Article can be accessed online at http://www.publishingindia.com

The Informational Elements of Product Design Briefs: An Exploratory Investigation

Ian Parkman*

Abstract

This study investigates the contents and use of product design briefs within new product development (NPD). These documents are utilized during the NPD process to capture, codify, and communicate various requirements of a project (e.g., target market, pricing, product attributes, materials, and design language). Drawing from a proprietary sample of 68 product design briefs and a survey sample of 157 managers our study: (1) Describes 51 "informational elements" (e.g., words, text, phrases, concepts, ideas, figures) commonly present within product design briefs, (2) Defines differences between information elements as rated by managerial "Importance", (3) Organizes information elements into a strategic framework through Exploratory Factor Analysis, and (4) Draws on related literature to offer theoretic rationale for the presence of information elements and underlying strategic dimensions. Our results provide the informational contents of successful product design briefs and become a first-step towards further understanding of these documents as integral aspects of NPD.

Keywords: New Product Development, Knowledge Management, Product Design Brief, Knowledge-Based Artifacts

Introduction

Phillips (2004), drawing on the British Standards Association, defines the product design briefs as, "A document that outlines the strategic direction for creative development, covering the specific task at hand, the communication objectives and strategy, and any elements that the executions must contain" (p. 37). Product design briefs are typically written documents (although they often contain images, diagrams, blueprints, schematics, sketches and occasionally video) that help teams engaged in New Product Development (NPD) specify the many requirements of a project by codifying and defining the business objectives, target market and corresponding design strategies for a product development project (Crawford, 1997; Bart and Pujari, 2007; Crawford and Di Benedetto, 2006; Wikstrom and Verganti, 2013). The focus of these functional documents is to provide designers, marketers, R&D staff, channel partners, and other stakeholders with a snapshot of the external environment (e.g., current industry trends, competing firms and offerings) as well as capturing relevant internal knowledge (e.g., technical or technological specifications, timelines, production objectives, budget, and success metrics) for the upcoming product development project (e.g., Ryd, 2004; Blyth and Worthington, 2001). In one widely cited example,

"General Motors realized its premium automobile brand, Cadillac, needed a major re-design to improve sales and increase market share. It was determined that the engineering of the luxury motor car was still considered state of the art, but the overall design of the vehicle was not exactly what the target audience wanted. A comprehensive design brief was created to guide marketing, engineering, and design through this major project. This major re-design has been credited for restoring the Cadillac brand to its former position as an icon of luxury for American cars. It can be argued that the design brief was the most important factor in the overall success of this project" (Phillips, 2004, p. 46).

However, despite the anecdotal importance of product design briefs, their use by firms within NPD has been characterized as unsystematic and largely ad hoc (Ozenc, Brommer, Jeong, Shih, Au, and Zimmerman, 2007; Redstrom, 2006; Crawford, 1997; Phillips, 2004; Bart and Pujari, 2007; Crawford and Di Benedetto, 2006). At the same time, while contemporary NPD has been

* *Assistant Professor of Marketing, University of Portland, United States. Email:parkman@up.edu*

characterized as the process by which firms transform organizational knowledge into new products (e.g., Madhavan and Grover, 1998; Frishammar, 2005; Axelson and Richtner, 2015), the precise mechanisms (such as product design briefs) facilitating this process have not been clearly described in empirical research (Hertenstein, Platt, and Veryzer, 2005; Sherman, Berkowitz, and Souder, 2005; Lynn, Reilly, and Akgun, 2000; Nagano, Stefanovitz, and Guimaraes, 2016). Scholars (e.g., Cooper, 1987; Ryd, 2004; Phillips, 2004; Blyth and Worthington, 2001) have suggested that because the organizational information contained in product design briefs is oftentimes highly proprietary in nature, organizations are understandably reluctant to release them for academic study. Consequently, it appears that the very importance of product design briefs to successful NPD has hindered their use in scholarly investigations (Phillips, 2004).

Accordingly, the focus of this research is to examine the form, contents, and use of product design briefs within NPD. Specifically, this exploratory study defines, for perhaps the first time, the types of information contained in these important documents. In particular, we seek to:

(1) Ground the use of product design brief documents in extant literature on knowledge-based assets and new product development,

(2) Define the "informational elements" -e.g., Words, text, phrases, concepts, ideas, figures, drawings, shapes, and colors (Kwan and Balasubramanian, 2003; Ibekwe-SanJuan and Dousa, 2014) contained within product design briefs,

(3) Describe differences between information elements as rated by managerial "*Importance*" to a successful product design brief,

(4) Organize information elements into strategic dimensions using Exploratory Factor Analysis (EFA), and

(5) Offer theoretic rationale for the presence of information elements and underlying strategic dimensions by integrating our findings with relevant literature.

The following sections provide a brief review of scholarly findings from the areas of NPD and Knowledge-based assets before describing our research design, data analysis, and interpretation of Factor Analysis results. We conclude by integrating our findings with general theory and discuss areas for future research.

Conceptual Background and Research Relevance

A number of theoretic and qualitative studies (e.g., Nakata and Im, 2010; Veryzer, 2005; Veryzer and Mozota, 2005) have explored the product design process from the perspective of knowledge-based NPD. This research stream focuses on the processes employed by firms in determining the attributes of a new product, such as its appearance and features or the aesthetic, usability, and ergonomic aspects of the product form (Verganti, 2006). However, this process is not well understood (Walsh, Roy, Bruce and Potter, 1992; Nakata and Im, 2010). In particular, the question of how firms codify, combine, absorb, and coordinate highly contextualized and difficult-to-codify knowledge during the NPD process is still unclear (Hertenstein, Platt, and Veryzer, 2005; Majava, Haapasalo, Belt, and Mottonen, 2013; Frishammar, 2005).

Against this background, we propose that although the role of product design briefs has historically remained underdeveloped in literature (Bart and Pujari, 2007; Crawford, 1997; Phillips, 2004; Herbruck and Umback, 1997; Walsh, Roy, Bruce, and Potter, 1992) but these documents potentially represent an underdeveloped knowledge-based asset contributing to successful product design processes by facilitating the codification, cataloging, and use of explicit as well as highly-tacit information during NPD. Simply put, the contents (i.e., "informational elements") of product design briefs are integral to helping NPD teams create successful products (Cooper, 1987; Phillips, 2004; Blyth and Worthington, 2001). Yet, to date, no empirical research has described product design briefs as knowledge-based artifacts within NPD, specified the information contained within them, or assessed manager's perceptions of differences across these informational elements. Our research attempts to address this gap in current understanding.

Knowledge-based Artifacts in New Product Development

Drawing on the areas of Knowledge Management (Bontis, 1996; Darroch, 2005; Darroch and McNaughton, 2003)

and Technology Management (Phaal, Farrukh, and Probert, 2006; Burgelman, Maidique, and Wheelwright, 1996; Atuahene-Gima and Murray, 2007), contemporary perspectives on NPD have established that the use of information and knowledge critically affects the product development process (e.g., Sherman, Berkowitz, and Souder, 2005; Chan and Yu, 2007; Jassawalla and Sashittal, 2000; Dougherty, 1989). However, research has also demonstrated that the sheer presence of information/knowledge is not enough, organizations often fail to effectively absorb and retain information available in hand (Maltz and Kohli, 1996; Jassawalla and Sashittal, 2000). Firms need to develop the capabilities that effectively codify, combine, absorb, and coordinate knowledge across multiple NPD projects (Adams, Day, and Dougherty, 1998; Lynn, Reilly, and Akgun, 2000; Millward, Byrne, Walters, and Lewis, 2006). As a consequence, researchers have emphasized the importance of knowledge-based assets and knowledge-based artifacts as tangible, durable repositories of organizational knowledge (Ulrich and Pearson, 1998; Melewar, Basset and Simoes, 2006, Hertenstein, Platt, and Veryzer, 2005) that enable firms to retain information in order to spur future new product development activities (Sherman, Berkowitz, and Souder, 2005). Knowledge-based assets broadly function to capture and codify general aspects of organizational culture, knowledge and learning as stories, routines, rituals, and common language, as well as physical objects that communicate something about the philosophy or character of the organization such as corporate visual identity, employee uniforms, logos, typeface, diagrams, schematics, sketches, planning documents, and prototypes (Ulrich and Pearson, 1998; Leuthesser and Kohli, 1995; Melewar and Saunders, 2000; Melewar, Basset and Simoes, 2006).

Alavi, Kayworth and Leidner (2005) develop the concept of knowledge based artifacts to describe the functional documents resulting from the process of capturing, storing and sharing a firm's knowledge. This concept highlights the importance of structured and formal knowledge sharing focused on codifying knowledge as durable, tangible artifacts where firms must develop, "communities of practice…that nurture and preserve the collective knowledge as tangible artifacts" (Heo and Yoo, 2002). Within the NPD context, researchers have stressed the importance of systematically developing knowledge-based artifacts as knowledge sharing platforms (De Maio, Verganti, and Coso, 1994). These documents are required to catalog and integrate the variety of technical and market information necessary for successful NPD. They also allow firms to collect and amass knowledge for use in future product lines as well as facilitating NPD activities beyond the single project scope (Sanderson and Uzumeri, 1995). The exercise of formally codifying firm knowledge for use in future product development efforts is emphasized by Wheelwright and Clark (1992), who argue that many NPD failures are due to an acute lack of aggregate planning across product development projects.

While the role of artifacts (i.e., product plans, product briefs, mood or inspiration boards, sketches, product concepts, technology roadmaps, and prototypes) as elements of NPD has been described anecdotally (e.g., Crawford, 1997; Bicen and Hunt, 2012, Ulrich and Pearson, 1998; Phaal, Farrukh, and Probert, 2006), very little empirical research has examined the form, contents and use of these potentially significant strategic documents. Accordingly, the purpose of this study is to address this gap in current understanding by examining product design briefs as a particular type of knowledge-based artifact commonly employed during NPD.

Product Design Briefs

Product design briefs are documents employed during NPD serving as a central meeting place for the various requirements of an NPD project, such as product development objectives, descriptions of the target market, current industry trends, competing firms and offerings, relevant technical or technological specifications, timelines, production objectives, budget and success metrics, along with product design and attribute details-e.g. shape, branding, dimensions, materials, personality, and so on (Phillips, 2004; Bruce and Daly, 2007). These documents capture the various written communication, blueprints, diagrams and schematics employed during the new product development process (Crawford, 1997; Bart and Pujari, 2007; Crawford and Di Benedetto, 2006; Evans, Pei, Cheshire, and Graham, 2015). While the functional purpose and importance of these documents, to capture and codify important information relating to a product development project, has been well-established in academic and practitioner-oriented literature this research

has tended to be focused on qualitative descriptions of product design briefs (e.g., Phillips, 2004; Blyth and Worthington, 2001; Forlizzi, 2008; Ryd, 2004; Bart and Pujari, 2007; Crawford, 1997; Herbruck and Umback, 1997; Walsh, Roy, Bruce, and Potter, 1992). The goal of this study is to address this gap in current understanding by providing a qualitative examination of the contents and use of product design briefs within NPD. More specifically we intend to clarify the types of information contained in these potentially important documents and describing their "importance" as rated by NPD managers.

Research Method

Determination of Product Design Brief Informational Elements

The determination of a complete set of product design brief informational elements is an important contribution of this study. To compile a detailed yet parsimonious set of informational elements, we restricted our focus to consumer product firms (see Appendix A). Initially, relevant literature and interviews with 63 high-level managers from consumer product firms who had considerable experience in creating and managing product design briefs were used to identify an initial listing of 138 relevant informational elements likely to be present in product design briefs (see Appendix A).

Next, we approached over 200 consumer product firms via email, phone, or face-to-face meetings and requested access to their product design briefs. These firms were assured that their product design briefs would only be used in an expert rating process to validate the preliminary list of informational elements. Our efforts resulted in access to 125product design briefs from 20 firms across 17 NAICS industry codes (see Appendix B). A panel of experts examined each brief for the "presence" of each of our 138 informational elements. For example, a product design brief for a running shoe that contains a bullet point noting that the target consumer of the product is,

"[An] avid runner, who is highly involved with running, training for a sub-4 [hour] marathon, at 40+ miles per/ week."

This statement was deemed by our expert raters to represent evidence of informational elements related to; "Product performance", "Status", "Involvement", "Prestige", "Intended use", and "Segmentation". Each product design brief in our sample was assessed by at least three raters who were provided with an instrument that listed our initial listing of 138 information elements on a scale from 3-- "Commonly Present" to 0-- "Completely absent". This process resulted in a more manageable final listing of 51 design brief information elements that became the basis for the survey instrument in our second stage of analysis (see Table 1). More specifically, the information element "Workmanship" was identified during our initial interview pool and was verified in related literature (e.g., Ehrich and Irwin, 2005). During our expert rating process the item was found to be moderately present in the sample of design briefs (mean = 1.21). Accordingly, "Workmanship" was carried through to our final listing of information elements. Conversely, although noted in literature, "Customization" was infrequently identified by raters (mean = 0.025) and was therefore dropped from further analysis in the pursuit of parsimony.

Data Collection

In second stage of our analysis, survey data was collected from NPD managers to assess the "importance" of each informational element within the product development process. Employing a non-probability snowball sampling technique (Churchill, 1995), this process began with identifying and contacting consumer product producing organizations (over 200 firms in total). In many cases, but not all, these contacts had also been solicited previously to provide product design brief documents for the first step of our analysis. Each individual respondent targeted for our survey occupied a senior position at their firm (descriptive statics reveal the average years of experience in the sample is 12.7) and was well connected among the wider target population of product development managers, engineers, designers and developers in their industry. The snowballing process was repeated over several months and resulted in 174 responses from fifty-seven organizations (although seventeen responses were discarded because of incomplete data; the remaining 157 responses were used for subsequent data analysis). This sample size and respondent rejection rate compares favorably with other studies of this nature targeting a highly specific population (Churchill, 1995).

Table 1: Univariate Statistics

Informational Element	*Mean (SD)*	*Factor*	*% ≥3.0*	*Informational Element*	*Mean (SD)*	*Factor*	*% ≥3.0*
Product Price Point	4.50 (0.76)	Target market	98.1	Graphics	3.91 (0.96)	Aesthetics	94.3
Sale Prices (Landed, Wholesale)	4.43 (0.82)	Target market	98.1	Sensory Appeal of the Product	3.90 (1.07)	None	89.8
Ties into Earlier Collections	4.34 (0.81)	None	98.1	Originality	3.85 (1.03)	None	92.4
Styling	4.32 (0.91)	None	96.2	Workmanship	3.84 (1.13)	Quality & workmanship	88.5
Design Language	4.27 (0.94)	Aesthetics	96.2	Consumer Involvement	3.83 (1.09)	Consumption expertise	88.5
Aesthetics	4.25 (0.93)	Aesthetics	95.5	Authenticity	3.81 (1.11)	None	89.2
Materials to be Used	4.20 (0.98)	Production	92.4	Sizes Required	3.73 (1.16)	Risk & Safety	86.7
Innovativeness	4.20 (0.93)	None	93.6	Prestige of the Product	3.72 (1.07)	Symbolic value	87.9
Technology Employed	4.18 (0.95)	None	95.5	Touch	3z.66 (1.14)	None	87.2
Product Performance	4.17 (1.12)	Form	90.5	Product-user Interactivity	3.65 (1.14)	Consumption expertise	84.7
Target Dates	4.17 (0.93)	Target market	95.5	Firm-level Positioning	3.60 (1.05)	Symbolic value	89.8
Multiple Versions or Colorways	4.15 (0.99)	None	92.4	Distribution / Suppliers	3.59 (1.03)	Place &Distribution	86.6
Product-level Positioning	4.15 (0.93)	Target market	94.9	Intended Product Life Cycle	3.57 (1.03)	Place &Distribution	87.9
Project Goals	4.10 (1.01)	Target market	94.3	Specific Production Capability	3.45 (1.18)	Production	81.5
Comfort	4.09 (1.11)	Quality & workmanship	89.8	Ergonomics of the Product	3.44 (1.24)	None	81.5
Technical Specifications	4.08 (1.07)	None	91.1	Sustainability of the Product	3.41 (1.04)	Place &Distribution	82.8
Product is New Introduction or Continuation	4.08 (0.98)	Target market	94.9	Product Weight	3.38 (1.23)	Quality & Workmanship	79.0
Differentiation of Product	4.06 (0.94)	None	95.5	Status the Product Provides	3.38 (1.10)	Image	80.9
Forecasts (Units, Dollars)	4.04 (0.97)	Target market	93.6	Related Promotional or Advertising Strategy	3.37 (1.14)	Place &Distribution	79.0
Consumer Meaning	4.03 (1.06)	None	90.5	Specific Production Facility or Location	3.31 (1.18)	Production	80.3
Comparisons with Existing or Competitor Technology	4.03 (0.95)	Consumption expertise	93.6	Sustainability of the Production Process	3.23 (1.13)	Place &Distribution	77.1
Specific Consumer Segments	4.02 (0.91)	Target market	96.2	Tagline for Target Consumer	3.22 (1.12)	Place &Distribution	79.0
Product Quality	4.01 (1.11)	Quality& workmanship	88.5	Expertise Required for use	3.13 (1.04)	Complexity	78.3
Emotional Appeal of the Product	3.97 (1.09)	Symbolic value	89.8	Product Safety	2.86 (1.19)	Risk & Safety	68.8
Associative (Name, Image, Logo)	3.93 (0.96)	Aesthetics	93.0	Product Risk	2.80 (1.17)	Risk & Safety	66.9
				User Health	2.76 (1.14)	Risk & Safety	65.6

In the survey instrument respondents were presented with a randomized listing of blocks of the 138 information elements developed through the first-step of our analysis and asked to indicate their level of agreement with the influence each informational element had on successful briefs at their company. A "successful" brief was defined as one that led to a product being developed as intended by those involved in the NPD process (Crawford and Di Benedetto, 2006). Responses were elicited on a 5-point scale anchored by "strongly disagree" and "strongly agree" (See Table 2).

FINDINGS

Data Analysis

As the number of information element variables in our survey instrument is considered too large to describe individual linkages or allow any confirmatory path analysis (Flynn, Sakakibara , Schroeder, Bates, and Flynn, 1990), we employed a standard data-reduction technique; exploratory factor analysis (EFA) to describe groupings of information elements contained within design brief documents. Table 1presents three important univariate statistics for each informational element-- i.e., its mean, standard deviation, and the percentage of respondents with scores greater than or equal to 3.0 (on a 5 point scale) for each element. The results indicate that 48 of the 51 elements have means above the scale's 3.0 midpoint. This finding can be interpreted as prima facie support for the success of our expert rating process in identifying the presence of informational elements. Indeed, 23 of the elements have "Importance" means above 4.0 on the 5 point scale. Also, for 43 of the 51 informational elements, at least 80% of the respondents had scores greater than or equal to 3.0, indicating the high degree of agreement across respondents within our sample. Collectively, these univariate statistics provide strong evidence that a majority of the 51 informational elements are perceived to influence the success of product briefs.

Lastly, the underlying dimensions of the informational elements were then examined using exploratory factor analysis (principal components analysis with a varimax rotation). The procedure was conducted following the procedures of Dillion and Goldstein (1984) and Kim and Mueller (1978). The conventional wisdom of including factors with eigenvalues of one or greater led to the identification of eight factors with a cumulative explained variance of 72%. A screen test also indicated that an eight-factor solution was appropriate. Elements were assigned to factors only if they had factor loadings of 0.4 or higher and did not have cross-loadings greater than 0.4 on more than one factor. The results of the factor analysis are shown in Table 2 and discussed in more detail below.

Table 2: Results of Factor Analysis

Informational Elements	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*	*F7*	*F8*
Factor 1: Target Market								
Sale Prices (landed, wholesale, etc.)	0.77							
Product Price Point	0.74							
Forecasts (units, dollars)	0.71							
Target Dates	0.68							
Specific Consumer Segments	0.68							
Product-level Positioning	0.64							
Project Goals	0.62							
Product is a new market introduction or continuation	0.57							
Factor 2:Quality and Workmanship								
Product Quality		0.81						
Product Performance		0.78						
Workmanship		0.76						
Informational Elements	*F1*	*F2*	*F3*	*F4*	*F5*	*F6*	*F7*	*F8*
Product Weight		0.73						
Comfort		0.71						

Factor 3: Place and Distribution								
Distribution / Suppliers			0.70					
Related Promotional or Advertising Strategy			0.70					
Intended Product Life Cycle			0.68					
Sustainability of the Product			0.65					
Tagline for Target Consumer			0.61					
Sustainability of the Production Process			0.59					
Factor 4: Consumption Expertise								
Expertise Required to use the Product				0.73				
Product-user Interactivity				0.70				
Consumer Involvement with the Product				0.67				
Comparisons with Existing or Competitor Technology				0.55				
Factor 5: Aesthetics								
Graphics					0.80			
Associative (Name, Image, Logo)					0.77			
Aesthetics					0.62			
Design Language					0.61			
Factor 6: Risk and Safety								
Product Safety						0.78		
Product Risk						0.70		
User Health						0.59		
Sizes Required						0.58		
Factor 7: Symbolic Value								
Prestige of the Product							0.75	
Status the Product Provides							0.74	
Firm-level Positioning							0.46	
Emotional Appeal of the Product							0.42	
Factor 8: Production								
Specific Production Facility or Location								0.84
Specific Production Capability								0.75
Materials to be Used								0.54
Percent Variation explained by each factor	39.90	7.74	7.02	4.86	3.94	3.11	2.94	2.60

All informational Elements rated on 5-response scale anchored by "Strongly Disagree" and "Strongly Agree

Description and Interpretation of Factors

The eight factors emerging from the factor analysis are described below. As the interpretation of the underlying dimensions is exploratory, we include insights from relevant literature to enrich interpretation and increase practical understanding.

Factor 1

Target Market describes the product-level knowledge necessary at the front-end of NPD. It captures a variety of relatively tangible and explicit information elements including the price point for the product, sales price, multiple versions of the product, target dates, goals and forecasts. Successful codification and articulation of this information (e.g., deadlines, timelines and project goals) helps to specify and direct firm capabilities and makes sure that resources are made available where and when needed. Additionally, these types of information elements are intended to help project teams creating products differentiated from competitor offerings and will occupy a clear position in the minds of consumers (McCormack, Cagan and Vogel, 2004; Aaker, 1997; Creusen and Schoormans, 2005). Consequently, research has shown

that information elements within our *Target Market* factor are significant predictors of NPD success (Frishammar, 2005; Urban, Hauser and Dholakia, 1987; Atuahene-Gima, 2005; Majava, Haapasalo, Belt, and Mottonen, 2013; Li and Calantone, 1998; Evanschitzky, Eisend, Calantone, and Jiang, 2012; Moorman and Miner, 1997; Reed and DeFillippi, 1990).

Specifically, our respondents deemed *Target Market* information elements as highly "important". Indeed, five of the top fifteen highest rated items reside within this factor. These specific elements vary from items defining "Product price point" (M = 4.50, SD = 0.76), "Sales price" (M = 4.43, SD = .82), and "Target dates" (M = 4.17, SD = 0.93) which were understandably deemed essential pieces of information to be included in a successful product design brief to more intangible and firm specific information such as "Product-level positioning" (M = 4.15, SD = 0.93) and "Project goals" (M = 4.10, SD = 1.01). Additionally, *Target Market* information must catalog the variety of marketing research information the firm has gathered relating to the focal NPD project including, "Forecasts" (M = 4.04, SD = 0.97) and "Specific consumer segment" (M = 4.02, SD = 0.91).

Factor 2

Quality and Workmanship captures information related to product form, product performance, and ergonomic specifications such as weight, quality, workmanship and comfort. Within the literature, these aspects of NPD help designers and developers to define a product's physical form as well as convey deeper meaning (McCormack, Cagan, and Vogel, 2004; Tractinsky, Katz, and Ikar, 2000). Considering our sample of consumer-oriented product firms, *Quality and Workmanship* information elements were considered extremely important for a successful product design brief. Specifically, clearly included were the desired "Product performance" (M = 4.17, SD = 1.12), "Comfort" (M = 4.09, SD = 1.11), and "Product quality" (M = 4.01, SD = 1.11) of an NPD project and all rated above 4.0 among our sample of managers. Additionally, the relatively high ratings of these *Quality and Workmanship* items suggest that they have a clear relationship with Factor 1: *Target Market* information such as firm strategy, product and brand positioning, consumer segmentation, and price point. This information provides NPD teams with a clear set of largely tangible and explicit requirements to help guide the product development process.

Factor 3

Place and Distribution items detail the functional information necessary to help guide the development of the focal product and deliver it to market. These information elements define the product's distribution strategy, manufacturing partners, intended product lifecycle, and the sustainability of the product's form and production (e.g., Ulrich and Eppinger, 1995). The specific items of "Sustainability of the product" (M = 3.41, SD = 1.04) and "Sustainability of the production process" (M = 3.23, SD = 1.13) capture the firm's attention to the concept of "designing for sustainability" (Ulrich and Eppinger, 2003), which describes organizational attention to, and consideration of, the broader downstream impacts of decision making that happens at the beginning of the design process - e.g., waste mitigation, energy use, environmental impact (Elkington, 2004). The purpose of these types of information elements is to help product teams identify and manage these issues as part of the NPD process. The implications of this information is to highlight sustainability's growing importance as a consumer-side concept (e.g., as a source of differentiation via branding and packaging (Charter and Clark, 2008)) as product-producing firms are under increasing pressure to develop products in a sustainable way and recent research has connected this drive to improved performance and competitiveness (Frishammar, 2005; Bridges and Wilhelm, 2008; Choi, Nies and Ramani, 2008).

Additionally, *Place and Distribution* information also includes information describing the tagline and related advertising campaigns accompanying the product's launch (McCormack, Cagan, and Vogel, 2004; Klang and Hacklin, 2013). The specific items within this factor include four information elements rated above 3.0 are, "Related promotions or advertising strategy" (M = 3.37, SD = 1.14) and "Tagline" (M = 3.22, SD = 1.12)) and two above 3.5 ("Distribution/ Suppliers" (M = 3.59, SD = 1.03) and "Product lifecycle" (M = 3.57, SD = 1.03)). Perhaps the most interesting finding related to this factor is that managers deemed these informational elements "important" not at all. It would appear that the information they would communicate was well outside the control of individual NPD managers and, secondly,

the items seem to originate from outside the confines of the product development team, if not indeed from outside the entire organization. Our data appears to indicate that the contents of a promotional campaign (e.g., tagline, tone, imagery, messaging) devised by a firm's advertising agency partners to promote a new offering could be of use to product developers, resulting in conflict with most extant findings in the area.

Factor 4

Consumption Expertise describes information related to the consumer expertise required to use the product, product-user interactivity, and the new product's similarity with existing products. Numerous findings in NPD literature have shown that products that are able to communicate specific meanings (through interactivity, consumer involvement, and the ability to differentiate themselves from existing or competitor technology) create firm-level competitive advantage (Johnson and Luo, 2008; Bloch, 1995; Hertenstein, Platt, and Veryzer, 2005; Majava, Haapasalo, Belt, and Mottonen, 2013; Hise, O'Neal, Parasuraman, and McNeal, 1990; Cooper and Jones, 2002). More specifically, despite our sample of primarily consumer-oriented firms, "Comparisons with Existing or Competitor Technology" (M = 4.02, SD = 0.93) seems to be a critically important competitive variable. This information element serves as a method for firms to benchmark themselves relative to other offerings and technologies in the marketplace as well as a method to codify competitive intelligence with close competitors. Secondly, through information elements such as, "Consumer involvement" (M = 3.83, SD = 1.09), Product-User interactivity (M = 3.65, SD = 1.14), and "Expertise required to use the product" (M = 3.13, SD = 1.04), this factor captures the attention contemporary NPD teams devote to understanding the demands of their product place on end-user consumers (Hestad and Keitsch, 2009; Tietz, Morrison, Luthje, and Herstatt, 2005; Lynch, O'Toole, and Biemanns, 2015; Poetz and Schreier, 2012).

Factor 5

Aesthetics helps to clarify the universe of possible aesthetic attributes available to product designers (e.g., graphics, imagery, logo, design language). Scholarly findings (e.g., Doordan, 2003; Ross, Overbeeke, Wensveen, and Hummels, 2012; Goode, Dahl, and Moreau, 2013) confirm that determining the optimal mix of aesthetic attributes (e.g., shape, symmetry, and proportion, symbolism, as well as color, logo, packaging, and typeface) are not only perceived in terms of their formal or technical properties, but also as symbolic and affective signals (Henderson, Giese, and Cote, 2004; Veryzer and Hutchinson, 1998) as wells as of higher order strategic attributes (i.e., product personality, loyalty, and durability). In particular, Bloch (1995) notes that consumer perceptions of a product's form as beautiful, appropriate, or attractive can positively influence product performance through decreased price sensitivity. As a consequence, determining the optimal mix of aesthetic attributes (e.g., the most compelling look and feel of a product) is an essential function of the product development process (Doordan, 2003; Cross, 2006). Evidence of the importance of this information to development teams is demonstrated by all four items that make up this factor being rated close to or above 4.0: "Design language" (M = 4.27, SD = 0.94), "Aesthetics" (M = 4.25, SD = 0.93), "Associative (name, image, logo)" (M = 3.93, SD = 0.96), and "Graphics" (M = 3.91, SD = 0.96). Additionally, several information elements that did not load on a single factor through our EFA procedure yet appear anecdotally to be closely related to aesthetics were also highly rated by our respondents ("Styling" (M = 4.32, SD = 0.91) and "Multiple versions or colorways" (M = 4.15, SD = 0.99). While the presence of aesthetic design information within product design briefs may appear intuitively usurping the value of our analysis is to define, for perhaps the first time, the specific types of information product developers deem important to be communicated during the NPD process.

Factor 6

Risk and Safety describes information elements addressing the perceived risk, safety and health issues related to a new product offering. Researchers have identified perceived risk as an important influence on consumer impressions of a product or service (Conchar, Zinkhan, Peters and Olavarrieta, 2004), especially in environments where personal safety is a concern (Luthje, 2004). Although respondents rated "Product safety" (M = 2.86, SD = 1.19), "Product risk (M = 2.80, SD = 1.17), and "User health" (M = 2.76, SD = 1.14) each below 3.0 this may be a result of our sample drawing primarily from consumer-oriented firms producing products with relatively low complexity and are generally less hazardous. Product design briefs for inherently risky products, such as firearms, may lay higher emphasis on capturing *Risk and Safety* information i.e., detailing the need for non-slip material in the handle.

Factor 7

Symbolic Value information elements help firms manage a product's attributes communicating complex meaning such as prestige, legitimacy, status, and emotional appeal. These largely intangible attributes act as visual cues that help consumers recognize a product, increase salience, or enhance perceptions of a product's positioning in relation to competitors (Crilly, Moultrie, and Clarkson, 2004; Desmet, 2002). The functional value of this information within product design briefs is to define for development teams the emotional and symbolic meaning the focal product is meant to evoke - e.g., in-group membership, status, social meaning to a consumer, or about a consumer (Rucker and Galinsky, 2008). Numerous researchers have pointed out that as contemporary consumers have come to expect high levels of product functionality and quality (Roozenburgand Eekels, 1995) many consumer-oriented products have begun to be evaluated on the basis of their symbolic (Bilton and Leary, 2004; Martin, 2004) and emotional appeal (Faulkner and Anderson, 1987), rather than on any technical attributes (Hoegg, Alba, and Dahl, 2010). Specifically, information elements in our sample relate to communicating the "Emotional appeal of the product" (M = 3.97, SD = 1.09), "Prestige of the product" (M = 3.72, SD = 1.07), "Firm-level positioning" (M = 3.60, SD = 1.05), and "Status of the product" (M = 3.38, SD = 1.10). These items represent a diverse mix of highly contextual and implicit strategic information to be well understood within a firm if these are to be effectively utilized to communicate symbolic value across multiple product development projects (e.g., Goldsmith and Clark, 2012; Eastman, Iyer, and Thomas, 2013).

Although not loaded with other items of the *Symbolic Value* factor, "Authenticity" (M = 3.81, SD = 1.11) appears to be a useful information element for connecting internal aspects of a firm's symbolic positioning - i.e., to imbue products and services with a set of ideals or traits which differentiate it from competing brands, particularly those that are framed as personifying the opposite values such as crass or opportunistic "commercialism" (Beverland, 2005; Rose and Wood, 2005) with consumers' desirous of expressing their actual, or idealized, self-image through an offering as badge or brand value (Khalid and Helander, 2004).

Factor 8

Production information elements describe what capabilities will be necessary for firm to bring the focal product development project to market. These elements guide the within-firm coordinating mechanisms that direct production facilities, specify production objectives, and manage supply chains and material sourcing within firms (Majava, Haapasalo, Belt, and Mottonen, 2013; Vroom and Olieman, 2011; Klang and Hacklin, 2013). *Production* information elements were considered quite broadly by our respondents with "Materials to be used" (M = 4.20, SD = 0.98) being rated as one of the most important items in our sample while "Specific production capability" (M = 3.45, SD = 1.18) and "Specific production facility or location" (M = 3.31, SD = 1.18) were deemed far less influential. Similar to other results of our analysis this may be related to the nature of our sample of consumer-oriented firms who generally produce products of low complexity.

Discussion and Directions for Future Research

This study provides a first-step toward understanding the form and contents of product design brief documents. At the broad level our study integrates the use of product design briefs with contemporary literature in knowledge-based NPD. More specifically, the 8 factors identified through our EFA define, for perhaps the first time, the precise types of information which is contained within product design briefs. This perspective addresses an important gap in the literature existing around the question of how information and knowledge are captured, codified, and communicated during product innovation (e.g., Nakata and Im, 2010; Veryzer, 2005; Veryzer and Mozota, 2005; Lindström, Löfstrand, Karlberg, and Karlsson, 2012). Our analysis of 68 product design briefs represents one of the first systematic attempts to empirically describe the information contained within these documents. Further, by connecting product design briefs to research in knowledge-based assets and artifacts we hope to clarify the strategic role of these potentially powerful, and under-researched, elements of NPD. By assessing the managerial "importance" of information elements contained in product design briefs we provide

insight into the types of information necessary to improve product development outcomes for firms. Lastly, we provide theoretic rationale of our EFA results by connecting each factor to findings in related research.

Perhaps most notably our study has clear implications for practitioners as well as academics. Managers involved in NPD may use the results of our EFA and managerial ratings as a general framework for considering the types of information need to be included in their firm's product design briefs. This information may help improve the ways product development teams manage the contents of briefing documents within their own contexts and marketplaces. Namely, our study highlights *Target Market* information to be a particularly important component of the product design brief. All seven informational elements from this factor appear in the top 20 most important items (See Tables 2 and 3). For example, pricing information (*Product price point* and *Sales price (landed, wholesale, etc.))* occupy the top two spots on our listing of "important" information elements with over 98% of respondents rating the elements greater than or equal to 3.0. This finding is interesting because historically pricing information has not been emphasized during the fuzzy-front end of NPD. For instance, concept testing, which is frequently considered a critical fuzzy-front end step of NPD often doesn't include price or is advised not to include it (Haley and Gatty, 1971; Iuso, 1975).

Secondly, it is interesting that *Place/ Distribution* information was considered to be less important compared to *Target Market.* Specifically, all six *Place/ Distribution* informational elements appear in the bottom third of our managerial importance listings. While at one hand a rational for this finding could be, simply, the functional areas of operations management, distribution, and marketing promotions/advertising may be less involved in the development of product design briefs than the other areas of the firm. This notion is further supported by the finding that managers in our sample considered information related to the *Symbolic Value* of the focal product (e.g., *Prestige, Status, Positioning*) as considerably less important than *Target Market* or *Quality/ Workmanship* factors– i.e., none of the *Place/Distribution* or *Symbolic Value* information element items received a mean above 4.0 (the *Place/Distribution* factor received an overall mean of 3.39 while *Symbolic Value* was 3.66*)* in addition there was a distinct variance in "importance" ratings across our sample with a no items receiving 90% or higher score on Percentage of Responses with Scores ≥ 3.0 on the 5-point scale, while all of the *Target Market* items scored higher than 90%.

On the other hand, our results do provide some clear evidence of the importance of other softer, intangible, tacit design and product form information to be included in product design briefs. Specifically, our respondents considered *Aesthetics* information elements (e.g., *Design language, Aesthetics, Associative (name, image, logo)* and *Graphics)* to be among the highest rated items (factor mean of 3.91 and all measures with greater than 90% above or equal to 3.0). Bloch (1995) notes that consumer perceptions of a product's form as beautiful, appropriate, or attractive can lead to improved strategic and competitive outcomes such as decreased consumer price sensitivity. Similarly, *Consumption Expertise* elements including *Comparisons with existing or competitor* technology, *Consumer* Involvement, *Product-User* interactivity were considered relatively "important" by our respondents (factor mean of 3.83). In addition, there were a number information elements conceptually related to these areas that were rated highly by our respondents yet did not load satisfactorily to a single factor in our EFA (e.g., *Styling* (M = 4.32, SD = 0.91), *Multiple colorways* (M = 4.15, SD = 0.99), *Sensory appeal* (M = 3.90, SD = 1.07), *Originality* (M = 3.85, SD = 1.03), *Authenticity* (M = 3.81, SD = 1.11), *Touch* (M = 3.66, SD = 1.14).The "importance" attached to these individual items provides supplemental support for the value of codifying this type of information in knowledge-based assets during NPD.

We hope this specific finding, among our broader results, contributes to the ongoing scholarly conversation around the role of product design within NPD and organizational strategy (see a special issue of the Journal of Product Innovation Management, Volume 28, Issue 3, May 2011 for a complete discussion). Our study provides an empirical demonstration of the role of product design briefs, generally, and information elements, specifically, play during the product design process. Verganti (2006), among others, has argued that most firms do not adequately explore the possibility of utilizing product design to exploit differences in consumer tastes, nor do they develop a strategic vision for the use of design as a source of long-term competitive advantage. Our study presents the product design brief as a method by which knowledge

and information is captured and communicated within a firm's NPD strategy. We contend the results of our study demonstrate product design briefs deserve increased scholarly and managerial attention as a potential 'Rosetta Stone' document serving to codify and translate a firm's broadly-based tacit knowledge into tangible elements of strategic information to be tactically integrated within individual NPD projects.

References

Aaker, D. A. (1995). *Strategic market management* (4th ed.). New York, NY: John Wiley & Sons, Inc.

Adams, M. E., Day, G. S., & Dougherty, D. (1998). Enhancing new product development performance: An organizational learning perspective. *Journal of Product Innovation Management*, *15*(5), 403-422.

Alavi, M., Kayworth, T., & Leidner, D. (2005). An empirical examination of the influence of organizational culture on knowledge management practices. *Journal of Management Information Systems*, *22*(3), 191-224.

Atuahene-Gima, K. (2005). Resolving the capability-rigidity paradox in new product Innovation. *Journal of Marketing, 69*(4), 61-83.

Atuahene-Gima, K., & Murray, J. Y. (2007). Exploratory and exploitative learning in new product development: A social capital perspective on new technology ventures in China. *Journal of International Marketing*, *15*(2), 1-29.

Axelson, M., & Richtnér, A. (2015). Reaping the benefits: Mechanisms for knowledge transfer in product development collaboration. *International Journal of Innovation Management*, *19*(2).

Bart, C., & Pujari, A. (2007). The performance impact of content and process in product innovation charters. *Journal of Product Innovation Management*, (24), 3-19.

Beverland, M. (2005). Crafting brand authenticity: The case of luxury wines. *Journal of Management Studies, 42*(5), 231-243.

Bicen, P., & Hunt, S. D. (2012). Alliance market orientation, new product development, and resource advantage theory. *Journal of Business & Industrial Marketing*, *27*(7), 592-600.

Bilton, C., & Leary, R. (2002). What can managers do for creativity? Brokering creativity in the creative industries. *International Journal of Cultural Policy*, *8*(1), 49-64.

Bloch, P. H. (1995). Seeking the ideal form: Product design and consumer response. *Journal of Marketing*, *59*(3), 16-29.

Blyth, A., & Worthington, J. (2001). *Managing the brief for better design.* London: Spoon Press.

Bridges, C. M., &Wilhelm, W. B. (2008). Going beyond green: The "why and how" of integrating sustainability into the marketing curriculum. *Journal of Marketing Education*, *30*(1), 33-46.

Boland, R. J., Collopy, F., Lyytinen K., & Yoo, Y. (2008). Managing as designing: Lessons for organization leaders from the design practice of Frank O. Gehry. *Design Issues, 24*(1), 10-25.

Bontis, N. (1996). There's a price on your head: managing intellectual capital strategically. *Business Quarterly*, Summer, 40-47.

Bruce, M., & Daly, L. (2007). Design and marketing connections: Creating added value. *Journal of Marketing Management, 23,* 929-953.

Burgelman, R. A., Maidique, M. A., & Wheelwright, S. C. (1996). *Strategic management of technology and innovation*, *2.* Chicago: Irwin.

Chan, E. C., & Yu, K. M. (2007). A framework of ontology-enabled product knowledge management. *International Journal of Product Development*, *4*(3-4), 241-254.

Charter, M., & Clark, T. (2008). Product sustainability: Organisational considerations. *International Journal of Product Development*, *6*(3-4), 251-275.

Chen, Z., & Dubinsky, A. (2003). A conceptual model of perceived customer value in e-commerce: A preliminary investigation. *Psychology & Marketing*, *20*(4), p.323.

Choi, J. K., Nies, L. F., & Ramani, K. (2008). A framework for the integration of environmental and business aspects toward sustainable product development. *Journal of Engineering Design*, *19*(5), 431-446.

Churchill, G. A. (1995). *Marketing research: Methodological foundations.* New York, NY: Dryden Press.

Conchar, M. P., Zinkhan, G. M., Peters, C., & Olavarrieta, S. (2004). An integrated framework for the conceptualization of consumers' perceived-risk processing. *Journal of the Academy of Marketing Science*, *32*(4), 418-436.

Cooper, R. G., & Jones, T. (2002). *Informing design decision-making in new product development: Firming up the fuzzy front end.* Salford, UK: University of Salford,

Centre for Design Manufacture and Technology.

Crawford, M.C. (1997). *New products management* (5th ed.). Homewood, IL: Irwin.

Crawford, M., & DiBenedetto, A. (2006). *New products management* (8th ed.) Boston: Irwin McGraw-Hill.

Crilly, N., Moultire, J., & Clarkson, P. (2004). Seeing things: Consumer response to the visual domain in product design. *Design Studies*, *25*(6), 547-577.

Cross, N. (2006). *Designerly ways of knowing*. London: Springer-Verlag.

Creusen, M. E. H., & Schoormans, J. P. L. (2005) 'The different roles of product appearance in consumer choice. *Journal of Product Innovation Management*, *22*(1), 63-81.

Darroch, J. (2005). Knowledge management, innovation and firm performance. *Journal of Knowledge Management*, *9*(4), 101-115.

Darroch, J., & McNaughton, R. (2003). Beyond market orientation: The adoption of knowledge management practices and the innovativeness of New Zealand firms. *European Journal of Marketing*, *37*(3), 572-594.

De Maio, A., Verganti, R., & Corso, M. (1994). A multi-project management framework for new product development. *European Journal of Operational Research*, *78,* 178-91.

Desmet, P. M. (2002). *Designing emotions*. Delft: Delft University of Technology.

Dillion, W. R., & Goldstein, M. (1984). *Multivariate analysis: Methods and applications*. New York: John Wiley and Sons.

Doordan, D. (2003). On materials. *Design Issues*, *19*(4), 3-8.

Dorst, K. (2008). Design research: A revolution-waiting-to-happen. *Design Studies*, *29,* 4-11.

Dougherty, D. (1989). Departmental and interdepartmental barriers to commercially viable product innovations in large firms: A grounded model. Working Paper.

Eastman, J., Iyer, R., & Thomas, S. (2013). The impact of status consumption on shopping styles: An exploratory look at the millennial generation. *Journal of Marketing Management*, *23*(3), 57-73.

Ehrich, K. R., & Irwin, J. R. (2005). Willful ignorance in the request for product attribute Information. *Journal of Marketing Research*, *42*(3), 266-277.

Elkington J. (2005). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, *36*(2), 90-100.

Evans, M., Pei, E., Cheshire, D., & Graham, I. (2015). Digital sketching and haptic sketch modelling during product design and development. *International Journal of Product Development*, *20*(3), 239-263.

Evanschitzky, H., Eisend, M., Calantone, R. J., & Jiang, Y. (2012). Success factors of product innovation: An updated meta-analysis. *Journal of Product Innovation Management*, *29*(S1), 21-37.

Faulkner, R. R., & Anderson, A. B. (1987). Short-term projects and emergent careers:

Evidence from Hollywood. *American Journal of Sociology*, *4,* 879-909.

Frishammar, J. (2005). Managing information in new product development: A literature review. *International Journal of Innovation and Technology Management*, *2*(3), 259-275.

Forlizzi, J. (2008). The product ecology: Understanding social product use and supporting design culture. *International Journal of Design*, *2*(1), 11-20.

Flynn, B. B., Sakakibara, S., Schroeder, R. G., Bates,K. A., & Flynn, E. J. (1990). Empirical research methods in operations management. *Journal of Operations Management, 9*(2), 250-273.

Gemser, G., & Leenders, M. (2001). How integrating industrial design in the product development process impacts on company performance. *Journal of Product Innovation Management*, *18*(1), 28-38.

Goldsmith, R. E., & Clark, R. A. (2012). Materialism, status consumption, and consumer independence. *The Journal of Social Psychology*, *152*(1), 43-60.

Goode, M. R., Dahl, D. W., & Moreau, C. P. (2013). Innovation aesthetics: The relationship between category cues, categorization certainty, and newness perceptions. *Journal of Product Innovation Management*, *30*(2), 192-208.

Ha, H. (2002). The effects of consumer risk perceptions on pre-purchase information in online auctions: Brand, word-of-mouth and customized information. *Journal of Consumer Mediated Communication*, *8*(October), 226-239.

Haines-Gadd, M., Hasegawa, A., Hooper, R., Huck, Q., Pabian, M., Portillo, C., & McBride, A. (2015). Cut the crap; design brief to pre-production in eight weeks: Rapid development of an urban emergency low-tech toilet for Oxfam. *Design Studies, 40,* 246-268.

Haley, R. I., & Gatty, R. (1971). The trouble with concept testing. *Journal of Marketing Research,* 8, 230-232.

Halstead, P., & O'Shea, J. (1989). *Bad year economics: Cultural responses to risk and uncertainty*. Cambridge: Cambridge University Press.

Henderson, P. S. Giese, J. L., & Cote, J. A. (2004). Impression management using typeface design. *Journal of Marketing*, *68*(4), 60-72.

Heo, D., & Yoo, Y. (2002). *Knowledge sharing in post merger integration.* Sprouts: Work Pap Info Environmental Systems Organization, *2*(4), 221–245.

Herbruck, D., & Umback, S. (1997). Design management and new product development: Linking people and process. *Design Management Journal*, *8*(2), 44-49.

Hertenstein, J. H., Platt, M. B., & Veryzer, R.W. (2005). The impact of industrial design effectiveness on corporate financial performance. *Journal of Product Innovation Management*, *22*(1), 1-21.

Hestad, M., & Keitsch, M. (2009). Not always a victim! On seeing users as active consumers. *International Journal of Product Development*, *9*(4), 396-405.

Hise, R. T., O'Neal, L., Parasuraman, A., & McNeal, J. U. (1990). Marketing / R&D interaction in new product development: implications for new product success rates. *Journal of Product Innovation Management*, *7,* 142-155.

Hoegg, J., Alba, J., & Dahl, D. (2010). The good, the bad, and the ugly: Aesthetic influence on information processing. *Journal of Consumer Psychology, 20*(October): 419-430.

Hutter, B. (2005). Ways of seeing: Understanding of risk in organizational settings. *Design, Risk and New Product Development in Five Small Creative Companies Organizational encounters with risk*. Cambridge: Cambridge University Press.

Ibekwe-SanJuan, F., & Dousa, T. M. (2014) *Theories of information, communication and knowledge: A multidisciplinary approach.* New York, Springer.

Iuso, B. (1975). Concept testing: An appropriate approach. *Journal of Marketing Research, 12*(2), 228-231.

Jassawalla, A. R., & Sashittal, H. C. (2000). Cross-functional dynamics in new product

Development. *Research Technology Management*, *43*(1), 46-49.

Johnson, W. H., & Luo, C. (2008). NPD project timeliness: the project-level impact of early engineering effort and customer involvement. *International Journal of Product Development*, *6*(2), 160-176.

Khalid, H. M., & Helander, M. G. (2004). A framework for affective customer needs in product design. *Theoretical Issues in Ergonomics Science*, *5*(1), 27-42.

Kim, J., & Mueller, C. 1978). *Introduction to factor analysis: What it is and how to do it*. Beverly Hills, CA: Sage Publications.

Klang, D., & Hacklin, F. (2013). Retaining fit between business models and product market strategies in changing environments. *International Journal of Product Development, 31*, *18*(3-4), 311-343.

Kwan, M. M., & Balasubramanian, P. (2003). Knowledge scope: Managing knowledge in context. *Decision Support Systems*, *35*(4), 467-486.

Leuthesser, L., & Kohli, A. K. (1995). Relational behavior in business markets:

Implications for relationship management. *Journal of Business Research*, *34* (November), 221-33.

Li, T., & Calantone, R. (1998). The impact of market knowledge competence on new product advantage: Conceptualization and empirical evidence. *Journal of Marketing*, *62*(October), 13-29.

Lindström, J., Löfstrand, M., Karlberg, M., & Karlsson, L. (2012). Functional product development: What information should be shared during the development process? *International Journal of Product Development*, *16*(2), 95-111.

Lorenz, C. (1995). Harnessing design as a strategic resource. *Long Range Planning*, *27* (5), 73-84.

Luthje, C. (2004). Characteristics of innovating users in a consumer goods field: An empirical study of sport-related product consumers. *Technovation, 24,* 683-695.

Lynch, P., O'Toole, T., & Biemans, W. (2015). Measuring involvement of a network of customers in NPD. *Journal of Product Innovation Management*, *33*(2), 166-180.

Lynn, R. Reilly, R., & Akgun, A. (2000). Knowledge management in new product teams: Practices and outcomes. *IEEE Transaction on Engineering Management,* (47), 221-231.

Madhavan, R., & Grover, R. (1998). From embedded knowledge to embodied knowledge: New product development as knowledge management. *Journal of Marketing*, *62*(4), 1-12

Majava, J., Haapasalo, H., Belt, P., & Mottonen, M. (2013). Product development drivers in literature and practice. *International Journal of Product Development*, *18*(6), 512-530.

Maltz, E., & Kohli, A. J. (1996). Market intelligence dissemination across functional Boundaries. *Journal of Marketing Research*, *33*(February), 47-61.

Martin, C. (2004). *Defining culture and communication for the purpose of national and international statistics program,* Paper presented to the third international conference on Cultural Policy Research, HEC Montreal, Montreal, CA.

McCormack, J. P., Cagan, J., & Vogel, C. M. (2004). Speaking the buick language: Capturing, understanding, and exploring brand identity with shape grammars. *Design Studies*, *25,* 1-29.

Melewar T. C, Basset, K., & Simoes, C. (2006). The role of communication and visual identity in modern organizations. *Corporate Communications: An International Journal*, *6,* 235-346.

Melewar, T. C., & Saunders, J. (2000). Global corporate visual identity: using an extended marketing mix. *European Journal of Marketing*, *34*(5/6), 538-550.

Millward, H., Byrne, C., Walters, A., & Lewis, A. (2006). New product development within small and medium-sized enterprises: Analysis through technology management maps. *International Journal of Innovation and Technology Management*, *3*(3), 283-302.

Moorman, C., & Miner, A. S. (1997). The impact of organizational memory in new product performance and creativity. *Journal of Marketing Research*, *34*(February): 91-106.

Nagano, M. S., Stefanovitz, J. P., & Guimaraes, T. (2016). Assessing some important factors to reduce obstacles in product innovation. *International Journal of Innovation Management*, *20*(3).

Nakata, C., & Im, S. (2010). Spurring cross-functional integration for higher new product performance: A group effectiveness perspective. *Journal of Product Innovation Management, 27*(4), 554-571.

Ozenc, K., Brommer, J. P., Jeong, B., Shih, N., Au, K., & Zimmerman, J. (2007). *Reverse alarm clock: A research through design example of designing for the self.* Proceedings of the Conference on Designing Pleasurable Products and Interfaces. New York, NY: ACM Press.

Phaal, R., Farrukh, C., & Probert, D. (2006). Technology management tools: generalization, integration and configuration. *International Journal of Innovation and Technology Management*, *3*(3), 321-339.

Phillips, P. L. (2004) *Creating the perfect design brief: How to manage design for strategic advantage*. New York: Allworth Press.

Poetz, M. K., & Schreier, M. (2012). The value of crowd sourcing: Can users really compete with professionals in generating new product ideas? *Journal of Product Innovation Management*, *29*(2), 245-256.

Reed, R., & DeFillippi, R. J. (1990). Causal ambiguity, barriers to imitation, and sustainable competitive advantage. *Academy of Management Review*, *15,* 88-102.

Redstrom, J. (2006). Towards user design? On the shift from object to user as the subject of design. *Design Studies, 27*(2), 123-139.

Roozenburg, N. F. M., & Eekels. J. (1995). *Product design: Fundamentals and methods*. London: John Wiley & Sons Ltd.

Rose, R. L., & Wood, S. L. (2005). Paradox and the consumption of authenticity through reality television. *Journal of Consumer Research*, *32*(2), 284-296.

Ross, P. R., Overbeeke, K. J., Wensveen, S. A., & Hummels, C. C. (2012). Designing for to kalon: How the unity of beauty and good inspires interactive product design. *International Journal of Product Development*, *16*(3-4), 187-206.

Rucker, D. D., & Galinsky, A.D. (2008). Desire to acquire: Powerlessness and compensatory consumption. *Journal of Consumer Research*, *35*(October), 257-267.

Ryd, N. (2004). The design brief as carrier of client information during the construction Process. *Design Studies*, *25*(3), 231-249.

Sanderson, S., & Uzumeri, V. (1992). Industrial design: The leading edge of product development for world markets. *Design Management Journal*, Summer, 26.

Sherman, D., Berkowitz, W. E., & Souder, R. (2005). New product development performance and the interaction of cross-functional interaction and knowledge management. *Journal of Product Innovation Management*, *22,* 399-411.

Tietz, R., Morrison, P. D., Luthje, C., & Herstatt, C. (2005). The process of user-innovation: A case study in a consumer goods setting. *International Journal of Product Development*, *2*(4), 321-338.

Tractinsky, N., Katz, A. S., & Ikar, D. (2000). What is beautiful is usable. *Interacting with Computers*, *13,* 127-145.

Ulrich K. T., & Eppinger, S. D. (1995). *Product design and development*. New York: McGraw-Hill / Irwin.

Ulrich, K. T., & Pearson, S. (1998). Assessing the importance of design through product archaeology. *Management Science*, *44*(3), 352-369.

Urban, G. L., Hauser, J., & Dholakia, N. (1987). *Essentials of new product management.* Englewood Cliffs, N.J.: Prentice-Hall.

Verganti, R. (2006). Innovating through design. *Harvard Business Review*, *84*(12), 114-122.

Veryzer, R. (2005). The roles of marketing and industrial design in discontinuous new product development. *Journal of Product Innovation Management*, *22*(1), 22-41.

Veryzer, R. W., & Hutchinson, J. W. (1998). The influence of unity and prototypicality on aesthetic responses to new product designs. *Journal of Consumer Research*, *24,* 374-394.

Veryzer, W. R., & Mozota, B. (2005). The impact of user-oriented design on new product development: An examination of fundamental relationships. *Journal of Product Innovation Management*, *22*(2), 128-143.

Vroom, R. W., & Olieman, A. M. (2011). Sharing relevant knowledge within product development. *International Journal of Product Development*, *14*(1-4), 34-52.

Walsh, V., Roy, R., Bruce, M., & Potter, S. (1992). *Winning by design*. Oxford: Blackwell.

Wheelright, S., & Clark, K. (1992). *Revolutionizing product development, quantum leaps in speed, efficiency, and quality*. New York: The Free Press.

Wikstrom, A., & Verganti, R. (2013). Storyboarding-Framing and reframing the design brief. In 20th International Product Development Management Conference, Paris, France, 23-25 June 2013.

Appendix A. Initial Listing of Information Elements(n = 138)

Effectiveness	***Trend toward ease and simplicity***
Risk	Trends
Health	Materials
Safety	Existing production facilities
Ergonomics/Biomechanics/gait/motion	Existing production capability
Technical Performance	Sizes
Flexibility (forefoot in shoes)	Weight
Movement	Shape
Weight	Originality/uniqueness
Prestige (sophistication, elegance, distinction)	Segmentation
Status	Differentiation
High-end	Distinction
Cool	Mystery and intrigue
Communication ability	Distribution Channels
'Wow" factor	Sales and wholesale organizations
Pride	Countries
Degree of sophistication and style	Global
Fashion	Service level of purchase situation
Touch/Feel	Time required to purchase
Smell	Length of Purchase Decision
Comfort	Ease of sale as purchase location
Emotional	Size of market segments
Engagement	Identification of segments
Interactivity	Ramifications of offering product
Expertise required to use	Market potential
Facilitates involvement	Name
Personality elements (expressive, stand out, make a statement)	Consumer price point
Associative (name, image, logo)	Dealer
Familiarity ("Nike" look or brand fit)	Factory cost
Uniformity	Price trends
Ties into earlier products or brand aesthetics	Price (in)elasticity
Brand history	Price categories or product line prices
Design language	Name

Effectiveness	***Trend toward ease and simplicity***
Familiarity	Single phrase or tagline describing product
Uniformity	Quality
Gender	Workmanship
Description or tagline for consumer ("sophisticated athlete")	Physical quality
Intended Use Situation or Frequency	Fit and finish
Identifies competitor(s)	Accreditation
Level, magnitude of competitor success or appeal	Leeds
Differentiation and segmentation	Technical Performance
Cost to consumer	Technical Specifications
Factory	Technology for technology's sake
Landed	Advantages of a technology
Price breakdown	Comparisons with existing technology or materials
Expected life cycle	New technology/tech innovation
Graphics	Intro date (domestic, global)
Aesthetics	Innovativeness
Colorways	Customization
Descriptive example	Promotion
Authenticity	Project Goals
Product Extendibility and New Market Entry	
Environmental analysis	

Appendix B. Industry NAICS Codes for Sample Design Briefs

Firm	***# of Briefs***	***NAICS code***	***Description***
A	14	316219	Other Footwear Manufacturing
B	7	339920	Sporting and Athletic Goods Manufacturing
C	4	334510	Electro Medical and Electrotherapeutic Apparatus Manufacturing
D	5	332212	Hand and Edge Tool Manufacturing
E	2	333991	Power-Driven Hand Tool Manufacturing
F	1	339114	Dental Equipment and Supplies Manufacturing
G	12	316213	Men's Footwear (except Athletic) Manufacturing
H	1	336991	"Motorcycle, Bicycle, and Parts Manufacturing"
I	5	315228	Men's and Boys' Cut and Sew Other Outerwear Manufacturing
J	6	315239	Women's and Girls' Cut and Sew Other Outerwear Manufacturing
K	1	339113	Surgical Appliance and Supplies Manufacturing
L	6	337121	Upholstered Household Furniture Manufacturing
M	5	337127	Institutional Furniture Manufacturing
N	3	332214	"Kitchen Utensil, Pot, and Pan Manufacturing"
O	1	312111	Soft Drink Manufacturing
P	6	316991	Luggage Manufacturing
Q	1	316999	All Other Leather Good Manufacturing
	125 total		