New Product Creativity Dimensions and Performance

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Abstract

A new product's meaningfulness and novelty are recognized as two distinct and important dimensions. Thus, researchers started to investigate their impact on new product performance. However, researchers' reports on the impact of novelty on performance are still mixed, and several issues need to be solved. One of these problems is comparing how strongly each of these dimensions affects the new product performance. The other is to investigate the contingent influence of market turbulence on the relation between the new product's novelty and its performance. Building on the resource-based view of the firm and signaling theory, this study aims to: 1) examine the impact of a new product's meaningfulness and novelty on its commercial performance; 2) compare the relative influence of these dimensions on product performance; and 3) examine the moderating effect of market turbulence on the relationship between the novelty and the new product's commercial performance. Data concerning 374 new products of Polish high- and medium-high-technology companies were examined to achieve these goals using structural equation modeling. First, the results indicated that a new product's meaningfulness is positively related to its commercial performance, whereas novelty is not. Furthermore, meaningfulness affects performance more strongly than product novelty, and market turbulence moderates the relation between the new product's novelty and performance. Subsequently, based on these findings, theoretical and managerial implications and directions for future research are provided.

Keywords: new product creativity, performance, market trurbulence

Introduction

A new product is an output of new product development (NPD) process that encompasses creative actions (e.g. Anderson, Potočnik and Zhou, 2014; Huang, 2020; Xu, 2020; Han, Forbes and Schaefer, 2021; Park and Suzuki, 2021). Every outcome of this kind of action is defined by its novelty and meaningfulness (Amabile and Pratt, 2016). Therefore, these two dimensions describe new product creativity (Im and Workman, 2004; Im, Montoya and Workman, 2013; Deng *et al.*, 2021; Yi, Amenuvor and Boateng, 2021). Both dimensions are shaped by companies' product development efforts and, therefore, can be controlled.

This situation calls researchers to investigate the impact of a new product's novelty and meaningfulness on its performance. It has already been shown that new product meaningfulness is positively related to new product outcomes (Im and Workman, 2004; Bicen, Kamarudin and Johnson, 2014; Chang, Hung and Lin, 2014; Nakata *et al.*, 2018). However, in the case of new product novelty, the research results are mixed. Some scholars find a positive relationship between this dimension and new product performance (Bicen, Kamarudin and Johnson, 2014; Chang, Hung and Lin, 2014), while others report no statistical connection (Im and Workman, 2004; Calantone, Chan and Cui, 2006). However, despite the growing attention to new product creativity, the current literature focuses mainly on studying the impact of each dimension separately. As a result, little is known about their relative influence on new product performance by comparing the effect of each of these dimensions on new product performance.

Further, the next overlooked issue in the stream of new product creativity studies is the influence of external conditions on the relation between new product creativity dimensions and its performance. Thus, this work undertakes the issue of moderating effect of market turbulence on the relation between product novelty and commercial performance.

Building on the resource-based view (RBV) of the firm and signaling theory, we aim to advance the understanding of the effects of the new product creativity dimensions on its performance. Following recommendations by Stewart and Zinkhan (2006), we integrate RBV and signaling theory to develop a framework to explore: 1) the impact of the dimensions of the creative new product on its commercial performance; 2) the relative influence of these dimensions on the new product performance; and 3) moderating effect of market turbulence on the relationship between new product novelty and commercial performance.

Our study provides the following contribution to the literature. First, we extend the previous works on the effects of the dimensions of new product creativity (Im, Montoya and Workman, 2013; Bicen, Kamarudin and Johnson, 2014; Chang, Hung and Lin, 2014; Nakata *et al.*, 2018; Zuo, Fisher and Yang, 2019) by comparing the impact strength of new product novelty on its performance with meaningfulness impact strength on its performance. Second, we investigate the role of market turbulence to understand the conditions that may influence the impact of new product novelty on its performance. Therefore, we contribute to the literature and practice by identifying market conditions that enhance this relationship.

Conceptual Background

The classic definition of creativity, provided by Stein, states that "The creative work is a novel work that is accepted as tenable or useful or satisfying by a group in some point in time" (Stein, 1953 p. 311). According to this definition, creativity is a process that leads to a new and useful outcome, and the latter could be anything, a work of a painter, car designer, or scientist. However, in the context of an organization, creativity is seen as "the production of novel and useful ideas by an individual or small group of people working together" (Amabile and Pratt, 2016 p. 158).

In a company, one of the important outcomes of creativity and innovation is a new product. According to both definitions of creativity – provided by Stein (Stein, 1953) and Amabile and Pratt (Amabile and Pratt, 2016) – a new product can be considered creative if it features both novelty and usefulness. The latter dimension is also called meaningfulness because a product's usefulness is expressed as meaningful benefits offered for customers (Heirati and Siahtiri, 2019). These two dimensions are commonly accepted as distinguishing features of a creative new product (Kim, Im and Slater, 2013; Nakata *et al.*, 2018; Selmi and Chaney, 2018; Xu, 2020; e.g. Deng *et al.*, 2021; Yi, Amenuvor and Boateng, 2021). The first dimension, i.e., novelty, reflects the uniqueness, originality, or newness of ideas incorporated in it. In contrast, the second one, i.e., meaningfulness, concerns usefulness, appropriateness, or meaningful benefits of the generated ideas to customers (Kim, Im and Slater, 2013). Therefore, we define new product creativity as the extent to which a new product offers novel and meaningful benefits to potential buyers compared to competitive products.

The new product outcome considered in this study is product commercial performance – indicating to what extent the new product meets its market and financial goals (Montoya-Weiss and Calantone, 1994) – was selected for two reasons. First, the commercial performance of a new product is a relatively overall assessment as it encompasses both financial and market performance. Second, this performance measure of a new product is determined most likely by both its meaningfulness and novelty (Im, Montoya and Workman, 2013; Kim, Im and Slater, 2013).

According to the RBV, explaining differences in firms' performance is based on two fundamental assumptions about their resources: the first one is resource heterogeneity, and the second – resource immobility (Peteraf, 1993; Barney and Hesterly, 2012). In this view, a product is considered a firm's tangible asset (Barney and Hesterly, 2012) that meets these two assumptions. In consequence, a product can be a valuable and rare resource that, in line with RBV, can be the basis for explaining the different results achieved by various products, even if they represent the same category and are offered in the same market.

The signaling theory is appropriate to describe behaviors of two parties (e.g., organizations, customers) when information asymmetry is present (Connelly *et al.*, 2011). Information asymmetry occurs when the level of information of parties involved in transactions is not equal (Spence, 1973). The essence of this theory is that one party (the sender) that has information reduces the information asymmetry by communicating (or signaling) that information to the second party (the receiver). In the context of this study, the signaling theory is applied to explain how firms use product novelty to draw the attention of customers and signal the existence of innovative products. This situation is particularly apparent in the case of turbulent markets, as they feature a high level of information asymmetry between companies and customers.

Hypothesis Development

We developed a theoretical framework presented in Figure 1. It is expected that new product meaningfulness positively impacts its commercial performance. Meaningfulness is a necessary and key dimension of any product. This dimension relates directly to product usefulness for buyers or its appropriateness to their needs and expectations. The latter, on the other hand, are growing and have no upper limit. Consequently, the higher the ability of a product to meet the needs of buyers, the higher the level of perceived benefits offered by the product to customers. And with the growth of the latter, the buyer surplus (Peteraf and Barney, 2003) and the willingness to buy the product grow. Therefore, the following research hypothesis was formulated:
H1: New product meaningfulness positively affects its commercial performance.

The impact of new product novelty on its commercial performance is likely to be dual. On the one hand, it is believed that novelty is a necessary attribute of a new product and supports its performance for the following reasons. First, novelty is needed to draw attention and generate the initial interest of potential customers (Nakata *et al.*, 2018). Second, customers tend to view the novelty of a new product as a proxy of additional benefit for them. According to the signaling theory, by underlying the novelty of a new product, the manufacturer sends a noticeable signal to potential buyers that innovative products offer unique benefits. Third, novelty exhibits product uniqueness or differentiation which increases the difficulty for competitors to imitate or substitute it (Zuo, Fisher and Yang, 2019). All these arguments suggest that the novelty of a new product increases its commercial success.

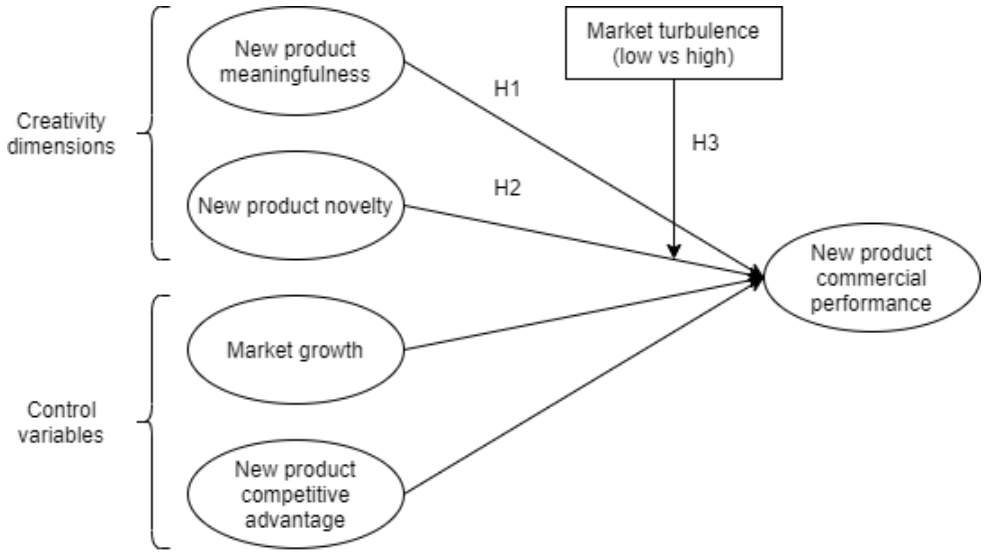


Fig. 1. Theoretical framework

However, on the other hand, Nakata et al. (2018) note that the increase in product novelty increases the level of unfamiliarity with the product for buyers. Nonetheless, the problem of this adverse effect is neither new nor unknown to new product professionals, so they are likely to keep it under control. Therefore, we follow the positive view of the relationship between new product novelty and its commercial performance and posit that:
H2: New product novelty positively affects its commercial performance.

It is worth comparing how strongly each dimension of a creative new product affects its commercial performance because we can thus determine which of these dimensions plays a more significant role in achieving this result. In this regard, we expect that the meaningfulness of a new product influences its commercial performance more strongly than its novelty. This is because meaningfulness directly relates to the total perceived benefits of the product, which, in turn, determines its economic value and customer surplus (Peteraf and Barney, 2003). Therefore, we posit that:
H3: New product meaningfulness affects its commercial performance more than its novelty.

This study assumes that the hypothesized relationship between new product novelty and its commercial performance (hypothesis H2) is contingent upon varying degrees of market turbulence. Following Jaworski and Kohli (1993), this study considers market turbulence as a frequent change in market demand, customer needs and preferences, and the market structure that cause customers to look for new products. Low market turbulence means that the market is predictable and static, whereas high turbulence concerns unpredictable and dynamic markets. Therefore, information asymmetry between suppliers and customers is likely higher in highly turbulent markets than in those with low turbulence. The signaling theory implies that in such markets, a supplier should send a clear signal for customers that product innovation has been launched. This can be done by increasing the novelty dimension. Conversely, developing product newness is not necessarily due to a situation of low market turbulence because customers know and identify suppliers and their offers. Thus, a moderating effect of market turbulence on the relationship is expected, and we posit that:
H4: Market turbulence moderates the relationship between product novelty and its commercial performance such that this association is stronger when market turbulence is high compared to when it is low.

We did not find any substantial argument that the connection between new product meaningfulness and commercial performance could be contingent on market turbulence. Therefore, we do not posit an analogous hypothesis to H4 concerning meaningfulness.

Methods

Sample and Procedure

To gather data, we performed a cross-sectional mail survey among high- and medium-high-technology companies in Poland employing more than 49 people, as these firms are quite heavily involved in new product development (Dmitrowicz-Życka *et al.*, 2019).

A sampling frame of Polish high and medium-high-technology companies employing more than 49 people was obtained from the HBI directory of Polish firms. It was used to randomly select 1,450 companies – due to budget constraints – that

were asked to participate in our mail survey. As a result, the questionnaire and a cover letter were sent to the person in the highest-ranked position in each company. We asked this person to choose a new product launched at least six months earlier and to forward the questionnaire to the person involved in this project. In total, after discarding incorrect questionnaires, we received 374 usable questionnaires, which yielded a rate of return of 25.8%.

Company size and industry type were used to describe the final sample. In terms of company size, the sample structure was as follows: 75.9% of firms employed 50 to 250 people, 20.1% employed 250 to 999 people, and 4.0% had more than 999 employees. In addition, the sample included the following proportions regarding industry type: machinery and equipment – 32.1%, industrial electrical machinery – 16.0%, motor vehicles – 15.2%, chemicals and chemical products – 14.2%, computer and electronic products – 10.4%, pharmaceutical products – 4.3%, other transport equipment – 2.9%, medical and dental products – 2.7%, air and spacecraft machinery – 1.3%, and weapons and ammunition – 0.8%.

Measures

All constructs were measured with established items in the literature. As used in a previous study (Im, Montoya and Workman, 2013), each of the two dimensions of new product creativity – meaningfulness and novelty – was measured with a four-item scale. In addition, its commercial performance was operationalized through four items chosen from Hultink et al. (2011) and Dabrowski (Dabrowski, 2018).

Two variables that commonly influence new product commercial performance were used as control variables: market growth and product competitive advantage. Market growth was measured with three items from (Parry and Song, 2010). Product competitive advantage was measured with four items selected from (Kim, Im and Slater, 2013). Additionally, we measured market turbulence that was used in the model as a moderating variable by four items selected from (Jaworski and Kohli, 1993).

We measured all items used in the constructs on seven-point Likert-type scales.

Data Analysis

Following Anderson and Gerbing (1988), the data were analyzed in two steps. First, confirmatory factor analysis (CFA) was used to test the measurement model, followed by structural equation modeling (SEM) to verify the multiple regression model for latent variables using Mplus v.8.1 statistical software. We applied SEM because it is generally considered as the standard method to examine the regressions between latent variables (Devlieger, Mayer and Rosseel, 2016).

To test hypotheses H1–H3, we verified a multiple regression model for latent variables, in which a dependent variable was the new product commercial performance, and independent variables were two dimensions of the creative new product – novelty and meaningfulness – and two control variables, i.e., market growth and product competitive advantage.

To test hypothesis H4, we applied a two-group analysis based on the multiple regression model, where a grouping variable was a dichotomous variable of market turbulence. The latter variable was created on the basis of the four items used to measure market turbulence. These four items were reduced by performing the principal component analysis (PCA) to one component that explained 63.5% of the total variance. Next, the median of this component was calculated, and the sample was divided into two groups based on its value. In addition, before performing the two-group analysis, we used the multigroup confirmatory factor analysis (MGCFA) to test measurement invariance in the two groups (Brown, 2015).

Results

Measurement Model and Measurement Invariance

The CFA involved five constructs included in the multiple regression model. The initial analysis led to the elimination of one item representing competitive advantage ("not at all cost-effective" versus "highly cost-effective"), but other items were retained. The measurement model provided an acceptable fit to the data: χ^2 (125) = 275.140, p <0.001, χ^2/df = 2.20, RMSEA = 0.057, SRMR = 0.045, CFI = 0.958, and TLI = 0.949. We applied a chi-square test to evaluate the model's fit. However, it has certain limitations, such as sample size sensitivity (West, Taylor and Wu, 2012). Thus, other fit indices were used to evaluate the model (West, Taylor and Wu, 2012) as recommended for the MLM estimator. The latter indices met the standards necessary for an acceptable fit: a CFI value of 0.95 or higher, an RMSEA value of 0.06 or less, an SRMR value of 0.08 or less, as well as an χ^2/df value of 5 or less (Hu and Bentler, 1999; West, Taylor and Wu, 2012). However, the required standard for a TLI value of 0.95 was not met (Hu and Bentler, 1999), but the difference between the TLI score (0.949) and this standard was so minor that it was assumed that the fit of the

measurement model to the data is acceptable. The estimates of the standardized factor loadings of all items are significant, as recommended (Brown and Moore, 2012), and they exceed 0.64. As indicated in Table 1, the average variance extracted (AVE) is greater than the required standard of 0.5 (Fornell and Larcker, 1981). Altogether, these outcomes indicate an adequate convergent validity of the measurement model.

Table 1: Construct correlations and discriminant validity

	CR	AVE	1	2	3	4	5
1. Product novelty	0.790	0.604	0.777				
2. Product meaningfulness	0.895	0.681	0.376	0.825			
3. Product competitive advantage	0.851	0.657	0.489	0.340	0.811		
4. Market growth	0.886	0.724	0.409	0.277	0.181*	0.851	
5. Product commercial performance	0.915	0.731	0.294	0.323	0.221	0.379	0.855

Note: Off-diagonal: construct correlations; along-diagonal: square root of the AVE; * $p < 0.01$ and all others correlations are significant at $p < 0.001$; CR – Construct reliability; AVE – Average variance extracted.

Table 1 demonstrates the construct reliability (CR), and all CR values exceed the critical value of 0.7 (Bagozzi and Yi, 2012). Table 2 also shows the construct correlations and the square root of the AVE. In line with Fornell and Larcker (1981), the constructs demonstrate discriminant validity because the square root of the AVE for each factor is greater than the highest correlation between the factors involving the focal factor.

The next important issue related to measurement is testing the invariance of the measurement scales across groups of low and high market turbulence. Vandenberg and Lance (2000) proposed testing measurement invariance by comparing hierarchically nested models: configural, metric, and scalar. Meade et al. (2008) proposed to test measurement invariance by comparing scores of two fit measures, namely CFI and REMSA. According to this rule, an assumption about measurement invariance can be rejected if a difference (Δ) between more and less restricted models is smaller than 0.002 for CFI and greater than 0.007 for RMSEA. Mplus v.8.1 was used to test measurement invariance as the tests of equal form, equal factor loadings, and equal intercepts can be performed by a single command (Brown, 2015). The MGCFA results presented in Table 2 show scalar measurement equivalence across low and high market turbulence groups. The assumption concerning measurement invariance may not be rejected because the difference ΔCFI is not smaller than -0.002 and the difference ΔRMSEA is greater than 0.007 (Table 2).

Table 2: Fit measures of models used for testing multigroup measurement invariance

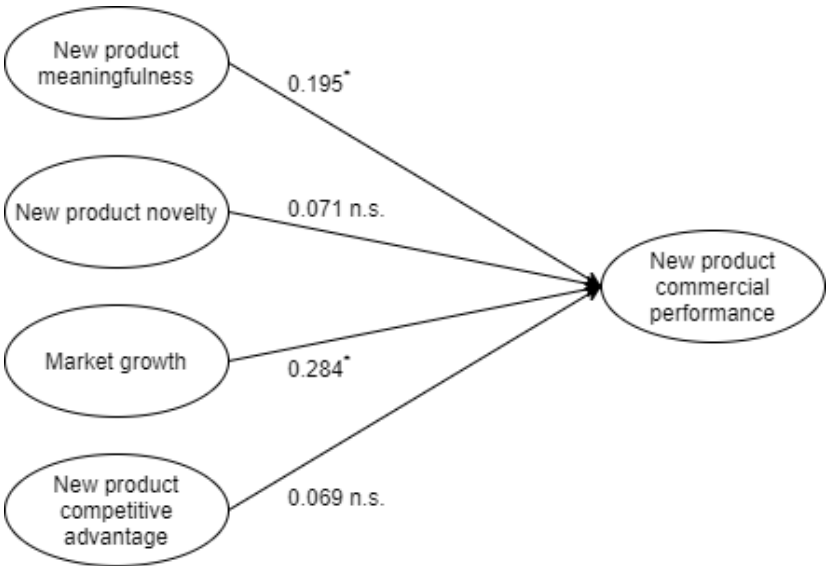
Model	χ^2	*df*	CFI	ΔCFI	RMSEA	ΔRMSEA
Configural invariance	406.599*	250	0.956	–	0.058	–
Metric invariance	429.531*	263	0.954	-0.002	0.058	0.000
Scalar invariance	443.994*	276	0.953	-0.001	0.057	-0.001

Note: * $p < 0.0001$

Hypothesis Testing

Figure 2 illustrates the multiple regression model of the new product novelty and meaningfulness, its commercial performance as well as the estimated effects, which provided an acceptable model fit: χ^2 (125) = 275.140, p <0.001, χ^2/df = 2.20, RMSEA = 0.057, SRMR = 0.045, CFI = 0.958, and TLI = 0.949.

Table 3 presents the test results for hypotheses H1 and H2. An examination of effects reveals a positive relationship between new product meaningfulness and its commercial performance (β = 0.195, p <0.001), whereas, contrary to expectations, such a relationship between its newness and commercial performance was not observed (β = 0.071, p >0.05). These findings support hypothesis H1 but not H2. Regarding the relationships between the control variables and new product commercial performance, market growth had a significant positive effect on its commercial success (β = 0.284, $p < 0.001$). Yet, such a link between new product competitive advantage and its commercial performance was not significant (β = 0.069, p >0.05). The model explained approximately 20.7% of the variance in new product commercial performance, as the coefficient of determination (R^2) was 0.207 for this construct.



Note: Standardized values; * $p < 0.001$; n.s. indicates statistical insignificance at $p > 0.05$.
Figure 2. Estimation of the multiple regression model

To verify hypothesis H3, the effect of new product meaningfulness on its commercial performance was compared to the effect of new product novelty on its commercial performance. The result of the Wald chi-square test revealed that these effects are not equal (χ^2 (1) = 4.220, p <0.05). However, as both effects were positive, it was concluded that the first effect (i.e., the influence of new product meaningfulness on its commercial performance) was stronger than the latter (i.e., the new product novelty to its commercial success). This outcome supports hypothesis H3.

Table 3: Results of testing hypotheses H1 – H2

Hypotheses	**Estimate (standard)**	***p*-value**	**Result**
H1 Product meaningfulness → Product commercial performance	0.195	0.000	Supported
H2 Product novelty → Product commercial performance	0.071	0.298	Not supported

Regarding hypothesis H4, we compared the effects of new product novelty on its commercial performance across two groups of low and high market turbulence. The estimates of these effects in both groups are shown in Table 4. The Wald chi-square test shows that the effects in both groups are not equal – that is, χ^2 (1) = 6.441, p <0.05. As the effect under low market turbulence is negative and not significant (β = -0.114, p >0.05), and the effect under high market turbulence is positive and significant (β = 0.237, p <0.001), it was concluded that the latter effect is more pronounced than the former. Therefore, hypothesis H4 was supported.

Table 4: Effect of a new product's novelty on its commercial performance under low and high market turbulence

Effect	**Low market turbulence**		**High market turbulence**	
	Estimate (standard)	*p*-value	Estimate (standard)	*p*-value
Product novelty → Product commercial performance	-0.114	0.242	0.237	0.000

Discussion and Conclusions

The empirical survey results confirmed our expectation of the positive effect of new product meaningfulness on its commercial performance. This relationship is likely due to the fact that when buying a product, buyers look for meaningful benefits to meet their needs. However, the latter does not have an upper limit, so along with the increase in the meaningfulness dimension of the product, one can observe an increase in its commercial results. Furthermore, this kind of influence is confirmed by the results of other studies (Im and Workman, 2004; Bicen, Kamarudin and Johnson, 2014; Chang, Hung and Lin, 2014; Nakata *et al.*, 2018).

Regarding the second dimension of the creative new product, namely its novelty, our results indicate no relationship between this dimension and its commercial results. Although still, in this case, the value of the novelty effect on the new product commercial performance is positive, this effect is not statistically significant. This finding is consistent with the study by (Im and Workman, 2004; Calantone, Chan and Cui, 2006), who also did not observe such an association. Most

likely, the reason for it is the dual impact of the novelty on the willingness to buy a new product, that has already been presented. Moreover, the scatter plot analysis between these two variables did not show any curvilinear relationship between them.

This study showed that new product meaningfulness influences its commercial performance more strongly than its novelty under normal market conditions. This might be because the former directly and to a greater extent than the latter relates to the total benefits of the product perceived by customers. In turn, these benefits determine customers' surplus within this product and, as a consequence, their willingness to buy it.

The next finding of this study concerns the moderating effect of market turbulence on the impact of new product novelty on its commercial performance. The results indicate that in conditions of high market turbulence, the novelty has a stronger impact on performance than when the market turbulence is low. Following the signaling theory, it seems that in high turbulent markets, the novelty of product innovation is an essential signal from suppliers to potential buyers that enhances its commercial performance.

The theoretical contribution of this study is twofold. First, we revealed that new product meaningfulness affects its commercial performance more than its novelty under normal market conditions. So far – to the best of our knowledge – researchers have not performed this kind of comparison. Second, our work showed that the relationship between the novelty of a new product and its commercial performance is contingent on market turbulence, which has not been studied so far. In this regard, our study suggests that market turbulence is likely to moderate the relationship between product novelty and its commercial performance. Moreover, this association is stronger when market turbulence is high compared to when it is low.

Our work has some managerial implications. Regarding innovative product meaningfulness or usefulness, we recommend managers develop this dimension of creative new product as much as possible. However, with regard to the novelty dimension of a new product, our recommendations for NPD managers are related to the level of market turbulence. In conditions of high market turbulence, NPD managers aiming to achieve a high commercial performance of the new product should develop this dimension, enabling the product to be distinguished among competing products. On the other hand, under low market turbulence, the novelty of product innovation does not appear necessary to obtain high commercial results because buyers have relatively good market recognition in stable environmental conditions. Nevertheless, some level of novelty may be needed to distinguish the new product against competing products.
This study has several limitations, and some of them can be addressed by future research. The first limitation is that our work relies on a cross-sectional data set, which restricts the examination of causal relationships. However, the relationships investigated are based on grounded theories and are substantially supported. The second limitation involves measuring new product commercial performance as a cognitive and perceptual variable. Future studies could consider gathering objective performance data to validate our outcomes. The third limitation is that this study's model only partially explains the variance in new product commercial performance, and other variables should also be examined.

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