Ph. D. in Business Administration

THESIS COLLECTION

to the Ph. D. dissertation entitled

The MIMIC model of the consumer-based brand equity

Testing the causal specification of consumer-based brand equity

by Attila Szőcs

Supervisor:

Dr. József Berács

Budapest, 2012

Marketing Department

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1 The background of the research

The concept of brand equity has gained in popularity since the 1980s. The field has undergone significant development, due to which the conceptual models (Aaker 1991, Keller 1993) were succeeded by an increasing number of empirical models (Yoo and Donthu 2000, Erdem and Swait 1998, Atilgan et al. 2009).

Brands stand out of the other marketing mix elements owing to the fact that they are capable of incorporating the positive effects of all marketing activities and by this they become effective signals of quality (Erdem et al. 2006).

In accordance with the above mentioned, brand equity appears as a concept with the help of which we are able to measure the equity of brands becoming increasingly valuable to companies. Two great fields of the measurement of brand equity are constituted by the measurement of the financial value as well as that of the consumer-based brand equity. The present paper focuses on measuring the latter.

1.1 Justification of the theme

Research related to brand management is included among the research priorities indicated by the Marketing Science Institute (MSI 2010) for the 2010-2012 period, which shows the great importance the prestigious institute attributes to brands since researches connected to brands and brand equity were equally determined as research priorities in the past two periods.

The development of a new consumer-based brand equity model is justified by the fact that the models developed until now are either only conceptual ones (Aaker 1991, Keller 1993) or they could only be applied to a certain product category or they have not proved to be stable enough when repeated. In several cases, brand equity was developed for a particular market, thus they are incapable of explaining in general the opportunities hidden in a brand name in the same way as the agency based brand equity models do (e.g. BAV) whose scientific rigor and methodological details however are less known.

The suggested consumer-based brand equity model of the present paper measures brand associations of a high level of abstraction that should make them independent from any product category or industry.

1.2 The goals of the research

Focusing on the issue of measuring consumer-based brand equity, we can summarize the main goals of the research in the following:

1. Building and estimating a second-order consumer-based brand equity model and checking its validity.
2. Testing the causal specification of the consumer-based brand equity.

1.3 The initial model of consumer-based brand equity

The initial MIMIC model of brand equity presumes brand equity as being a multidimensional construct. In the initial conceptual model consumer-based brand equity is caused by six dimensions: awareness, uniqueness, advantage, perceived quality, activity and trust.

We built the conceptual model based on Aaker’s (1991) and Keller’s (1993) conceptual models, on the empirical models built on Aaker’s (1991) model as well as on the results of Lehman, Keller and Farley’s (2008) article.

Four components of the Aaker (1991) model – Perceived quality, Loyalty, Awareness and Associations – were included in the empirical research (Yoo and Donthu 1997, 2000, Chau and Ho 2008, Atilgan et al. 2009, Kim and Hyun 2010). As opposed to this practice, in devising the present model, similarly to others (Erdem and Swait 1998) we interpreted Loyalty as a consequence rather than the antecedent of brand equity. To measure Loyalty, following Aaker's (1996) instructions we used questions that would refer to purchasing practice, but this way it is neither theoretically nor technically acceptable that the Loyalty dimension explain through Brand equity a consequence of Brand equity such as Purchase intention.

We regard Awareness as a concept that concretely refers to the presence of an association node in the consumer's mind, and we qualify every other brand-related concept as an association. Thus in our conceptual model the dimensions of Brand equity are Awareness and the brand name-related associations: Uniqueness, Advantage, Perceived quality, Activity and Trust.

Compared to the Aaker (1991) model and other models built on it (Yoo and Donthu 2000), the inclusion of the Trust dimension in the model is a novelty. We think that, when the number of accessible brands grows at a spectacular rhythm on the market and increasingly more low-quality products appear, trust in a brand is becoming one of the most important factors of consumer-based brand equity.

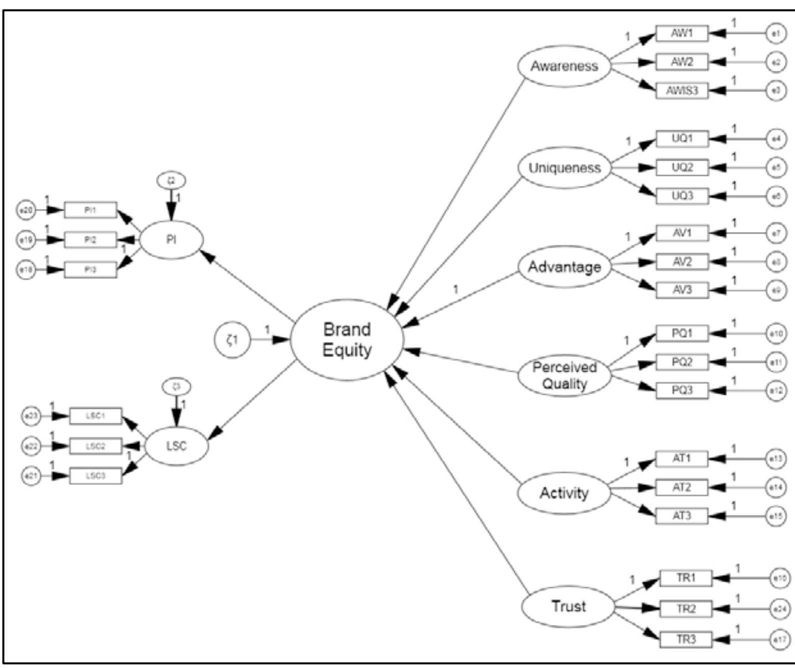
Uniqueness and Advantage together have to be able to measure a brand's differentiation. According to Aaker's (1996) instructions, the contents of the Associations dimension are best summarized by differentiation. The importance of differentiation is indicated also by the fact that in his 1996 article, Aaker describes the Associations dimension as Associations/Differentiation.

Causal specification

We define consumer-based brand equity as a second-order causal latent variable. As a consequence, we assume that consumer-based brand equity is a concept created as a result of various factors. We assume that the dimensions of consumer-based brand equity have to be estimated in a reflective measurement model.

From a technical point of view this means that a Type II (Diamantopoulos et al. 2008) second-order MIMIC model is appropriate to estimate consumer-based brand equity.

Figure 1: The initial causal MIMIC model of brand equity



Consumer-based brand equity is referred to in literature as a decision support tool that sets up a useful diagnosis for the managers about the ideas consumers have about the brand.

Consumer-based brand equity can be best formulated as a construct caused by brand-related associations in which the effect of brand-related associations is concentrated.

If we develop a model in which the indicators of consumer-based brand equity are first-order latent variables, we assume that brand advantages, brand awareness or trust in a brand are caused by consumer-based brand equity.

However, it is not a logically defensible assumption, to assume that the concept of consumer-based brand equity is already existent in consumers' mind, and brand-related associations such as uniqueness or trust are its reflections.

Trust in a brand, for instance, may be induced as an effect of well-structured communication campaigns, word-of-mouth, experience etc. In this sense, measuring trust with causal indicators may be well-grounded, since trust is the effect of experience, of convincing accounts of acquaintances, etc.

However, in consumer data collection we measure latent concepts by asking the interviewees about brand-related associations already present in their mind. In this form, we cannot seize the moment of creation, though. When the respondents answer questions related to advantages or perceived quality, their already existent ideas about the advantages and quality provided by the brand will manifest. In this sense, the only suitable method for measuring consumer-based brand equity dimensions is measuring with reflective indicators.

An average person might have definite ideas about the advantages and quality of the brands he knows (or uses), thus the reflective measurement of such concepts as Advantage or Uniqueness are methodologically well-grounded.

However, the consumer-based brand equity concept appeared as a theoretical term in literature, thus consumers do not have an already existing idea about it, consequently, no reflections of it can exist.

As opposed to the causal specification, the reflective specification of brand equity entails some risks as well. Brand-related measures are assumably distorted by the halo effect due to the brand name, because of which every brand-related variable will share a common variance. As a consequence, almost every valid concept could be validly built into a model with a latent variable (Brand equity) measured reflectively, since the concepts will always share some common variance due to the halo effect and common method.

As opposed to this, with the help of the causal specification we search for the answer to the question: what are those brand-related concepts that together can cause something that we call consumer-based brand equity.

Causal specification is supported by several empirical models. There are models in which brand equity is present as a dependent variable, and the causal relationships pointing at it coincide with the ones assumed by us (Yoo and Donthu 2000, Chau and Ho 2008); in the case of other models, causal specification was knowingly formulated but these models were estimated in PLS without disturbance (Martensen and Gronholdt 2004, Jensen and Klastrup 2008); in the Netemeyer et al. (2004) model, the causal direct effects directed from the dimensions of brand equity also support the causal specification.

In the conceptual development of the paper we took several viewpoints into consideration. Our consumer-based brand equity model has to be useful for the management; it is also an important, that brand equity dimensions be under the control of management. Our brand equity measure has to be suitable for measuring the strength lying in the name, independent from industry, that is, the dimensions measured have to be interpreted at a high abstraction level. It follows from the foregoing that measurement is appropriate to be applied to corporate brands, umbrella brands or product brands rather than on specific product models.

2 Methods used

Data collection started on 11th June 2011 and ended on 7th August 2011. As a result, the analysis was started with 421 observations. These data come from people living in 61 different settlements, 70% of which are in Harghita, 8.5% in Mureş, 8.4% in Covasna and 4.2% in Cluj counties, the remaining 8.9% are distributed among different counties.

Data measurement referred to three brands, Nokia, Samsung and iPhone. As best-quality data referred to Nokia, we based and tested our model onto them. In the course of analyzing the missing data we eliminated the observations with more than 30% missing data and, as our missing data did not qualify as MCAR[1], we imputed the 3.7% missing data with Direct ML estimation in Amos since this is the only procedure that is theoretically based as well. The imputed data were weighted according to gender and age, then, on the basis of the weighted data, we generated a correlation matrix, as weighted data are not supported by Amos.

[1] Missing Completely at Random

To build and test our model we use the structural equation modeling (SEM), which, despite its popularity, has not spread wide in marketing.

We distinguish causal models from composite (formative) as well as reflective models. In causal models the main concept is caused and determined by its indicators, in reflective models the latent variable determines its indicators. In composite models the measurement errors and the disturbance term is missing so in this case we cannot speak about a model with a latent variable since we presuppose we can fully explain the concept.

The disturbance term plays a central role in causal models (Diamantopoulos et al. 2008), since, similarly to the multivariate regression, we can measure the extent to which we were able to explain the concept.

In the bibliography, the formative[2] concept is widely used for denoting both causal and composite variables, which may lead to misunderstanding. Thus, following Bollen's (2011) proposal, we will use the concepts we have already introduced, and we are avoiding the use of the formative concept.

We illustrate the causal measurement model in a simplified way below:

[2] Kenneth Bollen drew attention to the author's incorrect use of concepts in personal correspondence.

$$\eta = \sum_{i=1}^{n} \gamma_i x_i + \zeta$$

Where x_i is the ith causal indicator, γ_i parameter measures the effect of ith indicator on η latent variable, while ζ is the disturbance term belonging to the latent variable. There is no correlation between the disturbance term and the indicators of the latent variable (cov (x_i, ζ)=0).

Analyses

In the search for the suitable causal specifications we analyzed the measurement model as a first step. In this process, we excluded several indicators from the analysis because of low weight, low significance or low explained variance. In the case of the six-factor CFA the fit indices (CFI 0.85, RMSEA 0.101) indicated an unacceptable fit.

After we eliminated some indicators, model fit got better (CFI 0.915, RMSEA 0.82).

The high correlation between Trust and Perceived quality (0.95) indicated that the two dimensions measured the same thing in fact, so we combined them. We qualified this result as a positive turn, since in building the research we were worried about the way the questions referring to quality would be answered. After an analysis of the previous problem we concluded that the respondents used their trust in quality as a proxy in order to answer the questions related to perceived quality.

The dimension of Awareness had to be excluded from our analyses because of low factor loading and non significant path estimates. It was an issue we had taken account of, since its independent fit had previously caused problems (Yoo and Donthu 2001), or others had to exclude it as well (Atilgan et al. 2009). We found the explanation of the phenomenon in the fact that, owing to the great awareness of brand names, the variables get so biased (extreme skew and kurtosis) that fit with the help of ML is not possible.

Two further constructs (Activity and Uniqueness) had to be excluded from the analyses as well. We incorporated Activity contrary to our conceptual requirements, as it is an important part of model building to clearly distinguish attitude variables from behavioral concepts. On the other hand, neither Activity nor Uniqueness could fit significantly into the model. The expectation formulated in the conceptual model was not met in the case of Uniqueness, and we had to give this construct up also because its interpretation at a high abstraction level is problematic. For example, the statement that the Nokia brand is unique is difficult to interpret (as it has both really unique and everyday models).

As a final result we accepted a two-dimensional MIMIC solution, in which the two dimensions of the consumer-based brand equity (Trust in quality and Advantage) determine the consumer-based brand equity, explaining more than 70% of it; and consumer-based brand equity has a positive effect on its two consequences, namely purchase intention and low search cost.

3 Results

Despite the fact that several empirical models and theoretical assumptions support the causal specification of consumer-based brand equity, we do not have knowledge of anyone having built a consciously specified causal model in covariance-based SEM. We think that we have managed to eliminate this gap, since our consumer-based brand equity model has excellent fit indices and it has a high explanatory power.

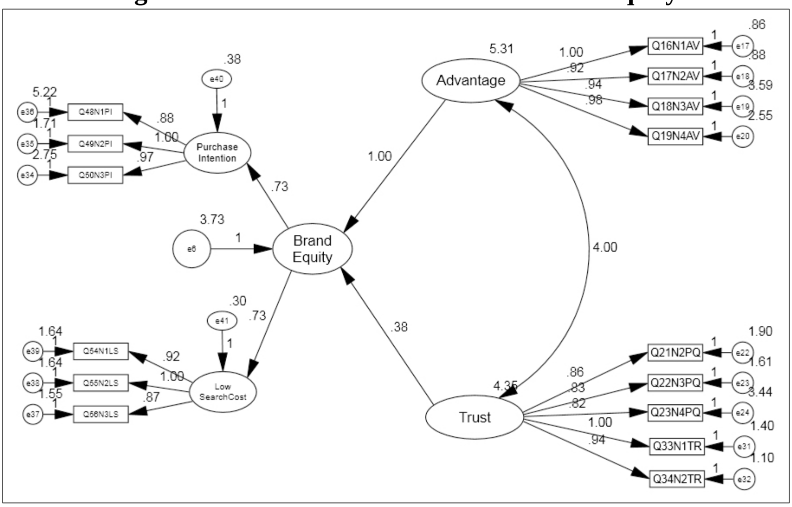
Thanks to the MIMIC specification, the sources of consumer-based brand equity have been clearly separated from its consequences.

Since literature knows little about testing causal models, there is great need for knowingly developing and using causal models where it is theoretically well-grounded (Diamantopoulos et al. 2008). In our research, we fitted a second-order factor model in covariance-based SEM (Amos 19), while the significant majority of second-order factor models described by Diamantopoulos et al. (2008) were estimated in PLS.

Keller’s conceptual model and the article by Lehman, Keller and Farley (2008) suggest that consumer-based brand equity is a multidimensional concept. In the Lehman, Keller and Farley (2008) article 27 concepts were measured, which were eventually reduced to six factors. The result of the present paper and other empirical results (Yoo and Donthu 1997, 2000, Chau and Ho 2008, Atilgan et al. 2009, Vazquez et al. 2002, Martensen and Gronholdt 2004) can be opposed to the accumulation of dimensions.

The model below illustrates the nonstandardized version of the MIMIC model accepted as the result of our research. The standardized version of parameters are presented when evaluating reliability.

Figure 2. The final MIMIC model of brand equity



On the basis of the results and the experience acquired in the course of assessment of model fit, we assume that consumer-based brand equity is not a multidimensional concept.

The two-dimensional structure of our model is also supported, among others, by the fact that it was able to explain 71% of the Brand equity dimension variance in the case of the

Nokia brand, that is, two dimensions were enough to explain the variance extracted of Brand Equity sufficiently.

The two-dimensional character also assures the managerial point of view, since it makes measurements simple and economical.

Advantage and Trust are exogenous variables in the model, therefore we do not estimate error at their level. However, we have to make it possible for them to correlate freely. In the case of Purchase Intention and Low Search Cost we estimate the disturbance term which corresponds to the variance unexplained by Brand Equity; whereas at the level of the indicators we estimate measurement errors that may originate from responding and other factors influencing the measurement.

Due to the disturbance term measured at the Brand equity level we can have a clear picture of the extent to which we explained the central concept with our causal indicators. This disturbance makes it possible to us to develop the model, since if we decrease it in the future, it will mean the improvement of the model, and, at the same time, it makes our model comparable to other models (provided any such model appears in the future).

Table 1: Fit indexes of the accepted model (F. 2)

χ^2	DF	CMIN/DF	GFI	IFI	TLI	CFI	RMSEA
216	85	2.54	0.909	0.969	0.961	0.968	0.07

The goodness of fit indicators of our model are excellent. The IFI, TLI and CFI exceed the conservative 0.95 boundary as well, the relative chi-square corresponds to the requirement made by Hair et al. (2009), the RMSEA value is good. We can also qualify the SRMR value (0.034) as outstanding.

The direct effects of the measured and latent variables are all significant. Since our data did not correspond to multivariate normality, we consider it important to check the validity of the model with the parametric bootstrap procedure which is independent from the multivariate normality assumption (Schumacker and Lomax 2010).

The significance values from the ML estimation correspond to the significance levels estimated by the parametric bootstrap procedure on a 1,200 sample with minimum difference. All these indicate that even in absence of multivariate normality we can accept our model estimated by ML, whose explanation lies in the fact that all our variables corresponded to the univariate normality. The values of the parameters estimated by the parametric bootstrap differ to a minimum extent from the values estimated by the ML, and this result also strengthens the validity of our model.

Another important measure of the goodness of fit is the standardized residuum matrix. Since we cannot interpret the value of the residuals, we analyze their standardized matrix, and if a value bigger than 2.58 is found, this indicates fit problems in the case of the given variables. In our case, the low values of the residuum matrix prove the excellent fit of our model.

Reliability - Validity

In order not to accept the model merely on the basis of fit and significance levels, in the following we will analyze the convergent and discriminant validity.

The four indicators introduced in the table below help in assessing the convergent validity.

Table 2: Testing the convergent validity of the accepted model

	CR	AVE	SRW	SMC
Advantage	**0.91**	**0.73**		
Q16N1AV			0.93	0.86
Q17N2AV			0.91	0.82
Q18N3AV			0.75	0.56
Q19N4AV			0.82	0.67
Trust	**0.90**	**0.65**		
Q21N2TR			0.79	0.63
Q22N3TR			0.81	0.66
Q23N4TR			0.68	0.46
Q33N1TR			0.87	0.76
Q34N2TR			0.88	0.78
Purchase Intention	**0.86**	**0.67**		
Q48N1PI			0.71	0.51
Q49N2PI			0.9	0.81
Q50N3PI			0.84	0.71
Low Search Cost	**0.92**	**0.79**		
Q54N1LS			0.89	0.79
Q55N2LS			0.9	0.81
Q56N3LS			0.88	0.78

The standardized regression weights (SRW) and the variance extracted (SMC) measure the reliability and validity of the measured variables, whereas the composite reliability (CR) and average variance extracted (AVE) measure the reliability and validity of the latent variables.

The standardized values and the variance extracted (SMC) can simply be read from the illustrated model, while the CR and AVE values had to be calculated on the basis of the formulas given by Hair et al. (2009).

The variance extracted of the measured variables, except for K23, exceed the 0.5 value and the standardized coefficients all exceed the 0.7 value. In the case of K23, as it is only slightly below the cutoff value, we retain it in our model.

We could assure the reliability of the four latent variables. In all the four cases, the CR exceeds 0.7 and similarly, the AVE exceeds 0.5, so we assume that our variables correctly map the contents of the dimensions.

In the analysis of the discriminant validity we have two possibilities, both of which we are going to look into.

In the first case we build up two CFA models. In the first model, the latent variables of the model are included, while in the second one we assume that every indicator belongs to a single latent variable. Inasmuch the fit of the solution with more latent variables can be assessed as better than the solution with one latent variable, our model fits the original covariance matrix better than the model with one latent variable.

The fit indicators of the one-factor solution are very bad, not even one indicator referring to at least acceptable fit. In such circumstances we can assert that the model fits the original covariance matrix much better than with a single latent variable. Therefore we assert that the latent variables of the model adequately discriminate.

A stricter, more conservative approach of analyzing discriminant validity supposes the comparison between the average variance extracted of two latent variables and the squared correlation existing between them.

Table 3: Discriminant validity analysis according to Hair et al. (2009)

1	2	$Corr.^2$	AVE1	AVE2	AVE1 - $Corr.^2$	AVE2 - $Corr.^2$
TR	AV	0.68	0.65	0.73	-0.03	0.05
TR	**PI**	0.53	0.65	0.86	0.12	0.33
TR	**LS**	0.56	0.65	0.79	0.09	0.23
AV	**LS**	0.65	0.73	0.86	0.08	0.21
AV	**LS**	0.65	0.73	0.79	0.08	0.14
PI	**LS**	0.9	0.86	0.79	-0.04	-0.11

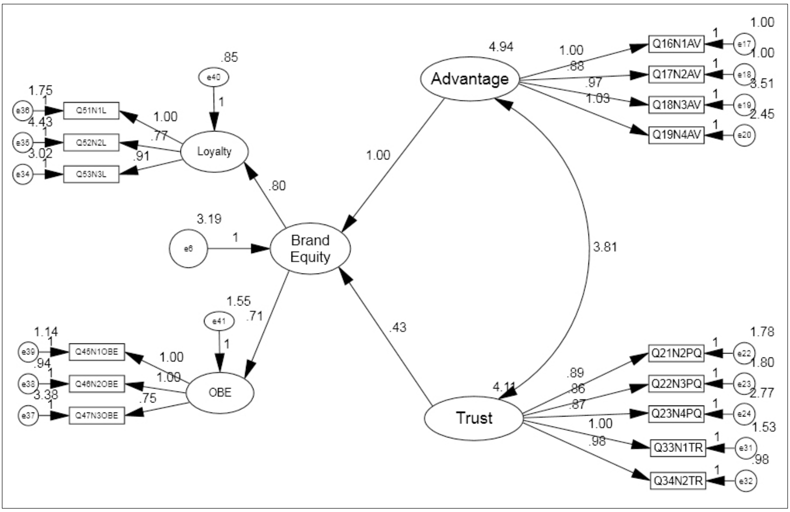
In order to be able to prove the discriminant validity, the values in the last two columns of the above table have to be positive. We can find three values with negative sign here. The first (-0.03) indicates lack of discriminant validity between the latent variables Trust and Advantage, that is, Trust shares more variance with Advantage than the variance explained by its own indicators. It has its explanation in the fact that we kept the K23 variable among the Trust indicators whose variance extracted is consequently lower than 0.5. If we eliminate it from the indicators, the AVE value of Trust increases to 0.70, while the correlation between Trust and Advantage does not change, and thus we can assure the discriminant validity of the Brand equity dimensions. Under the present circumstances we do not intend to eliminate K23 since we assume that it is an important content element of the concept. On the other hand, the CFA test has convinced us that the factors built into the model can adequately discriminate.

One possible solution to the problem of discriminant validity between the consequences is to include the consequences in the model as composite variable. Thus the correlation between consequences decreases to 0.77, and the improvement in the fit indicators show the stability and good fit of the model.

In order to analyze the external validity of the dimensions of Brand equity, we tested them with four different concepts: Appreciation, Relevance, Market leader role and Variety. In the case of all the four variables, the degree of correlation corresponded to the theoretical assumptions.

In order to analyze the external validity of the consumer-based brand equity model and to test the stability of the model, we tested it with two other consequences (Loyalty, Overall brand equity) as well.

Figure 3: Testing the model with other consequences



The stability of the model is spectacularly proved by the fact that it also fits well with other consequences, and besides the excellent fitting indicators the SMRM value (0.03) also shows a good fit.

Table 4: Fit indexes. Other consequences (F. 3)

χ^2	DF	CMIN/DF	GFI	IFI	TLI	CFI	RMSEA
244	88	2.87	0.908	0.964	0.955	0.963	0.075

In order to further check the stability of the model, we tested it in the case of two other brands, Samsung and iPhone as well.

In the case of Samsung, the fit is almost as good as in the case of Nokia, CFI (0.942) shows excellent fit, the RMSEA value is on the borderline (0.1), while the 0.05 value of the SRMR also shows a good fit.

In the case of the iPhone, the 0.916 value of the CFI indicates a good fit, but the RMSEA is weaker (0.12), which is counterbalanced by the SRMR here as well as its 0.005 value shows a good fit. We could count on a less well fitting model in the case of the iPhone, since the awareness of this brand is very low in comparison to the others. Despite the fact that meanwhile devising the model we assumed that brand equity can also be measured among non-users, on the basis of the respondents' answers and the experiences of fitting we have to formulate that a certain degree of awareness is necessary for respondents to give relevant answers.

Accepting and refusing the hypotheses

Table 5: Status of Hypotheses

Hypotheses	State
H1-1: We are capable to correctly assess the structural equation model containing the latent causal consumer-based brand equity and the two latent reflective consequence.	Accepted
H1-2: *Awareness positively and significantly influences brand equity.*	*Refused*
H1-3: *Uniqueness positively and significantly influences brand equity.*	*Refused*
H1-4: *Advantage positively and significantly influences brand equity.*	Accepted
H1-5: P*erceived quality positively and significantly influences brand equity.*	Accepted
H1-6: *Activity positively and significantly influences brand equity.*	*Refused*
H1-7: *Trust positively and significantly influences brand equity.*	Accepted
H1-8: *Consumer-based brand equity positively and significantly influences purchase intention.*	Accepted
H1-9: *Consumer-based brand equity positively and significantly influences low search cost.*	Accepted
H2-1a: *Consumer-based brand equity positively and significantly influences overall brand equity.*	Accepted
H2-1b: *Consumer-based brand equity positively and significantly influences loyalty.*	Accepted
H2-2a: *Esteem positively and significantly correlates with consumer-based brand equity dimensions.*	Accepted
H2-2b: *Relevance positively and significantly correlates with consumer-based brand equity dimensions.*	Accepted
H2-2c: *Market leadership positively and significantly correlates with consumer-based brand equity dimensions.*	Accepted
H2-2d: *Variety positively and significantly correlates with consumer-based brand equity dimensions.*	Accepted

All in all, out of the 15 hypotheses we were able to accept 12 and we refused 3.

4 Main results in headings

We built the consumer-based brand equity as a latent construct in our model since bibliography constantly refers to it as a multidimensional concept, but it has been operationalized as a latent notion by only a few (Atilgan et al. 2009).

With the help of the second-order MIMIC model we succeeded in clearly separating the sources and the consequences of the consumer-based brand equity.

We have succeeded in estimating consumer-based brand equity consciously measured with causal indicators with covariance-based estimator.

Few articles report on second-order latent variable models fitted in covariance-based environment, the majority using PLS for this purpose; undertaking the difficulties, we have managed to fit our second-order latent variable model in Amos.

Owing to the causal specification we have found a both theoretically and practically useful result. According to our result, consumer-based brand equity is not a multidimensional concept as suggested by Keller (1993) or Lehman et al. (2008), but it is a two-dimensional construct. This result is confirmed by other brand equity models as well. In Netemeyer et al.'s model (2004) the two dimensions of brand equity causes the willingness to pay price premium. In the Yoo and Donthu (2000) model, if we correctly interpret loyalty as a consequence, we also get two dimensions.

The two-dimensional solution is an intuitive model easy to interpret and easy to measure, which thus may be a much more attractive means for the management as well. We have to add that these two dimensions can explain as many variances in the consumer-based brand equity as the six dimensions of our conceptual model.

We consider that we have managed to highlight another essential problem with the causal specification of consumer-based brand equity: When measuring brand equity we ask questions related to the brand but the power hidden in the brand name (which we intend to measure) may, as a consequence of the halo effect and common method, share variances that depend on the brand rather than its content.

All these might have an important consequence, namely, when we use relative specification, we are able to fit several valid notions onto our model, as they will share variance due to the halo effect and common method. In a causal model we have to allow the exogenous variables to correlate, thus this problem will be highlighted in the course of fitting; in the reflective specification, however, dimensions are endogenous variables and there is no need for their free correlation and thus several consumer-based brand equity models can be built without us knowing which are the dimensions capable of determining, causing something together.

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