

Product Innovativeness: Systematic Literature Review and Proposal of a Multidimensional Construct

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Abstract:

Understanding the mechanisms behind the adoption of innovation has been of interest to marketing scholars for decades. Surprisingly, however, one of the most crucial elements in studying this phenomenon continues to be used heterogeneously in its conceptualization and measurement: product innovativeness. There is reason to believe that the inconsistent application of the construct partly accounts for varying results in empirical research studies. Hence, this article applies a systematic literature review on findings using the variable product innovativeness. Based on the synthesis of results, we propose a multidimensional conceptualization of the construct product innovativeness. More specifically, results suggest that the complexity of product innovativeness is best accounted for when including functional, behavioral, and design-related product perceptions. We conclude with future research avenues.

Keywords: product innovativeness, multidimensional, systematic literature review

1. Introduction

Consumer response to innovation continues to engage the attention of marketing researchers, and undoubtedly this field has generated valuable findings regarding drivers and barriers of innovation adoption (Hauser, Tellis & Griffin, 2006). Yet while product innovativeness (PI) is seen as one of the most important factors for new product success, empirical studies have also highlighted contradicting findings regarding the significance and direction of its effect on adoption (Lee & Colarelli O'Connor, 2003; McNally, Cavusgil & Calantone, 2010). There are studies that support a positive effect of innovativeness on new product performance (e.g., Danneels & Kleinschmidt, 2001; Gatignon & Xuereb, 1997) while others find a negative relationship (e.g., Atuahene-Gima, 1996). And still other authors have reported non-linear relationships between innovativeness and success (e.g., Goldenberg & Lehmann & Mazursky, 2001; Kleinschmidt & Cooper, 1991). This range of diverse findings may be attributed to several methodological and conceptual inconsistencies regarding the utilized concepts of innovativeness (Szymanski, Kroff & Troy, 2007). Motivated by this observation, we find the following issues deserve further attention:

First of all, despite a long-lasting discussion among researchers about the conceptualization of perceived PI (e.g., McNally et al., 2010), there still is a lack of conformance in the definition and measurement of this concept. Numerous studies have operationalized PI as a unidimensional construct such as “newness of an innovation” (Danneels & Kleinschmidt, 2001). Besides that, various operationalizations exist which represent different aspects of innovativeness, ranging from an absolute measure (e.g., “unique features”; Ali, Krapfel & LaBahn, 1995), innovativeness in relation to other products (e.g., “new product advantage”; Langerak, Hultink & Robben, 2004) or innovativeness in relation to a customer’s previous experience (“customer familiarity”; Calantone et al., 2006). To date, scholars have not agreed to one consistent conceptualization of product innovativeness.

Furthermore, the impact of PI on dependent variables such as product performance has frequently been analyzed under the assumption of linearity. However, there are hints that a linear function does not account for the complexity in comprehending PI. Kleinschmidt and Cooper (1991), for instance, found in their study that the effect of PI on product success follows a U-shaped curve. This result might raise the question, to what extent an “overly holistic” (Calantone, Chan & Cui, 2006, p. 408) representation of PI can reflect the individual effects of various innovativeness dimensions on consumer behavior. For instance, one might speculate that functional characteristics, which shape the consumers’ perception of a product’s ability to

fulfill its purpose (Bloch, 2011), are positively related to product evaluation (Hardie, Robertson & Ross, 1996). Behavioral innovativeness, on the other side, might be perceived as positive up to a certain level (Arts, Frambach & Bijmolt, 2011), but if learning costs get overly high, this can have a negative effect on purchase intentions (Calantone et al., 2006; Mukherjee & Hoyer, 2001).

Consequently, to predict the success of a new product, it needs to be recognized that an innovation can manifest various dimensions simultaneously but to different extents (Homburg et al., 2015). Therefore several dimensions of innovativeness need to be considered individually in order to account for their varying relationships with the dependent variables.

In summary, we address the following research questions:

RQ1: Which conceptualizations of PI have been utilized in marketing literature?

RQ2: What are the underlying dimensions of PI?

RQ3: What are the relationships of those dimensions with the dependent variable(s)?

The answers to those questions contribute to our development of a more specified concept of PI. Ultimately this can enable product managers to better understand the innovation perception of the consumer.

2. Methodology

To ensure a systematic procedure for the literature review, we followed the suggestions of Denyer and Tranfield (2009). At first, we performed a keyword search in the databases Scopus and Web of Science using the search terms listed in Table 1 and limiting results to A+ and A Journals as reported in the VHB-JOURQUAL3. This search has identified 722 unique results.

Title	AND	Title / Abstract / Keywords
"product innovati*" OR	"new product*" OR	consum* OR
"technolog* innovati*" OR	"new product*" OR	custom* OR
"design innovati*" OR	„newness“ OR	user* OR
"behavi* innovati*" OR	„novel attributes“	perform*
"innovation adoption" OR		

Table 1. Search terms used for identifying articles in the database search

Figure 1 documents the entire process of article selection and screening based on the PRISMA statement for reporting systematic reviews and meta-analyses (Page et al., 2021). Finally, 94 articles have been included in the last step of full-text screening as they relate to constructs or dimensions of PI and seem to consider the customer perspective. A cross-reference

search has supplemented the results. We have already worked up 26 articles at this stage, and the complete analysis will be available until September 2021.

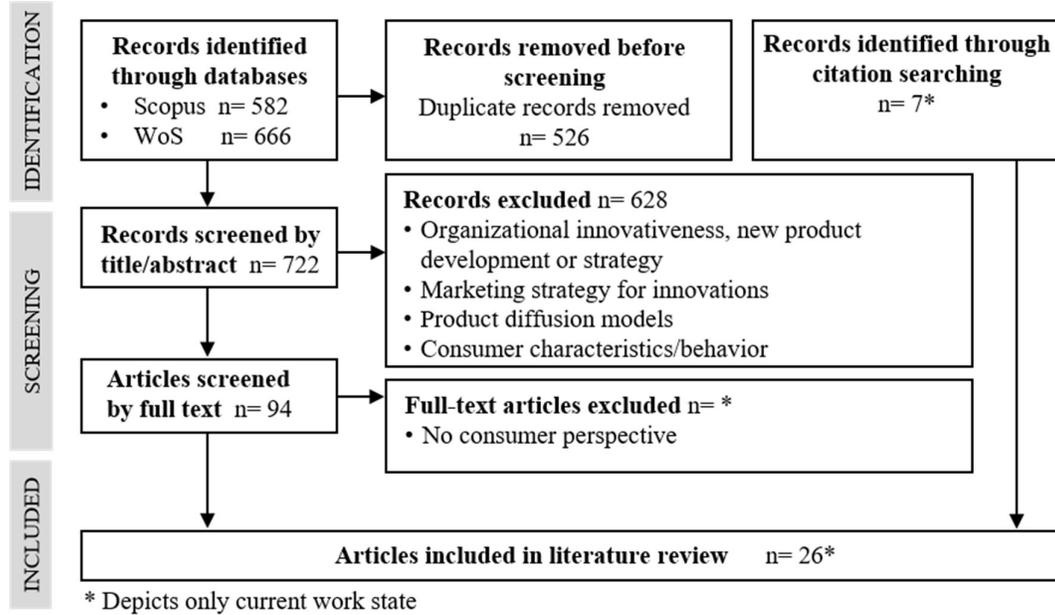


Figure 1. Search process flow diagram adapted from PRISMA Group (Page et al., 2021)

3. Results

Within the screened literature, we found conceptualizations of PI ranging from unidimensional to 3-dimensional constructs. Several studies also included multiple independent variables, which could be understood as dimensions for a second-order construct of PI. Due to page limits, the full literature table is not displayed here.

The conceptualization of PI used most commonly, is a unidimensional construct (n=10) relating to “innovativeness” (Calantone et al., 2006) or “newness” (Kleinschmidt & Cooper, 1991) of a product in varying degrees. The multidimensional constructs we found differ considerably concerning the content and selection of variables. For example, Flight, D'Souza and Allaway (2011) conceptualized “complexity in use” and “personal compatibility”. In contrast, Rindova and Petkova (2007) defined the dimensions “functional”, “symbolic”, and “aesthetic” for their framework, or Talke, Salomo and Wieringa (2009) applied “design newness” and “technical newness” as dimensions. Table 2 gives an overview of the dimensions used for modeling PI. Due to the inconsistent use of construct names, special attention has been given to the corresponding operationalizations, and the original terms are displayed in the second column.

Dimensions	Description or indicators (from the original study)	Article*
(generic) Product Innovativeness	(perceived) product innovativeness, service innovativeness radicalness of the innovation similarity to existing products newness to the market	[5] [8] [10] [14] [16], [7] [11] [18] [19] [12]
Function / Technology	unique features to customer utilitarian (“functional usefulness...”), functionality, functional newness of technology, technology innovation technology difference, discontinuity of technological capabilities product technological sophistication	[1], [20] [4], [15], [23] [20], [24] [6] [26] [8] [14]
Usage Behavior	customer familiarity (“change in consumer behavior”), discontinuity new technology to the customer (learning/experience/knowledge) newness to customers complexity (“difficult to understand and use”), complexity in use discontinuity of consumption pattern, change in behavioral patterns	[5] [20] [21] [1] [20] [3] [2], [9] [26], [19]
Design / Aesthetics	aesthetic dimension, innovation aesthetics innovative visual aesthetic design (prototypicality), design typicality hedonic (“aesthetic appeal” and “experiential and pleasurable use”) design innovation, design newness	[15], [23] [13], [17] [4] [24], [22] [25]
Compatibility	(personal) compatibility, consistent with values/operating systems	[2] [9], [7]
Symbolism	semiotic (“meaning or sign value”), symbolism, symbolic	[4], [15], [23]
[1] Ali et al. (1995)	[10] Fu & Elliott (2013)	[19] Lawton & Parasuraman (1980)
[2] Arts et al. (2011)	[11] Gatignon & Xuereb (1997)	[20] Lee et al. (2003)
[3] Atuahene-Gima (1995)	[12] Goldenberg et al. (2001)	[21] McNally et al. (2010)
[4] Bloch (2011)	[13] Goode et al. (2013)	[22] Mugge & Dahl (2013)
[5] Calantone et al. (2006)	[14] Henard & Szymanski (2001)	[23] Rindova & Petkova (2007)
[6] Chandy & Tellis (2000)	[15] Homburg et al. (2015)	[24] Rubera & Droge (2013)
[7] Cooper & DeBrentani (1991)	[16] Kleinschmidt & Cooper (1991)	[25] Talke et al. (2009)
[8] Evanschitzky et al. (2012)	[17] Landwehr et al. (2013)	[26] Veryzer (1998)
[9] Flight et al. (2011)	[18] Langerak et al. (2004)	

Table 2. Constructs used for modeling product innovativeness (*provisional table*)

Based on the results delineated in Table 2, five potential dimensions describing PI could be identified: function/technology, usage behavior, design/aesthetics, compatibility, and symbolism. To deliver the core dimensions, the absolute frequency and the common usage of those dimensions within articles have been examined. The technological and functional characteristics have been merged since, from an end-user perspective, technology should constitute the functionality of a product. In the analyzed literature, both variables have not been used in the same empirical work and have even been operationalized as indicators for the same construct (Ali et al., 1995). We take this as an indication that they represent the same dimension. Thereby the functional (n=10), behavioral (n=9), and design (n=8) dimensions are the most common ones applied by authors conceptualizing a multidimensional concept of PI.

This review also reveals that a large number of studies analyzed “product advantage” as an independent variable next to PI, but the distinction of those two variables is somewhat fuzzy. Product advantage variables included items linked to innovativeness (e.g., “product was highly innovative”; Langerak et al., 2004) and at the same time constructs of PI contained, e.g.,

“customer benefits” (Chandy & Tellis, 2000). Empirical results confirm that the two concepts are correlated positively (Calantone et al., 2006; Gatignon & Xuereb, 1997; Kleinschmidt & Cooper, 1991). It appears that an innovation should not only be new but also provide a benefit to the customer (Cooper & DeBrentani, 1991). Alexander, Lynch and Wang (2008) included the dimension “perceived benefit” into their concept of PI accordingly. We believe that advantage or benefit should not be considered as a dimension but could represent a mediator variable for PI (Kleinschmidt & Cooper, 1991). However, this relationship requires further investigation.

The dimensions compatibility (e.g., “complements other products owned”; Flight et al., 2011) and symbolism (e.g., “establishing a distinctive image”; Homburg et al., 2015) cannot be rated according to their innovativeness but can be a consequence of it. Since those concepts have been found less frequently in the literature, they have been excluded from further analysis.

4. Introducing the Multidimensional Construct of PI

There is a considerable number of studies that cannot find a significant effect of a generic concept of PI on dependent variables (Calantone et al. 2006; Cooper & DeBrentani, 1991; Henard & Szymanski, 2001). Further empirical studies yield a mixed picture (Evanschitzky, Eisend, Calantone & Jiang, 2012; Fu & Elliott, 2013; Kleinschmidt & Cooper, 1991) or find a positive effect of PI on product performance but did not distinguish PI clearly from product advantage (Langerak et al., 2004). We consider these contradicting findings to confirm the claim that a generic measurement of innovativeness is not adequate. Our assumption is supported by the study of Calantone et al. (2006) that could not find a direct effect of innovativeness on the dependent variable while familiarity and product advantage showed direct and positive effects on product success.

On the dimensional level, we mainly find support for the positive effect of the functional dimension on product success (Henard & Szymanski, 2001; Talke et al., 2009) as well as purchase intention (Homburg, Schwemmler & Kuehnl, 2015). McNally et al. (2010) reported a negative relationship between this dimension and customer discontinuity. For the behavioral dimension, there are only limited results, which provide indications that the complexity of the product, a lack of familiarity, or customer discontinuity have a negative effect on innovation adoption (Flight et al., 2011) or product performance (Arts et al., 2011; Calantone et al., 2006). Empirical evidence also indicates that design newness positively influences product sales (Talke et al., 2009). Homburg et al. (2015), however, could not find a significant effect of

aesthetics on purchase intention, and Goode, Dahl & Moreau (2013) emphasize the need for category cues to establish an effect of innovative design on product evaluation.

The findings explained above serve as a basis for our conceptual model development. Therefore we propose a 3-dimensional construct for PI covering the following dimensions:

- *Functional Innovativeness* is defined as the degree to which a consumer subjectively perceives a product or its functionalities as new (e.g., Talke et al., 2009). It describes the utilitarian value of a product (Bloch, 2011).
- *Behavioral Innovativeness* describes the extent to which a product requires physical or mental effort by the customer to understand and use it because of its newness (Mukherjee & Hoyer, 2001).
- *Design Innovativeness* is defined as the “deviation [...] from the current design state of a certain product category” (Mugge & Dahl, 2013, p. 34). Design refers to the observable appearance of a product or its features that provide utilitarian, hedonic, and semiotic benefits to the user (Bloch, 2011; Gemser & Barczak, 2020; Talke et al., 2009).

These dimensions are integrated by the stimulus-organism-response (SOR) paradigm to construct our proposed research model (Fig. 2), describing the adoption process in a more specified manner.

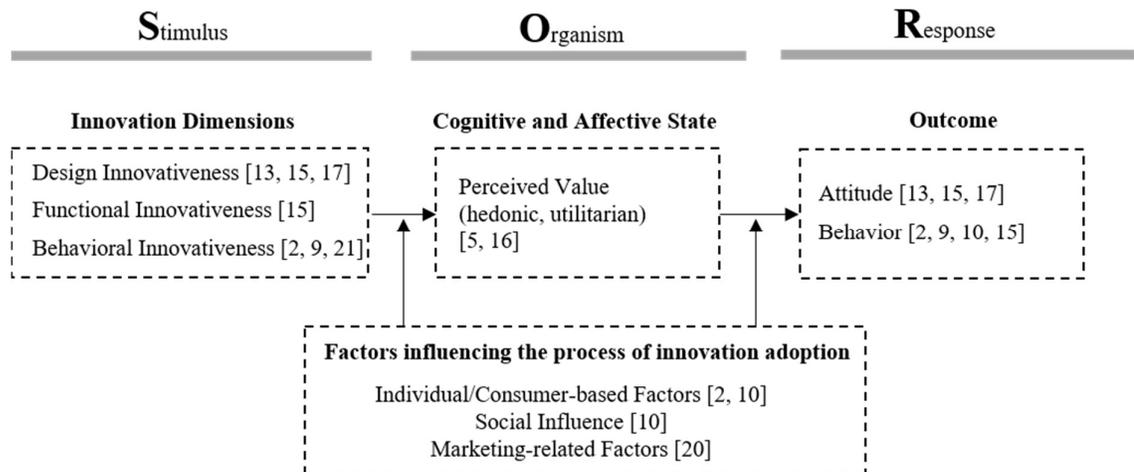


Figure 2. Proposed research model (provisional)

5. Discussion

Since we are still at the beginning of our research, the current review reflects only preliminary results. In this study, we reviewed research on innovativeness with a focus on the

consumer perspective. We found that a wide variety of constructs for PI have been utilized in marketing literature and that PI most often has been conceptualized on a generic level of newness. This confirms findings that have been documented in prior work, also considering the organizational and market perspective (e.g., Garcia & Calantone, 2002; McNally et al., 2010).

In addition, we extracted the underlying dimensions of PI and analyzed their relationships with dependent variables like innovation adoption. Our results suggest that PI is not sufficiently represented by a unidimensional construct since there are diverging effects of those dimensions. By providing a framework for a multidimensional concept, we comply with the beforementioned claim for a more consistent concept (McNally et al., 2010). This is the first study to our knowledge that suggests a functional, behavioral, and design dimension of PI.

We have provided the theoretical background for a concept of PI, which can serve as a foundation for researchers to develop the most suitable construct for their work. Nevertheless, a limitation of our study is the scope of articles (A and A+ journals only) that constrains the synthesis of results.

6. Future Research Implications

Arising from this work, a multitude of new research issues are emerging. Additional research is needed to test the proposed concept of PI empirically. This concept is based on the analysis of literature which can only represent a picture of how PI has been operationalized in the past, impaired by the methodological and conceptual inconsistencies criticized in the introduction of this paper (Szymanski et al., 2007). Following the approach of grounded theory (Glaser & Strauss, 2000), the dimensions deduced in theory should be verified in an inductive process based on the collection and analysis of qualitative customer feedback.

The assumed linearity for the general innovativeness construct has been questioned already (e.g., Kleinschmidt & Cooper, 1991). Therefore, a differentiated analysis of the individual functions of the variables included in the multidimensional construct is likely to prove highly informative. Moreover, it remains unknown whether there is also an interaction between different dimensions of PI.

With a view to the multiple and divergent operationalizations of the analyzed constructs, a further important issue is the development and validation of a measurement scale for the proposed multidimensional concept. This could support researchers seeking guidance on how to best operationalize PI and contribute to the progression of knowledge in the development of a widely accepted model of innovation adoption.

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