DEVELOPMENT OF A NEW PRODUCT BASED ON THE THEORY OF CONSUMER VALUES

Conceptualization of Sports News App

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Abstract

An objective of the research is to theoretically conceptualize a new digital product – a sports news app, based on the theory of consumer values, which can potentially later be used as a framework for actual product development. Consumer values, specifically performance, innovation, customization, entertainment and functionality are derived from the literature review. They are tested by measurement scales with five manifest variables for each value, selected based on the combination of literature review and own conceptualization. The psychometric properties of the measurement scales are assessed by reliability, convergent and discriminant validity and unidimensionality indicators that resulted from exploratory factor analysis and confirmatory factor analysis. The research results indicate that performance, innovation, customization and entertainment are perceived by the respondents as value dimensions that describe the conceptual design of the sports news app, while functionality is not.

Keywords: performance, innovation, customization, entertainment, functionality, sports news app, consumer behavior, consumer values.

1. Introduction

Over the last few years, an industry of sports news applications (apps) has been growing tremendously. Sports news apps are the main source of information for many sports fans. Many sports fans use them on a daily basis. Some of current top apps are Bleacher Report, Yahoo Sports, theScore, CBS Sports, SofaScore, LiveScore, BBC Sport, 365Scores, FlashScore etc. Considering that the market of sports news apps is vivid and dynamic, there is obviously an open space for improvement of the apps that are already available or development of new ones. Every app has different features. For example, some apps share live scores and statistics, some send push notifications, others show live text comments, stream games, while some enable users to personalize them and choose their favorite teams, etc. When put in a perspective of consumer behavior, each of these features is considered a motive for usage of the app, thus a perceived consumer value.

However, all of these apps are oriented toward the provision of the latest sports news, but there is no app that is able to provide all of these features combined. Consumers need to download a large number of apps to benefit from multiple functionalities, and this is not very practical. Therefore, customers very often express their dissatisfaction with the apps that they use.

A source of dissatisfaction with sports news apps are also factors not related to the app itself, but factors that influence users' quality of experience with an app. These factors can be, for example, user lifestyle, mobile phone battery efficiency, and other phone features (Ickin et al., 2012).

Another challenge in achieving customer satisfaction of sports news apps users is that the demographics of sports app users are extremely heterogenous (Qi and Cheng, 2022). Therefore, it is difficult to design a sports news app that will fit everybody's preferences.

Also, there are other communication channels that provide sports news, such as sports websites and other interactive platforms. These substitute products occupy a great market share of sports information. Therefore, the consumption of news through sports news apps is declining (Zhang et al., 2017). This trend is further amplified by the high quality of sports websites (Hur et al., 2011) and users' opportunity to interact with others within these communication channels (Qi and Cheng, 2022). Consequently, all this positively influences users' satisfaction and loyalty to the substitute products (Hur et al., 2011; Qi and Cheng, 2022), while users' attachment to the sports news apps is on a decline (Zhang et al., 2017).

We are striving to develop a theoretical concept of a sports news app that will provide sports information, be functional, innovative, customizable, and entertaining; thus, provide a complete solution for diverse population of sports fans.

By reviewing the literature about sports news apps, sports websites, and mobile apps in general, we learned that many of our colleagues with whom we share an ambition of developing a concept of a sports news app, use qualitative methods for evaluation of usability and performance in the human-computer interaction. However, despite the abundance of literature and numerous theoretical insights and empirical findings, no research was found that describes the conceptualization of a sports news app based on the theory of consumer values. Therefore, the objective of this paper is to fill that gap by providing a conceptualization of a new digital product – a sports news app, based on the theory of consumer values, and to develop and empirically test a typology of consumer values that describes the theoretically conceptualized product.

In the first part of this paper, theoretical concepts of multiple consumer values are elaborated based on the literature review to clarify their definition and verify their fitness for the design of a sports news app. Those consumer values are performance, innovation, customization, entertainment, and functionality. The measurement scales for these values are taken over from the literature and adapted, while some of the statements are developed by the student researcher. The scales are processed and analyzed by methods of multivariate analysis to refine them and reduce those manifest variables that negatively affect scales' reliability. In the second part of this paper, exploratory factor analysis (EFA) is used to extract the relevant factors that best reflect the sports news app values, to establish values that are relevant for the market of sports news apps and to eliminate the manifest

variables that disrupt the scales' convergent and discriminant validity. Confirmatory factor analysis (CFA) is conducted to produce scales' goodness-of-fit measures and verify the results of EFA.

Statistical data processing is performed in the statistical programs IBM SPSS Statistics 23 and IBM SPSS Amos 23.

2. Theoretical background

Before developing a concept for a new product, we need to explore what our customers/users value, and what value dimensions are the most important for our target market. The value theory is important in the design of a new product because the values perceived by customers are a purchase motive (Widing et al., 2003).

In doing so, specific dimensions of consumer values will be considered, based on the authors' earlier experience in the market of sports news apps and reviewed literature: performance, functionality, customization, innovation, and entertainment.

2.1. Performance

A product's performance is the quality of the physical outcome of using that product (Widing et al., 2003). Therefore, by understanding performance value we can assess the quality and reliability of the product. This means that by measuring performance, we can assess whether the product meets customers' needs and whether it can perform its intended function for a certain period of time. Chumpitaz Caceres and Paparoidamis (2007) argue that perceptions of service or product performance are antecedents to relationship satisfaction and that satisfaction can lead to trust, loyalty and commitment. This implies that the performance of products and services influences customer loyalty and that it is important to provide quality products/services that fulfill customers' expectations.

Quality of the product is the ability of the product to function without failure (Widing et al., 2003). An app performance is perceived by the customers as the quality of service (Ickin et al., 2012). In the service industry, a perception of service quality is defined based the expectations - as the difference between what customers think service should be, and how they perceive the actual performance of the service provided by a service provider. App providers generally do not provide any guarantee for the app performance. Service is usually provided at the 'best-effort' level and therefore is critical to the users' quality of experience (Ickin et al., 2012).

Product reliability is the measurement of the product's ability to avoid failure (Pecht, 2009). It's a dimension of the service experience (Parasuraman et al., 1985). In earlier research, evaluation of the quality of experience has mainly focused on an applications' usability (Dick, 2004 cited by Ickin et al., 2012). However, in markets of technological products, factors such as the performance expectations, perceived usefulness, information quality, and system quality (Zolkepli et al., 2021) influence their perceived performance.

In this paper, we adopt the notion of quality as a prime indicator of performance and therefore hypothesize:

H1: Performance is a value dimension of the sports news app conceptual design.

2.2. Innovation

Innovation can be defined as the design of some new features in products or services (Widing et al., 2003), in which people engage in transactions with others within an institutional order (Van de Ven, 1986). The nature of innovation can also be described as a change or novelty (Edwards-Schachter, 2018). Specifically, innovation is the implementation of some new or slightly changed processes (delivery, marketing, etc.) or products (Gault, 2018). Product innovation is the development of tangible goods and intangible services which are introduced to meet some market needs (Damanpour, 1991).

Therefore, the development of sports news app represents an improvement of the existing sports apps where both, tangible and intangible aspects of the product will be addressed to offer a more advanced sports news solution to customers' needs and wants. The target market for this innovative idea – conceptualization of sports news app, are sports consumers (Yoshida et al., 2013).

Therefore, we hypothesize:

H2: Innovation is a value dimension of the sports news app conceptual design.

2.3. Customization

Customization is the value that is beneficial for consumers because it enables them to adapt the product or service based on their preferences (Valenzuela et al., 2009). It occurs when custom-made products are designed based on customers' preferences which deliver clear customer benefits (Franke et al., 2009). However, the benefits of customization are not universal; they are dependent on various customer characteristics, especially product knowledge, product involvement, and their ability to express their product preferences (Franke et al., 2009). Therefore, to successfully implement customization, companies should clearly measure individual customer preferences (Simonson, 2005).

Customization strongly influences consumers' purchase and payment intentions. For example, mass customization may increase the perceived benefits by closely matching a product to a customer's needs. At the same time, mass customization reduces disadvantages typically associated with such customized offerings (Squire et al., 2004). Therefore, customers are willing to buy customized products and pay a slight premium for some specific products like cars (Franke et al., 2009).

For customization to take effect, customers should first express their preferences and needs for customization, based on which the companies can offer customized products and clearly demonstrate to their customers what are the benefits and added value of customization (Du and Tseng, 1999).

Many companies use customization to create value, customer satisfaction and loyalty, as well as to enhance their customer relationships (Turner et al., 2020) and increase customer engagement. Obviously, delivering value to the customer is a prerequisite for the long-term success of any customization strategy (Franke et al., 2009).

We therefore hypothesize:

H3: Customization is a value dimension of the sports news app conceptual design.

2.4. Entertainment

Entertainment value is an experiential and subjective multidimensional concept that is valuable to customers (Vladica, 2012). It is connected to fun, relaxation, stimulation, diversion, and many other associations (Bosshart & Macconi, 1998). Fun can be described as the experience of joy, happiness, and freedom, and it can be experienced with other people or by oneself. Its value stems from creating memorable experiences (Freeburg, 2020).

Entertainment in social media and news applications is a kind of a getaway from everyday life for the users of those applications (Riskos et al., 2022). Consumers use mobile applications and read the news to break the routine and move the rom social world. They also use online media to relax and enjoy (Chung & Yoo, 2008). Reading sports news is an everyday activity for a large number of people, and it is a source of entertainment for many sports fans.

Entertainment influences consumers' engagement with online news media both directly (Riskos et al., 2022; Chung & Yoo, 2008) and indirectly (Liu & McLeod, 2019) when consumers use online news media to pass their time (Riskos et al., 2022).

We therefore hypothesize:

H4: Entertainment is a value dimension of the sports news app conceptual design.

2.5. Functionality

Functional value is the ability of the product to perform utilitarian, functional or physical purposes (Sheth et al., 1991). It is contained in a product's attributes like features (Tzeng, 2011). Therefore, the functional value of mobile applications can be interpreted through apps' features and their ability to function and perform well.

Customers use mobile applications because of their perceived usefulness, i.e., because they think that they can perform their activities better with the mobile app, than without it. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her activity performance (Davis, 1989). Hence, mobile apps are information software that satisfies mobile users' needs (Wang et al., 2013). Not all mobile apps are equally user-friendly. Some mobile apps are perceived to be too difficult to use. However, if the benefits of using the app exceed the user's effort needed to use the app, customers conclude that an app has perceived ease of use (Davis, 1989). Perceived ease of use, in contrast, refers to "the degree to which a person believes that using a particular system would be free of effort (Davis, 1989). Therefore, the goal of every company's product design process should be to maximize the usefulness of its products or services. Thus, their products or services should be designed for users, and they have to be able to use them without effort.

We therefore hypothesize:

H5: Functionality is a value dimension of the sports news app conceptual design.

3. Sample, procedures and measures

The instrument of empirical research is a highly structured questionnaire for Likert scale-based assessment of respondents' attitudes. Likert scale degrees are coded with numbers from 1 to 5, where 1 indicates complete disagreement and 5 indicates complete agreement

with the statement. The questionnaire was designed by combining the adapted items from relevant consumer behavior literature and the conceptualization of items developed for this research. The concept of a sports news app was described at the introduction of the questionnaire. The questionnaire was tested for its clarity at the beginning of November 2021 on a non-probable convenience sample of 10 respondents. The respondents were identified through the student researcher's contact list which was used to detect individuals who have an interest in sports news or sports applications. Respondents' sustained suggestions for improvement of the questionnaire led to its slight modification and better clarity. The improvement consisted of the adjusted statements and text explanation of the concept, characteristics, and core functions in the statements related to the values that reflect the sports news application.

The research questionnaire contains twenty-five statements (manifest variables), five items for each consumer value: performance, innovation, customization, entertainment and functionality. Measurement scales are available in the Appendix (1.0.).

The survey was conducted on a convenience sample of users of other sports applications, and sports fans in general with whom a student researcher had a direct contact. Sample size is 51 respondents. Respondents were selected because of their knowledge and experience in using sports news applications in Croatian and English language. 100% of the respondents are Croatians, a student researcher's friends, family, colleagues and acquaintances. Majority of the respondents are students (32 of them) and the others are employed.

During November 2021, the respondents were contacted by e-mail and WhatsApp with a request to complete the survey which was available on Google Forms, in English language.

51 fully completed questionnaires were sustained because the responses were logical. The two responses with all 5s (completely agree answer) were also accepted because the observations represented respondents' actual preference for the product.

4. Methodology and results

Measurement scales were estimated using EFA. The designed measurement model was confirmed by CFA. The reliability of the measurement scales was tested by analyzing the Cronbach Alpha coefficient, specifically "if Item Deleted" and "Item-Total Correlation" indicators. The discriminant and convergent validity as well as unidimensionality of the measurement scales was examined by exploratory and confirmatory factor analysis.

Cronbach's Alpha is a measure of internal consistency of constructs, i.e., the average intercorrelation between items in a factor. Although it is considered that all values of the Cronbach's Alpha internal reliability coefficient above .6 to be satisfactory, the prevailing interpretation is that coefficient values greater than .7, .8, and .9 are acceptable, satisfactory, and excellent (*Malhotra and Birks, 2003*). The analysis of the "if Item Deleted" indicator determines whether there are items that reduce the reliability of the scale (*Malhotra and Birks, 2003*). Such items are excluded from the model.

The analysis of the "Item-Total Correlation" indicator determines whether there is a sufficiently strong correlation between the items and the scales. A satisfactory value of the

indicator should be greater than ,4 to measure the corresponding construct (*Malhotra and Birks, 2003*). Items with insufficiently strong correlations are omitted from the model.

4.1. Reliability of Scales

Table 1. Measurement scale *Performance*.

Performance value - Cronbach Alpha .799		
Items	Item-Total Correlation	Cronbach Alpha if Item Deleted
PERF _1	.658	.735
PERF _2	.563	.766
PERF _3	.590	.761
PERF _4	.495	.786
PERF _5	.626	.750

Source: Author's work

Table 2. Measurement scale *Innovation*.

Innovation - Cronbach Alpha .772		
Items	Item-Total Correlation	Cronbach Alpha if Item Deleted
INNOV_1	.449	.760
INNOV_2	.529	.742
INNOV_3	.690	.674
INNOV_4	.567	.724
INNOV_5	.545	.739

Source: Author's work

Table 3. Measurement scale *Customization*.

Customization - Cronbach Alpha .730 (.743*) (.777**)		
Items	Item-Total Correlation	Cronbach Alpha if Item Deleted
CUST_1	.324	.743
CUST_2	.498	.681
CUST_3	.691	.612
CUST_4	.634	.628
CUST_5	.383	.741

* After omitting item CUST_1

** After omitting item CUST_5

Source: Author's work

Table 4. Measurement scale *Entertainment*.

Entertainment - Cronbach Alpha .862		
Items	Item-Total Correlation	Cronbach Alpha if Item Deleted
ENTER_1	.721	.823
ENTER_2	.831	.797
ENTER_3	.743	.840
ENTER_4	.604	.852
ENTER_5	.655	.854

Source: Author's work

Table 5. Measurement scale *Functionality*.

Functionality - Cronbach Alpha .777 (.808*) (.812**) (.830***)		
Items	Item-Total Correlation	Cronbach Alpha if Item Deleted
FUNC_1	.688	.695
FUNC_2	.569	.732
FUNC_3	.712	.674
FUNC_4	.522	.745
FUNC_5	.292	.808

* After omitting item FUNC_5

** After omitting item FUNC_2

*** After omitting item FUNC_4

Source: Author's work

Tests of internal consistency of constructs and reliability of measurement scales resulted in omitting items CUST_1, CUST_5, FUNC_5, FUNC_2 and FUNC_4. All measurement scales are reliable. Five factors with a total of 20 manifest variables remain in further analysis.

4.2. Exploratory Factor Analysis

To meet the necessary conditions for performing EFA, sample size, multicollinearity, sampling adequacy, and normality of data are verified to confirm that the dataset is suitable for EFA.

To determine the minimum necessary sample size, MacCallum et al. (1999) recommend considering the sample size in relation to the level of communalities. If communalities are greater than .60, then a sample of fewer than 100 respondents is sufficiently large. De Winter and Dodou (2009) argue that the factor recovery can be reliable with sample sizes even well below 50 observations.

Table 6. Communalities of variables

	Initial	Extraction
PERF_1	1.000	.665
PERF_2	1.000	.660
PERF_3	1.000	.612
PERF_4	1.000	.669
PERF_5	1.000	.650
INNOV_1	1.000	.860
INNOV_2	1.000	.585
INNOV_3	1.000	.740
INNOV_4	1.000	.620
INNOV_5	1.000	.603
CUST_2	1.000	.528
CUST_3	1.000	.730
CUST_4	1.000	.740
ENTER_1	1.000	.709
ENTER_2	1.000	.845
ENTER_3	1.000	.751
ENTER_4	1.000	.633
ENTER_5	1.000	.717
FUNCT_1	1.000	.853
FUNCT_3	1.000	.817

Extraction Method: Principal Component Analysis.

Source: Author's work

In this research, the mean of all communalities is .699, which is consistent with the recommendation of MacCallum et al. (1999) for the mean level of communalities to be preferably .7 or higher to form a stable factor solution.

Correlations between variables are also considered. For factor analysis to be meaningful, the manifest variables must be correlated to a sufficient extent to form representative factors. An ideally factorable matrix contains moderate values of intercorrelations (Watson, 2017). To examine multicollinearity, a bivariate correlation matrix is formed. While extremely high correlations (> .95) were not observed, it was recognized that the manifest variable FUNCT_1 correlates multiple times at an extremely low level (< .1). Therefore, this manifest variable is omitted from further analysis. A bivariate correlation matrix is available in the Appendix (1.1.).

Bartlett's test of sphericity tests the null hypothesis that the original variables are mutually uncorrelated. Matrices whose "p" value on Bartlett's test is below .06 are suitable for factor analysis (Malhotra and Birks, 2003). The Kayeser-Meyer-Olkin measure of sample adequacy is used to quantify the degree of correlation of the observed manifest variables and assess the suitability of the sample for factor analysis. An acceptable value is higher than .5 (Malhotra and Birks, 2003).

Table 7. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.742
Bartlett's Test of Sphericity	Approx. Chi-Square	544.325
	df	171
	Sig.	.000

Source: Author's work

After omitting the manifest variable FUNCT_1, Bartlett test of sphericity indicates that there is a correlation of a sufficient number of items because the p-value of the test is .000. The Kaiser-Meyer-Olkin sample adequacy is moderate (.742) and indicates that the data is suitable for factorization (Malhotra and Birks, 2003).

There are conflicting opinions in the literature about the applicability of factor analysis to distributions that are not normally distributed. Visual inspection of the responses to the research statements reveals that the respondents' attitudes are mostly positive, thus, the distribution of respondents' answers is not symmetrical, but slightly curved to the right. Even though Kolmogorov-Smirnov test and Shapiro-Wilk test of normality confirm that the data is non-normally distributed (p-value .000), application of factor analysis is appropriate for descriptive purposes, i.e., to summarize relationships of multiple variables (Malhotra and Birks, 2003). Tests of normality are available in the Appendix (1.2.).

Principal components analysis (PCA) was used as the extraction method of the exploratory factor analysis. The Kaiser criterion was applied to determine the number of factors. The Varimax rotation method provided the best interpretable rotated factor solution, whereas minimum .6 factor loading was applied to suppress coefficients.

Table 8. Rotated Factor Solution – Principal Component Analysis (third iteration)

Rotated Component Matrix[a]

	Component			
	1	2	3	4
PERF_1	.035	**.810**	.103	.238
PERF_2	.186	**.744**	-.049	.099
PERF_3	.019	**.703**	.348	.020
PERF_5	.234	**.773**	.103	-.003
INNOV_1	.149	.048	**.847**	.351
INNOV_2	.149	.108	.148	**.845**
INNOV_3	.292	.168	.167	**.773**
CUST_3	.147	.201	**.822**	.077
CUST_4	.526	.125	**.691**	.029
ENTER_1	**.721**	.072	.141	.443
ENTER_2	**.854**	.082	.148	.285
ENTER_3	**.670**	.187	.488	.163
ENTER_4	**.716**	.213	.222	-.040
ENTER_5	**.805**	.115	.048	.149

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

[a.] Rotation converged in 5 iterations.

Source: Author's work

Three consecutive PCAs extracted four factors. Five manifest variables were removed from the model since they loaded on two factors, or did not load on any factor: PERF_4, INNOV_4, CUST_2, FUNCT_3 and INNOV_5. All but the fourth item of the *Performance* converged together. A scale for the *Entertainment* factor is confirmed as initially conceptualized. A factor *Innovation* is presented by two items, INNOV_2 and INNOV_3, while an item INNOV_1 converged to the factor *Customization* to which items CUST_3 and CUST_4 load, too. *Functionality* is not confirmed as a factor that describes sports news app and does not discriminate in the factor solution.

Table 9 indicates that the extracted four factors explain 72.273% of the total variance.

Table 9. Total variance explained

Component	Initial Eigenvalues			Loadings			Rotation Sums of Squared Loadings		
	Total	% Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% Variance	Cumulative %
1	5.774	41.243	41.243	5.774	41.243	41.243	3.379	24.137	24.137
2	1.858	13.273	54.516	1.858	13.273	54.516	2.506	17.902	42.039
3	1.328	9.485	64.001	1.328	9.485	64.001	2.397	17.118	59.157
4	1.158	8.272	72.273	1.158	8.272	72.273	1.836	13.115	72.273

Extraction Method: Principal Component Analysis.

Source: Author's work

After PCA, the following conclusions are put forward:

- The measurement scales are internally consistent and reliable, as indicated by the values of the Cronbach's Alpha coefficient (higher than .70).
- Measurement scales are convergently valid because their items have high factor loadings on the corresponding factors (higher than .7)
- Measurement scales are discriminately valid because the corresponding items have a high factor loading on the relevant factors, and lower cross-loadings on other factors.

4.3. Confirmatory Factor Analysis

Unlike EFA in which decisions on the number of extracted factors are based on a-priori knowledge of researchers, the CFA is used to examine and validate a-priori established factors and their indicators.

Construct, convergent and discriminant validity of the model are additionally verified in CFA, which will also enable examining the dimensionality of the measurement scales by specifying that each manifest variable in the measurement model loads only on one latent variable (factor), with an assumption of independence of the measurement errors (Malhotra and Birks, 2003).

Specification of the measurement model is provided in Figure 1.
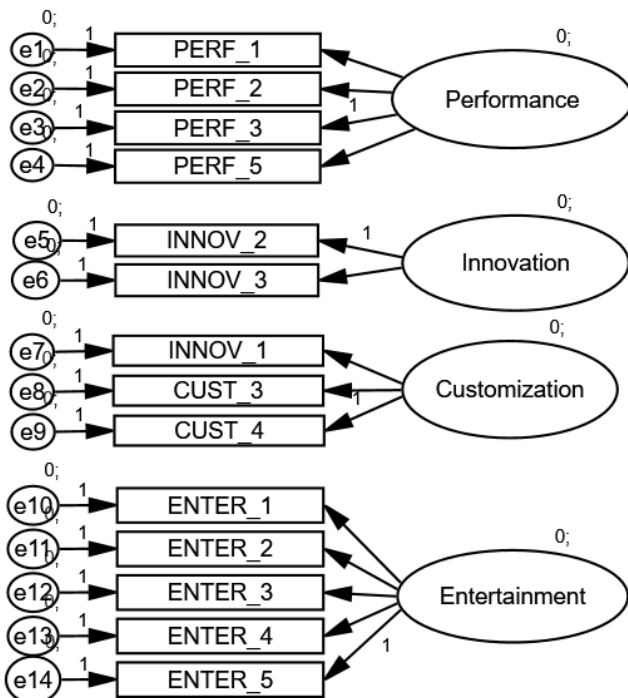
Fig. 1. Measurement model.
Source: Author's work

A single-level model is operationalized reflectively.

Construct validity concerns the extent to which a test or measure accurately assesses what it's supposed to. To confirm construct validity, standardized regression weights that compare the strength of the effect of each individual independent variable to the dependent variable should be higher than .70. Also, the strength of the relationships between the defined factors must be low, that is, the correlation coefficients must be less than .80 to confirm the unidimensionality of the measurement scales (Malhotra and Birks, 2003*)*.

Table 10. Factor Solution – Standardized regression weights

Item	Factor	Standardized regression weights
INNOV_2	Innovation	.655
INNOV_3		.845
PERF_3	Performance	.634
PERF_2		.635

PERF_1		.792
PERF_5		.730
CUST_4	Customization	.870
CUST_3		.737
INNOV_1		.781
ENTER_5	Entertainment	.697
ENTER_4		.672
ENTER_3		.812
ENTER_2		.886
ENTER_1		.814

Source: Author's work

Standardized regression weights are lower than .70 for items INNOV_2, PERF_3, PERF_2, ENTER_5 and ENTER_4. This suggests that these items could be removed from the model before potential future structural equation modeling. However, since the discrepancies to the cut-off criteria is not high, the model will not be trimmed in the continuation of the analysis. The reliability of all other individual indicators is high.

Table 11. Estimated correlation coefficients between the factors

Correlations			Estimate (r)
Performance	<-->	Entertainment	.399
Performance	<-->	Customization	.408
Innovation	<-->	Performance	.428
Innovation	<-->	Customization	.517
Innovation	<-->	Entertainment	.663
Customization	<-->	Entertainment	.677

Source: Author's work

The maximum correlation coefficient is r = .677, which confirms the unidimensionality of the measurement scales.

To assess the model fit, a set of measures is analyzed to verify fitness of the measurement model to empirical data. Ratio of χ2 statistic and degrees of freedom (CMIN/DF) values lower than 3 indicate an acceptable model fit. Thresholds for goodness of fit and adjusted goodness of fit indices (GFI and AGFI) should be above .90, above .80, and below .05 for excellent, good and weak model fit, respectively. Typically, normed, relative and comparative fit indices (NFI, RFI and CFI) close to 1 indicate a very good fit (Malhotra and Birks, 2003*).*

Table 12. Model fit

Index	Value
Discrepancy divided by degree of freedom (CMIN/DF)	2.057
Goodness-of-Fit Index (GFI)	.722
Adjusted Goodness-of-Fit Index (AGFI)	.626
Normed Fit Index (NFI)	.626
Relative Fit Index (RFI)	.564
Comparative Fit Index (CFI)	.756

Source: Author's work

CMIN/DF suggests that sample data and hypothetical model are an acceptable fit. GFI and AGFI are above .5 and indicate a moderate model fit. The values of NFI, RFI and CFI which are not close to 1 point to the conclusion that the proposed measurement model is somewhat appropriate for further analysis of testing the established relationships.

Convergent validity refers to how closely the new scale is related to other variables and other measures of the same construct. In continuation, convergent validity of the model is assessed through composite reliability (CR) which should have values higher than .7 and average variance extracted (AVE) which should be higher than .5 (Malhotra and Birks, 2003*).*

Table 13. CFA results/indicators of convergent validity

Factor	Item	CR	AVE
Innovation	INNOV_2	.724	.572
	INNOV_3		
Performance	PERF_3	.793	.491
	PERF_2		
	PERF_1		

	PERF_5		
Customization	CUST_4	.840	.637
	CUST_3		
	INNOV_1		
Entertainment	ENTER_5	.885	.609
	ENTER_4		
	ENTER_3		
	ENTER_2		
	ENTER_1		

Source: Author's work

CR of all factors is higher than ,7 and demonstrates satisfactory internal consistency of scale items. The values of AVE of all factors meet the criteria of approximately value .5, thus confirming the convergent validity of the reflectively measured constructs.

Discriminant validity refers to the degree to which a test or measure diverges from (i.e., does not correlate with) another measure, whose underlying construct is conceptually unrelated to it. Fornell-Larcker criterion will be used to assess the discriminant validity. It is based on the idea that a construct shares more variance with its associated indicators than with other constructs (Malhotra and Birks, 2003*)*.

Table 14. Discriminant validity by Fornell-Larcker criterion

	Customization	Performance	Innovation	Entertainment
Customization	**.798**			
Performance	.408	**.701**		
Innovation	.517	.428	**.756**	
Entertainment	.677	.399	.663	**.780**

Source: Author's work

The application of the Fornell-Larcker criterion confirms the discriminant validity of the constructs because the AVE square root of each variable displayed on the diagonal of the matrix is greater than the correlations of the variable with all other variables in the model.

Overall, the results of the CFA partially confirm the results of the EFA. Even though the discriminant and convergent validity are confirmed, as well as the unidimensionality of the measurement scales, construct validity should be improved as well as the model fit which is moderate.

5. Conclusions, limitations and further research

This paper provides a theoretical conceptualization of sports news app, based on the application of the theory of consumer values, and its empirical validation on a sample of 51 respondents – sports fans. An initial conceptualization of sports news app included five consumer values: performance, innovation, customization, entertainment and functionality. Exploratory factor analysis refined the hypothesized theoretical model and extracted all values, except functionality, as factors whose scales possessed good psychometric characteristics. Confirmatory factor analysis confirmed that the constructs are reliable, convergently and discriminately valid and unidimensional. H5 was not supported, while H1, H2, H3 and H4 are sustained. However, five of the regression coefficients indicating the construct validity were below the optimum rule of thumb. Also, the indices of the model fitness to the empirical data were only moderate.

An objective of the research - to theoretically conceptualize a sports news app based on the theory of consumer values is achieved. The conceptualized digital sports news product is best reflected by performance, innovation, customization and entertainment value. However, an initially intended practical application of the research results - actual industrial development of a sports news app with performance, innovation, customization and entertainment as prominent features, will not be pursued further because of the low construct validity and poor model fit. The researchers will rather work on remedying the major limitations of this research and using the learning curve to repeat the research and create a more solid base for the actual app development.

The major limitations of this research were the following.

The authors reviewed a limited number of literature sources. This caused some difficulties in design and understanding of constructs. For example, performance and functionality can easily be confused. If analyzed on a level of measurement scales, these two are somewhat redundant. These two values could also be broken down to attributes such as quality, durability, reliability, utility, etc., to account for more different purchase motives. A variety of value dimensions that were not considered in this research could also be used to describe a sports news app, such as escapism, hedonism or timeliness. It is not quite certain that respondents and consumers correctly understand innovation value – the question is *for which existing product is this an innovation?* Generally, the measurement scales also lack theoretical origin, and too many of the manifest variables were designed by the student researcher.

Another limitation is the timing. The complete research process was carried out within November 2021, which is insufficient time for an iterative process of design of measurement scales, piloting the research, and surveying the respondents.

Sample characteristics are the following limitation. Not only is the sample size rather small for research with potential industrial application, but the sampling procedure is insufficiently clear. Respondents targeted by the student researcher are actually friends and family. One should expect that they are biased toward the student researcher's intention of conceptualizing the sports news app. In repeated research, a population of sports fans and athletes should be targeted. They can be identified through sports clubs and associations. There is also an option of using social media to identify sports fans and athletes.

In terms of methodology, more attention should be given to the methodology of market research, specifically to differentiate between a personal interview and a focus group, probability and non-probability sample and piloting vs. main research.

Further research on the topic of design of a sports news app can be improved by better anchoring the constructs in the consumer behavior literature. Variety of possible consumer values can be tested to theoretically conceptualize the new product. A methodology demonstrated in this research paper can also be implemented for the design of compatible digital sports products: sports news portals and web sites.

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Appendices

1.0. Measurement Scales

Performance:

1) The quality of this firm's services is superb (Widing et al., 2003).
2) The content of this firm's services is of high-quality (Own conceptualization).
3) The content of this firm's services is up to date (Own conceptualization).
4) The quality of firm's service has been improved (Widing et al., 2003).
5) The information provided by product/service is correct (Own conceptualization).

Innovation:

1) The firm's services are one step ahead of the competition's offers (Widing et al., 2003).
2) The firm's services provide me with something new (Own conceptualization).
3) The firm's services offer something different from what is already existing (Own conceptualization).
4) The firm's services represent significant advances when compared to similar services that already exist (Widing et al., 2003).
5) The firm' services are revolutionary (Own conceptualization).

Customization:

1) The firm is able to offer me individually customized products or services (Widing et al., 2003).
2) The product/service is offered in large variety, and with many options, so that I can have the kind of product/service I like (Widing et al., 2003).
3) The application gives me option to customize it by myself in order to provide me with the information which I want to see (Own conceptualization).
4) I can use a custom-made service/product from this firm without sacrificing timeliness (Widing et al., 2003).
5) I can use a custom-made service/product from this firm without sacrificing quality (Widing et al., 2003).

Entertainment:

1) The firm's product/service entertains me (Own conceptualization).
2) The content of the app is engaging (Own conceptualization).
3) The content of the firm's product/service is interesting (Own conceptualization).
4) The content of the firm's product/service is interactive (Own conceptualization).
5) Using this service feels like 'an escape' (Own conceptualization).

Functionality:

1) The application is understandable (Own conceptualization).
2) I can customize the app easily (Own conceptualization).
3) The application is logical (Own conceptualization).
4) The usage of the app is simple (Own conceptualization).
5) The application shows what I want to see first (Own conceptualization).

1.1. A Bivariate Correlation Matrix:

Correlation Matrix

		PERF_1	PERF_2	PERF_3	PERF_4	PERF_5	INNOV_1	INNOV_2	INNOV_3	INNOV_4	INNOV_5	CUST_2	CUST_3	CUST_4	ENTER_1	ENTER_2	ENTER_3	ENTER_4	ENTER_5	FUNC_1	FUNC_3
Correlation	PERF_1	1.000	.540	.450	.368	.591	.246	.223	.341	.397	.414	.093	.289	.199	.221	.215	.248	.226	.145	.302	.238
	PERF_2	.540	1.000	.425	.383	.395	.066	.207	.227	.618	.383	.203	.182	.276	.178	.257	.193	.272	.227	.207	.229
	PERF_3	.450	.425	1.000	.415	.508	.288	.186	.179	.402	.225	.103	.316	.297	.199	.133	.418	.206	.089	.283	.265
	PERF_4	.368	.383	.415	1.000	.395	.389	.208	.427	.320	.167	.238	.425	.527	.305	.420	.558	.467	.294	.031	.202
	PERF_5	.591	.395	.508	.395	1.000	.181	.153	.233	.359	.408	.252	.287	.245	.238	.216	.346	.312	.358	.422	.501
	INNOV_1	.246	.066	.288	.389	.181	1.000	.450	.433	.280	.256	.495	.637	.664	.355	.306	.602	.335	.251	.195	.231
	INNOV_2	.223	.207	.186	.208	.153	.450	1.000	.553	.334	.278	.321	.226	.192	.477	.363	.322	.253	.264	.089	.283

INNOV_3	.341	.227	.179	.427	.233	.433	.553	1.000	.487	.519	.445	.300	.342	.496	.540	.406	.223	.394	.086	.225
INNOV_4	.397	.618	.402	.320	.359	.280	.334	.487	1.000	.528	.401	.252	.429	.334	.392	.375	.330	.250	.334	.433
INNOV_5	.414	.383	.225	.167	.408	.256	.278	.519	.528	1.000	.333	.204	.255	.407	.344	.289	.235	.369	.222	.206
CUST_2	.093	.203	.103	.238	.252	.495	.321	.445	.401	.333	1.000	.459	.524	.355	.444	.426	.482	.487	.152	.225
CUST_3	.289	.182	.316	.425	.287	.637	.226	.300	.252	.204	.459	1.000	.626	.270	.341	.446	.323	.214	.053	.131
CUST_4	.199	.276	.297	.527	.245	.664	.192	.342	.429	.255	.524	.626	1.000	.494	.567	.604	.432	.534	.274	.319
ENTER_1	.221	.178	.199	.305	.238	.355	.477	.496	.334	.407	.355	.270	.494	1.000	.736	.683	.408	.606	.062	.303
ENTER_2	.215	.257	.133	.420	.216	.306	.363	.540	.392	.344	.444	.341	.567	.736	1.000	.679	.666	.625	.098	.256
ENTER_3	.248	.193	.418	.558	.346	.602	.322	.406	.375	.289	.426	.446	.604	.683	.679	1.000	.604	.523	.223	.313

ENTER_4	.226	.272	.206	.467	.312	.335	.253	.223	.330	.235	.482	.323	.432	.408	.666	.604	1.000	.456	.190	.263
ENTER_5	.145	.227	.089	.294	.358	.251	.264	.394	.250	.369	.487	.214	.534	.606	.625	.523	.456	1.000	.264	.412
FUNC_1	.302	.207	.283	.031	.422	.195	.089	.086	.334	.222	.152	.053	.274	.062	.098	.223	.190	.264	1.000	.726
FUNC_3	.238	.229	.265	.202	.501	.231	.283	.225	.433	.206	.225	.131	.319	.303	.256	.313	.263	.412	.726	1.000

Source: Author's work

1.2. Tests of Normality

Tests of Normality:

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PERF_1	.336	51	.000	.693	51	.000
PERF_2	.385	51	.000	.625	51	.000
PERF_3	.464	51	.000	.543	51	.000
PERF_4	.415	51	.000	.605	51	.000
PERF_5	.301	51	.000	.751	51	.000
INNOV_1	.447	51	.000	.592	51	.000
INNOV_2	.435	51	.000	.584	51	.000
INNOV_3	.387	51	.000	.673	51	.000
INNOV_4	.33	51	.000	.717	51	.000
INNOV_5	.253	51	.000	.833	51	.000
CUST_2	.364	51	.000	.633	51	.000
CUST_3	.456	51	.000	.574	51	.000
CUST_4	.417	51	.000	.636	51	.000
ENTER_1	.423	51	.000	.568	51	.000
ENTER_2	.356	51	.000	.676	51	.000
ENTER_3	.473	51	.000	.526	51	.000
ENTER_4	.276	51	.000	.774	51	.000
ENTER_5	.231	51	.000	.861	51	.000
FUNCT_3	.34	51	.000	.713	51	.000

a. Lilliefors Significance Correction

Source: Author's work