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DESIGN ORIENTATION AND NEW PRODUCT PERFORMANCE

Raji Srinivasan and Gary L. Lilien

ABSTRACT

Purpose — *The products of some firms emerge neither from new technology developments nor from attempting to address articulated consumers' needs, but from a company-internal design-driven approach. To explore this design-driven approach, we propose a construct,* design orientation*, as a firm's ability to integrate functionality, aesthetics, and meaning in its new products. We hypothesize relationships between a firm's design orientation, customer orientation, technological orientation, and willingness to cannibalize on its new product performance.*

Methodology/approach — *We use data from surveys of senior marketing executives entrusted with design in 252 US firms, we validate the construct of design orientation and establish its distinctiveness from related constructs of creativity, technological orientation, and customer orientation. Using a structural equation modeling approach, we test the hypotheses and find support for them.*

Findings — *Individually, design orientation, technological orientation, and customer orientation improve new product performance. In addition, customer orientation decreases the positive effect of design orientation while willingness to cannibalize increases the positive effect of design orientation on new product performance.*

Implications for theory and/or practice − *More than two-thirds of respondents (69%) perceive that their firm can improve its new product performance by* increasing *its design orientation, an overlooked organizational capability*.

Originality/value − *Although practitioners have acknowledged the importance of design as a strategic marketing issue, there is little in the literature on how firms can benefit from building capabilities in the design domain, the issue we focus on in this research*.

Keywords: Product design; aesthetics; new product performance; design orientation

Firms take different approaches in the new product development domain to achieve a competitive advantage, usually relying either on a market-pull or a technology-push approach (Dosi, 1992). The market-pull approach (Lilien, Morrison, Searls, Sonnack, & von Hippel, 2002; Urban & von Hippel, 1988) views the innovation process as driven by the firm's customer orientation, developing products that respond to the explicit needs of the firm's customer base (Atuahene-Gima, Slater, & Olson, 2005; Sinkula & Baker, 2005). The technology-push approach (Abernathy & Clark, 1985), driven by the firm's technological orientation (Gatignon & Xuereb, 1997), focuses on the development of new technologies and products with superior functionality. Both the market-pull and the technology-push approaches have been shown to be effective in developing successful new products (Atuahene-Gima et al., 2005; Gatignon & Xuereb, 1997).

An alternative way to develop new products is the design-driven approach. Drawing on evidence from Italian firms such as Alessi and Artemide, Verganti (2008) proposes that the products of firms following the design-driven approach are driven neither by the needs articulated neither by their customers nor by new technology developments. Rather, those products emerged because of the firms' ability to integrate functionality, aesthetics (styling including appearance, sound, touch, smell, and feel), and meaning into products that make the product more relevant to customers and produce a superior customer experiences, implementing what Srinivasan, Lilien, Rangaswamy, Pingitore, and Seldin (2012) termed the total product design concept.

Swatch watches, launched in 1983, are an illustration of the total product design concept in action, achieved through a design-driven approach. Swatch's adoption of a new product line characterized by plastic materials, colorful styles, and lower prices positioned watches as fashion accessories (Glasmeier, 1991).

Swatch watches entailed neither market-pull (users did not articulate a need for watches as fashion accessories) nor technology-push (no new technology).

In this chapter, we conceptualize *design orientation*, as a firm's ability to implement the total product design concept, that is, to integrate functionality, aesthetics, and meaning in its products (Srinivasan et al., 2012). We note that this conceptualization of the total product design concept is consistent with the framework proposed by other scholars in the literature (e.g., Park, Jaworski, & MacInnis, 1986 who propose functionality, experiential, and symbolic attributes of brands). We develop and test a model that relates the firm's design orientation, along with other firm-level capabilities to new product performance.

Using data from a survey of senior marketing executives in 252 strategic business units of US firms in the goods sector, we validate the construct of design orientation and establish its distinctiveness from related constructs of creativity, technological orientation, and customer orientation. Using a structural equation modeling approach, we test the proposed model and both find support for it and find that the findings are robust to alternative samples, model specifications, and measures.

We find that a firm's design orientation, customer orientation, and technological orientation each individually improve new product performance. Customer orientation and design orientation interact negatively while willingness to cannibalize (Chandy & Tellis, 1998) and design orientation interact positively in their effect on new product performance. Technological orientation does not interact with design orientation to affect new product performance. Marginal effects analyses uncover an unexplored opportunity − most managers (69%) perceive that their firm can improve new product performance by *increasing* their design orientation.

In the next section, we present the theory and hypotheses. Following that, we describe the method, data, hypotheses tests, and analyses that examine the robustness of the findings. We conclude by discussing the chapter's theoretical and managerial contributions, limitations, and opportunities for further research.

THEORY

Design Orientation

Strategy theorists describe how firms build competitive advantage by developing superior capabilities (Wernerfelt, 1984), which include skills reflected in organizational culture and processes that enable firms to develop competencies (Day, 1994; Leonard-Barton, 1992). Employing these ideas, we view design orientation as a capability reflecting the firm's view that it can draw on its internal

capabilities to develop design-driven products that address customer needs that may be, as yet, latent or unarticulated. An example of such a firm is Apple under Steve Jobs: "We built [the Mac] for ourselves. We were the group of people who were going to judge whether it was great or not" (Sheff, 1985). As Isaacson (2011) notes in his biography, what Jobs had in mind was functionality combined with superior aesthetics that had emotional resonance with the target consumers.

New Product Performance

Developments in the strategy literature indicate that different capabilities entail distinctive cultures, behaviors, resources, processes, and outcomes. Thus, when capabilities co-occur, there may be interactions that either improve or harm outcomes (Burton, Lauridsen, & Obel, 2002; Venkatraman & Camillus, 1984). Hence, we propose interactions between design orientation (design-driven) and (1) customer orientation (i.e., market-pull), (2) technological orientation (i.e., technology-push), and (3) willingness to cannibalize, on new product performance. We denote the proposed relationships in Fig. 1.
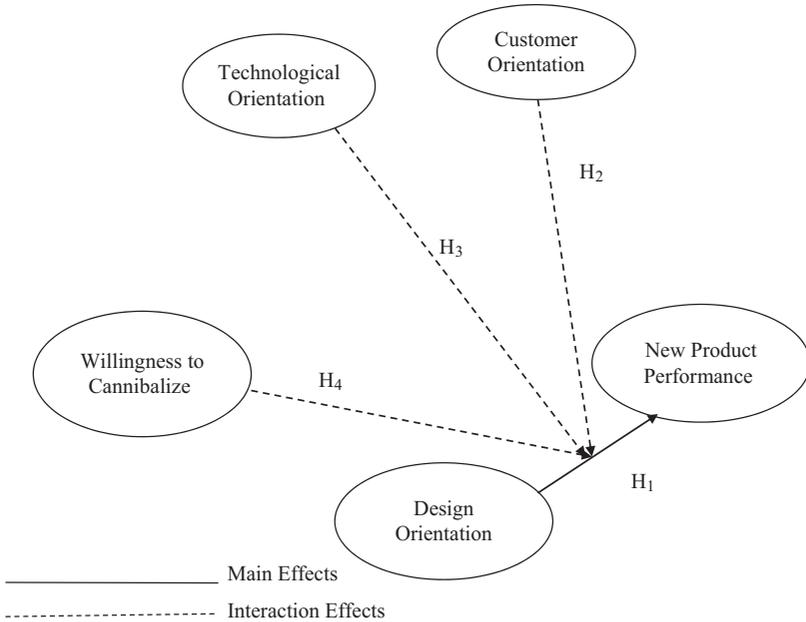

Fig. 1. Conceptual Model.

Design orientation. As a firm's design orientation increases, it may begin to consider itself the arbiter of taste, perhaps downplaying or even disregarding inputs from customers (Wessel, 2012). For example, Jonathan Ive, Apple's Senior Vice President, noted: "Our goal isn't to make money. It sounds a little flippant, but it's the truth. Our goal and what makes us excited is to make great products. If we are successful, people will like them and if we are operationally competent, we will make money" (Solon, 2012). This quote suggests that as a firm's design orientation increases, it may introduce products that do not appeal to consumers, which may hurt new product performance.

Other evidence indicates that, all else equal, superior product design increases customers' preferences and satisfaction (Creusen & Schoormans, 2005; Srinivasan et al., 2012) as well as sales, profits, and stock returns (Hertenstein, Platt, & Veryzer, 2005). Moreover, a firm's design orientation may be a rare and inimitable capability, which enables it to develop new products that are well differentiated and superior to competitive products in the marketplace. All of these arguments suggests a positive effect of design orientation on new product performance. Thus, we propose H_1:

> **H1:** The higher a firm's design orientation, the higher its new product performance.

Design orientation and customer orientation. Customer orientation is a capability driven by beliefs that put the customers' interests first. A customer-oriented firm creates superior value for customers by developing offerings that meet the articulated needs of their customers (Deshpandé, Farley, & Webster, 1993, Jaworski & Kohli, 1993; Narver & Slater, 1990). Customer orientation enables the firm to learn about the needs of its customers, which are used to develop new products. Thus, greater customer orientation provides superior market insights leading to new products addressing customers' articulated needs and improved product performance (Atuahene-Gima et al., 2005; Sinkula & Baker, 2005). Our interest here is in the interaction effect between the firm's design orientation and customer orientation on new product performance, which we discuss next.

When a customer-oriented firm also has high design orientation, there will be an emphasis on incorporating the expressed needs of its customers in its products. Trying to satisfy those expressed needs may impede such a firm's ability to effectively integrate functionality, aesthetics, and meaning in its products. Market-pull and design-driven approaches are characterized by different processes and metrics. For example, in the market-pull approach, there is likely to be extensive pretesting of new products with the firm's customers. In such pretesting, customers may reject design-driven products which do not appear to fit their current needs, calling for redevelopment efforts. Hence, design orientation and customer orientation may result in a conflict between the design-driven and market-pull approach to new product development. As a result, product

development in such firms may be driven in different directions and the resulting new products may not benefit from the advantages of either approach. Thus, we propose H_2:

> **H2:** The higher a firm's customer orientation, the weaker the positive effect of design orientation on its new product performance.

Design orientation and technological orientation. Technology-oriented firms invest in research and development, are proactive in acquiring new technologies, and use them in building new products with superior functionality (Gatignon & Xuereb, 1997). Such firms can use their technical knowledge to build solutions to meet the needs of their customers. The performance of new products in such firms is linked to the development of new technologies.

Technologically oriented firms may be willing to explore radical aesthetics and meanings (enabled by high design orientation) to showcase new products' superior functionalities powered (Geels, 2004). As A. G. Lafley, Chief Executive Office, Procter and Gamble, noted (2004), "Design can unlock the technological performance we build into a product and help the consumer see it, touch it. Good design is serious business." Thus, when technologically oriented firms also have high design orientation, they will integrate the high functionality of their products from their new technologies with related superior aesthetics and meaning, which should result in superior new product performance. Thus, we propose H_3:

> **H3:** The higher a firm's technological orientation, the stronger the positive effect of design orientation on new product performance.

Design orientation and willingness to cannibalize. Willingness to cannibalize is the extent to which a firm is prepared to reduce the value of existing investments to explore new directions (Chandy & Tellis, 1998). It is a trait of the firm and resides in its culture. Firms that are willing to cannibalize their existing products are more likely to introduce radical innovations. The question of interest to us is the interaction effect between a firm's design orientation and its willingness to cannibalize on its new product performance.

Firms with high design orientation are sensitive to the importance of effective integration of functionality, aesthetics, and meaning in products, which can result in new products with radical new meanings (Verganti, 2008). Such products with radical meaning may undermine the firm's current investments in existing product platforms, brands, and channels (Christensen, 1997). Hence, as with radical innovations (radical on technology and customer benefits), we anticipate that the firm's willingness to cannibalize may be synergistic with the firm's design orientation so that they may be viewed as strategic complements, resulting in a joint positive effect on new product performance. Thus, we propose H_4:

H4: The higher a firm's willingness to cannibalize, the stronger the positive effect of design orientation on new product performance.

METHOD

We view a firm's design orientation as a capability, and capabilities are embedded in the organization's culture, systems, and processes (Leonard-Barton, 1992; Teece, Pisano, & Shuen, 1997). A firm's culture is best articulated through its senior management, suggesting a primary data collection strategy as most appropriate to test our hypotheses. In order to attempt to reduce functional bias in response (Kumar, Stern, & Anderson, 1993), we sought a single, identical senior management function across firms. As new product performance connects the firm to the marketplace, we chose senior marketing executives as the most appropriate class of respondents.

We engaged with six senior marketing and management academics with expertise in the product development area to develop our measures. We pretested the measures with six senior managers and after refinement, administered a pre-test of the survey to 30 managers. We then made final adjustments, resulting in the scale items listed in Appendix A.

We sought senior marketing executives as key informant-respondents from a cross-industry sample of firms. We focused on firms in the goods sector and excluded services (e.g., banking, insurance) whose intangible product characteristics differ from those of tangible goods. We drew our sample from amongst the business school alumni of large public university in the Southwest part of the United States ($n = 1,752$) and from the professional membership lists of two leading design and product development organizations ($n = 307$) in the US goods sector for a total sample size of 2,059. The unit of analysis within the firm is the strategic business unit (SBU). As an incentive for completing the survey, we offered respondents a Kindle book on product design (*The Future Design of Things* by Donald Norman) and a copy of the study's findings.

The surveys were fielded online using Qualtrics online survey software. Of those fielded, 105 emails were returned because of incorrect addresses, 60 emails were returned with out-of-office responses, and 40 managers returned the surveys because they believed that they were not qualified to respond, yielding 1,795 surveys that we believe reached a potentially qualified respondent. We received 252 completed surveys, yielding an effective response rate of 14%.[1]

In Panel A of Table 1, we provide the profiles of respondents; most (64%) were at the level of Director and above. In Panel B of Table 1, we provide the profiles of sample firms by industry, sales, and number of employees.

Table 1.

Panel A: Profile of Respondents in Sample		
Title of Respondent	Number of Respondents	Percentage
Manager	90	36
Director	85	34
General manager	12	5
Vice president	28	11
Senior vice president	22	9
Chief executive officer/founder	15	6
Total	252	100

Panel B: Profile of Sample Firms		
	Number	Percentage
Industry groups		
Computers	17	7
Consumer electronics	13	5
Construction	11	4
Consumer products	54	21
Food and beverage	14	6
High technology	46	18
Industrial products	42	17
Pharmaceuticals	9	4
Software	24	10
Other	22	9
Total	252	100
Sales		
≤$100 million	86	34
$101−499 million	36	14
$500−999 million	22	9
$1−4.99 billion	38	15
≥$5 billion	70	28
Total	252	100
Employees		
<100	63	25
101−1,000	61	24
1,001−10,000	49	19
10,000−100,000	46	18
101,000−200,000	20	8
>200,000	13	5
Total	252	100

Measures

We developed new measures for design orientation and adapted existing scales for the other measures. To reduce response burden, we used a subset of scales from past research. All measures (reported in Appendix A) were Likert-type scales anchored at 1 (strongly disagree) and 7 (strongly agree).

We measured new product performance covering the commercial performance of the products in the market using a three-item scale adapted from Griffin and Page (1996).

As capabilities include culture, processes, and behaviors (Leonard-Barton, 1992; Teece et al., 1997), we measured design orientation using five items covering the firm's culture, processes, and behaviors pertaining to the integration of functionality, aesthetics, and meaning in its products.

We measured customer orientation using a four-item scale adapted from Deshpandé and Farley (1998). For technological orientation, we used a three-item scale adapted from Gatignon and Xuereb (1997); for willingness to cannibalize we used a three-item scale adapted from Chandy and Tellis (1998). We also measured creativity, using a three-item scale adapted from Amabile (1988), to establish the discriminant validity of design orientation.

The reliabilities of the various measures were high and ranged from 0.734 to 0.945. The dependent variable, new product performance measure, displayed good variability (mean = 8.255, standard deviation = 3.229, range = 3−20 (scale range: 3−21), which we attempt to explain in our model.

To assess the validity of the measures, we conducted two additional analyses. First, we conducted exploratory factor analyses of the constructs in our model; the loadings were higher than 0.70 for all the scale items. Second, we assessed the validity of the constructs by including all independent and dependent latent variables in one confirmatory factor analysis model with the free correlations among the factors (Bagozzi, Yi, & Phillips, 1991). The model fit the data well: comparative fit index (CFI) = 0.921; Tucker Lewis Index (TLI) = 0.929; root mean square error of approximation (RMSEA) = 0.082; standardized root mean square residual (SRMR) = 0.070.

Because we use a key informant, we examined possible threats from common method bias. First, we used Harman's one-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) and found no evidence of common method bias. Second, we had a second informant for 21 of the 252 firms, a sample too small for a formal multitrait, multimethod assessment. However, *t*-tests of the differences between the two informants' reports were not statistically significant (K = key informant and S = second informant): design orientation (K = 14.15, S = 14.24, *ns*), technological orientation (K = 9.40, S = 9.21, *ns*), customer orientation (K = 10.29, S = 10.14, *ns*), willingness to cannibalize (K = 10.66, S = 10.72, *ns*), and new product performance (K = 8.26, S = 8.30, *ns*).

Table 2. Descriptive Statistics and Correlation Matrix.

Construct	Mean (Std. Deviation) Min−Max	1.	2.	3.	4.	5.
1. New product performance	8.255 (3.229) 3−20	1.000				
2. Design orientation	14.147 (7.132) 5−35	0.517	1.000			
3. Technological orientation	9.401 (4.361) 3−21	0.659	0.426	1.000		
4. Customer orientation	10.290 (4.509) 4−28	0.474	0.453	0.391	1.000	
5. Willingness to cannibalize	10.655 (3.991) 3−21	0.510	0.472	0.441	0.512	1.000

All correlations above 0.15 significant at $p < 0.05$ and correlations above 0.20 significant at $p < 0.01$.

Thus, the tests do not identify any threats to the validity of the results from the mono-method source of the measures.

Table 2 provides the descriptive statistics and correlations of the constructs. The correlations between design orientation and customer orientation, technological orientation and willingness to cannibalize are positive and significant, suggesting that they co-occur in firms.

Validity of Design Orientation

Reliability and Discriminant Validity. Cronbach's alpha for the five-item design orientation scale was 0.945 indicating high reliability. The design orientation scale exhibited good variance, ranging from 5 to 35, covering the full range of the scale with a mean of 14.1 (standard deviation = 7.1). We examined the discriminant validity of design orientation from the related constructs of customer orientation, technological orientation, and creativity. The factor loadings were large and significant ($p < 0.01$). The factor loadings for design orientation ranged from 0.842 to 0.905. There was a good fit of the model to the data (CFI = 0.926, TLI = 0.91, RMSEA = 0.090, SRMR = 0.070). We then examined the convergent and discriminant validity of these four constructs (Fornell & Larcker, 1981). The composite reliability (CR) and average variance extracted (AVE) (design orientation: CR = 0.943, AVE = 0.769; customer orientation: CR = 0.865, AVE = 0.500; technological orientation: CR = .893, AVE = 0.738; creativity: CR = 0.926, AVE = 0.806) indicate internal consistency and convergent validity. Regarding discriminant validity, the 95% confidence intervals of the correlations between the constructs were well below 1.00 and their AVEs exceeded the squared correlations

between them. Thus, design orientation is distinct from customer orientation, technological orientation, and creativity.

Nomological Validity. To establish nomological validity, we assessed the degree to which a construct behaves as it should within a system of related constructs called a nomological net (Peter, 1981). The firm's product design history should be positively related to its design orientation, which, in turn, should be positively related to product design quality. Thus, we estimated a path model relating the firm's product design history (two-item scale, see Appendix A) to design orientation, which, in turn, is related to product design quality (a two-item scale also in Appendix A). The data fit the model well (CFI = 0.936, TLI = 0.893, SRMR = 0.071, RMSEA = 0.083) and product design history was related to design orientation ($b = 0.765$, $p < 0.01$), which, in turn, was related to product design quality ($b = 0.637$, $p < 0.01$). Overall, these results provide evidence of nomological validity for design orientation.

RESULTS

Model-Free Evidence: Bivariate Relationships

We examine the relationships between design orientation and (1) customer orientation, (2) technological orientation, and (3) willingness to cannibalize (median splits) and new product performance. In Fig. 2, we report the bivariate
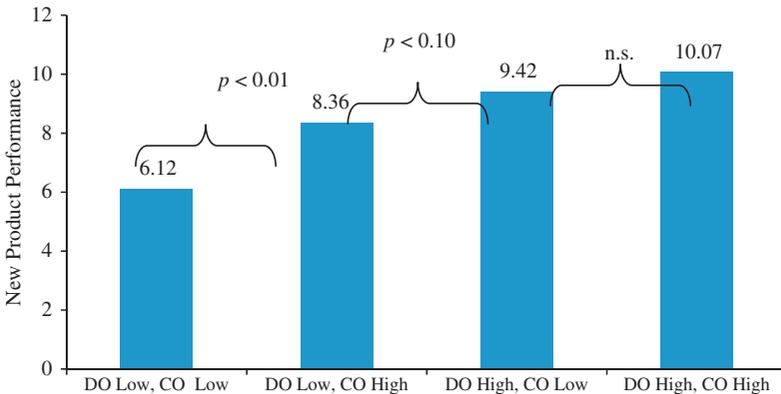

Fig. 2. Design Orientation (DO), Customer Orientation (CO), and New Product Performance. *Notes*: Customer orientation is positively related to new product performance, when design orientation is low but not when it is high. However, design orientation is positively related to new product performance when customer orientation is both low and high.

relationship between design orientation, customer orientation, and new product performance. High customer orientation is positively related to new product performance when design orientation is low ($6.12-8.36$, $p < 0.01$) but not when it is high ($9.42-10.07$, ns). High design orientation positively related to new product performance when customer orientation is both low ($6.12-9.42$, $p < 0.01$) and high ($8.36-10.07$, $p < 0.05$). As the firm's design orientation increases and customer orientation decreases, new product performance increases ($8.36-9.42$, $p < 0.10$).

We get similar results (provided in Appendix B: Figs. B1−B2) for the bivariate analysis of design orientation and (1) technological orientation and (2) willingness to cannibalize and new product performance. The model-free evidence suggests that (1) design orientation, customer orientation, and technological orientation each increases new product performance and (2) there may be interactions between design orientation and (a) customer orientation, (b) technological orientation, and (c) willingness to cannibalize on new product performance.

Estimation Results

Our conceptual model proposes both main and interaction effects of the explanatory variables on new product performance (Fig. 1). We estimate the model using the full-information maximum likelihood approach (Muthén, 2010). The estimation approach does not provide the traditional fit statistics, such as RMSEA and CFI commonly used in path models. Following Muthén (2010), we assessed model fit by estimating a model with only main effects (baseline model) which we compared with the hypothesized model with the interaction effects using the associated log-likelihoods. We provide the results of this baseline model in Column 1 of Table 3. We also include the following control variables in the baseline model: creativity, firm size, a scaled measure of the total number of employees, competitive intensity, a three-item measure adapted from Jaworski and Kohli (1993) and industry design intensity.

To test the hypotheses, we estimate a model that includes the main effects of explanatory variables, the control variables, and the related interaction effects on new product performance. We get similar results without the inclusion of the control variables. We report the results of this estimation in Column 2 of Table 3. A likelihood ratio test of the baseline model (Column 1) versus the model with interaction effects (Column 2) yields a χ^2 difference of 445.784 (degrees of freedom $= 4$, $p < 0.01$) supporting the hypothesized model.

We find that as hypothesized in H_1, design orientation ($b = 0.200$, $p < 0.05$) increases new product performance. With regard to its joint effect with customer orientation on new product performance, we find that as hypothesized in H_2, the higher the customer orientation, the lower the positive effect of design orientation on new product performance ($b = -0.136$, $p < 0.05$). (Note that the

Table 3. Design Orientation and New Product Performance.

Variables	Column 1 Baseline Model Parameter Estimate (std. error)	Column 2 Model for Hypotheses Testing (N = 252) Parameter Estimate (std. error)	Column 3 B2B Sample (N = 193) Parameter Estimate (std. error)
Design orientation (H_1)	0.120 (0.072)*	0.200 (0.101)**	0.136 (0.070)*
Design orientation × Customer orientation (H_2)	–	−0.136 (0.055)**	−0.122 (0.060)**
Design orientation × Technological orientation (H_3)	–	0.024 (0.037)	0.007 (0.041)
Design orientation × Willingness to cannibalize (H_4)	–	0.172 (0.084)**	0.165 (0.098)*
Technological orientation	0.356 (0.097)***	0.183 (0.082)**	0.360 (0.099)***
Customer orientation	0.095 (0.102)	0.200 (0.101)**	0.150 (0.117)
Willingness to cannibalize	0.144 (0.164)	0.050 (0.145)	0.146 (0.159)
Creativity	0.124 (0.122)**	0.132 (0.108)	0.119 (0.108)
Size	−0.007 (0.052)	−0.034 (0.038)	0.001 (0.042)
Competitive intensity	0.006 (0.069)	−0.014 (0.072)	−0.001 (0.071)
Industry design intensity	0.025 (0.056)	0.019 (0.052)	0.031 (0.056)
Model fit			
Log-likelihood	−10,020.019	−13,027.199	−10,017.096
Akaike's Information Criterion (AIC)	26,326.399	20,306.037	20,343.193
Bayesian Information Criterion (BIC)	26,805.861	20,739.284	20,749.212
Sample-size adjusted BIC	26,374.725	20,317.981	20,328.406

***denotes $p < 0.01$, **$p < 0.05$ and *$p < 0.10$.

empirical support for the negative interaction effect between customer orientation and design orientation offers further evidence that shared variance from the mono-method data is not a threat.)

We find no support for H_3, the joint effect of technological orientation and design orientation on new product performance ($b = 0.024$, ns). However, as hypothesized in H_4, the higher the firm's willingness to cannibalize, the higher the positive effect of design orientation on new product performance ($b = 0.172$, $p < 0.05$).

With respect to the main effects of the key explanatory variables, both technological orientation ($b = 0.183$, $p < 0.05$) and customer orientation ($b = 0.200$, $p < 0.05$) increase new product performance, while, willingness to cannibalize ($b = 0.050$, ns) has no main effect. The control variable of creativity ($b = 0.132$, ns), firm size ($b = -0.034$, ns), competitive intensity ($b = -0.014$, ns), and industry design intensity ($b = 0.019$, ns) have no effect on new product performance. We performed additional analysis which examines the validity of the results.

Robustness Analyses

Multigroup Analysis. There are many differences between business-to-business (B2B) and business-to-consumer (B2C) firms (Grewal & Lilien, 2012) that suggest differences in the impact of design orientation on new product performance. To assess this possibility, we re-estimated the path model using only the data on B2B firms ($n = 193$; the B2C sample was too small to estimate the full model).

We report the results in Column 3 of Table 3. Consistent with the full sample (Column 2 of Table 3), the results support the main effect (H_1) of design orientation ($b = 0.136$, $p < 0.10$), the interaction effect (H_2) between design orientation and customer orientation ($b = -0.122$, $p < 0.05$) and the interaction effect (H_4) between design orientation and willingness to cannibalize ($b = 0.165$, $p < 0.10$) on new product performance. Hence, the results are robust to samples of B2B versus B2C firms.

Validity of Measures. As we used key informants, we do not have objective data for the measures. Hence, we examine the validity of the subjective measures for product design quality and business performance for those firms for whom we are able to get objective data from secondary sources. Of the respondents, 155 provided the name of their firm, an optional response item. For those firms, we used the Factiva database to collect the number of product design awards they had won over the past five years and correlated that number with the two-item measure of history of product design quality obtained in the survey. The correlation was 0.674, ($p < 0.01$), providing support for the subjective product design quality measure. In addition, we collected a two-item subjective measure of the firm's business performance in the survey (Performance

relative to competitors, performance relative to last year (1 − much worse than, 7 − much better than) (alpha = 0.680). For the 28 publicly listed firms, we correlated the subjective measure of business performance with the equivalent objective performance measure of return on assets (Fiscal year 2011) adjusted by industry (4-digit Standard Industry Classification code) from Standard and Poor's Compustat database. The correlation was 0.652, ($p < 0.01$), providing support for the subjective measure of relative performance. These results support the validity of the information provided by the key informants.

Multiple Respondents. We have multiple respondents for 21 sample firms. We used the more senior of the respondents in the sample of 252 firms which we used for hypotheses testing (Column 2 of Table 3). We examined the robustness of our hypotheses tests using two alternative approaches. First, we averaged the responses of multiple respondents and then re-estimated the model as if we had only a single response from the firms. Second, we selected a random respondent and re-estimated the model. The results in both approaches (not reported here) are consistent with those in Column 2 of Table 3, reinforcing our confidence in the responses of our key informants.

Marginal Effects Analysis

To quantify the effects of moving from a firm's status quo, we use the model estimated in Column 2 of Table 3 to obtain firm-specific marginal effects of design orientation and customer orientation on new product performance. As each marginal effect combines estimates of the main and interaction effects (Table 3), it is a multivariate function of random variables. We use the delta method (Mantrala, Prasad, Sridhar, & Thorson, 2007) to obtain the standard error and confidence intervals of the firm-specific marginal effects. We obtained the upper and lower limits of a 95% confidence interval for each marginal effect to assess whether it was positive and statistically significant, negative and statistically significant, or not significantly different from zero. The marginal effect of an increase in design orientation and associated statistical significance (negative, positive or not different from zero) indicates whether the firm has over-, under- or at about the right level of design orientation with respect to its effect on new product performance. We performed the same analysis for customer orientation. We summarize the marginal effects of design orientation and customer orientation for the sample firms in Panels A and B in Fig. 3.

From Panel A in Fig. 3, we see that managers of most firms (69%) perceive that their firm can benefit (i.e., improve their new product performance) by increasing their design orientation. Managers in 28% of firms perceive their design orientation to be about right (i.e., will neither benefit nor be hurt by an increase or decrease) and managers in only 3% of firms perceive that their firms will benefit by decreasing their design orientation.
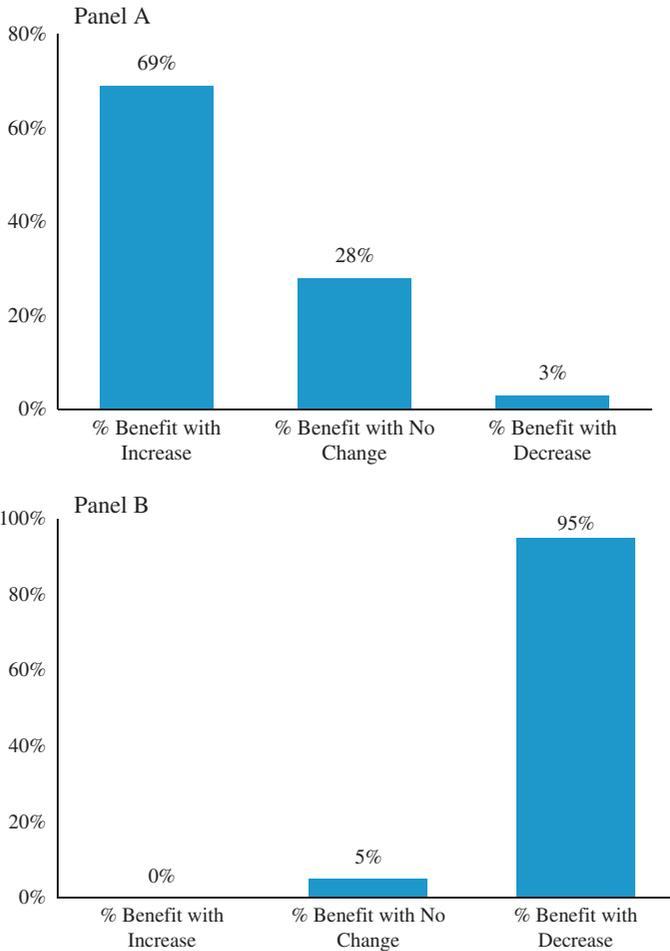
Fig. 3. Marginal Effects Analysis. Panel A: Design Orientation and New Product Performance. Panel B: Customer Orientation and New Product Performance. *Note*: In Panel A, % of sample firms that can benefit (i.e., improve their new product performance) by (1) increasing their design orientation (69%), (2) with no change (28%), and (3) decreasing their design orientation (3%).

These three groups of firms in Panel A in Fig. 3 do not differ on firm size, industry design intensity, and competitive intensity. However, firms that are about right on design orientation and those that can benefit from a decrease in design orientation (relative to those which can benefit from an increase in design orientation) have higher design orientation ($p < 0.01$), are more customer-oriented ($p < 0.01$), and more willing to cannibalize ($p < 0.01$).

From Panel B of Fig. 3, we see that managers in most firms (95%) perceive that their firms will benefit (i.e., their new product performance will improve) by decreasing customer orientation and managers in 5% of firms perceive that their firms' new product performance will not change by increasing customer orientation.

DISCUSSION

As technological capabilities become more universally available, firms are exploring other venues when seeking a competitive advantage. One such venue is that of product design. Although practitioners have acknowledged the importance of design as a strategic marketing issue (Nussbaum, 2006), there is little in the academic literature that aids in understanding the role of how firms can benefit from building capabilities in the design domain, the issue we focus on in this chapter.

The findings on the domain and distinctiveness of design orientation indicate that the capability to develop design-driven products is distinct from what is needed for products driven by market insights or technology. The findings support a contingency-based model of new product performance rewards to firms' design orientation, dependent on their customer orientation and willingness to cannibalize. The marginal effects analyses uncover an unexplored opportunity − most firms' managers (69%) perceive that their firm can improve new product performance by *increasing* their design orientation. Managers in only 28% of firms consider that they are at about the "right" level of their design orientation (i.e., they cannot benefit from an increase) with respect to new product performance.

Managerial Implications

Note that most firms in our sample report did not report high levels of new product performance (mean = 8.255, standard deviation = 3.229, minimum = 3, maximum = 20; scale range = 3−21). Given the importance of new products in improving business performance, our findings should be useful for firms looking to improve in this domain.

Our findings on the domain and distinctiveness of design orientation indicate that the capabilities to develop design-driven products and to develop new products in response to new technologies and articulated customers' needs are distinct. For firms looking to improve new product performance, customer orientation and design orientation represent strategic substitutes, representing distinct mechanisms to new product performance. In contrast, design orientation

Table 4.   Illustrative Application of Marginal Effects for Four Sample Firms.

Characteristic	Alpha	Beta	Gamma	Delta
Firm size	Small (<$100 million)	Medium ($101−499 million)	Large (>$5 billion)	Small (<$100 million)
Industry	Business-to-business	Business-to-business	Business-to-consumer	Business-to-consumer
New product performance (scale range: 3−20)	4	9	9	17
Design orientation (5−35)	5	9	35	33
Marginal effect of design orientation[a]	0.224***	0.390 (*ns*)	1.140***	0.333 (*ns*)
Customer orientation (4−28)	16	19	9	28
Marginal effect of customer orientation	−0.529***	−1.114***	−4.970 (*ns*)	−4.661 (*ns*)
Willingness to cannibalize (3−21)	7	15	7	21
Marginal effect of willingness to cannibalize	−0.690 (*ns*)	−0.995 (*ns*)	−1.148 (*ns*)	2.320***

[a]On new product performance.

and willingness to cannibalize reinforce one another to improve new product performance.

Managers can use their firms' and competitors' organizational characteristics to generate firm-specific estimates of the effectiveness of design orientation in new product development. Table 4 illustrates this approach for four firms in our sample. For Alpha Corp., a small B2B firm, the marginal effects of design orientation (5), customer orientation (16), and willingness to cannibalize (7) are 0.224 ($p < 0.01$), −0.529 ($p < 0.01$), and −0.690 (*ns*), respectively. For Beta Corp., a medium-sized, B2B firm, the marginal effects of design orientation (9), customer orientation (19), and willingness to cannibalize (15) are 0.390 (*ns*), −1.114 ($p < 0.01$), and −0.995 (*ns*), respectively. For Gamma Corp., a large B2C firm, the marginal effects of design orientation (30), customer orientation (9), and willingness to cannibalize (7) are 1.140 ($p < 0.01$), −4.970 (ns), and −1.148 (*ns*), respectively; for Delta Corp., a small B2C firm, the marginal effects of design orientation (33), customer orientation (28), and willingness to cannibalize are 0.333 (*ns*), −4.661, and 2.320 ($p < 0.01$), respectively.

Overall, these findings suggest that one size does not appear to fit all in assessing the tradeoffs between design orientation, customer orientation, and willingness to cannibalize on new product performance. Managers in Alpha

Corp. and Gamma Corp. can increase their new product performance by decreasing their design orientation, while managers in Alpha Corp. and Beta Corp. can improve their new product performance by decreasing customer orientation. Managers in Delta Corp. will not improve their new product performance by increasing either design orientation or customer orientation, but can do so by increasing their willingness to cannibalize.

Design vendors can use our findings to educate their (customer) firms that combining a market-pull approach based on their customer orientation with a design-driven approach fueled by their design orientation hurts new product performance.

Theoretical Contributions

To supplement the two dominant product development approaches of market-pull (driven by customer orientation) and technology-push (driven by technological orientation) in business practice and in the literature, we propose and validate a third firm-level approach (design orientation) to developing new products. Using a cross-industry sample of firms, we measure it reliably, and demonstrate its empirical distinctiveness from customer orientation, technological orientation, and creativity.

We also develop and provide support for hypotheses concerning the interaction between this new construct and three established constructs, customer orientation, technology orientation, and willingness to cannibalize. Our findings show that firms with design orientation can achieve superior new product performance in the absence of technological orientation and/or without customer orientation. Moreover, while customer orientation and design orientation working independently improve new product performance, working together, they emerge as strategic substitutes, being less beneficial for new product performance. Further, the lack of support for the interaction effect between design orientation and technological orientation suggests that represent distinct, independent routes to new product performance.

Limitations and Opportunities for Further Research

Our research has limitations that qualify our findings and present opportunities for further research. Our cross-sectional design limits our ability to study the effects of changes in the key constructs or in the environment on design orientation and its effects over time. (e.g., Are the rewards to design orientation sustainable?) Further research could use a longitudinal methodology to capture the time-dependent dynamics of the new product development process.

In this study, we focused on firms in the goods sector. Future work that examines service firms where there is potential to improve the design of service experiences would be useful. Further, as the unit of analysis in this research is the SBU, we did not relate design orientation to financial performance (e.g., profits, stock returns). Future research using secondary data of publicly listed firms relating their design orientation to financial performance would be a useful extension to this work.

In summary, we believe that both practitioners and scholars will find the design orientation construct useful and that more research remains to be done to refine and extend the construct, explore its drivers, and quantify its impact on organizational outcomes.

NOTE

1. To assess threats from non-response bias (Armstrong & Overton, 1977), we examined and found no difference in key variables between late (last 25%) and early (first 25%) respondents, (L = late, E = early): Design orientation ($L = 14.10$, $E = 14.14$, not significant [ns]), technological orientation ($L = 9.30$, $E = 9.42$, ns), customer orientation ($L = 10.18$, $E = 10.34$, ns), willingness to cannibalize ($L = 10.55$, $E = 10.75$, ns), and new product performance ($L = 8.26$, $E = 8.30$, ns).

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APPENDIX A: MEASURES OF MULTI-ITEM SCALES

New product performance ($\alpha = 0.802$) (adapted from Griffin & Page, 1996)

1. We introduce new products that face high consumer acceptance
2. We are very successful in our new product introductions
3. Our products are very successful in the marketplace

Design orientation ($\alpha = 0.945$) (new scale)

1. We strongly value products that integrate functionality, aesthetics, and brand meaning
2. We recognize that integrating functionality, aesthetics, and brand meaning is critical in our product development process
3. Our product developers understand the inter-relationships between a product's functionality, aesthetics, and brand meaning
4. Our product development processes enable the seamless integration of functionality, aesthetics, and brand meaning in our products
5. We integrate functionality, aesthetics, and brand meaning in our products early in the product development cycle.

Customer orientation ($\alpha = 0.854$) (adapted from Deshpandé & Farley, 1998)

1. Our business objectives are driven primarily by customer satisfaction
2. We constantly monitor our commitment to serving our customers' needs
3. Our strategy for competitive advantage is based on our understanding of customers' needs
4. We are more customer-focused than our competitors

Technological orientation ($\alpha = 0.888$) (adapted from Gatignon & Xuereb, 1997)

1. Our company uses sophisticated technologies in new products
2. We excel at developing new technologies for our products
3. Our organizational environment is conducive to the development of new technologies

Willingness to cannibalize ($\alpha = 0.734$) (adapted from Chandy & Tellis, 1998)

1. We support projects even if they could potentially take away from sales of existing products
2. We can easily change established procedures to develop a new product
3. We frequently pursue a new technology even if it destroys the value of our existing investments

Industry design intensity ($\alpha = 0.811$) (new scale)

1. Many companies in our industry rely on product design as a source of competitive advantage
2. Superior product design is expected from companies in our industry

3. The products in our industry are very distinctive in design

Creativity ($\alpha = 0.921$) (adapted from Amabile, 1990)

1. There is a great deal of originality in our new products
2. Many of our products are very creative
3. Our products are more novel than those of our competitors

Product design history ($\alpha = 0.913$) (new scale)

1. We have an established tradition of well-designed products
2. We have a history of superior product designs

Product design quality recognition ($\alpha = 0.721$) (new scale)

1. Our consumers frequently comment on the superior designs of our products
2. Many of our products have won product design awards.

Business performance ($\alpha = 0.856$)
   Overall performance of the company

1. Compared to last year
2. Compared to our major competitors

Notes: The unit of analysis was the SBU. All items were scored using a seven-point scale, where 1 corresponds to "strongly disagree" and 7 to "strongly agree."

APPENDIX B
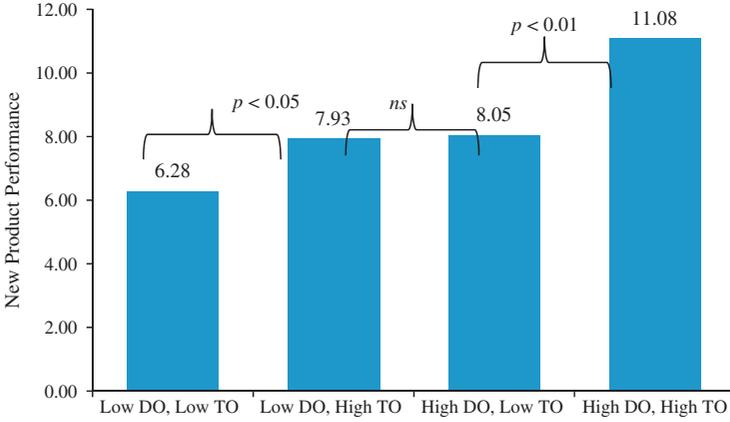
Figs. B1−B2

Fig. *B1*.   Bivariate Analysis of Design Orientation (DO), Technological Orientation (TO), and New Product Performance.

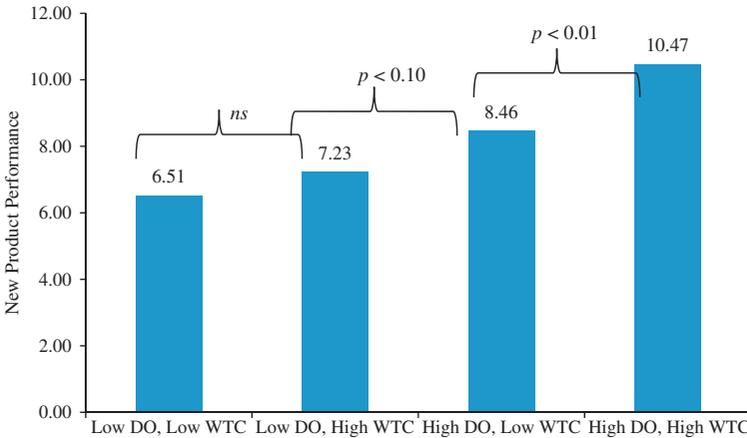*Fig*. *B2*.   Bivariate Analysis of Design Orientation (DO), Willingness to Cannibalize (WTC), and New Product Performance.