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# **Inferential evaluations of sustainability attributes: Exploring how consumers imply product information**

Verena Gruber, Bodo B. Schlegelmilch, Michael J. Houston

## **Author information:**

Verena Gruber is Research Associate at the Institute for International Marketing Management, WU Vienna, Welthandelsplatz 1, 1020 Vienna, Austria ([verena.gruber@wu.ac.at](mailto:verena.gruber@wu.ac.at)).

Bodo B. Schlegelmilch is Chair of the Institute for International Marketing Management and Dean of Executive Education, WU Vienna, Welthandelsplatz 1, 1020 Vienna, Austria ([bodo.schlegelmilch@wu.ac.at](mailto:bodo.schlegelmilch@wu.ac.at)).

Michael J. Houston is the Ecolab-Pierson Grieve Chair in International Marketing at Carlson School of Management, University of Minnesota, 321 19<sup>th</sup> Ave. S., Minneapolis, MN 55455, United States ([mhouston@umn.edu](mailto:mhouston@umn.edu)).

**Abstract:**

**Consumers are often confronted with incomplete product information. In such instances, they can eliminate the product from further consideration due to higher associated uncertainty or ask for more information. Alternatively, they can apply subjective theories about covariation to infer the value of missing attributes. This paper investigates the latter option in the context of sustainability and provides an in-depth exploration of consumers' inference formations. Drawing from rich qualitative data, it offers a conceptualization of the underlying relationships consumers use to infer product sustainability based on other product attributes. The study further assesses whether these findings can be captured in a quantifiable way. To this end, inferred sustainability is conceptualized as a formative second-order construct, thereby depicting the influence of inference-triggering product attributes.**

**Keywords:**

Sustainability, Inter-Attribute Inferences, Consumer Behavior

In business, issues of sustainability run throughout the entire supply chain, including the points of purchase and consumption. Marketplace decisions by consumers represent a key contributor to the achievement of sustainability: “Every time someone makes a decision about whether (or not) to purchase a product or service there is the potential for that decision to contribute to a more or less sustainable pattern of consumption. Each purchase has ethical, resource, waste, and community implications” (McDonald et al., 2006, p.516). However, sustainable products, defined as “products with positive social and/or environmental attributes” (Luchs, Naylor, Irwin, & Raghunathan, 2010, p. 18), represent only a small proportion of overall demand (UNEP, 2005a). Retail food products and cosmetics have been reported to be forerunners in the provision of sustainable products, whereas in other product categories, market shares for sustainable brands do not exceed 4% (UNEP, 2005b). This might stem from the fact that the sustainability of products is hardly discernible for consumers as it potentially refers to wide array of aspects ranging from animal by-products to working conditions in factories or child labor (Auger et al., 2008). Only in rare cases are consumers provided with a specific label such as “Fair Trade”; more often they are confronted with incomplete information concerning the sustainability of products. Prior research has shown that if no such information is available, consumers are unlikely to specifically ask for the product’s sustainability (Ehrich & Irwin, 2005). Nevertheless, they might form an opinion and make an educated guess concerning whether a product is sustainable or not. In such cases, consumers infer beyond given properties to assess the value of unobservable attributes (Kardes, Posavac, & Cronley, 2004). These inferences are subjective evaluations of attributes on which consumers do not have any explicit information and are based on other available product attributes. In an era of increasing public attention towards sustainability and sustainable consumption, it is likely that these concepts are also mirrored in consumers’ inference formation processes.

Consider a market interaction in which sellers have perfect knowledge about the sustainability of their products, e.g. whether they were being produced under fair working conditions, minimal use of resources, or involve only organic ingredients. Consumers, on the other hand, are not fully informed about these aspects but may want to consider them due to the societal desirability of acting in a sustainable and responsible way. In such situations, rather than specifically asking for more information on a product's sustainability (Ehrich & Irwin, 2005), consumers may apply cognitive schemata to infer the missing information regarding sustainability. This process of inference formation about sustainability attributes based on existing attribute information is the focus of this paper.

The aim of this research is to explore consumers' associations concerning a product's sustainability in the absence of specific information provided on sustainability. Furthermore it investigates whether, in consumers' minds, sustainability attributes are connected to and contingent on other product attributes. Previous literature has addressed the importance of inferences in the formation of a company's overall ethical perception and image (Brunk, 2010) but the possibility that consumers draw inter-attribute inferences to assess the sustainability of a product has not yet been explored. A sound knowledge of inter-attribute inferences is important for companies in order to understand how their products are evaluated and on which attributes they should position them. Accordingly, this research seeks to offer several contributions: It extends prior literature on consumers' decision making with regard to sustainability by explicitly focusing on situations in which a product's sustainability is not discernible for consumers. In this context, the study explores whether consumers still think of and consider social and environmental aspects and, if so, what strategy they utilize to derive this assessment. Furthermore, the research adopts both a qualitative methodology to explore and shed light on consumers' cognitive strategies when evaluating product attribute bundles, as well as a quantitative approach which aims to make these relationships tangible and

measurable. Against this background, this research broadens the current understanding of sustainability in a consumption context and draws attention to the neglected aspects of consumers' sustainability inference formation in the case of incomplete product information.

## **THEORETICAL FOUNDATIONS**

Sustainability is an important topic both for academia (Kotler, 2011) and industry practice (Cone, 2011) in both industrialized and emerging countries (Chan, 2001; Thøgersen, Jørgensen, & Sandager, 2012). Concern regarding responsible and sustainable corporate practices has exponentially grown among consumers (Freestone & McGoldrick, 2008), who regularly take these issues into account when evaluating companies and their products (Cone, 2010; Taneja, Taneja, & Gupta, 2011). Furthermore, consumers increasingly opt for socially and environmentally responsible brand attributes rather than focusing on traditional functional or emotional ones (Kotler, 2011). Consumers' decision making with regards to sustainability has received increasing attention and it has been found that price and quality remain the predominant purchase criteria. Sustainability attributes are valued in isolation but consumers are not willing to trade-off quality or pay a significant price premium (Auger et al., 2003; 2008). What these studies have in common is that they presuppose the discernibility of sustainability attributes for consumers. However, many companies have only recently started to explicitly integrate sustainability attributes into their products' positioning, and hence their product descriptions, while others do not include them at all. This raises the question how consumers evaluate a product's sustainability without specific information. Ehrich and Irwin (2005) found that, rather than asking for more information, most consumers choose the willful ignorance of such attributes. In contrast to the eschewal of information on sustainability

attributes, there may be an additional strategy for consumers: to use existing information concerning other product attributes to infer the sustainability of the respective offering.

Consumers' inference formation is an important component to understanding their decision making processes when confronted with incomplete product information (Lynch & Srull, 1982). In order to minimize the risk and uncertainty associated with product choices based on incomplete attribute information, consumers draw inferences about these missing attributes. Broadly, inference formation refers to the construction of meaning beyond explicitly stated information. It describes the application of existing subjective knowledge about causalities to generate if-then linkages (Kardes, et al., 2004). The objective is to make a prediction about an unobservable attribute (Broniarczyk & Alba, 1994b) and the mechanism consumers employ is correlating the missing attribute with an observable one. Put differently, consumers have formed underlying theories concerning covariations and apply them when evaluating products (Baumgartner, 1995). The specific inference process that occurs in a certain situation depends on several factors, such as whether cues that trigger the process are situationally available or memory-based (Lynch & Srull, 1982). Memory-based inferences are easier to retrieve compared to identifying and judging stimulus-based information (Kardes, et al., 2004).

Another aspect of the process involves the source of inference formations. Correlation-based inferences can be formed either through inferences from an existing to an absent attribute within the same product (Ford & Smith, 1987), or from information about existing attributes of other products (Ross & Creyer, 1992). Accordingly, Ford and Smith (1987) distinguish between another-brand and a same-brand strategy, depending on the used source. Even though there are mixed results concerning the preference for either one of these strategies depending on the context, stronger support is given for consumers' usage of same-brand inference processes over other-brand inferences (Russo & Doshier, 1983). Thus,

consumers are likely to draw inferences from one product attribute to another before comparing the focal product with other product alternatives. These correlations are based on an individual's intuitions about the world and certain inherent relationships and can serve as an important source of product beliefs. In many cases, these inferences substitute for the search for information or even direct product experience (Broniarczyk & Alba, 1994b). Within this research, the focus lies on inductive, memory-based inferences or, more specifically, on how consumers use specific product attributes to draw conclusions about other attributes, such as sustainability.

### **QUALITATIVE EXPLORATION**

It is not possible to investigate consumers' inferences about sustainability by drawing their attention to the attributes in question. Therefore, a qualitative approach is necessary to investigate whether consumers articulate concerns which they are not made aware of by means of the research design. The overall objective of this qualitative study is to gain an in-depth understanding of the meanings ascribed by consumers to product attributes. Such evaluations are characterized by a subjective and complex cognitive process. Therefore, qualitative research was identified as appropriate approach to knowledge generation (Gummesson, 2005). More specifically, an exploratory approach is employed to develop a grounded understanding of consumers' internalized processing structures (Glaser & Strauss, 1967), which should ultimately allow gauging consumers' inference formations about sustainability. Further guidance was provided by the long interview of McCracken (1988) and the phenomenological approach (Thompson, Locander, & Pollio, 1989), which helped to ensure a preferably nondirective interview technique and stimulate deliberate and associative statements. Through broad and undirected in-depth interviews concerning general



consumption criteria, consumers' thoughts about sustainability emerged as well as the mental process leading to their sustainability evaluations.

Interviewees were purposively chosen to maximize structural variation (Glaser & Strauss, 1967) and recruited via a mixture of convenience and snowball sampling. In total, 23 in-depth interviews were conducted in participants' homes which ranged from 45 to 120 minutes in length. Interviews covered the same topics, including general grand tour questions referring to consumers' shopping behavior, decision making criteria, and evaluation of different products. The data collection phase was concluded at the point of theoretical saturation (Glaser & Strauss, 1967) and only repetitive emerging patterns.

### **Analysis and Interpretation**

Interviews were conducted and transcribed partly by the researchers in order to gain more contextual knowledge and insight into the topic, as well as partly by externals in order to have a certain sequential distance to the text and its analysis. Interviews were coded according to inference processes and trigger attributes. Several important inference processes could be identified based on the analysis of all transcripts. For categorization purposes, the findings are structured according to different trigger attributes.

### **Emerging Patterns**

As theorized, interviewees reveal a subjective model or understanding of socioeconomic reality which denotes that certain features or attributes of a product are inherently connected to each other. Through this inference process, they construct the overall value of the product.

This behavioral structure does not necessarily reflect a true causal model but only depicts the interviewees' views of reality (Miles, 1983). Consumers have formed certain theories about how things are related in the world and "the particular subject of knowledge they happen to apply can bias their interpretation of an experience and their perception of its causes and effects" (Wyer, 2004, p. 202). Once such conceptualizations are established, they are very likely applied frequently and to different contexts. The following discussion is structured according to those product attributes which are often used by interviewees for inference formations about sustainability.

### *Quality*

Sustainability is a very ambiguous attribute as it refers to an elusive concept that in consumers' minds is strongly connected to quality perceptions. Accordingly, this first uncovered relationship refers to inferences about sustainability based on a product's perceived quality:

I only buy organic eggs, the ones where chicken can run around freely and get only feed with herbs and grasses. On the packaging it said that it's from one farmer close to the supermarket where I bought it. I think it is important to support local farmers and then also the taste is a lot better. And that's quality for me. So for me, if it is a high quality product it should also be organic, I mean organic producers just care more about the whole production process and that's what you realize then in the quality of the products. It is not about how they look like, especially the vegetables, if they are perfectly round or maybe shriveled, it is about whether they come from farmers rather than greenhouses (female, 29)

### *Price*

Perceived price is clearly a very important proxy for assessing a product's performance on several other attributes. For the interviewees, it is also a highly salient cue to entice inference formations about sustainability attributes. When the price is high, consumers automatically

assume that the production process takes place in a socially and environmentally responsible manner:

When buying products, there are several things I can assess: I know something about price and quality, but I do not know how it was produced. I can more or less exclude that it was made involving child labor because that would be extremely outrageous if something like that is sold for a high price (...) My experience showed me that these... cheap products made in mass production do not look like this or are presented in such a way (female, 52).

### *Country of Origin*

A product's origin in a developing country can trigger inferences about unsustainability, while developed countries convey a notion of socially and environmentally responsible practices. While consumers take these perceived correlations into account, they do not seem as pronounced as in the case of perceived price and quality. Rather than dismissing a product alternative with a perceived unfavorable country-of-origin, consumers are willing to compromise. Nevertheless, consumers use the perceived country image to infer a product's sustainability:

If I see where certain products come from, I know immediately that they were produced as cheaply as possible. What comes to my mind is that these people do not earn anything, they have to do hard work for a minimum wage, and then companies export these products to the Western hemisphere just so that we can get our clothes for as little as possible. This does not mean that I am not happy if I can make a good deal when shopping. But I am feeling bad about it, when I think of what it entails (female, 62).

### *Visual Appeal*

Another attribute used by consumers to form inferences about sustainability is the design of a product. However, the relationship is very ambiguous and differs from consumer to consumer. When evaluating sustainability based on good design, some consumers attribute a positive

relationship. On the other hand, there are some consumers who are still prejudiced concerning unappealing aesthetics of sustainable products. Nevertheless, the visual appeal of a product does entice inference formations about sustainability:

I do think that good design means a higher price. And I am of the opinion that more expensively designed pieces are usually made in high-wage countries to achieve an exceptional design. I believe that I associate a low price always with mass production and a stylish design is not mass production for me. They need good materials and skilled people to do such things and not child labor (male, 54)

One of these companies where I like to shop is very sustainable. It started 20 years ago and back then they were producing potato sacks, I mean their clothes really looked like potato sacks. Nowadays they really have trendy clothes as well and they are really only made with organic ingredients, so not just organic cotton and then chemical dyestuff but also the coloring is organic (female, 34).

### **Leading and Lagging Attributes**

In the context of inter-attribute inferences, it is important to further differentiate attributes according to their likelihood to elicit inference processes. Some attributes trigger an unmediated formation of inferences about sustainability and, therefore, reflect the typical inter-attribute correlation, i.e. the “if x then y” linkage. Such attributes are labeled leading attributes. For example, price induces consumers to immediately infer a product’s sustainability. The same applies to quality. High quality products are assumed to be produced in a sustainable and responsible way. Other attributes are not that important in inducing inferences about sustainability. Typical lagging attributes are country-of-origin and visual appeal, whose abilities to elicit inferences are restricted and not very pronounced. As lagging attributes entail high levels of uncertainty, consumers tend to assess them in combination with other attributes.

## **Conceptualization of the Construct**

After gaining an understanding concerning consumers' evaluations of product sustainability without respective information, the question arises how to make these tangible. Consequently, the next step of this study is to assess whether it is possible to conceptualize consumers' inference formations in a measurable way. Inferences have so far been investigated primarily via the implicit association test (IAT; Greenwald, McGhee & Schwartz, 1998) or related experimental designs. These have been used, for example, to demonstrate consumers' implicit associations concerning the tastiness of unhealthy food (Raghunathan, Naylor & Hoyer, 2006) or their assumptions of ethicality being connected to gentleness (Luchs et al., 2010). Rather than looking at one specific association, a structural model is set up to portray a more holistic view of different product attributes and their influence on inferred sustainability. Based on the rich qualitative insights and understanding, the construct domain of inferred sustainability is defined. By specifying the content domain, the scope which the latent variable is intended to capture, is set out (Diamantopoulos & Winklhofer, 2001). Defining the conceptual domain of the construct is of utmost importance and requires "the identification of what the construct is intended to conceptually represent" (MacKenzie, Podsakoff, & Podsakoff, 2011, p. 298). Given this particular methodological approach, the interviews were needed to help identify relevant attributes to be included within the model. Against the background of the qualitative findings, it is therefore necessary to assess prior conceptualizations of the four attributes used by consumers to form inferences about sustainability.

Perceived quality is a very elusive concept and not directly observable (Zeithaml, 1988). It refers to a more abstract construct than the other trigger attributes. Nevertheless, consumers explicitly mention their quality judgments when forming inferences about a product's sustainability. Price was found to provide consumers with important cues about the value of a product (Yoo, Donthu, & Lee, 2000), such as when price is lowered the value of a

product increases (Dodds, Monroe, & Grewal, 1991). However, in terms of sustainability, there is a reverse relationship: when a price is high, consumers associate higher product sustainability. Another product attribute that has been examined in the context of inference formation is country-of-origin, which influences the interpretation of other product attributes (Brunk, 2010; Hong & Wyer, 1989, 1990). Perceived country image is a construct proposed by Magnusson et al. (2011) and specifically emphasizes consumers' perceptions of a country-of-origin. Also, the design of a product, as reflected in consumers' perceptions of its esthetics (including material, color, size etc.) (Bloch, 1995; Lee, Ha, & Widdows, 2011), has an influence on consumers' overall evaluation of a product. Within the qualitative study, it also became apparent that both visual appeal and perceived country image do lead consumers to form inferences about product sustainability.

Consumers infer sustainability based on perceived price, perceived quality, perceived country image and visual appeal of a product. Upon encountering these product attributes they are enticed to form stimuli-based inferences about sustainability. Accordingly, inferred sustainability conceptually represents a composite of perceived country image, perceived price, perceived quality and visual appeal. This composite reflects consumers' inferred assessment of product sustainability. In the mind of consumers, each of these stimuli not only represents a facet of product sustainability but is also a separate construct.

The focal construct, inferred sustainability, is therefore defined as *consumers' perceptions about a product's sustainability based on direct inferences from the high-diagnostic attributes of perceived price, perceived quality, visual appeal and perceived country-of-origin image*. These attributes are a set of distinct causes, each of them depicting a specific aspect of the inferred sustainability (IS) construct domain (Diamantopoulos, Riefler, & Roth, 2008). The specification of these four indicators is considered to be sufficiently inclusive as other potential attributes result in indirect inference processes via perceived price, perceived

quality, visual appeal and perceived country image. The proposed construct domain of IS also suggests that companies should specifically take these four proxy attributes and their respective influence on sustainability perceptions into account when positioning a product.

In terms of dimensionality, inferred sustainability is proposed to be a second-order construct with four first-order dimensions, which are the attributes identified to trigger direct inference processes. These constructs therefore combine in a compensatory manner, meaning that their effects are independent of each other and a change in one of them is a sufficient but not necessary characteristic to change the meaning of inferred sustainability (MacKenzie et al., 2011). The composite depends on the values of the forming constructs in as far as changing one of them will entice consumers to form a different inference about the product's sustainability. All of the constructs are added together to form the second-order dimension. Thus, the conceptualization of IS as a composition of its parts requires a formative operationalization. The identified direct attributes are reflectively modeled first-order constructs and inferred sustainability is modeled formatively, as the first order dimensions are used to infer sustainability. According to the classification of Jarvis et al. (2003), the present model is a Type II, i.e. a reflective first-order and formative second-order model. Referring to the theoretical decision rules set out by Jarvis et al. (2003), the second-order construct is modeled formatively as a) the direction of causality is from the three first-order dimensions to IS, b) a change in the first-order dimensions causes a change in the IS construct rather than vice versa and c) first-order dimensions are not interchangeable and employ different themes.

## QUANTITATIVE STUDY

### Design & Sample

Based on the insights from the qualitative interviews, a survey is designed such that respondents go through a hypothetical purchase situation and evaluate different aspects of a product based on limited information. A pullover as a well-known representative of a hedonic product category serves as the focal purchase object. Hedonic consumption experiences are more likely to entice inference formations as respondents are more emotional in the purchase situation and therefore activate a larger network of associations. Inferences are especially likely to arise in regularly purchased product categories rather than in unfamiliar ones where consumers will assess product attributes in more detail (Dodds et al., 1991). On the other hand, products which are bought on a daily basis are most often chosen out of habit. Furthermore, as visual appeal and country-of origin-image have been identified as potential trigger attributes, the chosen product specifically takes these aspects into account.

Respondents were asked to answer questions referring to their decision-making in purchase situations and their evaluation of various product attributes. More specifically, they had to imagine shopping for a pullover and finding one in their favorite color, the right size, and made out of 100% cotton. After having first answered questions concerning their perceptions of the product, respondents were sequentially offered additional information about the pullover's price (medium priced) and country-of-origin (European country). Eventually they were asked about aspects relating to product sustainability.

The measurement of all first-order latent constructs entails the use of previously published multi-item scales. More specifically, perceived price and perceived quality items are based on Yoo et al. (2000), perceived country image items on Klein et al. (1998) and Magnusson et al. (2011), and visual appeal items on Lee et al. (2011). Additionally, three



items were generated to measure inferred sustainability directly (“X seems to be a sustainable product”, “The likelihood that social and environmental aspects have been considered in the production of X is very high”, “In terms of sustainability, X is very favorable”) in order to calculate a multiple-indicators, multiple-causes (MIMIC) model. All of the items were measured on a five-point Likert-type scale anchored at “strongly disagree” to “strongly agree”. Before the actual research was conducted, the items were assessed by a pool of 25 consumers. They were asked to evaluate all items for their clarity and conciseness as well as to pay specific attention to wording, format and layout. This pretest resulted in minor adjustments concerning the clarification of instructions and the wording of individual questions.

After proposing the theoretical model, the data were screened. The questionnaire was sent out via email to university employees and students as well as other contacts. The total of 823 completed questionnaires was first cleared of outliers, resulting in a final sample of 810 respondents. Additionally, three respondents stated to have never bought a pullover before when being asked about prior purchase experience and were therefore excluded from the sample. This resulted in a final sample of 807 respondents, consisting of 62.2% females and 37.8% males. The age ranged from 18 to 67 years with a mean of 26 years. As recommended, 30% of all respondents were randomly assigned to a holdout sample (Hair, Ringle, & Sarstedt, 2011), which left the analysis sample with 564 respondents.

Since this research study is highly exploratory and the objective is to predict sustainability inferences, the appropriate method for the calculations is PLS-SEM (Hair et al. 2011) in SmartPLS (Ringle et al. 2005).

## Measurement

The conceptualization of IS as a composition of other attributes' influences requires a formative operationalization. The second-order latent variable is set up through the repeated use of all indicator variables of the first-order constructs. IS is therefore specified as a latent variable representing all the manifest variables of the first-order latent variables (Wetzels et al. 2009). First-order latent variables are related to their manifest variables using mode A (reflective) in their outer model. The second-order construct IS is consequently related to the first-order constructs using Mode B (formative) in the inner model. Additionally, the MIMIC model with three reflective indicator items is set up to compare the findings of the repeated indicator use. The MIMIC model should provide further assessment of the appropriateness of the formative first-order constructs.

First, the psychometric properties of all items are examined in order to assess how well they relate to the latent constructs. Table 1 presents construct-to-item loadings of the reflective measures (demonstrating standardized loadings of above 0.78) as well as measures to gauge the internal consistency of the first-order constructs.

\*\*\* Insert Table 1 about here \*\*\*

To assess internal consistency, the composite reliability (CR) was calculated which consistently exceeds 0.89, as well as the Cronbach's  $\alpha$  values (above 0.8 in all constructs), fulfilling the reliability benchmark proposed by Nunnally (1978). Moreover, there is support for discriminant validity as the average variance extracted (AVE) exceeds 0.74, as well as the squared correlations of the latent variables (LV) (Fornell-Larcker criterion) as depicted in Table 2.

\*\*\* Insert Table 2 about here \*\*\*

Additional support for discriminant validity comes through the examination of indicators' cross-loadings, which are highest on their designated constructs (see Table 3)

\*\*\* Insert Table 3 about here \*\*\*

Figure 1 presents the measurement and structural model, as well as the three reflective IS indicators for the MIMIC model. Furthermore, it displays the path coefficients of the respective proxy attributes, which show that perceived price and perceived quality have the strongest impact on inferred sustainability, followed by perceived country image and visual appeal. This is in line with the qualitative findings indicating a difference between leading and lagging attributes.

\*\*\* Insert Figure 1 about here \*\*\*

### **Assessment of the Structural Model**

A bootstrapping procedure (564 cases and 5000 samples, individual changes) was run to obtain the standard errors of the estimates and assess the significance of path coefficients, which are depicted in Table 4.

\*\*\* Insert Table 4 about here \*\*\*

Furthermore, the structural model is assessed through a blindfolding procedure with an omission distance of 7, meaning that every 7<sup>th</sup> data point is omitted and the resulting parameter estimates are then used to predict the omitted ones. The blindfolding procedure issues the Stone-Geisser's Q, postulating the model's ability to correctly predict the indicators

of each endogenous latent construct, which is consistently above 0.31, thereby providing support for the predictive relevance of the model.

In order to assess the validity of the second-order formative construct of inferred sustainability, the MIMIC model is estimated (Diamantopoulos & Winklhofer, 2001). To this end, the three reflective indicator variables are incorporated to measure IS and the model is evaluated by means of the holdout sample. The psychometric properties of the indicator variables as well as the latent constructs are similarly good as the results obtained by repeatedly using the first-order indicators. Thus, the reflective indicators provide a good benchmark for evaluating the formative construct's external validity (see Table 5). Furthermore, this analysis resulted in an  $R^2$  value of 0.33 for the IS construct.

\*\*\* Insert Table 5 about here \*\*\*

Modeling inferred sustainability as second-order formative constructs renders the interpretation of this construct as a superfluous effect, as all variance has been explained by the first-order constructs (Wetzels, et al., 2009). However, the intention is to examine the respective contribution of each one of the first-order constructs which can be assessed well by looking at the total effects. Furthermore, one does not need to assume that inferred sustainability is a real entity because “constructs with formative indicators are seen as theoretical constructions (rather than real entities) that summarize (and therefore depend upon) people's responses to the items used to represent the construct” (MacKenzie, et al., 2011, p. 303). Inferred sustainability can be thought of as a humanistic aspect of products, as proposed by Holbrook and Corfman (1985): It describes consumers' subjective and highly relativistic response to certain product features. The formative conceptualization of IS provides interesting insights into the influence of various product attributes to form inferences about sustainability.

## DISCUSSION

Consumers are often forced to make decisions among options with incomplete attribute information. In these situations, they may either opt for not choosing any alternative to circumvent the attached uncertainty (Dhar, 1997; Greenleaf & Lehmann, 1995) or ignore the attribute in question (Ehrich & Irwin, 2005). However, consumers can also opt to form inferences about missing attributes. Inferences about missing product attributes are based on individuals' intuitions about the world and certain inherent correlations (Broniarczyk & Alba, 1994a; Raghunathan, Naylor, & Hoyer, 2006; Sujan & Dekleva, 1987). Thus, understanding consumers' inference-formation processes is crucial as it influences both product evaluations and choice (Huber & McCann, 1982; Yates, Jagacinski, & Faber, 1978). To this end, the purpose of this research has been to explore 1) whether consumers evaluate product sustainability in the absence of information on this issue, and 2) what these inference formations look like.

To the best knowledge of the authors, the current study provides the first empirical investigation of consumers' inferences about sustainability attributes. The qualitative study offers in-depth insights into consumers' cognitive processes and how sustainability is reflected in the process of product evaluations. The quantitative study then mirrors the qualitative findings in so far as it shows the influence of proxy attributes towards inferred sustainability. The path coefficients demonstrate that perceived quality and perceived price have a higher influence on inferred sustainability than perceived country image and visual appeal. Visual appeal is rather weakly, but nevertheless significantly related to IS. Accordingly, this inference process is not as distinct as the others. Overall, the quantitative results reiterate the categorization into leading and lagging attributes. The leading attributes of perceived price and perceived quality entice consumers to make strong and unmediated inferences about product sustainability, whereas lagging attributes are used in a

supplementary manner. In order to take account of alternative explanations, both mediation and moderation of perceived price and perceived quality in the relationship between visual appeal and perceived country image to inferred sustainability have been examined. However, neither of these interactions yielded significant results. Accordingly, the current conceptualization of IS appears to provide a useful portrayal of the qualitative insights.

### **Key Findings**

This research offers a possible new avenue in its investigation of inferences about sustainability attributes and therefore entails several contributions. It demonstrates how consumers evaluate sustainability attributes even when there is no information available on sustainability. Due to increased public awareness, consumers think about and assess a product's sustainability when making purchase decisions. If such information is not available, they are prone to form inferences based on other observable attributes. The differentiation between direct and indirect inference formations provides additional insights into consumers' cognitive processes. Understanding these processes is important to academia to allow for a more systematic examination of the effects of inferences on product preference or choice. Finally, the exploratory quantitative study and the conceptualization of IS as formative second-order construct address the paucity of empirical evidence for this type of model (Diamantopoulos et al., 2008).

### **Managerial Implications**

The findings could have important implications for marketers who aim at a better understanding of the impact of missing attribute information. Despite its ever increasing

importance among several stakeholders, the concept of sustainability is still difficult to grasp and hardly understood by companies. This study suggests that even if companies purposely omit information on their products' sustainability, consumers will still form theories about this attribute. Depending on the product's attribute bundle, these formed inferences can be advantageous or disadvantageous to companies. The proposed concept suggests that companies should recognize the four attributes perceived price, perceived quality, visual appeal and perceived country image when managing the product positioning in terms of sustainability. The type of perceived correlation is important for companies to assess whether they should specifically communicate a product's sustainability. If the correlation is considered to be positive regardless of specific sustainability information, there is no urgent need for action. Expensive products or products with high perceived quality are automatically assumed to be sustainable. However, if a product has been made in a developing country, is rather cheap, or has an exceptional design, it is advisable for companies to specifically address sustainability attributes.

Furthermore, as perceived brand origin influences brand attitude despite the potential inaccuracy of these beliefs (Magnusson, Westjohn, & Zdravkovic, 2011), consumers' inferences concerning product sustainability can affect their preferences. In many cases, these inferences replace the search for information or direct product experience (Broniarczyk & Alba, 1994b). They may even lead to the conscious ignorance of new information made available (van Osselaer & Alba, 2003). Self-generated correlations and conclusions are often more memorable and face only limited counter argumentation (Stayman & Kardes, 1992). Marketers should be aware of the fact that generated inferences can have a very persistent character. It is important to inform consumers about the actual nature of certain relationships and educate them about the benefits associated with them. Such a retroactive interference can help to reverse previously learned relationships (Tulving & Psotka, 1971).

### **Limitations and Avenues for Future Research**

The likelihood of inference formation depends on several contextual factors, including the level of expertise an individual has in a specific product category and knowledge about certain attributes. Experts have been shown to more readily detect missing information and form moderate judgments (Kardes, Sanbonmatsu, & Herr, 1990). This interaction provides an interesting avenue for further research.

Given the lack of guidelines for assessing validity and reliability in formative models, the reported tests contain some elements of subjectivity (Cenfetelli & Bassellier, 2009; Petter, Straub, & Rai, 2007). Finally, the second-order construct was modeled by repeatedly using all manifest variables and the results further cross-checked with the MIMIC model. A different approach, which has not been investigated within the present research, would use latent variable scores of first-order constructs as manifest variables for the second-order constructs. In general, these first empirical insights will hopefully stimulate further research in these conceptual and methodological areas.



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**Table 1: Psychometric Properties and Measurement Statistics**

<b>Construct</b>	<b>Item*</b>	<b>Loading</b>	<b>CR</b>	<b>AVE</b>	<b>Cronbach's <math>\alpha</math></b>	
<b>PERCEIVED PRICE</b>	PP1	X is expensive	-0.903	0.898	0.746	0.828
	PP2	Pricing is favorable	-0.787			
	PP3	X's price is negative	-0.898			
<b>PERCEIVED QUALITY</b>	PQ1	Must be good quality	0.880	0.920	0.794	0.870
	PQ2	Seems reliable	0.896			
	PQ3	Won't last long	0.898			
<b>PERCEIVED COUNTRY IMAGE</b>	PCI1	Positive attitude towards X	0.862	0.899	0.747	0.831
	PCI2	Dislike products made in X	0.862			
	PCI3	Have good feelings about X	0.869			
<b>VISUAL APPEAL</b>	VA1	X must be esthetically appealing	0.891	0.909	0.834	0.803
	VA2	Won't like looks of X	0.935			

CR= Composite Reliability; AVE= Average Variance Extracted

\* Items are presented in abbreviated form

**Table 2: Fornell-Larcker Criterion**

	<b>PCI</b>	<b>PP</b>	<b>PQ</b>	<b>VA</b>
<b>Perceived Country Image (PCI)</b>	0.747	0	0	0
<b>Perceived Price (PP)</b>	0.013	0.747	0	0
<b>Perceived Quality (PQ)</b>	0.048	0.109	0.794	0
<b>Visual Appeal (VA)</b>	0.003	0.051	0.004	0.834



Table 3: Cross Loadings

Indicators	Reflective Constructs			
	Perceived Quality	Perceived Country Image	Visual Appeal	Perceived Price
Perceived Quality 1	0.8798	0.1607	0.0363	0.2546
Perceived Quality 2	0.8956	0.2188	0.0652	0.2973
Perceived Quality 3	0.8977	0.2049	0.0718	0.3294
Perceived Country Image 1	0.1929	0.8626	0.0485	0.0966
Perceived Country Image 2	0.1871	0.8616	0.0285	0.0937
Perceived Country Image 3	0.1894	0.8689	0.0619	0.1031
Visual Appeal 1	0.0962	0.0644	0.9346	0.2256
Visual Appeal 2	0.0139	0.0302	0.8914	0.1804
Perceived Price 1	0.3084	0.0858	0.2195	0.9026
Perceived Price 2	0.2584	0.0953	0.1046	0.7866
Perceived Price 3	0.2894	0.1126	0.2465	0.8978

**Table 4: Total Effects Bootstrapping**

	<b>Path Coefficients</b>	<b>Standard Error</b>	<b>t Statistics</b>	<b>p-values*</b>
<b>Perceived Country Image -&gt; Inferred Sustainability</b>	0.332	0.052	6.145	<.0001
<b>Perceived Price -&gt; Inferred sustainability</b>	0.496	0.028	17.518	<.0001
<b>Perceived Quality -&gt; Inferred Sustainability</b>	0.543	0.024	22.238	<.0001
<b>Visual Appeal -&gt; Inferred Sustainability</b>	0.156	0.051	3.083	.0021

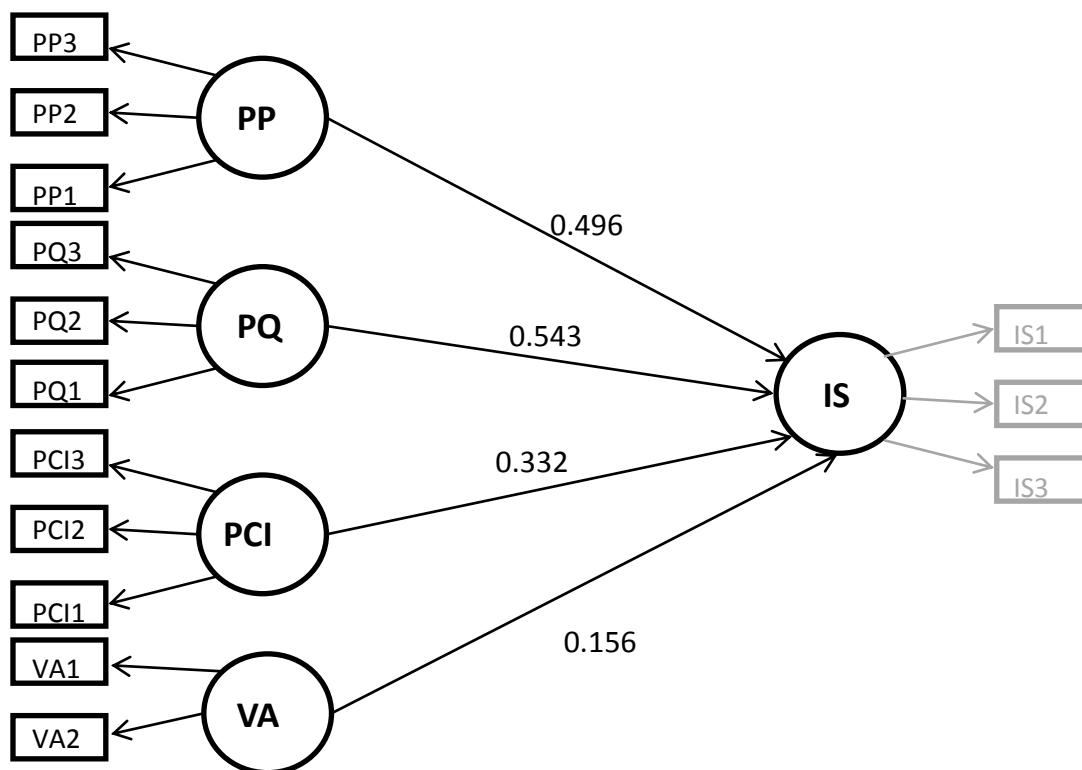
\*p-values for a two-tailed test; calculated by means of TDIST function in Excel based on empirical t value and df (see Hair et al., 2013)

**Table 5: Psychometric Properties MIMIC Model**

<b>Construct</b>	<b>Item*</b>	<b>Loading</b>	<b>CR</b>	<b>AVE</b>	<b>Cronbach's <math>\alpha</math></b>	
<b>PERCEIVED PRICE</b>	PP1	X is expensive	-0.909	0.897	0.746	0.828
	PP2	Pricing is favorable	-0.767			
	PP3	X's price is negative	-0.907			
<b>PERCEIVED QUALITY</b>	PQ1	Must be good quality	0.871	0.920	0.793	0.870
	PQ2	Seems reliable	0.891			
	PQ3	Won't last long	0.910			
<b>PERCEIVED COUNTRY IMAGE</b>	PCI1	Positive attitude towards X	0.852	0.899	0.747	0.831
	PCI2	Dislike products made in X	0.872			
	PCI3	Have good feelings about X	0.868			
<b>VISUAL APPEAL</b>	VA1	X must be esthetically appealing	0.889	0.909	0.833	0.804
	VA2	Won't like looks of X	0.937			
<b>INFERRED SUSTAINABILITY</b>	IS1	X seems to be a sustainable product	0.938	0.935	0.828	0.895
	IS2	Likelihood of social/environmental aspects considered in production is high	0.859			
	IS3	In terms of sustainability, X is very favorable	0.931			

CR= Composite Reliability; AVE= Average Variance Extracted

\* Items are presented in abbreviated form

**Figure 1: Model of Inferred Sustainability\***

\*The path coefficients refer to the operationalization of IS as formative composite via repeated indicator use