

Effects of Strategic Orientation on Product Design: Focusing on the Relationship with the Product Life Cycle

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The purpose of this study is to clarify how a strategic orientation in product development organizations affects product design. While existing studies have shown that a company's strategic intent affects product design development process and corporate performance, these studies have not sufficiently clarify strategy-specific impacts on product design outputs. This study clearly identified the effects of four main types of the strategic orientation—"customer orientation," "competitor orientation," technology orientation," and "entrepreneurial orientation"—on product design outputs. This study also showed effects of each strategic orientation on product design outputs related to the product life cycle. This study demonstrated that the types of strategic orientation that could be effective on product design outputs differs in the growth and maturity stages of the product life cycle.

Keywords: *Design Management, Strategic Orientation, Product Life Cycle*

1 Introduction

This study clarifies how a strategic orientation toward product development affects product design. Existing studies on design management relate a company's strategic intent to product design process and corporate performance but never specify effects of the strategies (Swink, 2000; Sung & Gilmour, 2002; Ravasi & Lojcono, 2005; Marsili & Salter, 2006; Hsu, 2013). We show how four main types of the strategic orientation—"customer orientation," "competitor orientation," technology orientation," and "entrepreneurial orientation"—impact product design outputs with a focus on the relationship with the product life cycle. This is because the effects of strategic orientation are impacted by the market situation faced by a company (Jaworski & Kohli, 1993; Gatignon & Xeureb, 1997). This study gives further clarification on the effect of company's strategic behaviors on product design by analyzing how each of those four types affects product design outputs during the growth and maturity stages of the product life cycle.

2 Literature Review and an Analytical Framework

2.1 Design Management Goals and Performance

Product design is an important element, affecting the user's purchase preference, product sales, and corporate performance (Hertenstein et al., 2005; Guo, 2010). Design

management generally seeks to achieve differentiation from the competitors' products (Kotler and Rath, 1984) by increasing innovativeness and uniqueness in its design (Truong et al., 2014). In fact, highly innovative and unique designs increase the appeal to users and performance of a product (Talke et al., 2009; Rubera, 2015). Therefore, we focus on the two qualities of design outputs- innovativeness and uniqueness- and examine to see if a product with these qualities achieves high performance.

2.2 Strategic Orientation and Product Design

Existing studies in design management generally relate a company's strategic intent to its development of product designs and corporate performance, but they seldom disclose the effects of specific strategies (Swink, 2000; Sung & Gilmour, 2002; Ravasi & Lojacono, 2005; Marsili & Salter, 2006; Hsu, 2013). Therefore, this study focuses on the concept of "strategic orientation" which dictates a company's strategic behavioral tendency. This strategic orientation has been thought to affect decisions in new product development, innovation creation, and a company's performance in various ways. Considering the fact that product design refers to product concepts, specifications, functions, and quality, as well as a company's philosophy (Borja de Mozota, 2003; Utterback et al., 2006), it is reasonable to say that product design largely reflect the company's strategic orientation. The main types of the strategic orientation are "customer orientation," "competitor orientation," "technology orientation," and "entrepreneurial orientation."

Customer orientation emphasizes responsiveness to customers by analyzing and understanding their needs. It raises corporate performance by increasing organizational learning and employees' organizational commitment (Narver & Slater, 1990; Kohli & Jaworski, 1990; Deshpande, Farley & Webster, 1993; Hult, Ketchen & Slater, 2005; Kirca, Jayachandran & Bearden, 2005). *Competitor orientation* emphasizes responsiveness to competitors' actions. It raises a company's commercial performance by creating superior products in competitive markets (Cooper, 1984; Narver & Slater, 1990). *Technology orientation* emphasizes aggressive acquisition of sophisticated technologies for new product development (Cooper, 1984; Kanter, 1988; Zhou, Yim & Tse, 2005). A company with high technology orientation chooses to establish new technological solutions to meet customers' needs and proactively aims for innovation creation through new technology development (Workman, 1993). *Entrepreneurial orientation* affects a company's performance by developing strategies through proactive policies, competitive aggression, and risk-taking approaches (Lumpkin & Dess, 1996; Lumpkin & Dess, 2001; Matsuo, Mentzer & Özsomer, 2002; Dess & Lumpkin, 2005).

2.3 Strategic Orientation and Product Life Cycle

As stated above, strategic orientation relates to decisions in new product development, innovation creation, and a company's performance and also has significant impact on product design outputs. However, whether a strategic orientation influences the performance depends upon the growth, uncertainty, and the degree of competition in the market (Jaworski & Kohli, 1993; Gatignon & Xeuereb, 1997). In the analysis of the relationship between the product life cycle and customer orientation, Wong and Ellis (2007) find that the degrees and effects of customer orientation differ with stages of the product life cycle. Lumpkin and Dess (2005) also argue that the effect of an entrepreneurial orientation differs during the growth and maturity stages of a product life cycle.

2.4 Analytical Framework

Based on existing research, we have set up an analytical framework with the focus on a company's strategic orientation, market situation in the product life cycle, and product design outputs. First, existing studies show that a strategic orientation impacts product design output. We analyze how a strategic orientation toward customers, competitors, technology and entrepreneurship relates to product design outputs. Existing studies also show that the degree to which strategic orientation affects product design outputs differs with the product life cycle. We focus on the growth and maturity stages of the product life cycle as factors that interact with strategic orientation to influence product design outputs because the growth stage, where the market expands, and the maturity stage, where the competition intensifies, are very important stages that largely affect a company's market shares and performance.

We use the analysis of interactions for these environmental factors. This analysis of interactions considers the effect of the change in the concerned variables under a certain condition of effect. This, therefore, enables us to analyze the effect of strategic orientation on product design outputs in consideration of the factors of the product life cycle.

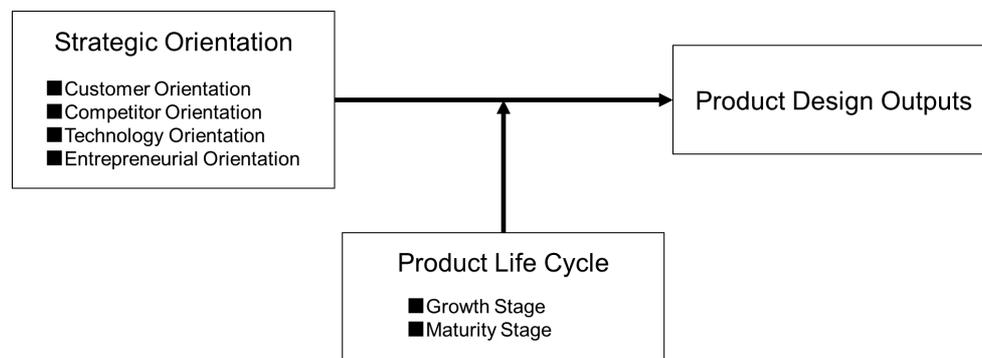


Figure 1. Analytical Framework

3 Survey Overview and Measurement

3.1 Survey Overview

In this study, we carried out a questionnaire survey, "Survey on Corporate Product Development Activity," targeting manufacturing companies listed in the first section of the Tokyo Stock Exchange (TSE). Between November and December 2017, we surveyed 5,523 employees of 511 manufacturers via the Internet, for which we received responses from 2,226 employees from 391 companies. The questionnaires were given to employees in the product development field with questions related to their companies' product development. We chose the former group of respondents because their established companies have long-standing product development organizations. This group also encompasses companies that produce a diverse array of products in differing markets, including clothing and textiles, chemicals (cosmetics), household goods, electric equipment (appliances, machine equipment, and computers), and automotive and transport equipment.

3.2 Measurement Scale

Generally, design management seeks to create design output with high innovativeness and uniqueness to differentiate products from competitors (Kotler & Rath, 1984; Talke et al.,

2009; Truong et al., 2014; Rubera, 2015). Those design outputs are then expected to contribute to a company's performance (Hertenstein et al., 2005; Guo, 2010). Subjects entered responses on a 7-point Likert scale to the questions related to "their organizations' product designing" such as "Does your company often come up with new designs?," "Can your company's products be quickly differentiated by consumers from other companies'?" and "Has your company been successful in developing new products that can capture major market shares?" Verification factor analysis (VFA) measured principal components.

We set the four previously indicated orientations (customer, competitor, technology, and entrepreneurship) as elements in a strategic orientation toward product development. We then drew questions from existing research, responses entered by subjects on a 7-point Likert scale, and VFA measured results.

Finally, we examined the former half (growth stage) and the latter half (maturity stage) of product lifecycles. The growth stage is the stage when products start to be broadly accepted in the market, but new competitors also enter the market, and functionally enhanced products are launched by other companies. Product design and technology are fluid during this stage, making the market and the technology highly uncertain (Levitt, 1965; Rink & Swan, 1979; Moon, 2005). The maturity stage exhibits a gradual transition to process innovation and incremental innovation with the emergence of a dominant design (Abernathy and Utterback, 1978). Therefore, the competition intensifies, as does the need to improve existing product functions and technologies and sales strategies (Levitt, 1965; Rink & Swan, 1979; Moon, 2005). Subjects answered questions about both stages on a 7-point Likert scale, and VFA analysed components.

Table 1 Factor Analysis

Factors	Items	Factor Loadings	Cronbach's α	Contribution Ratio (%)	Existing Research
Customer Orientation	The satisfaction of existing customers is an important business goal.	.807	.715	63.841	Narver & Slater (1990)
	Actions that meet customer needs are emphasized.	.825			
	We have almost no biases when interpreting customer information.	.764			
Competitor Orientation	We target markets where we have an advantage over competitors.	.790	.740	65.801	Narver & Slater (1990)
	We always respond to competitive actions by competitors that threaten our company.	.818			
	Our business structure and systems are coordinated in response to target markets.	.826			
Technology Orientation	New product development tends to use sophisticated technologies.	.907	.783	82.189	Zhou, Yim & Tse (2005)
	Our new products always use cutting edge technology.	.907			
Entrepreneurial Orientation	We tend to agree with high-risk projects (that have the likelihood of creating very high profits).	.807	.724	63.558	Lumpkin & Dess (1996)
	I believe that achieving company goals requires bold actions in response to changes in environment.	.743			
	We are bold and aggressive in making the most of potential opportunities.	.854			
Growth Stage	Our companies accept new product ideas well.	.756	.706	54.680	Zhou, Yim & Tse (2005), Wong & Ellis (2007)
	New competitors are entering the market.	.612			
	The company's foundational technologies are rapidly changing.	.777			
	We are realizing many new product ideas through technology innovation.	.797			
Maturity Stage	Customer needs in response to our products are changing over time.	.669	.652	49.524	
	Competitors are frequently revising the functionality of their products.	.805			
	Competitors are frequently revising their sales strategies.	.789			
Product Design Outputs	Current technology is often improved in new product development.	.514			
	The product designs provided by our company often include new things.	.851			
	Consumers immediately differentiate our company's product designs from those of our competitors.	.811			
	We are successful in developing hit products that capture major market shares.	.757			Talke et al. (2009), Truong et al. (2014), Rubera (2015), Guo (2010)

Notes: N=2,226

Table 2 Descriptive Statistics Value and Pearson's Correlation Coefficients

Items	Average	S.D	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Customer Orientation	0.000	1.000	1.000												
2. Competitor Orientation	0.000	1.000	.779 **	1.000											
3. Technology Orientation	0.000	1.000	.623 **	.662 **	1.000										
4. Entrepreneurial Orientation	0.000	1.000	.603 **	.653 **	.676 **	1.000									
5. Customer Orientation × Growth Stage	0.483	1.149	-.149 **	-.093 **	-.066 **	-.037	1.000								
6. Competitor Orientation × Growth Stage	0.523	1.180	-.090 **	-.122 **	-.093 **	-.044 *	.799 **	1.000							
7. Technology Orientation × Growth Stage	0.596	1.175	-.064 **	-.093 **	-.157 **	-.072 **	.684 **	.726 **	1.000						
8. Entrepreneurial Orientation × Growth Stage	0.533	1.134	-.038	-.045 *	-.075 **	-.044 *	.680 **	.720 **	.745 **	1.000					
9. Customer Orientation × Maturity Stage	0.299	1.174	-.004	.042 *	.027	.058 **	.553 **	.441 **	.401 **	.403 **	1.000				
10. Competitor Orientation × Maturity Stage	0.319	1.232	.040	.047 *	.038	.067 **	.433 **	.556 **	.422 **	.426 **	.777 **	1.000			
11. Technology Orientation × Maturity Stage	0.318	1.197	.026	.039	.008	.039	.420 **	.450 **	.570 **	.452 **	.678 **	.746 **	1.000		
12. Entrepreneurial orientation × maturity Stage	0.327	1.168	.059 **	.071 **	.040	.078 **	.401 **	.431 **	.428 **	.589 **	.704 **	.744 **	.733 **	1.000	
13. Product Design Outputs	0.000	1.000	.473 **	.506 **	.533 **	.494 **	-.024	-.072 **	-.051 *	-.026	.054 *	.055 **	.035	.059 **	1.000

Notes: N=2,226 **<.01, *<.05

4 Analysis Results and Discussion

Table 3 Multi-Regression Analysis Result

Items	β	t-value	Significance
Intercept	-.011	-.541	
Customer Orientation	.108	3.705	***
Competitor Orientation	.134	4.382	***
Technology Orientation	.269	10.237	***
Entrepreneurial Orientation	.158	6.210	***
Customer Orientation × Growth	.096	3.009	***
Competitor Orientation × Growth	-.146	-4.461	***
Technology Orientation × Growth	.055	1.924	*
Entrepreneurial Orientation × Growth	.002	.077	
Customer Orientation × Maturity	-.019	-.652	
Competitor Orientation × Maturity	.077	2.477	**
Technology Orientation × Maturity	-.034	-1.223	
Entrepreneurial Orientation × Maturity	-.004	-.126	
adjusted R square		.346	
F		98.892	

Notes: N=2,226, ***<.01, **<.05, *<.1

First, each of the four strategic orientations have positive effects on product design outputs. It is especially noteworthy that customer orientation has a positive effect on with product design outputs.

Existing studies note that customer orientation boosts corporate performance by increasing organizational learning and employees' organizational commitment (Narver & Slater, 1990; Kohli & Jaworski, 1990; Hult, Ketchen & Slater, 2005; Kirca, Jayachandran & Bearden, 2000). However, although a customer orientation contributes to incremental innovation, it can hinder radical innovation (Koldor, 1971; Bennet & Cooper, 1981; Utterback, 1996) because customers do not fully know their potential needs and lack a sense of ideal product design or functionality (Utterback, 1996). Nevertheless, customer orientation has a positive effect on performance in this study where product design is a performance variable. These results indicate that in the field of product designing, product development activities that emphasize on responses to the needs and knowledge of users effectively generate highly innovative and unique designs that can be differentiated from those of competitors and had never existed in the market.

Second, our results show that effects of strategic orientation toward product development differ during the different stages of the product life cycle. During the growth stage customer and technology orientations have a positive effect, whereas a competitor orientation has a negative effect. However, during the maturity stage, competitor orientation has a positive effect.

Generally, the growth stage features relatively high market and technological uncertainty as there is fluidity in product designs and technologies with incompletely defined customer needs (Levitt, 1965; Rink & Swan, 1979; Moon, 2005). Customer orientation has a positive impact on product design

during the growth stage because to lead the market, companies respond to “early adopters”, who seek more innovation and originality in product designs. In other words, in the growth stage, companies focus on searching for potential customer needs and increase innovativeness and uniqueness of their product designs by reflecting those needs. Existing studies on relations between customer orientation and innovation, however, mainly focused on responses to visible needs of “late majorities” who bought after a product’s functionality and design were relatively set in the market (Rogers, 1995), making customer orientation seem as the setback for radical innovations. Our results indicate that customer orientation during the maturity stage does not affect product design outputs. They endorse existing research. These results also indicate that product design outputs change depending on what type of customer needs a company focuses to respond to at each stage of the product life cycle.

Our results show that technology orientation also increases product outputs during the growth stage, which has no dominant design, and the product technology is highly fluid. Eisenman (2013) notes that innovative technology development increases innovativeness of design outputs because a product’s concept and value are more easily conveyed to customers by embedding innovative technologies in the product design. In short, in the growth stage with a relatively high uncertainty of technology, innovative technology development impacts product designs.

Finally, competitor orientation correlates negatively with the impact of product design during the growth stage but positively during the maturity stage. This finding suggests that during the maturity stage, when customer needs are more fixed and stable, there is benefit from focusing on differentiating products and emulating market leaders. Emphasizing on responding to competitors during the growth stage has the opposite effect because uncertainty in the market itself is high.

5 Contribution and Limitations of the Study

First, it empirically and quantitatively verified how four elements of strategic orientation separately influenced product design outputs. Existing studies on design management address how overall corporate strategy for design affects development process of product designs and corporate performance (Swink, 2000; Sung & Gilmour, 2002; Ravasi & Lojacono, 2005; Marsili & Salter, 2006; Hsu, 2013) but do not clarify strategy-specific impacts, whereas this study clearly identified the effects of the four main strategic orientations (customer orientation, competitor orientation, technology orientation, and entrepreneurial orientation) on product design outputs.

Second, related to the product life cycle, we showed relative effects of each strategic orientation on product designs. Existing studies clarified the effect of customer and entrepreneurial orientations in relation to the product life cycle but only examined them individually, whereas this study examined each component of the strategic orientation at the same time and demonstrated that the type of strategic orientation that could be effective on product design outputs differs in the growth and maturity stages of the product life cycle.

Third, our results suggested that the effect of customer orientation possibly differs depending on the types of customers that a company focuses on in its product development. Existing studies show that customer orientation has no effect on radical innovation. However, our results showed that, in the growth period with the focus on potential needs of customers, innovativeness and uniqueness of product designs increase because of those progressive customer needs being reflected in product design development.

However, this study also has its limitations. For example, we sampled 2,226 employees of 391 manufacturers listed in the first section of the TSE without considering differences in product areas. Because the length of product life cycles and competitive circumstances differ by industry, future studies should measure the effect of strategy orientation with these differences in mind. Additionally, we measured the strategic orientations of product development organizations through individual employee’s responses in each company. Because the strategic orientation is a concept indicating strategic behavioral tendency of a company as a whole, future efforts should be made to measure the tendency on an organizational level.

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