Journal of Business Research*, 10(1):126-149.

Chi, H.K., Yeh, H.R. & Yang, Y.T., 2009. The impact of brand awareness on consumer purchase intention: The mediating effect of perceived quality and brand loyalty. *The journal of international management studies*, *4*(1):135-144.

Conradie, E.S., Roberts-Lombard, M. & Klopper, H.B. (2014). The influence of the eleven Ps: an internal marketing and brand awareness perspective in a service environment. *Southern African Business Review*, 18(1):100-121.

Dibb, S., Simkin, L., Pride, W.M. & Ferrell, O.C. (2012). *Marketing: concepts and strategies.* 6th ed. Andover: South-Western Cengage Learning

Du Toit, M. & Erdis, C. eds., (2013). *Fundamentals of branding*. Juta.

Erdem, T., & Swait, J. (2004). Consumer and brand evaluations as drivers of brand equity: A dynamic capabilities framework. *International Journal of Research in Marketing*, 21(3):299-316.

Farhat, K., (2020). Linking brand engagement to customer-based brand equity and role of brand experience, brand personality, and brand affect: A case of automobile market of Pakistan. *Management Science Letters.*

Funk, D. & Levis, A.M. (2009). *Conscious branding*. New York: Business Expert Press.

Gaskin, J., James, M., Lim, J., & Seed, J. (2023), "Master Validity Tool", AMOS Plugin. Gaskination's StatWiki.

Gill, M.S. & Dawra, J. (2010). Evaluating Aaker's sources of brand equity and the mediating role of brand image. *Journal of Targeting, Measurement and Analysis for Marketing*, *18*(3):189-198.

Hair, J.F. Jr., Black, W.C., Babin, B.J., & Anderson, R.E. (2019). *Multivariate Data Analysis*. 8th Cengage Learning.

Hattingh, A. (2020). Antecedents of wrist-based fitness tracker usage amongst members of the South African Generation Y cohort. Masters dissertation. Vanderbijlpark: North-West University. Retrieved 31 January 2022, from https://north.on.worldcat.org/search?databaseList=&queryString=no:1241728447

Hattingh, A., & Muller, C. (2022). North-West University South Africa and the Open University of Mauritius: Refereed proceedings of the Social Sciences International Research Conference (SSIRC) conference. https://commerce.nwu.ac.za/sites/commerce.nwu.ac.za/files/files/SSIRC/SSIRC-2022-Proceedings-Amended.pdf

Henseler, J., C. M. Ringle, & M. Sarstedt (2015). A New Criterion for Assessing Discriminant Validity in Variance-based Structural Equation Modeling, *Journal of the Academy of Marketing Science*, 43(1):115-135.

Henseler, J., Hubone, G., & Ray, P.A. (2016). Using PLS path modelling in new technology research: updated guidelines. *Industrial Management & Data Systems*, 116(1): 2-20.

Hyun, H., Park, J., Hawkins, M.A. & Kim, D. (2022.) How luxury brands build customer-based brand equity through physical experience. *Journal of Strategic Marketing*: 1–25.

Jooste, C.J., Strydom, J.W., Berndt, A. & Du Plessis, P.J. (2012). *Applied strategic marketing*. 4th ed. Cape Town: Pearson.

Kapferer, J.N. (2012). *The new strategic brand management: Advanced insights and strategic thinking*. Kogan Page Publishers.

Keller, K. L. (2013). Strategic brand management: building, measuring, and managing brand equity. Pearson Education.

Kim, J.H. & Hyun, Y.J., 2011. A model to investigate the influence of marketing-mix efforts and corporate image on brand equity in the IT software sector. *Industrial marketing management*, *40*(3):424-438.

Kotler, P. & Keller, K. (2012). *Marketing Management*. 14th Edition. Upper Saddle River: Pearson Education.

Lamb, C.W., Hair, J.F. & McDaniel, C. (2011). *Essentials of marketing*. Cengage Learning.

Macdonald, E. & Sharp, B. (2003). Management perceptions of the importance of brand awareness as an indication of advertising effectiveness, *Marketing Bulletin*, 14(2).

Malhotra, N.K., Birks, D.F., & Wills, P. (2012). *Marketing Research: An Applied Approach* (4th ed.). Essex: Pearson Education.

Markert, J. (2004). Demographics of age: Generational and cohort confusion. *Journal of Current Issues & Research in Advertising*, 26(2):11–25.

Muller, C. (2019). Generation Y students' attitude towards and intention to use activity-tracking devices. Doctoral thesis. Vanderbijlpark: North-West University. Retrieved March 14, 2022, from https://repository.nwu.ac.za/handle/10394/32242

Pallant, J. (2020). *SPSS survival manual: A step-by-step guide to data analysis using IBM SPSS*. 7th ed. London, UK: McGraw-Hill Education.

Phipps, M., Brace-Govan, J. & Jevons, C. (2010). The duality of political brand equity. *European Journal of Marketing*, *44*(3/4):496-514.

Saleem, S., Rahman, S.U. & Umar, R.M. (2015). Measuring customer-based beverage brand equity: Investigating the relationship between perceived quality, brand awareness, brand image, and brand loyalty. *International Journal of Marketing Studies*,*7*(1):66-77.

Sankar, D. & Sankarnath, P.R. 2021. Effect of brand equity on consumer purchase intention with special reference to two-wheeler industry. *International Journal of Mechanical Engineering*, 6(3):3104-3112.

Schiffman, L.G. & Kanuk, L.L., 2014. *Consumer Behaviour*, Global Edition: Global Edition.

Singh, B., (2022). Measuring consumer-based brand equity of prestigious mass brands using masstige mean score scale. *International Journal of Consumer Studies*. https://doi.org/10.1111/ijcs.12839

Statista (2020). Wearables: South Africa. Retrieved, June 8, 2020 from https://www.statista.com/outlook/319/112/wearables/south-africa

Statista. (2022). Global wearable device market share from 3rd quarter to 3rd quarter 2021, by product category. Retrieved, 10 October 2022, from https://www.statista.com/statistics/690731/wearables-worldwide-shipments-by-product-category/

Šugrová, M., Šedík, P., Kubelaková, A. & Svetlíková, V. (2017). Impact of the product quality on consumer satisfaction and corporate brand. *Економічний часопис-XXI*, *165*(5-6):133-137.

Tabachnick, B. G., and Fidell, L. S. (2013). Using multivariate statistics. 6th ed. Boston, Pearson.

Veloutsou, C., Christodoulides, G. & De Chernatony, L. (2013). A taxonomy of measures for consumer-based brand equity: drawing on the views of managers in Europe. *Journal of Product and Brand Management*, 22(3):238–248.

Wood, L. (2000). Brands and brand equity: definition and management. *Management decision*, *38*(9):662-669.

Yoo, B., Donthu, N., & Lee, S. (2000). An examination of selected marketing mix elements and brand equity. *Journal of the Academy of Marketing Science*, 28(2), 195–211.