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Advancing e-business in Sports and Wellness: the role of synchronicity, coach reputation and home phygital environment on retention in Online Home Fitness

Abstract:

Purpose

Associating sports, wellness and digital technology, online home fitness e-business models (OHF) focus primarily on the recruitment of users and, subsequently, on the retention and expansion of their frequency of use. To date, few studies have explored the antecedents associated to retaining and expanding the frequency of use. The current study aims to explore this gap. Drawing on the stimulus-organism-response (S-O-R) theoretical framework and on the theory of the extended marketing mix for services, the research investigates as *stimuli* the role of type of class (synchronous or asynchronous) (process), coach reputation (people), and home phygital environment (phygital evidences) on patronage and frequency of use (*response)*, mediated by perceived value (*organism*).

Design/methodology/approach

A survey comprising 286 valid responses examined the direct and indirect effects of the proposed stimuli on perceived value (hedonic, social, and utilitarian) and their subsequent influence on patronage and frequency of use. SmartPLS Version 4.0 was used for the estimation of the structural equation modelling.

Findings

The findings indicate the duality of synchronicity in generating utility, with synchronous classes directly enhancing hedonic and social value, while also indirectly affecting patronage. Furthermore, phygital home environments significantly contribute to

utilitarian value, and coach reputation is critical in fostering social value. Both are relevant to customer retention. While inspecting the mediating effects, the findings of the study demonstrate that the value of OHF extends beyond being a *convenient and effective* alternative to traditional training classes. To cope with continuous use, users of OHF must perceive fun, excitement (hedonic), sense of belonging to the group and friendly (social) interactivity.

Originality

The present study makes a significant contribution to theory on an e-business model in sports and wellness by means of mapping the triggers that account for its growth and sustainability. Focusing on exploring retention and expansion of their frequency of use by means of proposing and validating as stimuli: type of class (synchronous and asynchronous), home phygital environment, and coach reputation.

Keywords: S-O-R; e-business model; sports and wellness IT; synchronicity; coach reputation; home phygital environment; customer retention; patronage; frequency of use

Introduction:

The global wellness market reached $1.5 trillion in 2022, with projected growth of 5–10% in the coming years (Callaghan et al.,2021). This study focuses on fitness, the third largest category of consumer spending within wellness (Callaghan et al.,2021). Specifically, the focus is on online home fitness (OHF). Growing at 33% annually, OHF has become a dynamic category (Sinha,2024), featuring a diverse ecosystem: gym apps (e.g.Nike Training Club), web-based platforms (e.g.,YouTube live/pre-recorded videos), and smart equipment (e.g.Peloton,Tonal). These operate through varied revenue models (e.g., subscriptions, freemium, advertising) and offer both synchronous and asynchronous classes (Chiu et al.,2024).

Associating sports, wellness and digital technology (Sport and Wellness IT), these novel e-business models rely on recruiting audiences, who access the exercises remotely from home (Funk,2017). Once recruited, business success lies in retaining the acquired customers and expanding their frequency of use. Retention and expansion of use is of fundamental importance for e-business models, which rely on customer lifetime value to accommodate their high customer acquisition costs. This contradicts the idea that technology initial adoption and rapid growth are the most critical aspects in e-business models (Gupta and Legmann,2003) and sets the stage for the research problem.

Previous studies in online fitness do not distinguish the triggers of customer acquisition from those of customer retention and expansion of use, with value perception (eg. ease of use, enjoyment, usefulness, social interactions) (Kim,2022; Zhu,2023; Chiu and Cho,2021; Huang and Ren,2020; Beldad and Hegner,2018; Cho,2016; Nguyen-Viet,2022; Stragier et al.,2016; Hahm et al.,2022), satisfaction (Huang and Ren, 2020; Cho, 2016) and health consciousness (Debarun,2022; Damberg,2022) being predominantly explored (as in Table 1)

However, a key distinction between the mechanisms of customer acquisition and retention lies in the evolving perspective of users' evaluations, once product usage occurs. While acquisition may be driven by promotional efforts and expected outcomes, retention depends more critically on users' cumulative experience with the service characteristics and its impact on the reassessment of value and satisfaction. While using a fitness platform, users interact with the service specific characteristics and as result are expected to reassess their value perception and satisfaction (Pan et al.,2012; Ahmad and Buttle,2001). The current study focuses on exploring as research question, how the service characteristics experienced by users along their regular use of the platform, influence their perceptions of value and satisfaction. This approach is particularly relevant because the service characteristics are precisely the decisions that managers can actively shape and optimize to achieve the desired outcomes.

While exploring previous studies in OHF (Table 1) it is evident the limited and dispersed knowledge on the influence of service characteristics. Some of existing examples are: *i)* visual content of apps (Chiu and Cho,2021; Kim,2022); *ii)* physical attractiveness of the coach (Kim,2022); *iii)* dynamics of interaction (e.g. gamification, coopetition) (Chiu and Cho, 2021; Zhang, J., et. al.,2023); i*v)* specific functionalities (e.g. instructions provision, self-performance monitoring) (Huang and Ren,2020) and *v)* information quality provided (Chen et al.,2020)

In view of this gap, the current study focuses on exploring as research question, how the service characteristics experienced by users of OHF influence their perceptions of value and satisfaction, and explain their retention.While investigating this research question and further characterizing the research gap, the current study builds on the S-O-R Theory (Mehrabian and Russell,1974), positioning OHF as a *service encounter*, thus

the service characteristics are positioned as *stimuli (S)* (Kunkel et. al., 2017), which lead to changes in *organisms'(O)* cognitive and emotional states, and *responses (R)*.

INSERT TABLE 1 HERE

To investigate the *stimuli*, three pillars of the extended marketing mix for services are considered, namely: *service processes, service environment and service personnel* (Lovelock and Wirtz,2022). In view of these, the following stimuli are proposed as antecedents of OHF retention*: i)* home phygital environments, capturing the physical (e.g. the space, decor) and digital evidences of the service environment (e.g. the video and sound) (Banik,2021; Palmero and Price,2019); *ii)* coach reputation capturing the human actors involved in delivering the service; and, *iii*) type of class (synchronous or asynchronous) which defines the processes according to which the training lessons are delivered.

Previous studies in sport research associated customer retention to perceived value (Kunkel et. al.,2017). Thus, when consumers perceive utilitarian, hedonic or social value they tend to feel satisfied and thus commit and stay with the company (Kunkel et. al.,2017; Prebensen and Rosengren,2016). In the current study it is proposed that the type of class synchronicity, coach reputation and home phygital environments (*stimuli*) influence users´ frequency of use and patronage (*response*) by means of their effects on perceived value (*organism*).

Findings contribute to the theory and management of an e-business model in sports and wellness by means of mapping the triggers for its growth and sustainability. Antecedents that characterize online home fitness are considered for their effects on how the service encounter is perceived. Implications for practice and theory are discussed.

Literature review

S-O-R Theory

The S-O-R Theory (Mehrabian and Russell,1974), has been vastly adopted while exploring novel business models and digital resources adoption (Nguyen Huu et. al.,2023; Shah Alam et. al.,2024; Zhu et. al.,2023).Thus, it allows to assess how external features of a technology (*stimuli*) influence internal perceptions (*organism*) and subsequent behaviour (*responses*) (Shah Alam et. al.,2024).

The service characteristics of online home fitness proposed as *stimuli* are based on three pillars of the extended marketing mix for services (Lovelock and Wirtz,2022) and are accessed as follows:

Service Process - Type of class (synchronous or asynchronous):

In services, the process refers to how production and consumption occurs (Westerbeek & Shilbury, 1999), specifically the procedures and flow through which the service is delivered (Lovelock & Wirtz, 2022). In OHF, this is shaped by class structure and timing. Thus, synchronous (live) or asynchronous (pre-recorded) class formats become a key indicator of the service process, influencing how users experience and engage with the activity. Synchronous classes offer real-time interaction and feedback (Culbreth & Martin, 2025), while asynchronous ones allow for flexibility and self-paced learning (Zeng & Luo, 2024).

From a service design perspective, choosing between synchronous or asynchronous formats determines the timing, interactivity, and user control over the service experience, which are core attributes of service process design (Bitner et al., 2008). In view of the

direct role of type of class in shaping the structure of service delivery (Chiu, et al., 2024; Amiti, 2020), it is proposed as *stimuli* within the S-O-R framework.

Service environments - Home phygital environments:

Service environment refers to characteristics of the context where a service is performed (e.g. décor) (Lovelock and Wirtz,2022). In service environments, atmospherics refer to the design of the physical environment in which a service is delivered (Lovelock and Wirtz, 2022). This concept encompasses elements such as spatial layout, ambient conditions (e.g., lighting, sound, temperature), and visual cues, all of which influence how customers interpret their service experience.

In online home fitness, the service environment shifts from firm-controlled spaces (e.g., gyms) to users' homes. While providers can't directly control the home setting, digital design elements (e.g., audio-visual quality, platform aesthetics, ambient cues) interact with users' physical space, creating a phygital experience. This broadens the concept of atmospherics, acknowledging how users incorporate digital elements into their environment (e.g., mats, lights, sound) to boost motivation and comfort (Banik, 2021).

Home phygital environments are expected to influence users' value perception through immersion, sense of presence, realism, and quality of service (Nguyen Huu et. al., 2023; Lovelock and Wirtz,2022). Previous research emphasized the importance of considering ambient factors in the design atmospherics of e-services (Kim,2021), with the home of the user being considered as integral component of service experience (Kang et al,2019). These insights support that home phygital environment is proposed as *stimuli* within the S-O-R framework.

Service Personnel/people - Coach reputation:

Service personnel refer to all human actors who play a part in the service delivery (Lovelock and Wirtz,2022). The reputation of the coach is an antecedent for perceived coach competency (Edwards and Washington, 2013), with effects on satisfaction and retention (Outlaw and Toriello, 2014; Wekesser et. al., 2021). In the context of OHF, as the coach is the primary point of contact between the service provider and the user, it is expected to significantly affect customer satisfaction and retention (Sharma and Singh, 2022).

Therefore, within the S-O-R framework, coach reputation is considered for its influence on users' cognitive and emotional responses, such as perceived value, and ultimately, retention.

Organism and responses – Value perception, satisfaction, patronage and frequency of use:

Based on the S-O-R framework, value perception (hedonic, utilitarian, and social) represents the internal state (*organism*), while satisfaction, patronage, and frequency of use are *responses*. Prior studies show that consumption is shaped by perceived value, with these three value types influencing behavior across various contexts, including sports and wellness (Gallarza et al., 2011; Seippel, 2006; Skille & Østerås, 2011). In this study, as users interact with OHF service characteristics (*stimuli*), they reassess perceived value (*organism*), which in turn impacts satisfaction, patronage, and use (*responses*) (Pan et al., 2012; Ahmad & Buttle, 2001).

Utilitarian value denotes consumption as result of the functions performed by the product (Lee and Kim,2018), being rational and involving quality, usefulness, and

convenience (Schivinski et. al.,2020). In the context of online home fitness, utilitarian value comes along with being fit (well trained) and healthy (Söderström, 2023; Wang, et. al., 2023) with the practicality and effectiveness of exercising from the convenience of home, as in *my place, my time* (Seippel, 2006).

Hedonic value denotes the experiential aspects associated with the consumption process, it is subjective and is captured by motives associated to feelings of joy, and happiness. In the context of OHF, it is expected that the feeling of fun, playfulness, enjoyment, excitement and relaxation due to the music, and the movements, contribute to its perceived value (Söderström,2023; Habachi et. al., 2024; Stragier et. al.,2016; Zhu, Wang, et. al.,2023).

Sports in general are accepted for their social value, as a way to connect and socialize (Jular and Tari Kasnakoglu,2017; Söderström,2023; Seippel,2006). In the context of OHF it is expected that as the training sessions mimic the physical social context (e.g. exercise dynamics, music and group language expressions) users are able to perceive the social presence of coaches and other participants (Kim,2022; Nguyen et. al.,2023; Zhang, J., et. al.,2023; Wang, et. al.,2023; Dessart and Duclou,2019), with impact on perceived social value.

Hypothesis Development

Class type is expected to impact utilitarian value, though further research is needed for comparing the effects, as both synchronous and asynchronous formats offer utility. Synchronous classes provide real-time interaction and feedback (Bründl et al., 2022), enhancing perceptions of helpfulness and accountability (Guo & Fussell, 2022;

Ratan et al., 2022; Chiu et al., 2024). In contrast, asynchronous classes offer flexibility through on-demand access, supporting convenience and comfort (Amiti, 2020).

Hedonic value may also be shaped by class type, though it is not clear how synchronous and asynchronous may relate. Synchronous formats can create spontaneous, social, and novel experiences (Chiu, et al., 2024; Ratan et al., 2022), yet may also cause frustration due to Wi-Fi issues, poor sound or lighting, or unstructured content. Additionally, scheduling constraints and social anxiety from group exposure (Quinco-Cadosales, 2021) may reduce enjoyment.

Finally, the type of class is also expected to impact social perceived value. In synchronous classes users can interact with others and the coach (Chiu et al, 2024). Thus, dynamics of group classes with real-time interaction with the coach and others not only determine how members relate to and engage with one another, but also generates a greater sense of group belonging and friendliness (Harris et. al., 2005; Mabrito, 2006; Chiu et al., 2024). Therefore, the following hypotheses are proposed.

H1: The type of class (synchronous and asynchronous) influences perceived value of online home fitness (OHF) with impact on:

H1a: utilitarian value.

H1b: hedonic value.

H1c: social value.

In OHF, users´ homes deliver on physical (e.g. light, decoration, space) and digital cues (e.g. quality and size of the image, sound). It is expected that as environments of home-fitness are pleasant, bright, and relaxed, users´ may sense a deeper immersion in the fitness lessons, which influences their sense of presence and quality perception. Presence has been defined as users´ perception of non-mediation, the illusion of being

there (Lee, 2004;Lim et. al.,2015) and is expected to impact on the way users capture hedonic, social and utilitarian value (Westerbeek and Shilbury,1999). Thus, home phygital environment is expected to impact the sense of enjoyment and thrill, belonginess to a group (Chiu, et. al.,2024) and effectiveness of training lessons.

The following hypotheses capture these effects:

H2: Home phygital environments have a positive effect on perceived value of online home fitness (OHF) with effects on:

H2a: utilitarian value.

H2b: hedonic value.

H2c: social value.

Coach reputation extends beyond first impressions, influencing trust and users' willingness to continue the activity over time (Manley et al., 2010). In this study, it is defined as an aggregated perception formed through users' ongoing experiences with the coach. This aligns with Veloutsou and Moutinho (2009), who describe reputation as a perception-based judgment of a service agent's credibility, trustworthiness, and honesty. In OHF, where coaches are key contact points, users rely on visible cues and repeated interactions to assess character and reliability. Coach reputation reflects more than competence, it captures the overall impression from user-coach dynamics and is central to how users perceive value.

The following hypotheses capture these effects:

H3: Coach reputation has a positive effect on perceived value of online home fitness (OHF) with effects on:

H3a: utilitarian value

H3b: hedonic value

H3c: social value

In the context of OHF, as utilitarian value motivates exercising (with OHF being perceived as convenient, practical and effective), it is also expected that it influences hedonic perceived value (Sweeney and Soutar,2001; Chiu et. al.,2024). From this perspective, as the utility of OHF influences its practice, it is expected to also impact on the perceived joy and fun associated to exercising, as in the hypothesis below:

H4: Utilitarian perceived value has a positive effect on hedonic value of online home fitness (OHF).

The effects of perceived value on satisfaction are well documented in e-services and e-sports (Kunkel et. al.,2017). Satisfaction is a cognitive-affective appraisal which serves as an attitudinal response, resulting from the value that is captured by consumers in the service encounters (Babin, et. al.,2005). In the context of OHF, it is expected that the more users acknowledge value in their experience of exercising from home, the more satisfaction will be perceived (Babin et. al.,2005; Lee and Kim,2018; Chiu, et. al.,2024).

Since usage and patronage stem from satisfaction (Boksberger and Melsen, 2011), this study proposes that satisfaction mediates the effect of perceived value on frequency and patronage. When users perceive functional, hedonic, and social value, they are more likely to continue and increase OHF use due to resulting satisfaction (Clemes et al., 2011).

The following hypotheses capture the proposed effects.

H5: Satisfaction with online home fitness mediates the effects of utilitarian value of OHF on frequency of use (H5a) and patronage (H5b).

H6: Satisfaction with home fitness mediates the effects of hedonic value of OHF on frequency of use (H6a) and patronage (H6b).

H7: Satisfaction with home fitness mediates the effects of social value of OHF on frequency of use (H7a) and patronage (H7b).

The conceptual model below (Figure 1) captures the effects proposed.

INSERT FIGURE 1 HERE

Methodology

Data were collected from respondents practicing online home fitness via video streaming platforms (e.g., YouTube, Zoom). A self-administered Qualtrics survey was used, with items adapted from established scales (see Table 2). Constructs were measured using 7-point Likert-type scales. Frequency of use was captured with a single question, and class type was coded as binary (1 = synchronous; 0 = asynchronous). Types of subscription (Free and Paid) and gender were considered for control.

Data were collected in Germany, chosen for its size and maturity in the European fitness market. Germany leads in fitness club memberships with 11.71 million members (FitQS, 2024) and is a top market for digital fitness, generating €1.0 billion in 2022, with projected growth to €8.5 billion by 2030 (CAGR 29.5%) (Grand View Research, 2023).

This reflects strong health and tech-driven wellness trends, making Germany a relevant context for studying online home fitness (OHF).

A native German has translated the original items from English to German and three academics native in German have back translated to English, so items could be checked for their face validity. Data collection complied with norms issued by respective ethics committee.

INSERT TABLE 2 HERE

Data was collected using a non-probabilistic method through an online survey shared via email and messaging apps. Participants were encouraged to forward the link to others practicing online home fitness (OHF). Screening questions ensured only OHF users were included. To reduce self-selection bias, the invitation stressed participation importance without offering incentives. While not random, this approach is suitable for early-stage or theory-building research focused on construct relationships (Sarstedt et al., 2017).

SmartPLS Version 4.0 was used for the estimation of the measurement and structural parameters of the research model. SmartPLS, is a variance-based PLS-SEM technique which is particularly suited for exploratory research like ours (Hair et al., 2021), and handles complex models more efficiently, especially when the model includes formative constructs (Hair et al., 2021). Concerning the sample, the study aimed for a sample size above 200 as it meets established thresholds for PLS-SEM models with moderate complexity (Hair et al.,2022).

The measurement model was assessed to examine the underlying theory, followed by structural modelling to assess the relationship among latent variables (Hair et. al.,2019).

Results

In total 286 responses were obtained. The demographic and online sports profiles of the respondents are shown in table 3. The sample is mostly composed by women (2/3) in the age group between 25-34. In terms of occupation, 65% of respondents were either employed or unemployed. Most respondents follow online classes 2-3 times a week (51%), use free OHF platforms, with no payment associated (70%) and enjoy acceptable Wi-fi connection (92%).

INSERT TABLE 3 HERE

Measurement model

Initially, the measurement model was accessed for its discriminant, convergent validity and internal consistency (Hair, 2017). Results confirm discriminant validity as Fornell-Larcker criterion confirms that the square root of every individual construct is higher than the correlation of this construct with any other (Table 4). The Heterotrait-Montrait ratio (HTMT) was also inspected with all items below the threshold of 0.85 (Henseler et. al.,2015) (Table 5).

INSERT TABLE 4 AND 5 HERE

Convergent validity was inspected by means of the outer loadings and average variance extracted (AVE). Results from both tests confirm convergent validity: *i)* most of the outer loading are greater than 0.80, the two indicators that fall below the threshold (0.70) were still considered sufficient (0.68 and 0.64); *ii)* average variance extracted (AVE) was well above the threshold (0.50) with all constructs between 0.63 and 0.80 (Table 6) (Hair, 2017)

Finally, internal consistency was inspected by means of alpha Cronbach's and composite reliability. Results from both tests confirm internal consistency with results above the threshold (0.70) (Garson, 2016; Hair, 2017): *i)* alpha Cronbach was between 0.70 and 0.90; *ii)* composite reliability was between 0.83 and 0.93 (Table 6) (Hair, 2017).

INSERT TABLE 6 HERE

Structural Model

The structural model has a SRMR of 0.067 for the saturated model and 0.097 for the estimated model, in line with expected (<0.10), with NFI of 0.828 and 0.817 for the saturated and estimated models respectively, in line with decision criteria (0.8 < NFI<1.0) (Hair et. al., 2017). Thus, the estimates are accepted for a good model fit.

Multicollinearity was inspected by means of VIF values, which were in a range between 1.00 and 3.18, below the threshold of 5 (Hair, 2017) (Table 6). Sequentially, coefficients of determination (R-squared) were accessed. Values range from 0 to 1 with a higher value reflecting a higher level of predictive accuracy (Sarstedt et. al., 2017). Generally, one can say that a R-squared of 0.19 is considered weak, 0.33 moderate and 0.67 substantial (Garson, 2016). According to this criterion, results were mostly moderate (R^2_satisfaction=0.46; R^2_patronage =0.40; R^2_social=0.46; R^2_utilitatian=0.42), except for hedonic value which was substantial (R^2_hedonic=0.64) and frequency of use which was at a weak level (R^2_frequecy=0.16).

Hypotheses testing

Direct, indirect and total paths are analysed and bootstrapping is used for estimating path significance. As in Table 7, H1*a* which proposed that type of class influences utilitarian value was rejected (path-coefficient=0.062; p-value>0.05; CI=-0.131-0.247). Therefore, both synchronous and asynchronous classes have similar effects on perceive utilitarian value.

INSERT TABLE 7 HERE

In H1b the authors propose that the type of class influences the way users of OHF perceive hedonic value. Results confirm that synchronous classes tend to generate more hedonic value (path coefficient=0.296; p-value<0.01; CI=0.526-0.710) with users associating its practice to fun and enjoyable moments. In H1c it is proposed that type of class influences social perceived value. Results confirm the effects (path coefficient=0.954; p-value<0.01; CI=0.772-1.132). Thus, synchronous classes can evoke more sense of group belonging and friendliness when compared to asynchronous classes. Interestingly, when F-squares are compared, the effects of class on social perceived value are considered large (f-square: 0.304) differing from the effects on hedonic perceived value (f-square: 0.044) (Khalilzadeh and Tasci, 2017) (Table 7).

In H2a it is proposed that home phygital environments have significant influence on how users perceive the utility of online home fitness. Results support the hypothesis, so the more users perceive that practicing fitness in their homes is relaxing and pleasant, the more utilitarian value is perceived (path coefficient=0.487; p-value<0.00; CI=0.371-0.588). In H2b, it is proposed that home phygital environments impact how users perceive hedonic value. Results confirm the effects of home phygital environments on hedonic value (path coefficient=0.147; p-value<0.00; CI=0.048-0.244). Thus, the more

home phygital environments are perceived as relaxing and pleasant, users associate higher hedonic value to OHF. In H2c, the effects of phygital environments on social value are inspected. Results support the hypothesis (path coefficient=0.110; p-value<0.05; CI=0.026-0.198), so the more the home phygital environments are perceived as relaxing and pleasant, the more users perceive the sense of belonging and friendliness associated to social value. Moreover, when H2a, H2b and H2c are inspected for the size of their effects, it is concluded that H2a has large effects on utilitarian value (f-square: 0.329), meanwhile H2b and H2c have small effects (f-square_H2a: 0.036; f-square_H2b: 0.018) (Khalilzadeh and Tasci, 2017).

In H3a, it is proposed that the coach reputation influences the way users perceive utilitarian value (Edwards and Washington, 2013; Manley et. al., 2010). Results confirm the effects (path coefficient=0.259; p-value<0.00; CI=0.154-0.365). In H3b, the effects of coach reputation on hedonic value are inspected. Results support the hypothesis (path coefficient=0.096; p-value<0.05; CI=0.006-0.184). In H3c, it is expected that coach reputation affects social value. Results support the effects proposed (path coefficient=0.396; p-value<0.00; CI=0.296-0.490). Therefore, the more coaches are perceived as reputable, trustworthy and honest, the more users will capture utilitarian, hedonic and social value. In this group of hypotheses, a larger effect size of coach reputation on social perceived value is noticeable when H3a, H3b and H3c are compared (Khalilzadeh and Tasci, 2017) (f-square_H3a: 0.088; f-square_H3b: 0.036; F-square_H3c: 0.222) (Table 7).

In H4, the effects of utilitarian value on hedonic are inspected (Sweeney and Soutar, 2001). Results support the hypothesis (path coefficient=0.624; p-value<0.00; CI=0.526-0.710), so the more users perceive OHF for being effective, helpful, necessary or practical, the more they enjoy it, find it fun and exciting. When f-square is inspected,

a large effect size is captured (f-square_H4: 0.633) (Khalilzadeh and Tasci, 2017) (Table 6).

Table 7 presents the results for H5, H6 and H7, where satisfaction is proposed for its mediating effects on frequency of use and patronage (Bagozzi, 1982; Brady et. al., 2006; Clemes et. al., 2011). Results validate the mediating effects of satisfaction on frequency of use (H5a) (specific indirect effect: 0.074; p-value<0.05; CI=0.003-0.097) and patronage (H5b) (specific indirect effect: 0.119; p-value<0.05; CI=0.010-0.176).

Results also validate the effects mediating effects of satisfaction on frequency of use (H6a) (specific indirect effect: 0.142; p-value<0.00; CI=0.031-0.163) and patronage (H6b) (specific indirect effect: 0.227; p-value<0.00; CI=0.103-0.265).

In the last group of hypotheses (H7a and H7b) it is proposed that the effects of social perceived value on frequency of use (H7a) and patronage (H7b) are mediated by satisfaction. The two hypotheses are accepted due to significant effects on frequency of use (specific indirect effect:0.105; p-value<0.00; CI=0.022-0.123) and patronage (specific indirect effect:0.168; p-value<0.00; CI=0.075-0.203). While evaluating the effect sizes of individual indirect hypotheses, it is noticeable the mediating effect of satisfaction on the relation between hedonic value and patronage, which is considered moderate (Ogbeibu and Lowry,2023), and thus, larger than all the other indirect effects.

Finally, the remaining specific indirect effects were examined. Although not hypothesized, they help clarify how stimuli influence satisfaction. Results position class type (synchronous) as the strongest indirect predictor of satisfaction: type of class → social → satisfaction (effect = 0.252; p < .001; CI = 0.156–0.354).

To assess the model's out-of-sample predictive power, the PLSpredict procedure was implemented (Shmueli et al.,2016). All endogenous constructs demonstrated

positive $Q^2>0$. Thus, the model exhibits predictive relevance (Hair et al.,2022). More specifically, the constructs *hedonic* ($Q^2= 0.396$), *satisfaction* ($Q^2= 0.387$), *social* ($Q^2= 0.393$), and *utilitarian* ($Q = 0.405$) surpassed the commonly used threshold of 0.35, suggesting strong predictive relevance. The construct *patronage* showed moderate predictive capability ($Q^2= 0.133$), while *frequency* displayed a small but positive Q^2 value ($Q^2= 0.039$), indicating limited predictive relevance. Overall, the results support the model's ability to accurately predict most key outcome variables, particularly those related to consumers' experiential and functional evaluations.

Additionally, comparison of the model's prediction errors (RMSE and MAE) with those of a linear benchmark model revealed that the PLS-SEM model produced lower or comparable error values across most indicators, reinforcing its practical predictive utility.

Results obtained were controlled for the effects of gender and type of subscription (free classes or paid). Both binary variables were included as moderators by creating interaction terms with key predictor variables. The model was re-estimated with 5,000 bootstrap resamples to test the statistical significance of the interaction effects. The results revealed that the interaction effects involving gender were not statistically significant, suggesting that gender does not significantly moderate the structural relationships in the model. In contrast, two interaction terms involving subscription type indicated significant moderation effects. In the first, the effects of coach reputation on hedonic path was stronger for free users compared to paid users ($\beta = 0.174$, $p = 0.04$, 95% CI = 0.005, 0.342). In the second, the effects of type of class on social path was stronger for free users compared to paid users ($\beta = 0.53$, $p = 0.007$, 95% CI = 0.139, 0.925).

Discussion

This study contributes to e-business theory and practice in sports and wellness by mapping triggers of growth and sustainability. It applies the S-O-R framework using three stimuli: class synchronicity, coach reputation, and home phygital environments.

Results validate the effects of all three *stimuli* on perceived value, except for the type of class on utilitarian value. Thus, synchronous and asynchronous classes do not differ for their effects on how users perceive the utility of OHF. While specific indirect effect sizes are inspected, the three components assume notable role in contributing to the outcomes, being most noticeable the impact of type of class (synchronous classes), by means of its effects on social perceived value, and further on patronage.

Theoretical Implications

While prior research links perceived value to user retention in online fitness (e.g., Kim,2022; Zhu, 2023; Chiu and Cho,2021), few studies examine how specific service characteristics from the extended marketing mix shape and reassess that value over time. This study explores how repeated user interactions with class synchronicity (process), coach reputation (personnel), and home phygital environments (physical/digital setting) influence perceived value and retention. By modeling these elements together, it offers a comparative view of their relative impact. This extends the S-O-R framework with a service mix lens, focusing on retention and highlighting how service design affects value perceptions during use.

A key finding is the role of class type: synchronicity boosts hedonic and especially social value and patronage but has no significant effect on utilitarian value. The utility of live sessions may be offset by reduced ease and convenience. While synchronous classes

offer real-time interaction, asynchronous formats provide greater flexibility, allowing users to follow their own pace (Zeng & Luo, 2023). This control enhances perceived competence (Ratan et al., 2022), as users can pause, rewind, or replay, under high cognitive load (Guo & Fussell, 2022). In contrast, synchronous pacing may hinder comprehension. Thus, asynchronous classes may offer greater utility by enabling users to better manage their learning process.

This result contributes to theory as it highlights the duality of synchronicity in generating utility (Amiti,2020; Bründl et. al.,2022; Mabrito,2006; Ratan et. al.,2022), despite of its positive trade-offs in influencing perceived value.

Previous studies suggest that while designing sport customer experiences, all relevant touchpoints shall be considered (Funk,2017). The results of the current study highlight the relevance of home phygital environments due to their impact on utilitarian value, and potential effects on perceived easiness and convenience (Amiti, 2020).

Finally, coach reputation was validated for its noticeable effects on social value. This is of relevance as previous studies focused only on coaches with large base of followers (Zhang and Sun,2024), while the present findings confirm the role of coach reputation on predicting outcomes, independently from their popularity.

Interestingly, despite that online home fitness may be seen primarily as a *convenient and effective* method to do sports (Guo and Fussell, 2022), findings support the idea that customer patronage and frequency of use depends on extending the perceived value beyond its utility. Users of OHF also need to perceive fun, excitement (hedonic), sense of belonging to the group and friendliness (social) to cope with its continuous and frequent use.

Practical contributions

Three recommendations are proposed. First, as findings favor synchronous over asynchronous classes, practitioners should explore how to integrate synchronicity into their business models (Zhang and Sun, 2024). Recent studies have explored the challenge of adding synchronous elements to asynchronous online classes, where scalability is key. Gunness et al. (2023) note that while asynchronous formats offer flexibility and scale, synchronous elements help foster user retention by reducing feelings of isolation and boosting motivation. Partial synchronicity thus appears as a promising approach, combining benefits of both formats.

This is especially relevant to the current study, as perceived social value strongly influences users' patronage and usage frequency. Incorporating partial synchronicity into fitness class design may help balance scalability with the relational depth needed for retention. For that, prior studies suggest mimicking live setups in recordings (e.g., simulating other participants in the video recording) (Chiu et al., 2024; Guo & Fussell, 2022). Expanding on this idea, practitioners might offer partially synchronous experiences, such as combining recorded classes with live chats using real or virtual coach chatbots (Bründl et al., 2022). While exploring this format, Culbreth and Martin (2025) introduce the term bichronous online learning (BOL), which blends synchronous and asynchronous elements in one environment. Their study highlights the effectiveness of mobile instant messaging (Discord) in supporting the hybrid model by enabling instant peer interaction without live contact.

Second, as the study shows the importance of users' homes in designing the OHF experience (Funk, 2017), it raises the challenge of optimizing a touchpoint outside business control. Educating users on preparing their phygital home environments (e.g., space, light, sound) is a reasonable recommendation. Providing complementary

materials (e.g., water bottles, sport mats) could enhance the physical setting. Virtual technologies like AR or VR may also help, as they allow for a manipulated environment with improved light and décor (Loureiro et al., 2019; Langaro & Martins, 2020).

Third, as the results reveal the relevance of coach reputation on creating social value, businesses are requested to consider this as a requirement in their personnel strategies. Whilst doing coach reputation management, business tasks may include recruiting coaches accordingly, training and supporting their reputation efforts (e.g. offering space in the OHF platform for testimonials and interactions) (Zhang and Sun, 2024).

As a final note, while this study shows that the perceived value in OHF includes hedonic, social, and utilitarian dimensions, user motivations vary. Those with an utilitarian predominant focus may value enjoyment or social features less. Thus, OHF providers should consider segmenting users and offering customizable experiences. For example, as the findings suggest that free-tier users may place greater importance on hedonic and social cues. Platforms with both free and paid models could tailor value propositions accordingly, emphasizing social connection and coach reputation in free-tier messaging.

Limitations and future studies

As this study did not address subscription models or specific training types, future research could explore how these factors influence results. Moreover, although this

study acknowledges the importance of exploring the findings among users with distinct motivations, it did not pursue this route. Future research could address this opportunity by applying techniques such as cluster analysis. Such segmentation would allow for a more nuanced understanding of how different types of users respond to coach reputation, class type, and other service features, thereby improving the efficiency of marketing strategies in digital fitness contexts.

The concept of *partial synchronicity* requires further inspection. Future studies shall embrace them, while exploring design alternatives. For instance, considering that previous studies validated the use of Discord in bichronous online classes (BOL) (Culbreth and Martin, 2025), future studies could delve into finetuning specific service design experiences. One possible design could involve a weekly routine in which a pre-recorded workout video is shared at the beginning of the week, followed by participant interaction through asynchronous comments, which culminates in a live Q&A session with the instructor. Investigating how users respond to these hybrid configurations could help optimize digital fitness services for both scalability and retention.

This study examined online home fitness (OHF) delivered via standard computer or mobile interfaces, operationalizing the *home phygital environment* through users' interaction with video, audio, and their immediate physical space. While this reflects the most common OHF format, it does not capture emerging technologies like VR, AR, or wearable-integrated systems, which may offer more immersive experiences. These could alter how *stimuli* are perceived within the S-O-R framework. Thus, the study presents a practical but limited view of *phygital environments*. Future research should explore virtual elements, as AR can enhance immersion, focus, and realism (Jo et al., 2023), increasing perceived hedonic value (Sun & Yuan, 2024). By overlaying virtual elements onto the physical environment (in case of AR technologies), users experience enhanced

immersion, focus, control and sense of realism (Jo et al., 2023), leading to perceived hedonic value (Sun and Yuan,2024). Virtual coaches and participants may also impact on perceived social value, offering new directions for studying engagement and behavioral outcomes in digitally augmented fitness.

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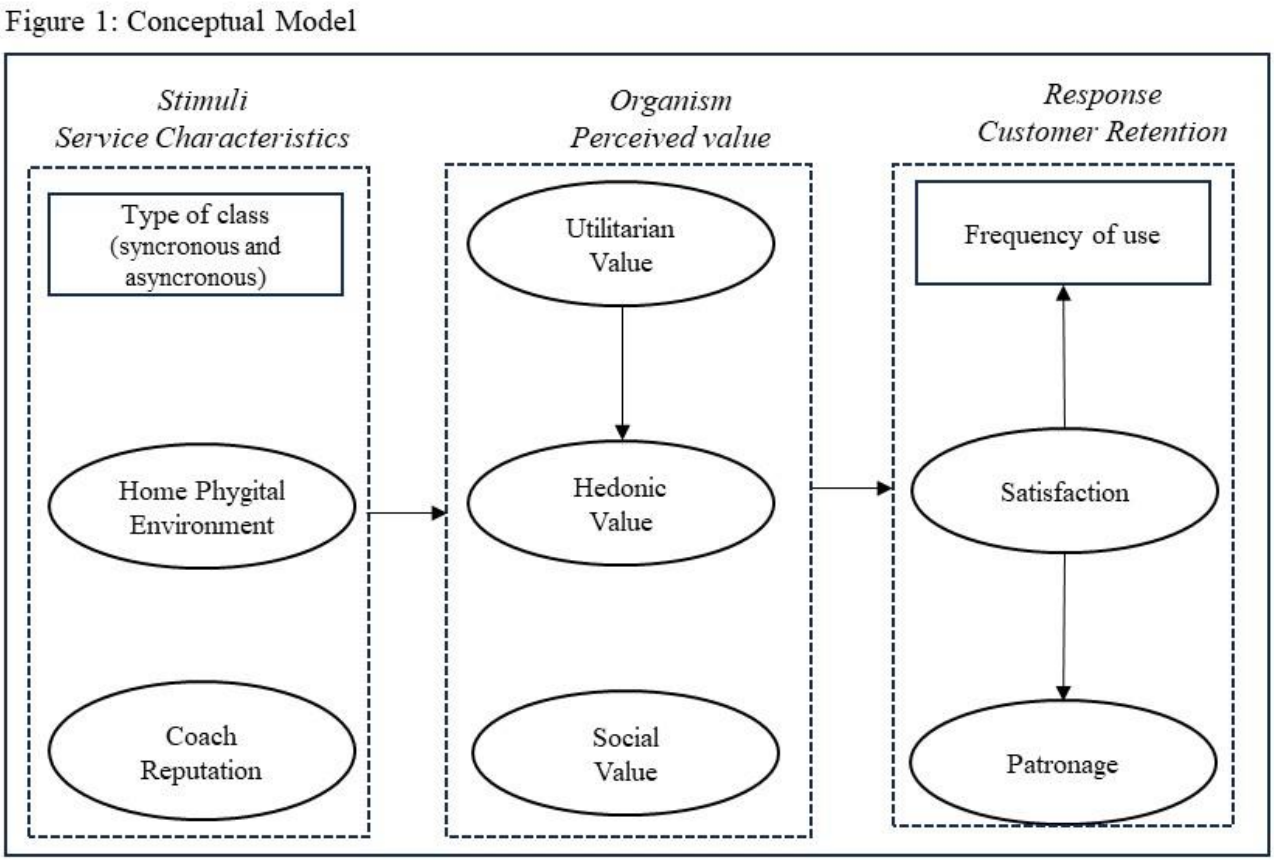
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Figure 1: Conceptual Model



Source: authors own work

Table 1: Contributions of Previous Studies in the context of Online Fitness organized according to S-O-R

Authors	Aims and Main Findings	Stimuli – characteristics of the service encounter	Organism	Responses
Zhu, Wang, et al., (2023)	This study explores factors influencing acceptance of health and fitness apps during the COVID-19 lockdown, using the Theory of Consumption Values and Theory of Perceived Risk. Key findings: lockdown strongly increased intention to use; physical appearance, health, enjoyment, and affiliation had positive effects; privacy and security risks had negative effects; some relationships were moderated by gender.	Condition of the lockdown, Financial risk, Privacy risk, Security risk	Physical appearance, General health, Enjoyment, Learning, Social interaction, Affiliation, Condition of the lockdown, Financial risk, Privacy risk, Security risk	Intention to use health and fitness apps
Kim (2022)	This study examines how fitness YouTube channel attributes and YouTubers influence flow experience, channel satisfaction, and behavioral intention during COVID-19. Key findings: Flow is driven by information quality, visual content, and physical attractiveness; satisfaction by social interaction, information quality, and visuals; and behavioral intention by both flow and satisfaction.	Information quality, Visual content, Physical attractiveness of youtuber	Social interaction, Information quality, Visual content, Social attractiveness, Physical attractiveness, Attitude homophily	Flow experience, YouTube channel satisfaction, Behavioral Intention
Nguyen et al. (2023)	Examines social factors predicting members' continuance intention (CI) in digital health and fitness communities. Findings: Social presence (SP) positively influences sense of belonging (SB); SP and SB positively influence emotional engagement (EE) and appreciation of recognition (AR); EE and AR positively influence CI; Social influence (SI) positively influences AR and CI.	Social Presence	Social Presence, Sense of Belonging, Social Influence	Continuance Intention Emotional Engagement, Appreciation of Recognition
Zhang, J., et al, 2023	Investigates effects of social interaction mechanisms on experiential and instrumental outcomes of a gamified fitness app.Key findings: Interpersonal competition increases engagement and daily steps; Pure cooperation increases engagement but decreases steps; Interpersonal and intergroup coopetition positively affect both outcomes; Hybrid coopetition has a negative interaction effect on daily steps.	Cooperation, Competition, Coopetition	Cooperation, Interpersonal competition, Intergroup competition, Interpersonal coopetition, Intergroup coopetition, Hybrid coopetition	Game engagement (experiential outcome), Daily steps (instrumental outcome

Liu et al. (2023)	Examines the influence of online fitness user engagement on value co-creation behavior. Key findings: emotional resonance and immersive experience partially mediate the relationship between user engagement and value co-creation behavior. Social engagement is the most important factor in explaining value co-creation.		User engagement Emotional resonance, Immersive experience	Value co-creation behavior
(Dessart and Duclou, (2019)	Determines the impact of online community participation on attitudes and product-related behaviour in the health and fitness sector. Key Findings: online community identification and engagement increase health environment sensitivity, resulting in heightened engagement in physical fitness and healthy product choices.		Online community identification, Online community engagement	Health environment sensitivity, Physical fitness, Healthy food choices
Cho and Chiu (2022)	Explores how the perception of the COVID-19 pandemic affects the argument quality of advertisement, attitude, and purchase intentions of indoor fitness products. Key Findings: the perception of COVID-19 had significant effect.	Perception of COVID-19	Argument quality of advertisement Attitude toward indoor fitness products	Purchase intention of indoor fitness products
Habachi et al. (2024)	Examines the impact of the gameful experience on behavioral outcomes, focusing on the relationship between the gameful experience, brand loyalty, and intention to use the branded app. Key Findings: gameful experience has a positive and significant impact on brand loyalty and intention to use the branded app. Self-image congruity (SIC) moderates the outcomes.	Gamification	Gameful experience, Self-image congruity	Brand loyalty, Intention to use the branded app
Stragier et al. (2016)	This study examines factors driving continued use of online fitness communities, comparing novice and experienced users. Key findings: self-regulatory and enjoyment motives positively influenced perceived usefulness, which predicted habitual Strava use. Social motives didn't affect perceived usefulness directly but still drove habitual use. Experienced users showed stronger self-regulatory and enjoyment motives and were more likely to develop habitual use.		Self-regulatory motives, Enjoyment motives, Social motives, Use experience	Perceived usefulness, Habitual Strava use;
Chiu and Cho (2021)	This study applies the extended Technology Readiness and Acceptance Model (TRAM) to examine intentions to use health and fitness apps. Key findings: users show higher positive and lower negative TR than non-users. Positive TR positively affects PEOU, PEN, and PU, while negative TR negatively affects them. PEOU, PEN, and PU all positively influence intention to use.		Technology readiness, Perceived ease of use, Perceived enjoyment, Perceived usefulness	Intention to use health and fitness applications

Ba and Wang (2013)	This study investigates the effectiveness of motivation mechanisms in an online fitness community. Key finding: users' exercise activity strongly correlates with their participation in the digital health community.	Number of posts, type of membership (paid vs. free)		Number of exercise activities, level of fitness achievements of users
Zhang and Sun (2024)	Develops a comprehensive model for joint course pricing between well-known coaches and online fitness platforms during the transition from offline to online services. Key findings:optimal prices for well-known coaches' in online fitness platforms increase with market size.	Coach popularity	Market size; Fame spillover effect coefficient; Platform usage unit price	Prices for online services
Chiu et. al. (2024)	Explores the determinants of individuals' intentions to follow fitness. Facilitating conditions, performance expectancy, hedonic motivation, and social interaction emerged as the most influential factors.		Facilitating Conditions, Social Influence, Effort Expectancy, Performance Expectancy, Hedonic Motivation, Habit, social interaction and relaxation	Behavioural Intention to follow fitness YouTube channels
Damberg (2022)	Analyzes future use intentions fitness apps in the UK, focusing on health consciousness. Health consciousness, habit, and perceived price value predict future app use intentions.		Health consciousness, price value, habit, exercise motivation.	Future intention to use fitness apps.
Hahm, et al. (2022)	Examines acceptance of wrist-worn wearable devices and their impact on effective use of fitness functions. Knowledge acquisition, perceived usefulness, and ease of use drive the effective use of wearable functions.		Knowledge acquisition, perceived usefulness, perceived ease of use.	Effective use of wearables.

Source: authors own work

Table 2: List of items

Construct	Item		Source
Hedonic Value	(HV1)	Not fun:fun	Voss et. al. (2003)
	(HV2)	Dull:Exciting	
	(HV3)	Not delightful:Delightful	
	(HV4)	Not thrilling:thrilling	
	(HV5)	Unenjoyable:Enjoyable	
Utilitarian Value	(UV1)	Ineffective:Effective	Voss et. al., (2003)
	(UV2)	Unhelpful:Helpful	
	(UV3)	Not fuctional:Functional	
	(UV4)	Unnecessary:Necessary	
Social Value	(SV1)	I feel like a part of an online sports group.	Allen (2003)
	(SV2)	I can really be myselg in this online sports group.	
	(SV3)	People in my online sports group are friendly to me.	
	(SV4)	I feel proud of belonging to this online sports group.	
Environments	(AM1)	Unpleasant:Pleasant	Sherman et. al. (1997)
	(AM2)	Tense:Relaxed	
	(AM3)	Dull:Bright	
Coach Reputation	(REP1)	This coach is trustworthy.	Veloutsou and Moutinho (2009)
	(REP2)	This coach is reputable.	
	(REP3)	This coach makes honest claims.	
Satisfaction	(SAT1)	I am fully satisfied with my online sports classes.	Henning-Thurau (2004)
	(SAT2)	My online sports classes always fulfill my expectations.	
	(SAT3)	My online sports classes have never disappointed me so far.	
	(SAT4)	My experiences with my online sports classes are excellent.	
Patronage	(INT1)	I want to continue using online home sports classes rather than discontinue ist use.	Bhattacherjee (2001)
	(INT2)	My intentions are to continue using my online home sports classes rather than any alternative means.	
	(INT3)	If I could, I would like to discontinue the use of my online home sports classes (Invert)	

Source: authors own work

Table 3: Demographics

		%
Gender	Male	25.7
	Female	74.3
Age	18-24	29.4
	25-34	55.8
	35-44	7.3
	45-54	4.6
	55-64	2.6
	64-74	0.3

Source: authors own work

Table 4: Discriminant validity Fornell Larcher criterion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Environments	**0.849**								
(2) Coach Reputation	0.441	**0.899**							
(3) Frequency of use	0.134	0.194	**1.000**						
(4) Hedonic value	0.573	0.491	0.376	**0.849**					
(5) Type of class	-0.057	-0.237	-0.122	-0.232	**1.000**				
(6) Satisfaction	0.502	0.641	0.394	0.621	-0.175	**0.854**			
(7) Social Value	0.318	0.546	0.252	0.470	-0.500	0.503	**0.825**		
(8) Utilitarian Value	0.603	0.480	0.239	0.774	-0.116	0.554	0.367	**0.836**	
(9) Patronage	0.326	0.383	0.451	0.570	-0.039	0.634	0.253	0.501	**0.794**

Source: authors own work

Table 5: **Discriminant validity HTMT criterion**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Environments									
(2) Coach Reputation	0.500								
(3) Frequency of use	0.139	0.207							
(4) Hedonic Value	0.636	0.543	0.395						
(5) Patronage	0.369	0.450	0.517	0.681					
(6) Satisfaction	0.564	0.718	0.414	0.687	0.739				
(7) Social value	0.364	0.633	0.271	0.536	0.319	0.576			
(8) Type of class	0.059	0.254	0.122	0.245	0.100	0.191	0.555		
(9) Utilitarian value	0.675	0.534	0.261	0.855	0.597	0.615	0.421	0.129	

Source: authors own work

Table 6: Results convergent, internal validity, VIF and R-Square

		Convergent Validity		Internal Consistency		
Construct	**Item**	**Loadings**	**AVE**	**CR**	**AC**	**VIF**
	(HV1)	0.866				2.520
	(HV2)	0.859				2.819
	(HV3)	0.885				2.894
	(HV4)	0.827				2.482
Hedonic Value	(HV5)	0.808	0.721	0.928	0.903	2.034
	(UV1)	0.878				3.184
	(UV2)	0.884				3.324
	(UV3)	0.890				2.948
Utilitarian Value	(UV4)	0.684	0.700	0.920	0.891	1.580
	(SV1)	0.828				1.970
	(SV2)	0.742				1.536
	(SV3)	0.852				2.114
Social Value	(SV4)	0.875	0.680	0.895	0.843	2.326
	(AM1)	0.881				2.609
	(AM2)	0.896				2.851
	(AM3)	0.883				2.484
Environments	(AM4)	0.726	0.721	0.911	0.869	1.524
	(REP1)	0.875				2.214
Coach	(REP2)	0.917				2.823
Reputation	(REP3)	0.903	0.807	0.926	0.881	2.505
	(SAT1)	0.855				2.205
	(SAT2)	0.889				2.821
	(SAT3)	0.782				1.939
Satisfaction	(SAT4)	0.885	0.729	0.915	0.876	2.413
	(INT1)	0.921				2.001
	(INT2)	0.798				1.506
Patronage	(INT3)	0.637	0.631	0.834	0.709	1.421

AVE: average variance extracted

CR: coefficient of reliability

CA: cronbach alpha

Source: authors own work

Table 7: Hypotheses Testing

		Path Coefficients	T statistics	P-values	F-square	Hypotheses
H1a	Type of class →Utilitarian	0.062	0.639	0.523	0.001	rejected
H1b	Type of class →Hedonic	0.296	4.177	0.000**	0.044[c.]	accepted
H1c	Type of class →Social	0.954	10.379	0.000**	0.304[a.]	accepted
H2a	Environments →Utilitarian	0.487	8.797	0.000**	0.329[a.]	accepted
H2b	Environments →Hedonic	0.147	2.942	0.003**	0.036[c.]	accepted
H2c	Environments →Social	0.110	2.504	0.012*	0.018	accepted
H3a	Coach →Utilitarian	0.259	4.807	0.000**	0.088[c.]	accepted
H3b	Coach →Hedonic	0.096	2.131	0.033*	0.036	accepted
H3c	Coach →Social	0.396	7.969	0.000**	0.222[b.]	accepted
H4	Utilitarian →Hedonic	0.624	13.293	0.000**	0.633[a.]	accepted
H5a	Utilitarian →Satisfaction →Frequency	0.074	2.180	0.029*		accepted
H5b	Utilitarian →Satisfaction →Patronage	0.119[c.]	2.245	0.025*		accepted
H6a	Hedonic →Satisfaction →Frequency	0.142[c.]	3.986	0.000**		accepted
H6b	Hedonic →Satisfaction →Patronage	0.227[b.]	4.601	0.000**		accepted
H7a	Social →Satisfaction →Frequency	0.105[c.]	4.009	0.000**		accepted
H7b	Social →Satisfaction →Patronage	0.168[c.]	5.037	0.000**		accepted

*<0,05; **<0,001
a. Large effect; b. Moderate effect; c. small effect

Source: authors own work