

Using Design Briefs to Empirically Replicate and Extend the ‘Designence’ Model of Strategic Design Value

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ABSTRACT

Despite increasing attention from academics and practitioners design management lacks a widely-agreed upon conceptual measure. The ‘Designence’ Model proposed by Borja de Mozota (2006) offers an appealing approach to framing the strategic value of design by using the well-recognized Balanced Score Card framework to present a multi-faceted view of design management made up of four holistic perspectives: Customer Value Perspective, Process Value Perspective, Organizational Learning Perspective, and Financial Value Perspective. Our study hopes to spur increased interest in the framework by presenting a replication of the underlying “information-based invisible assets” that make up the ‘Designence’ Model with data derived from content analysis of product design briefs. Exploratory Factor Analysis confirms that the information elements contained within these documents closely aligns with the strategic design value variables identified in the ‘Designence’ Model. Further, we extend the framework by empirically describing the relationships between the four perspectives of the Model and two measures of firm performance suggested, but not tested, in the original study; individual project-level performance and overall firm competitive advantage.

Keywords: Design Management, Competitive Advantage, Strategic Design, Balanced Score Card.

INTRODUCTION

The insight that, “good design is good business” attributed to IBM President Tom Watson in a talk at Harvard Business School (from Hertenstein, Platt, and Veryzer, 2005) characterizes the broad acceptance that design has earned as a beneficial force for organizational strategy and performance. Accordingly, scholarly interest in design strategy has largely shifted to the concept of design management, defined as, “...the organizational and managerial practices and skills that allow a company to attain good, effective design” (Chiva and Alegre, 2009). Design management is now broadly employed in scholarly research as a concept to describe the connectiveness between firms’ design strategy and performance alongside the effective management of people, projects, processes and procedures during the development of products, services, surroundings, and experiences (Erichsen and Christensen, 2013; Borja de Mozota, 2002; Calabretta, Montana, and Iglesias, 2008). However, as Borja de Mozota (2011) argues, “Most research in design management is rather practice-based and tends to describe design concepts in an organizational context through design theories: design project management, design strategy, managing a creative team.” Research in design management has been largely exploratory, qualitative, and anecdotal in nature resulting in a lack of empirical research from which to build theory or further support the use of design management as a

variable in business strategy research (Borja de Mozota and Kim, 2009; Lam, 2017). As Verganti (2006) acknowledges,

“We miss a theory to explain why and how leading firms that have brought design at the heart of their business model, such as Alessi, Artemide, Apple, or Bang & Olufsen... The strong focus of recent literature on user-centered design has left a major empty spot in theory of product innovation management: we miss the capability to understand how breakthrough innovations driven by design are created.” (p. 5)

In an effort to address this ‘empty spot’, Borja de Mozota and colleagues propose the ‘Designence’ Model of strategic design value (Borja de Mozota, 2002; 2006; 2011; Borja de Mozota and Wolff, 2019). This framework integrates design management with concepts from business strategy and organizational management, such as the resource-based view (Wernerfelt, 1984) and value-based management (Haspeslagh, Noda, and Boulos, 2001), to present a holistic and multi-faceted perspective of strategic design value. Specifically, the ‘Designence’ Model adopts the well-recognized Balanced Scorecard (BSC) model of competition, performance, and value creation (Kaplan and Norton, 1996) to provide a “common language” for designers and managers to assess the influence and impact of design on firm strategy. Thereby, the ‘Designence’ Model, “...turns design into an activity of the organization and a resource that improves its organizational, knowledge and information capital” (Borja de Mozota, 2011, p. 286). By reframing design in the language of business strategy the typology addresses a paradox that oftentimes emerges in organizations between designer’s conviction to create value (for their firms, customers, as well as society) and their confusion with what organizations mean by – and how they create – value. However, despite its intuitive and conceptual appeal, the form and impact of the ‘Designence’ Model has only been illustrated anecdotally; through case studies and qualitative managerial interviews (e.g., Borja de Mozota and Kim, 2009;). This study hopes to support further application and use of the ‘Designence’ Model by presenting a replication of Borja de Mozota’s (2006) methodology that led to the development of the framework. Specifically, we follow the original study by employing exploratory factor analysis (EFA) methodology to reconstitute the underlying dimensions of the four categories of strategic design value proposed by the framework: Customer Value Perspective, Process Value Perspective, Organizational Learning Perspective, and Financial Value Perspective with new data from expert ratings of product design brief documents. Secondly, we extend the Model by using hierarchical linear regression to examine the relationships between the four perspectives on two levels of performance identified, but not tested, by Borja de Mozota (2006, p.46); individual product-level performance and more enduring firm-level competitive advantage.

1. METHODOLOGY

A vigorous literature has emerged proposing a variety of empirical methods for assessing the strategic value of design (e.g., Junginger, 2006; Lam, 2017). One approach which has gained significant acceptance in business strategy and product management scholarship (e.g., Phillips, 2004; Bart and Pujari, 2007; Erichsen and Christensen, 2013) as well as design literatures (Scaletsky and da Costa, 2019; Acklin, 2011; Celi, 2012) is content analysis of product design briefs. Scholars propose that these documents act as “frozen knowledge” of design-based capabilities, routines, and outcomes (Bruce and Bessant, 2002; Bruce and Daly, 2007). We propose that content analysis of product design briefs provides an appropriate and novel method to replicate and extend the ‘Designence’ Model because it offers a new, yet comparable, way to identify the underlying elements that support design management as a

coordinating mechanism for the various functions engaged with creating new products within a firm including marketing, operations/ production management, finance, engineering, and design. Specifically, the ‘Designence’ Model (Borja de Mozota, 2006) employs in-depth interviews with managers from thirty-three design-driven European SMEs to develop a listing of twenty-one strategic design variables, or “information-based invisible assets”, based on the work of Hamel and Prahalad (1994). These strategic design variables include information related to descriptions of the target customers and competitors, technology usage, product pricing, and product attribute details (e.g. shapes and colors, branding, materials), as well as more tacit characteristics such as product personality, originality, and consumer meaning. Our use of content analysis presents an opportunity to confirm the presence of these “information-based invisible assets” that make up the ‘Designence Model’ within the actual product design brief documents used by firms to develop new products.

In a first step, following the direction of Borja de Mozota (2006), we conducted interviews with over forty-eight firm managers and surveyed related literature to generate an initial listing of 105 “information-based invisible assets” (Paas, Renkl, and Sweller, 2003) made up of words, phrases, concepts, ideas, variables, and constructs that may relate to strategic design management. In a second step, these “information-based invisible assets” were verified and refined through an expert rating procedure based on content analysis of a sample of sixty-eight proprietary product design brief documents collected from twenty-two design-driven firms representing seventeen separate NAICS industry codes (e.g., Footwear Manufacturing; Hand Tool Manufacturing; Dental Equipment; Motorcycle, Bicycle and Parts Manufacturing; Institutional Furniture; and Kitchen Utensil, Pot and Pan Manufacturing). Eighteen expert raters who were identified through our interview process with NPD managers were randomly assigned a subsample of product design brief documents alongside our initial listing of 105 “information-based invisible assets”. The average years of experience in our expert rater sample was 12.7, which is comparable to other studies of this nature that target highly specific populations (Churchill and Iacobucci, 1995). Through this process 274 individual ratings of our 105 information elements were conducted, including items such as “Workmanship” that were deemed to be regularly occurring (mean = 1.21 on a three-point scale ranging from 1 -- “Not at present” to 3 -- “Clearly present”) which were carried through for further analysis, while items such as “Customization” that were infrequently identified (mean = 0.025) were dropped from further analysis. This process resulted in the initial listing of 105 information elements being reduced to fifty-one deemed to represent the various strategic design value variables that make up design management (Phillips, 2004; Bart and Pujari, 2007).

1.1. Exploratory Factor Analysis (EFA)

Secondly, repeating the methodology used by Borja de Mozota (2006), we employed Exploratory Factor Analysis (EFA) as a standard data-reduction technique to isolate categories or groupings of our “information-based invisible assets” into more manageable factors (e.g., Flynn, Sakakibara, Schroeder, Bates, and Flynn, 1990). Our EFA process identified eleven distinct factors that emerged from our fifty-one information elements: F1 Customer Insights; F2 Business Model; F3 Aesthetics; F4 Authenticity; F5 Symbolic/ Experiential Value; F6 Functional Value; F7 Promotions/ Distribution; F8 Sustainability; F9 Production/ Development; F10 Project Management; F11 Risk/ Safety. These factors account for 79.31% of the variance in the matrix (KMO statistic, 0.879; Bartlett statistic, 6554.11) at a significance-level of < 0.001. Borja de Mozota’s (2006) original EFA processes reduced twenty-one

“information-based invisible assets” into nine strategic design value variable factors with the highest scores in their data matrix. These nine variables were rationalized by Borja de Mozota (2006) as the ‘Designence’ Model. Specifically, they are; Design creates a new market (M = 3.90), Design creates competitive advantage (M = 5.39), Design is a core competency (M = 5.12), Design contributes significantly to benefits perceived by customers (M = 5.00), Design allows the company to sell at a higher price (M = 4.69), Design improves co-ordination between marketing and R&D functions (M = 4.68), Design accelerates the launch of new products (M = 4.07), Design changes relationships with suppliers (M = 3.70), and Design improves co-ordination between production and marketing (M = 4.00). Our eleven factors and their underlying information element contents appear to closely correspond to the nine strategic design value variables that emerged from Borja de Mozota’s (2006) analysis. In the interest of parsimony, we have combined our four lowest loading factors (F8 Sustainability; F9 Production/ Development; F10 Project Management; F11 Risk/ Safety) with the two lowest Mean variables from the original study to present a replication of the ‘Designence’ Model (see Table 1. below).

Our replication addresses a clear limitation of the original ‘Designence’ Model; It’s lack of detail and specificity. By identifying a broader listing of fifty-one underlying information elements our content analysis data provides much greater depth of insight into the precise ideas, concepts, processes, activities, skills, priorities, structures, resources, and capabilities that support each factor of the Model. For example, our factor F1 Customer Insights, made up of the information elements “Consumer involvement”, “Product-User Interactivity”, “Consumer Segments”, “Differentiation”, and “Firm-level Positioning” appears in close alignment with the ‘Designence Model’ factor of Design Creates a New Market. However, by clearly defining the underlying constructs that make up the variable, along with the Cronbach Alpha contribution of each information element, our data provides much needed clarity to the exact elements that may help firms use the ‘Designence Model’ to better understand how Design Creates a New Market.

Table 1. Exploratory Factor Analysis Results (n = 274) and 'Designence' Model Strategic Design Value Variables (Borja de Mozota, 2006)

	F1	F2	F3	F4	F5
	<i>Customer Insights</i>	<i>Business Model</i>	<i>Aesthetics</i>	<i>Authenticity</i>	<i>Symbolic / Experiential</i>
'Designence' Model Design Value Variable	<i>Design creates a new market (M = 3.90)</i>	<i>Design creates competitive advantage (M = 5.39)</i>	<i>Design is a core competency (M = 5.12)</i>	<i>Design contributes significantly to benefits perceived by customers (M = 5.00)</i>	<i>Design allows the company to sell at a higher price (M = 4.69)</i>
Percent of variance (%)	36.8	6.4	5.7	4.8	3.7
Cronbach Alpha	0.9	0.85	0.86	0.81	0.9
Expertise	0.7				
Consumer involvement	0.68				
Product-user interactivity	0.68				
Consumer segments	0.61				
Comparisons	0.54				
Originality	0.53				
Firm-level positioning	0.52				
Innovativeness	0.52				
Differentiation	0.51				
User health	0.44				
Price point		0.8			
Sale prices		0.79			
Earlier products, brand		0.57			
Forecasts		0.55			
New market intro		0.52			
Prod-level positioning		0.46			
Styling			0.67		
Multiple versions			0.66		
Graphics			0.64		
Aesthetics			0.62		
Associative			0.61		
Materials			0.54		
Design language			0.43		
Workmanship			0.39		
Authenticity				0.55	
Consumer meaning				0.42	
Prestige					0.75
Status					0.71
Emotional appeal					0.58
Touch					0.51
Comfort					0.51
Sensory appeal					0.5

	F6	F7	F8	F9	F10	F11	
	<i>Functional Value</i>	<i>Promotions</i>	<i>Sustainability</i>	<i>Production/ Dev</i>	<i>Project Management</i>	<i>Risk/ Safety</i>	
<i>Designence' Model Design Value Variable</i>	<i>Design improves co-ordination between marketing and R&D functions (M = 4.68)</i>	<i>Design accelerates the launch of new products (M = 4.07)</i>	<i>Design changes relationships with suppliers (M = 3.07)</i>				<i>Design improves co-ordination between production and marketing (M = 4.00)</i>
Percent of variance (%)	3	2.8	2.5	2.2	2.1	2	
Cronbach Alpha	0.86	0.76	0.87	0.71	0.71	0.74	
Product performance	0.7						
Technical specifications	0.67						
Weight	0.64						
Product quality	0.52						
Ergonomics	0.47						
Technology	0.45						
Product life cycle		0.61					
Related promos		0.55					
Tagline		0.54					
Distribution/ Suppliers		0.48					
Sustainability – production methods			0.72				
Sustainability – Design process			0.67				
Production facility				0.63			
Production capabilities				0.48			
Target dates					0.63		
Project goals					0.6		
Sizes					0.37		
Product risk						0.72	
Product safety						0.61	

1.2. Exploratory Factor Analysis (EFA) Results and the Balanced Score Card

Thirdly, to help rationalize our EFA results and organize our replication of the 'Designence' Model relative existing literature we further follow the methodology of Borja de Mozota (2006) by employing the Balanced Score Card (BSC) for Design Management approach. The Balanced Score Card (Kaplan and Norton, 1996) is a foundational business strategy concept offered to help firms build strategies based on alignment between four inter-related concepts of value creation and performance: Customer Value Perspectives, Financial Value Perspectives, Internal Business Processes, and Innovation and Learning metrics. Borja de Mozota (2006) extends this idea by applying the BSC approach to Design Management in an effort to provide design professionals with an analogous tool to measure, manage, and defend their contribution to firm value using terminology and concepts familiar to business managers. Specifically, Borja de Mozota (2006) contends that the four perspectives of the BSC model neatly coincide with the four powers of design embodied by the 'Designence' Model.

Specifically, following Borja de Mozota (2006) the BSC framework further organizes the EFA factors of the model within four inter-related perspectives, made up of: Customer Value Perspective (DESIGN AS DIFFERENTIATOR) including Design creates a new Market, Design allows the company to sell at a higher price, and Design accelerates the launch of new products; Process value perspective (DESIGN AS COORDINATOR) with Design improves co-ordination between marketing and R&D functions, Design changes relationships with suppliers, and Design improves co-ordination between production and marketing; Organizational learning perspective (DESIGN AS VISION AND DIRECTION) comprised of Design is a core competency and Design contributes significantly to benefits perceived by customers; and lastly, Financial value perspective (GOOD DESIGN AS GOOD BUSINESS) through Design creates competitive advantage (see Figure 1. below).

CUSTOMER VALUE PERSPECTIVE		PROCESS VALUE PERSPECTIVE	
<i>‘How should we appear, through design to our customers?’</i>		<i>“How can design help improve business processes?”</i>	
DESIGN AS DIFFERENTIATOR		DESIGN AS COORDINATOR	
Strategic design value variables (Borja de Mozota, 2006)	Exploratory Factor Analysis Results	Strategic design value variables (Borja de Mozota, 2006)	Exploratory Factor Analysis Results
<ul style="list-style-type: none"> • Design creates a new Market • Design allows the company to sell at a higher price, • Design accelerates the launch of new products 	<p>F1 <i>Customer Insights;</i></p> <p>F5 <i>Symbolic/ Experiential Value</i></p> <p>F7 <i>Promotions/ Distribution</i></p>	<ul style="list-style-type: none"> • <i>Design improves co-ordination between marketing and R&D functions</i> • <i>Design changes relationships with suppliers</i> • <i>Design improves co-ordination between production and marketing</i> 	<p>F6 <i>Functional Value</i></p> <p>F8 <i>Sustainability</i></p> <p>F9 <i>Production/ Development</i></p> <p>F10 <i>Project Management;</i></p> <p>F11 <i>Risk/ Safety</i></p>
ORGANIZATIONAL LEARNING PERSPECTIVE		FINANCIAL VALUE PERSPECTIVE	
<i>” How does design sustain our ability to change and improve?”</i>		<i>“To succeed financially, how should design appear to our stakeholders?”</i>	
DESIGN AS VISION AND DIRECTION		“GOOD DESIGN IS GOOD BUSINESS”	
Strategic design value variables (Borja de Mozota, 2006)	Exploratory Factor Analysis Results	Strategic design value variables (Borja de Mozota, 2006)	Exploratory Factor Analysis Results
<ul style="list-style-type: none"> • <i>Design is a core competency</i> • <i>Design contributes significantly to benefits perceived by customers</i> 	<p>F3 <i>Aesthetics</i></p> <p>F4 <i>Authenticity</i></p>	<ul style="list-style-type: none"> • <i>Design creates competitive advantage</i> 	<p>F2 <i>Business Model</i></p>

Figure 1. The Balanced Score Card for Design Management Model with ‘Designence’ Model Strategic Design Value Variables (Borja de Mozota, 2006) and EFA.

The BSC is a useful structure for framing our results because, as Borja de Mozota (2006) contends, it represents the value created by designers in, “... the language shared and understood by most executives” (p. 47). Further, by employing the BSC framework the

'Designence' Model provides a concrete way to harmonize the different competing characterizations of design management's effect on performance that exist in literature (e.g., Calabretta, Montana, and Iglesias, 2008; Chen and Venkatesh, 2013). Specifically, "...the BSC tool is a cause-and-effect model, in that each perspective has an impact on the other three. Employee quality, for example, drives customer value and financial value; process improvement affects financial value and customer value, and so on. Just as a designer working on a project is used to thinking holistically, the BSC indicators are meant systemically improving the quality of product design improves employee satisfaction and creates new knowledge that can generate better production process performance (and vice versa). In the same way, the BSC shows how each design discipline is linked with other design disciplines in a system based on a common, central vision" (Borja de Mozota, 2006, p. 48).

1.3. Hierarchical Linear (HLM) Regression

Finally, in an effort to extend the applicability of the 'Designence' Model and the Balanced Score Card for Design Management approach, we employed hierarchical linear regression to empirically test the relationships between the four concepts of the BSC, operationalized through our EFA process, and two measures of firm performance. Following the suggestion of Borja de Mozota (2006) we considered firm performance at two distinct levels: To assess the proximate effects of design management captured in the Model we assessed the project-level performance of individual firm product offerings by adapting extant measures of new product success related to sales, Return on Investment (ROI), and market share (Atuahene-Gima, Slater and Olson, 2005; Song and Parry, 1997). While, secondly, to evaluate the influence of design management as a more enduring core competency we assessed overall firm-level competitive advantage (Swink and Song, 2007). Computed reliabilities for our Dependent Variables were: Product-level Performance, 12-items ($\alpha = .72$) and Competitive Advantage, 6-items ($\alpha = .80$) (see Table 2 below).

At the broad level, our HLM results validate that the direct effect of the 'Designence' Model on both Product Success (F-value = 17.688, p-value < .001) as well as Competitive Advantage (F-value = 24.841, p-value < .001) is positive and statistically significant. This can be taken as evidence that the Model accurately captures the underlying elements of design management that are important for both firm- and product-level performance. However, perhaps more importantly, our findings also indicate that individual EFA factors underlying the four concepts of the BSC framework may have distinctly different effects on firm performance. Specifically, while our factors of F1 Customer Insights/ Design helps create a new market (CUSTOMER VALUE PERSPECTIVE), F3 Aesthetics/ Design is a core competency (ORGANIZATIONAL LEARNING PERSPECTIVE), and F9 Production and Development/ Design changes relationships with suppliers and Design improves co-ordination between production and marketing (PROCESS VALUE PERSPECTIVE) each appeared strongly related to both levels of firm- and product-level performance, our data additionally suggests that F4 Authenticity/ Design contributes significantly to benefits perceived by customers (ORGANIZATIONAL LEARNING PERSPECTIVE), and F5 Symbolic and Experiential Value/ Design allows the company to sell at a higher price (CUSTOMER VALUE PERSPECTIVE) appear far more important for the enduring Competitive Advantage of the firm than any single, individual product offering. While, alternatively, F6 Functional Value/ Design improves coordination between marketing and R&D functions (PROCESS VALUE PERSPECTIVE) and F7 Promotions and Distribution/ Design accelerates the launch of new products (CUSTOMER VALUE

PERSPECTIVE) were most strongly associated with the successes of individual product projects and less so for competitive advantage. And most intriguingly, the Financial Value Perspective of the 'Designence' Model operationalized by our F2 Business Model/ Design creates competitive advantage was only weakly significantly related to both Product Success (F-value = 2.849, p-value = .052) and Competitive Advantage (F-value = 5.705, p-value < .05).

Table 2. Hierarchical Linear Regression (HLM) Results (n= 274)

Balanced Score Card for Design Management	Factors	DV					
		Product Success	R ²	F-Ratio	Competitive Advantage	R ²	F-Ratio
CUSTOMER VALUE PERSPECTIVE	F1 – Customer Insights/ <i>Design creates a new market</i>	.052***	0.062	10.957	.135***	0.106	17.797
	<i>DESIGN AS DIFFERENTIATOR</i>						
	F5 – Symbolic and Experiential Value/ <i>Design allows the company to sell at a higher price</i>	.236**	0.056	8.829	.293***	0.086	14.109
	F7 – Promotions/ <i>Design accelerates the launch of new products</i>	.302***	0.091	15.065	.342***	0.117	19.862
PERFORMANCE VALUE PERSPECTIVE	F6 – Functional Value/ <i>Design improves co- ordination between marketing and R&D functions</i>	.325***	0.105	17.688	.377***	0.142	24.841
	F8 – Sustainability/ <i>Design changes relationships with suppliers & Design improves co-ordination between production and marketing</i>	0.2	0.04	6.274	.439***	0.193	35.909
	<i>DESIGN AS COORDINATOR</i>						
	F9 – Production and Development/ <i>Design changes relationships with suppliers & Design improves co-ordination between production and marketing</i>	0.201	0.04	6.324	.306***	0.094	15.55
	F10 – Project Management/ <i>Design changes relationships with suppliers & Design improves co-ordination between production and marketing</i>	.228**	0.052	8.228	.314***	0.099	16.401
	F11 – Risk and Safety/ <i>Design changes relationships with suppliers & Design improves co- ordination between production and marketing</i>	.311***	0.097	16.109	.358***	0.128	22.075
FINANCIAL VALUE PERSPECTIVE	F2 – Business Model/ <i>Design creates competitive advantage</i>	0.052	0.019	2.849	.151*	0.037	5.705
<i>"GOOD DESIGN AS GOOD BUSINESS"</i>							
ORGANIZATIONAL LEARNING PERSPECTIVE	F3 – Aesthetics/ <i>Design is a core competency</i>	.285***	0.081	13.231	.291***	0.084	13.827
	<i>DESIGN AS VISION AND DIRECTION</i>						
	F4 – Authenticity/ <i>Design contributes significantly to benefits perceived by customers</i>	.169*	0.029	4.42	.254***	0.065	10.347

*** p < .001

** P < .01

* p < .05

2. DISCUSSION

Firstly, within the 'Designence' Model's CUSTOMER VALUE PERSPECTIVE our results provide clear empirical support for the notion that a focus on understanding customers and their needs is essential to how organizations effectively use design management to direct people, projects, and processes (Erichsen and Christensen, 2013). In particular, our findings highlight how specific "information-based invisible assets" such as "Consumer involvement", "Product-User Interactivity", "Consumer Segments", and "Differentiation" relate to what Caban-Piaskowska (2016) suggests is the most important driver of strategic design value; the ability to capture and connect with consumers' desires for inimitable things that are specially and uniquely designed for them. As Acklin (2011) suggests; customers and their problems are in the center of interests of companies that apply design management. A key contribution of Borja de Mozota (2002; 2006) is the insight that the Design is a Differentiator perspective of the 'Designence' Model provides a framework for describing how successful design management seems to be clearly related to firms' abilities to focus and direct their product design processes to deliver uniqueness to consumers and create differentiation from competitor offerings. However, the Model leaves open the question of how and which firm abilities, processes, skills, routines, etc. are important for delivering uniqueness and differentiation. Our results provide additional insight into these underlying drivers. Specifically, Factor 1 Customer Insights, Factor 5 Symbolic Experiential Value, and Factor 7 Promotions each relate to this perspective. (see Figure 1.). F1 Customer Insights contains underlying information elements of design management that define the firm's target customers (e.g., our information elements "Customer segments") as well as how those consumers perceive and evaluate offerings in the marketplace (e.g., "Innovation", "Originality", "Comparisons", and "Differentiation") and how they will consume or use the offering (e.g., "User expertise", "Consumer involvement", and "Consumer interactivity"). Our regression results suggest strong positive support for the powerful product- and firm-level effects of clear Customer Insights (F-value = 10.957, p-value < 0.001 for Product Success and F-value = 17.797, p-value < 0.001 for Competitive Advantage). Our findings align with many descriptions of design management as a "managed process" within firms (Bruce and Bessant, 2002) used to direct and focus information gathered about target customers into distinctive offerings that will stand out from rivals and connect with target customers. In particular, researchers such as McCormack, Cagan and Vogel (2004) suggest that customer-centric inputs have a critical importance to successful NPD processes while Micheli, Perks, and Beverland (2018) argue that one of the most important aspects of design management is a thorough understanding of the company and its competitors. As Best (2015) argues, "Apart from quality and functionality, design management enables an organization to fulfil the needs of consumers who expect high aesthetic experiences, i.e. added value in products addressed to them" (p. 6). Our results suggest that design management helps to direct the people, projects, and processes of a firm related to the CUSTOMER VALUE PERSPECTIVE into both successful new products and enduring competitive advantage.

In addition, our results also suggest that factor F5 Symbolic/ Experiential Value (e.g. information elements related to "Prestige", "Status", "Luxury", "Comfort", "Sensory Appeal") is more important for holistic firm competitive advantage (F-value = 14.109, p-value < .001), rather than any single, individual product's performance (F-value = 8.829, p-value < .01). This finding aligns with NPD and business strategy literature that argues that contemporary consumers have come to expect product functionality and quality as prerequisites, and that

truly successful products must not only perform well but also resonate with consumers in some additional symbolic or emotional way (Bloch, 1995; Hertenstein, Platt, and Veryzer, 2005). McBride (2007) points out that distinctive product offerings create “non-material value” (p. 17), which causes consumers to evaluate them not only on their physical or technical attributes, but to see, “...nearly all things as experience goods” (p. 22). Our results demonstrate which elements of strategic design value of the ‘Designence’ Model may contribute to the creation of emotional and symbolic value for firms through the process of maintaining and reinforcing distinctive brand attributes or product cues which tend to endure and carry through multiple individual product lines. As an example, Borja de Mozota (2006) provides a case study which describes the impact brand value has on the success of the Decathlon TriBord Surfing Wetsuit product line and how design management supports the connection consumers perceive with the Decathlon brand across a wide variety sports product categories (p.50). In the case study, these consumer feelings of connection appear to be related to the “Status”, “Emotional appeal”, and “Prestige” they feel towards the broader Decathlon brand. Accordingly, our results reaffirm the notion that an important function of the ‘Designence’ Model is to help firms manage the CUSTOMER VALUE PERSPECTIVE across many different product lines of an organization (Crilly, Moultrie, and Clarkson, 2004). It also implies that the concept of design management is inherently a dynamic concept that requires firms, designers, and product managers adapt and evolve their conceptions of “Status”, “Prestige”, and “Sensory appeal” over time in order to maintain connections with target consumers (Muenjohn, Chhetri, Hoare, As-Saber, Suzumura and Ishikawa, 2013).

Third, the PERFORMANCE VALUE PERSPECTIVE of the ‘Designence’ Model captures an organizational capabilities-oriented view of Design as Performance (Borja de Mozota, 2002; 2006), where our F6 Functional Value, F9 Production, F10 Development, and F11 Risk/ Safety capture the multitude of firm process for managing design within NPD including, “Deadlines”, “Timelines”, “Product performance”, “Technical specifications”, “Quality management”, “Technology”, “Development”, and “Project goals”. As well as how these critical “information-based invisible assets” flow between and among different functional areas of the organization. Many depictions of design management emphasize that an important characteristic of firms that effectively use design is the ability to successfully structure and manage cross-functional product development teams (Wolff and Amaral 2016; Silva and Merino, 2017). Miller and Moultrie (2013) argue that one of the key benefits of design management is the synergy it fosters within interdisciplinary projects. Indeed, McBride (2007) argues that,

“Design management is a method of supporting the development of networking and building relations through a greater awareness of the need for connections between the worlds of producers, technologists, constructors, as well as artists and designers, with the community of recipients and consumers of art and design” (p. 20).

Our results provide clear support for these general benefits, as well as perhaps more importantly, defining some of the underlying dimensions of Design as Performance showing significant positive relationships between F6 Functional Value for both Product success (F-value = 17.688, p-value < .001) and Competitive Advantage (F-value = 24.841, p-value < .001) and F10 Development Processes at the Product- (F-value = 8.228, p-value < .01) and Competitive Advantage- (F-value = 16.401, p-value < .001) levels. These findings provide empirical evidence for the role design management and the ‘Designence’ Model play as the link between individual product projects and the overall competitive advantages of the firm. While numerous authors (e.g., Borja de Mozota and Wolff 2019; Scaletsky and da Costa, 2019;

de Mello Freire, 2017) have advocated for design to be considered equally with marketing, sales, engineering, or research departments of firms, the lack of clear empirical findings may have impeded both the broader acceptance of design as a strategic function. Our results provide much-needed context to the underlying conditions in which the design function contributes to new product development as an aspect of firm strategy-- e.g., how information related to F6 Functional Value or F10 Project Management are captured and shared and how the process of identifying opportunities and interpreting customer needs and translating those insights into new offerings through our F9 Production/ Development.

Lastly, our F2 Business Model appears to provide the only cluster of information elements related to the FINANCIAL VALUE PERSPECTIVE of the 'Designence' Model (Borja de Mozota, 2006) made up of "information-based invisible assets" that capture the instrumental aspects of NPD, such as "Product price point", "Forecasts", mode of "Market entry", "Product-level positioning", and the firm's "Previously introduced products". Our results show a non-significant relationship between F2 and Product success (F-value = 2.849, p-value = .052) and only a weakly significant effect on Competitive Advantage (F-value = 5.705, p-value < 0.05). Our interpretation of these results is that while these aspects of design management would intuitively appear to be important anecdotal discussions with managers suggest that its influence may have already been decided upon before being catalogued in a product design brief. For example, one respondent described how a product design brief for a microwave oven within their firm may contain information elements related to F2 Business Model that specify the outward appearance, pricing strategy, and the product-level positioning of the product (e.g., aluminium, with rounded corners, a rubberized handle and a white digital touchpad, at the \$XX price point). However, they proposed that this design information would already be widely understood across the organization and that any individual product would be naturally expected to align with the broader brand positioning of the firm (i.e., as a "modern", "refined", and "expensive" offering relative to competitors). This suggests, as Borja de Mozota (2006) describes within the Steelcase case study in the original paper, that the original 'Designence' Model as well as our replication offered in this study may ultimately be useful for managers as a framework for revealing the holistic benefits of design management that may be poorly represented in traditional measures of performance or Competitive Advantage. Specifically,

"Measurements related to the workplace have typically focused on cost per workspace, space efficiency, reconfiguration costs, and energy use— the cost side of the cost/benefit equation. The workplace, however, significantly affects an organization's people, processes, and technology. In the business results model shown below, the workplace is one of four key factors that drive business results. Efforts in all four areas must be integrated, balanced, and measured" (p. 52).

3. CONCLUSIONS

This study presents a replication and extension of the 'Designence' Model of strategic design management by using content analysis of product design briefs to define the underlying dimensions of the Model, as well as empirically describe the relationships between each of the four perspectives of the Model on measures of product- and firm-level performance. Our results contribute to the ongoing scholarly conversation around design management and business strategy by providing managers and scholars much greater insight into the individual "information-based invisible assets" that make up the Model. Borja de Mozota (2006) specifically developed the framework to, "...bridge the gap between the world of designers and the world of managers" (p.44). Specifically, our results may provide a much-needed clarity to the precise functions that constitute design as a "managed process" within firms (Bruce and

Bessant, 2002, p. 38). Our replication of the 'Designence' Model allows for concepts that were historically lumped together, or considered separately, to be more clearly understood as inter-related. For example, the F3 Aesthetics cluster includes items related to a product's "Graphics" and "Materials", that provide greater context to the original study's conception of Design as a core competency, while our F4 Authenticity captures "Consumer meaning" by which the 'Designence' Model describes how Design contributes significantly to benefits perceived by customers. Borja de Mozota (2006) paraphrases leadership scholar Peter Drucker by noting, "...one cannot manage what is not measured. So, measuring the impact of design value is a key success factor for designers who want to successfully implement their design strategy— and for design managers who want to present design as a tool for value management." (p. 47). Accordingly, a clear contribution of our replication and extension is to highlight the separate, yet essentially inter-connected, holistic relationships between the four perspectives of the 'Designence' Model. Our results provide empirical clarity to the distinction Kimbell (2012) proposes between "design-as-an-outcome" and "design-as-a-process", where "Design-as-an-outcome" refers to the physical artifact created by an organization, represented in our Design as a differentiator perspective of F1 Customer Insights, F3 Aesthetics, F9 Production/Development and Design as Vision perspective F3 Aesthetics, F4 Authenticity, F5 Symbolic/Experiential Value. Alternatively, "Design-as-a-process" information refers to the creative, yet rational process employed to develop the solution to a "complex problem" captured in our Performance Value Perspective including F6 Functional Value, F9 Production, F10 Development, and F11 Risk/ Safety. By, perhaps for the first time, defining and separating the precise, skills, processes, mechanisms, and knowledge "information-based invisible assets" and strategic design value variables that flow through design management we hope to spur further research into the distinct role design plays in firm strategy and performance. While Borja de Mozota (2002; 2006), Moll, Montana, Guzman, and Parellada (2007), Calabretta, Montana, and Iglesias (2008), and Chen and Venkatesh (2013), among others, have identified a variety of design management elements and factors that influence organizational performance these studies have been largely qualitative and anecdotal. Our results provide useful empirical detail to precisely how and which specific aspects of design management relate to competitive advantage and product-level performance. Indeed, a noteworthy benefit of our EFA results are the breadth, and parsimony, provided by our fifty-one information elements grouped into eleven distinct factors explaining 79.31% of the variance in our data. We hope that by replicating and extending the 'Designence' Model our results spur greater interest in the Model as a method to organize the complexity, as well as potential, of managing design within an organization.

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