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Using Quality Function Deployment to Assess If a Strategy Is Market-Oriented

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ABSTRACT

This paper introduces a new application of Quality Function Deployment (QFD) as a method for companies to assess and improve their market orientation. Specifically, it allows a company to measure the degree to which the factors it holds to be Competitive Advantages (CAs) are consistent with what customers want. Unlike current measures of market orientation, the methodology uses a multi-tiered platform (top executives and customers). Results from applying the method to the wood products industry in the United States and Chile suggest that the following CAs are relevant for meeting architects' (customers') wants and needs: innovation (process, business, and product), differentiation in quality of the material, and export orientation.

Keywords: market orientation, architects, innovation, quality function deployment

Introduction

The ability to sustain a competitive advantage is one of the most pervasive business concepts advanced in the past few decades and appears in innumerable academic and industry-oriented publications. The concept has evolved from traditional industrial economics and notions of cost/quality positioning (Porter 1980), to resource-based theories of core competencies (Barney 1991, Bharadwaj et al. 1993), and the disruptive "rule-breaking" tactics oriented at dislodging industry incumbents (D'Aveni 1994, Christensen 1997, Hamel 2000). Within the marketing discipline, however, the concept is quite context specific; that is, "…(sustaining) the basis on which customers will choose your product over the competitors'… " (Winer 1999, p. 52). This is supported and maintained by a firm's marketing orientation – an organizational focus on the customer and competition (Day and Wensley 1983, Grimm and Smith 1997).

Despite the widespread adoption of a marketing orientation as a key to sustaining competitiveness, there are limitations with extant measures, such as common source bias or the self-typing approach. Responding to these limitations, this paper presents a new methodology for measuring and improving the market orientation of a company. This methodology, Quality Function Deployment (QFD), uses a multi-tiered platform of respondents (top executives and architects) to overcome problems typically associated with common source bias. Moreover, different sources of competitive advantage are defined and ranked in importance by two respondent groups using a multi-stage data-collection approach, avoiding the self-typing problem. Finally, to improve the ability to generalize our findings and to provide insights for the U.S. industry regarding the competitive advantages of one important competing country, an empirical test was conducted using the wood products industry in two different cultural settings – the United States and Chile.

Reassessing Market Orientation

The last decade has seen significant interest in the market orientation concept (Narver and Slater 1990, Jaworski and Kohli 1993, Kohli and Jaworski 1990, Day and Nedungadi 1994, Day 1994). Ruekert (1992, p. 225) was among the earliest theorists who asserted that a market focus consists of "orienting the activities of the business to satisfying customer needs and wants." Perhaps the most influential measure is that of Narver and Slater (1990) who inferred that market orientation consisted of three behavioral components (customer orientation, competitor orientation, and interfunctional coordination) and two decision criteria (long-term focus and profitability). Kohli and Jaworski (1990) provided a different perspective in arguing that a market orientation encompasses the stages of generating, disseminating, and responding to market intelligence. The latter perspective emphasizes exogenous factors that influence customer wants and needs. Even so, because the concept is still evolving, there is little surprise that disagreement continues to exist regarding its precise definition (Slater and Narver 1999, p. 1,169).

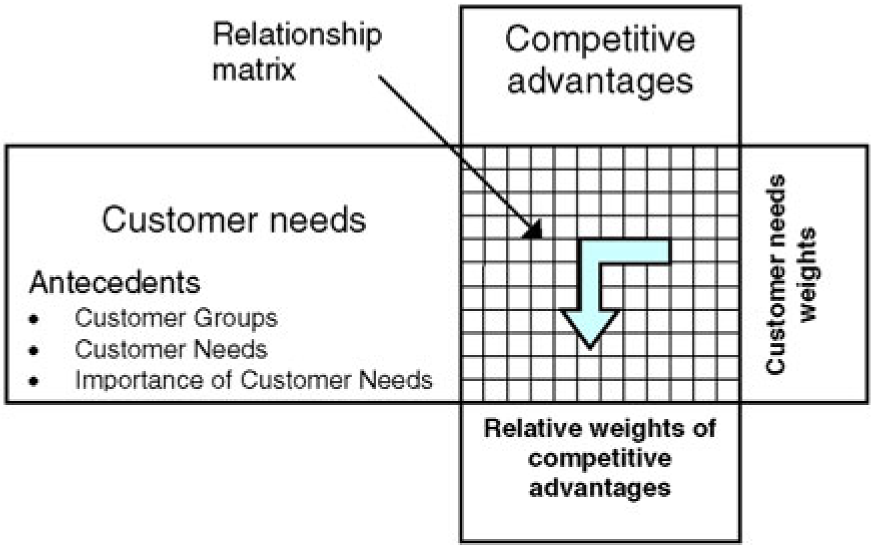
While these approaches have been useful in guiding theory development and empirical studies, there are still problems inherent in them. Conceptually, it is widely held that market orientation and superior financial performance are inextricably related, if not positively correlated. Nevertheless, researchers have found this link to be elusive in empirical investigations. Jaworski and Kohli (1993) used subjective measures of performance (e.g., overall performance relative to competitors) and found a significant link between market orientation and performance. As reported by Noble et al. (2002), however, the use of objective performance measures has resulted in complex and even unsupportive results. Some researchers have argued that innovation mediates the effect of market orientation on performance, thus suggesting a solution for the lack of consistency in the relation between them (Deshpandé et al. 1993, Hurley and Hult 1998, Han et al. 1998, Hult and Ketchen 2001). Even with this clarification, however, there does not appear to be consistency when different measures of performance are employed.

Beyond empirical inconsistency, there are operational issues. Despite the popularity of the Narver and Slater (1990) measure, there are risks resulting from common source bias (i.e., all conclusions are derived from one source of information). They asked company managers about the three behavioral components: customer orientation, competitor focus, and interfunctional coordination. Their approach did not consider the opinion of the customer directly. Instead, it was measured as perceived by a manager, thus it has a "common source bias." Taken together, it is hardly surprising that there is little clarity regarding "how a market orientation benefits the firm" (Slater and Narver 1999, p. 1,168).

Conceptual Model and Considerations

Figure 1 presents the conceptual model that underpins the proposed methodology. The model utilizes key ideas from Quality Function Deployment (QFD) – a tool of Total Quality Management (TQM) that incorporates both the customer and competitor emphasis required by a market orientation (Cohen 1995). TQM can be defined as a set of models and tools for involving all employees in continuous improvement of aspects important to the customer (Day 1994). It is noted that both the marketing concept and TQM assume superior performance through a focus on customer satisfaction, with the difference being that TQM offers numerous prescriptive and supporting organizational tools (Day 1994). QFD is one of those tools, and Day defines it as aiding "the integration of customer requirements into the design process and measures the cost of quality" (1994, p. 47). QFD was originally used in new product development, but applications have since diversified (Bossert 1991).

Figure 1. Conceptual model.



In a traditional QFD application, customer needs (termed as *Voice of the Customer*) are compared with design parameters of products still in the design stage (termed as *Voice of the Company*) in order to discover those product features that most likely would satisfy customer requirements (Bossert 1991, Cohen 1995). In this study, strategy is the "product" under analysis, and the competitive advantages (heretofore referred to as CAs) of the companies are the design parameters of the product. Consideration of these two elements (CAs and customer needs) at the same time allows identification of specific CAs that best satisfy customer needs. Further specificity is gleaned in terms of the relative (highest) weights or ranking in our model. Transformation of customer needs weights into CAs weights is achieved through the relationship matrix (**Fig. 1**) that connects both interacting elements.

Innovation is one of the key success factors in today's hypercompetitive environment (Grimm and Smith 1997, D'Aveni 1994) and appears in this study as a very important CA, as will be elaborated later. Boer and During (2001) suggest three types of innovation: Product, Process, and Business. Product innovation refers to the development of new products or the improvement of existing ones. Process innovation refers to operational improvements that reduce delivery time, increase flexibility, or lower operational costs. Finally, business innovation refers to improvements in customer-focused activities and/or TQM. Han et al. (1998) reported an alternative innovation typology that distinguishes between technology and administration-related innovations. Interestingly, both classifications are consistent, because it can be argued that both product and process innovation fall into technological innovation, whereas business innovation and administration-related innovation are similar concepts.

Methods

Sample: The Wood Products Industry

Our methodology is applied in the context of the wood products industry. Early research concluded that wood products companies are primarily production and cost-driven (Rich 1986). Findings of more recent work suggest an evolution of strategy over time toward differentiation and a move away from a production mentality toward a marketing mentality or market orientation (e.g., Bush and Sinclair 1991, Juslin and Hansen 2003, Niemelä 1993). During the past decade, the industry has faced new pressures from global competitors, threats from substitute products such as steel, concrete, and plastics, pressure from environmental groups, and shifts in channel power from traditional wholesalers and wood products companies to big box retailers, such as The Home Depot or Lowe's (Dibrell and Down 2002). These new conditions proved to be exceedingly difficult for the U.S. wood products industry and caused a dramatic consolidation, illustrated by the fact that 119 sawmills shut down or went out of business between 1996 and 2002 (Spelter 2002). Subsequent upgrading of remaining sawmills offset the loss of capacity.

This research specifically applies to wood products for a number of reasons. Wood product companies are often too competitor oriented, and significant competitive gains can be made from an improved customer focus. The business strategies of wood products companies have been studied less extensively (Bush and Sinclair 1991, Bush et al. 1991, Rich 1986). These studies categorized the CAs of wood products companies in terms of the three generic strategies defined by Porter (1980, 1985): cost leadership, differentiation (e.g., in service), and focus (niche markets). The same studies found that many companies were "stuck in the middle," in that they pursued both a cost leadership and a differentiation strategy. Contrary to Porter's expectations (1980), however, those "stuck in the middle" companies did not typically perform worse than those with a clear orientation. Thus, Porter's (1980) classification scheme was not able to differentiate between the worst-to-the-best performers among wood products companies.

Consistent with the globalization of the wood products industry, we chose to conduct our research in two countries, the United States and Chile. The first is the largest producer and consumer of wood products in the world (FAO: Food and Agriculture Organization of the United Nations). The second is relevant to analyze as Chile is the main offshore supplier (of the United States) in several wood product categories (e.g., softwood moldings), surpassing Canada and even domestic production (Lignum 2005). Chile is also interesting to analyze as the Chilean wood products industry is relatively young (approximately 40 years old), yet topped the national profits ranking in 2002 (Angel 2001, Estrategia 03/24/2003).

A more compelling reason for choosing the Chilean industry is that U.S. companies tend to look at Chile as a benchmark, since it enjoyed the status as the world low-cost leader in white wood logs and sawmilling in 2000, outpacing countries such as Brazil and South Africa, which have lower labor costs, but do not enjoy the efficiency of the Chilean industry (Wood Markets 2002). In this regard, some of the most powerful forest products companies in the world are trying to offset the advantage of Chilean and Latin American companies in general by actively buying land in different Latin American countries. Several hundred thousand acres have been purchased in recent years and the land grab continues, as international companies are becoming aware of the region's exceptional natural tree growth rates and its generally favorable business environment (Seattle Times 06/02/03, Forestweb 01/25/2006).

Defining the Multi-Tiered Platform: The Voice of the Customer

In our methodology, two groups for data collection and analysis were utilized. The first is the customer group. The customer analysis has been discussed in two previous articles by Wagner and Hansen (2004a, 2004b). In this paper, only the main aspects of this analysis will be mentioned.

In this study, the focus was the construction industry, as new residential and non-residential construction accounted for almost half of all U.S. sawn softwood consumption in 2000 (UNECE 2001). Moreover, we argue that the evolving preferences of those who specify the use and function of construction materials may greatly affect the consumption of wood products. Those who specify include new homebuyers and professional customer groups, such as architects, construction firms/contractors, and structural engineers. Because most new homes and apartments are built prior to sale, the purchaser of a new home often has little influence on material selection. It is the composite group of architects, structural engineers, and construction firms that work together in the material selection process.

Since the use of QFD requires the selection of only one customer group (Cohen 1995), a number of preliminary analyses was employed to decide between architects, structural engineers, and construction firms (Wagner and Hansen 2004b). Initially, a decision of whether to include architects and structural engineers, or both, as representatives of customer groups (Voice of the Customer) was guided by conducting conjoint and cluster analyses to identify differences among the material preferences of both groups of professionals. Architects and structural engineers are held to be very similar concerning material preferences (Kozak and Cohen 1999). The results of our preliminary analyses were consistent with Kozak and Cohen (1999) and also hold across both the Chilean and U.S. samples. The only difference observed was on environmental (green) issues, which appeared to be far more important for architects than for structural engineers. Since we were especially interested in environmental preferences in the selection of materials for construction projects, architects were selected as our customer group of interest.

Although construction companies ultimately purchase materials, the influence of architects in the material selection process of medium and large construction projects tends to be very significant (Kozak and Cohen 1999; Wagner and Hansen 2004a, 2004b). Architects can largely influence material substitution, especially if alternative material costs are similar.

Our preliminary analysis indicated that architects separate wood products into three different groups: structural (e.g., dimension lumber), where strength and structural properties are the main requirements; appearance (e.g., moldings), where aesthetics is the main issue; and engineered wood products (e.g., glulam beams), where both strength properties and appearance issues are important. This product classification was maintained throughout the research.

The identification of architect needs regarding construction materials was done via personal interviews with a convenience sample of 17 practicing architects (4 in Chile and 13 in the United States). During the interviews, architects were asked about the good and bad characteristics of wood products. They were also asked about what can increase the appeal of wood so that it will be preferred over competing materials, such as steel, concrete, or plastics. Respondents answered the same question for each of the three product groups.

Importance of Customer Needs

A carefully constructed mail questionnaire was developed based on information from interviews and the extant literature to assess the importance of attributes identified through the interviews. The United States and Chilean cases were studied separately. The U.S. study pursued a nationally representative sample of chief architects (of architect offices). The Tailored Design Method (Dillman 2000) was used and questionnaires were sent by mail to a random sample of 1,200 architects. The response rate, excluding non-deliverables, was 34 percent. We controlled for the four possible sources of error detailed by Dillman (2000): sampling, coverage, measurement, and non-response. Specifically, regarding non-response, it is common practice to assume that late respondents (second mailing) are more similar to non-respondents than early respondents (first mailing) (Armstrong and Overton 1977). Early respondents were compared to late respondents on a total of 30 attributes. Only one statistically significant difference was found (two-sided p-value < 0.05), which was not enough to indicate any evidence of non-response error.

Chilean managers tend not to participate in surveys, so it was very difficult to obtain responses in Chile. Accordingly, our approach was to select a convenience sample of the largest architecture offices (sample size of 85). The small sample size allowed us to first send a questionnaire by mail and follow up by phone. Each architecture office was called an average of 15 times to obtain 53 answers (a 62% response rate). Because we utilized a convenience sample, we chose to not test for the presence of non-response bias.

The Voice of the Company: Wood Products Firms

Following the selection of architects as a proxy for customer groups, the second stage of our methodology analyzed the CAs of wood products companies and compared them among the three product groups used in the customer stage of the study. The company analysis has been discussed in a previous article by Wagner and Hansen (2005). In the present paper, we will point out only the main aspects of that analysis.

CAs were identified through in-person interviews with top executives in 35 U.S. and 8 Chilean firms. The highest possible executive in each firm was targeted. In most cases, vice presidents or CEOs of companies were contacted. Interviews in the United States were conducted in six different states (Oregon, Washington, Idaho, Arkansas, Georgia, and South Carolina) representing the two main wood producing regions of the United States: the Pacific Northwest and the South. In an effort to create a representative sample, a balanced number of companies from the three product groups, in a range of sizes (small, medium, and large companies) were included. In terms of firm annual sales, Chilean companies ranged between $1.5 million and $1.2 billion. The annual sales of U.S. companies ranged between $2 million and $25 billion, with three firms in the Fortune 500 industry ranking.

Judgment Data

A central part of any QFD application is the work of several judges (experts). In this case, the judges rated the relationships between concepts of the architect needs and CAs. The values generally used for the different linkage levels are 9, 3, 1, and 0, which correspond to a strong, moderate, slight or possible, and no link between the concepts (Cohen 1995).

Coding relationships utilized the *Nominal Scale Data* developed from qualitative judgments (Perreault and Leigh 1989). The potential problem with this type of data, however, is unacceptable interjudge reliability, defined by Kassarjian (1977, p. 14) as "the percentage of agreement between several judges processing the same communications material." A frequently used measure of reliability is the ratio of agreements among the judges to the total number of coding decisions (Bellman and Park 1980, Banerjee et al. 1995). Kassarjian (1977) and Kolbe and Burnett (1991) recommend percentage of agreement values greater than 80 percent.

Selection of the Expert Team

The quality of judgment-based data and interjudge reliability depends on the adequacy of the underlying classification scheme and also on the skill and motivation of the judges (Perreault and Leigh 1989, Wagner and Hansen 2002). We decided to have three experts in order to avoid ties. One expert represented the architects (Voice of the Customer). We also had a vice-president of a medium-sized wood products company (Voice of the Company) and a professor of strategic management who is familiar with the industry. Importantly, this follows the recommendations of the technique that was used to gather expert opinion: Delphi (Clayton 1997). It is asserted that a team of experts with heterogeneous backgrounds can be much smaller in number than a team of experts with homogeneous backgrounds, as the heterogeneity of the background of the experts helps that all points of view will be considered when making decisions. For the Chilean data, one architect rather than an expert team was used.

The weights of customer needs were not provided to the experts in order to avoid bias in judgments. The category definitions and coding directions were given in writing, as recommended by Perreault and Leigh (1989) in order to have a standardized stimulus. The use of Delphi drives convergence among judges by requiring several rounds of expert teamwork until the evaluations coincide (Clayton 1997). QFD experts recommend seeking a realistic consensus, that is to say, search for a consensual decision that most team members agree with and the remaining members can live with (Cohen 1995). Thus, the following convergence criterion was set before the first round of expert teamwork: the evaluation of an individual relationship (one cell of the matrix) would be considered reliable if the measurements fell in no more than two adjacent categories, for example, 9 (strongly linked) and 3 (moderately linked). The first round of questions achieved a convergence level of approximately 60 percent and the second round 94 percent. The third round resulted in 100 percent convergence, allowing final calculation of CAs weights.

Results

Tables 1 and 2 report customer needs for the United States and Chile, respectively. The questionnaire respondents were asked to assign a value for each attribute in each product group, according to the level of importance that the feature has in the material specification process. The scale used corresponded to a 1 to 7 interval scale, from "less important" (1) to "more important" (7). **Tables 1 and 2** display the attribute names and their mean and standard deviation in the left three columns. The remaining column shows a classification of the attributes into importance groups.

The treatment of customer requirements in this study departs from traditional QFD. Typically, the weights of customer needs are determined through market research and even small differences among attributes are kept, regardless of their statistical significance (Cohen 1995). We preferred to categorize attributes into importance groups based on statistical significance. In that respect, we defined that attributes will be categorized in a maximum of three groups: "a" for important attributes, "b" for attributes of medium importance, and "c" for low importance attributes. Attributes inside a group are not statistically different from one another, but there are significant differences ($\alpha = 0.01$) between any two attributes of different importance groups. As elaborated in Wagner and Hansen (2004b), this categorization of attributes into groups is part of a new method for identifying and assessing key customer group needs.

The actual attributes determined through the interviews are shown in **Tables 1 and 2**. As can be seen, there are six sets of customer requirements.

Table 1. Attribute weights and categorization for U.S. wood products.

	Mean	SD[a]	Importance groups[b]
Structural products			
Materials available	5.83	0.89	A
Uniform quality	5.63	1.25	A
Dimensionally stable	5.53	1.29	A
Adaptability	5.54	1.16	B
Durability	5.17	1.41	B
Knowledgeable work force	5.14	1.40	B
Low cost	4.97	1.34	B
Environmentally sustainable	4.96	1.49	B
Fire concern	4.23	1.60	C
Appearance products			
Appearance, warmth, tactile	5.83	0.98	A
Honest material	5.44	1.40	A
Offgassing	4.87	1.60	B
Environmentally sustainable	4.87	1.56	B
Durability	4.84	1.60	B
Low cost	4.50	1.38	B
Engineered wood products			
Uniform quality	6.05	0.87	A
Dimensionally stable	6.03	0.94	A
Strong material	5.90	0.99	B
Adaptability	5.39	1.17	B
Environmentally sustainable	5.05	1.47	B
Feasibility of curves	4.76	1.54	B

Low cost	4.76	1.29	B
Offgassing	4.43	1.68	C
Appearance, warmth, tactile	4.16	1.74	C

[a] SD = standard deviation.
[b] The categorization method is outlined in Wagner and Hansen (2004b).

Table 2. Attribute weights and categorization for Chilean wood products.

	Mean	SD[a]	Importance groups[b]
Structural products			
Structural properties	5.91	1.18	a
Durability and maintenance	5.79	1.20	a
Uniform quality	5.75	1.31	a
Appearance	5.60	1.27	a
Low cost	5.25	1.28	a
Fast construction	5.15	1.42	a
Fire concern	4.79	1.49	b
Lack of constructive solutions	4.02	1.64	b
Appearance products			
Appearance, warmth, tactile	6.58	0.57	a
Honest material	6.19	0.90	a
Durability and maintenance	5.87	0.90	a
Feasibility of curves	5.32	1.46	b
Material easy to refurbish	5.23	1.32	c
Low cost	4.42	1.26	b
Engineered wood products			
Uniform quality	6.10	0.81	a
Durability and maintenance	6.06	0.98	a
Appearance	6.00	1.00	a
Feasibility of curves	5.88	1.16	a
Fire concern	5.77	1.11	b
Glue quality	5.60	1.41	c
Low cost	5.04	1.33	b
Lack of competitors	4.88	1.34	b
Lack of constructive solutions	4.74	1.61	c

[a] SD = standard deviation.
[b] The categorization method is outlined in Wagner and Hansen (2004b).

Integrating Customer Needs and Competitive Advantages

The previous stages of this research rendered a total of six sets of CAs and customer requirements, consistent with three product groups and two countries. Below, relevant aspects of QFD and Judgment data are reviewed using **Figure 2** as a visual aid.

Figure 2. QFD Application, U.S. Structural Group.

Competitive Advantages

Architect wants and needs (referring to wood materials)	Excellence of sales and marketing personnel, personal contacts	Old company: customer loyalty, reputation, reliability	Differentiation in customer service (on-time shipping, tailored to customer needs)	Own distribution system, deal with the end-user directly, no intermediaries	Green, environmentally concerned image	Own forestland: log cost control, secure supply, cash source	Interfunctional coordination (i.e. sales, wood procurement, and trucking division)	Agreements with retailers like Home Depot or Lowe's (prime grade, no wane)	Raw material supply from all over the world	One stop shop, breadth of product mix	Differentiation in quality of the material	Process innovation: State of the art facilities, technology leadership	**Weights of architect needs**
Material available	1	1	3	3	1	3	3	3	9	9	3	3	**9**
Uniform quality	0	1	0	0	1	3	3	3	-1	9	9	9	**9**
Dimensionally stable	0	1	0	0	1	0	0	3	3	0	9	9	**9**
Adaptability	0	0	1	0	0	0	1	0	3	0	3	1	**3**
Durability	0	0	0	0	0	0	0	3	3	0	3	0	**3**
Knowledgeable work force	0	0	3	0	0	0	0	0	1	0	0	3	**3**
Low cost	0	0	0	3	0	1	3	3	3	-1	-3	3	**3**
Environmentally sustainable	0	0	0	3	9	3	1	3	-3	0	3	1	**3**
Fire concern	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Algebraic importance	9	27	39	45	54	66	69	108	120	159	207	213	1116
Relative Importance	1%	2%	3%	4%	5%	6%	6%	10%	11%	14%	19%	19%	100%

Algebraic importance	9	27	39	45	54	66	69	108	120	159	207	213
Absolute importance	9	27	39	45	54	66	69	108	156	165	225	213
Algebraic/Absolute (%)	100	100	100	100	100	100	100	100	77	96	92	100

Figure 2 shows the actual QFD application for the U.S. structural product group. Customer needs obtained through our set of architect interviews are located on the left of the matrix and were the first piece of information obtained, as is recommended by Cohen (1995). The second piece of information entered into the matrix is the weights of the architect needs, which were determined with the Chilean and U.S. surveys. As shown in **Tables 1 and 2**, we depart from traditional QFD by using three levels of importance ("a", "b", and "c") for attributes of high, medium, and low importance, respectively. Numerical values were assigned to these levels of importance: 9, 3, and 1 for attributes of type "a", "b", and "c", respectively. This convention is analogous to the numerical values recommended by Cohen (1995) for the linkage values of the relationship matrix.

The existence of negative relationships among the concepts of the Voice of the Customer and the Voice of the Company is a problem. A relationship matrix should only consist of positive numbers, because its intent is to measure the strength of relationships, which are then added to obtain a gross total. Importantly, traditional QFD applications have commonly dealt with negative relationships (Cohen 1995). One example would be in the design of cars, where fuel performance requested by the customer correlates negatively with safety criteria of the designers, due to the likely increase in weight of a safer car frame.

The recommendations of Cohen (1995) were followed for the treatment of the six negative relationships encountered in this study. The procedure consists of obtaining both the algebraic importance (adding relationships with their signs, either positive or negative) and the absolute importance (adding relationships considering them all positive) of each CA and then comparing both numbers (**Fig. 2**). The last row of **Figure 2** shows the ratio of the algebraic and absolute importance. It can be seen that the three affected CAs of this product group did not change their importance in a significant way; although, *Raw material supply from all over the world* would increase its importance if all relationships were positive, but would still stay below the importance of the next CA: *One stop shop*. The other two U.S. product groups show similar results. The Chilean product groups do not have negative relationships.

Importance of CAs

Figure 2 also shows the relative weights of CAs. The algebraic importance of each CA is obtained by adding the multiplications of the weight of each architect need by the level of relationship of that architect need with the CA. For example, the algebraic importance of *Process innovation*, in the second to last column of **Figure 2**, is formed by multiplying: 9*3 + 9*9 + 9*9 + 3*1 + 3*0 + 3*3 + 3*3 + 3*1 + 1*0 = 213. The relative importance (weight) of a CA is simply the percentage of its own algebraic importance to the gross total of the algebraic weights, equivalent to 1116 in the U.S. structural product group. Therefore, the relative importance of *Process innovation* is 100 * (213/1116) = 19%.

Table 3 shows the sets of relative weights for the three product groups for both the United States and Chile. The weights tell us the relative importance of each CA in meeting the needs of architects. The low or null importance of some CAs does not mean that they are not relevant. It only means that they are not important for meeting the needs and wants of our customer group: architects.

Table 3. Relative weights of competitive advantages by product group and country.

U.S. Structural Products Group	**QFD**	**Chilean Structural Products Group**	**QFD**
Process innovation (technology leadership)	19%	**Export oriented**	39%
Differentiation in quality of the material	19%	Agreements with big box retailers	34%
One stop shop, diversified line of products	14%	Own forestland	10%
Raw material supply from all over the world	11%	Vertical integration	9%
Agreements with big box retailers	10%	Old company: customer loyalty, reputation	3%
Interfunctional coordination	6%	Quick and flexible organization	3%
Own forestland	6%	Third-party environmental certification	3%
Green, environmentally concerned image	5%		
Own distribution system, no intermediaries	4%		
Differentiation in customer service	3%		
Old company: customer loyalty, reputation	2%		
Excellence of sales and marketing personnel	1%		
U.S. Appearance Products Group	**QFD**	**Chilean Appearance Products Group**	**QFD**
Green, environmentally concerned image	20%	Excellent raw materials	51%
Product innovation	18%	**Export oriented**	18%
Differentiation in quality of the material	16%	R&D targeting customer needs	18%
Raw material supply from all over the world	14%	Globalized company	11%

Process innovation (technology leadership)	10%	Old company: customer loyalty, reputation	2%
Business innovation (marketing research)	4%	Excellence of sales and marketing personnel	0%
Own distribution system, no intermediaries	4%		
Old company: customer loyalty, reputation	4%		
One stop shop, diversified line of products	4%		
Own forestland	3%		
Products with different levels of completion	2%		
Differentiation in customer service	0%		
Excellence of sales and marketing personnel	0%		
U.S. Engineered Wood Products Group	**QFD**	**Chilean Engineered Wood Products Group**	**QFD**
Differentiation in quality of the material	20%	R&D targeting customer needs	45%
Product innovation	14%	**Export oriented**	39%
Excellence of technical personnel	13%	Leading information technology	8%
Process innovation (technology leadership)	12%	Vast distribution network	7%
One stop shop, diversified line of products	12%	Old company: customer loyalty, reputation	2%
Green, environmentally concerned image	8%	Excellence of sales and marketing personnel	0%
Agreements with big box retailers	7%		
Business innovation (marketing research)	6%		
Own forestland	6%		
Own distribution system, no intermediaries	3%		
Differentiation in customer service	0%		
Excellence of sales and marketing personnel	0%		

Role of Innovation

As previously mentioned, innovation is one of the key success factors in today's hypercompetitive environment (Grimm and Smith 1997). The results of the QFD application indicate that the three types of innovation (process, business, and product) received high weights, meaning that a focus on innovation permits improved satisfaction of customer needs, and thus an enhanced market orientation. In that respect, *Process innovation* leads the U.S. structural product group with a 19 percent importance; and, in the two other product groups, the addition of the weights of the three types of innovation accounts for more than 30 percent of the total relative importance (**Table 3**).

Export Orientation: A Clear Chilean Differentiator

The most notable difference among the CAs of the United States and Chile is the exclusive presence of *Export oriented* in the Chilean product groups. The model predicts that this CA is extremely relevant for fulfilling architect needs, as it ranks first or second in all Chilean product groups, with weights as high as 39 percent in the structural and the engineered wood products groups.

Raw Material Supply from All Over the World

This CA attains interesting weights (11% and 14% in the U.S. structural and U.S. appearance product groups, respectively), whereas only a few executives (5) named this advantage during the interviews. Both *Export orientation* and *Raw material supply from all over the world* are competitive advantages typical of multinational or global companies.

Excellence of Sales and Marketing Personnel

This CA is relatively unimportant across product groups and countries. Perhaps, *Excellence of sales and marketing personnel* would be extremely significant for other customer groups, for example, retailers. Since this CA has little relevance for fulfilling architect needs because they do not directly buy the raw materials, the theory is validated empirically, supporting the reliability of this QFD application.

Discussion and Directions for Future Research

The main objective of this paper is to introduce a methodology for measuring and improving the market orientation of a company. Our measure adapts Narver and Slater's (1990) behavioral definition of market orientation as we define market orientation as having both a customer and a competitor focus. Even so, our method possibly provides an improved measure, because it uses different sources of information (customers, company executives, and experts) to assess the importance of CAs for satisfying the needs of a customer group. The importance of CAs shows executives which advantages provide high customer value. Thus, they can develop and foster those CAs, in turn improving the market orientations of their firms.

One of the four different approaches to the measurement of strategy at the business-level presented by Snow and Hambrick (1980) is the self-typing approach. This method has been used in many strategy studies (Rich 1986, McKee et al. 1989, Niemelä 1993, Hansen et al. 2002), and basically allows an organization's manager to characterize the organization's strategy. This approach is generally used with written descriptions of strategy, and managers are asked to classify their organization with respect to the competition. Guth and Macmillan (1986) and Hansen et al. (2002) identified an important problem related with the self-typing approach. They argued that managers tend to rate their own company at least in an average position with regard to the competition for every characteristic, limiting the usefulness of this type of data. Our study avoids the self-typing approach, as it does not require managers to compare the competitive situation of their company with respect to that of other firms. Instead, executives provided the competitive advantages held by their companies, without rating them, and the application of the model allowed the customer opinion to determine the importance of each competitive advantage.

One important matter is that a correct application of this method requires perfectly defined customer needs and competitive advantages. Clarity in these concepts helps assure that each expert will understand each issue in the same way.

Importantly, the purpose of this investigation was only to propose the model and underline its theoretical advantages. We did not intend to further the understanding of the linkage of market orientation and performance. A logical future development, however, would be to encourage a sample of companies to measure their degree of market orientation using this technique, those companies taking action fostering those CAs important to the customer and assessing if those actions really improve the financial performance of the firms.

Finally, it is important to note that the proposed methodology blurs the boundaries of strategy, industrial organization economics, operational effectiveness, and marketing. Our model uses marketing theory and related tools for discovering and measuring customer needs. QFD serves as a connector between customer needs and competitive advantages. All in all, the methodology allows the use of customer opinion to evaluate the competitive advantages of companies, the basic blocks of strategy in industrial organization economics.

Managerial Implications

The business world has seen the rise of the perennial gale of creative destruction predicted by Schumpeter (1975) during WWII. This new competitive environment is here to stay and adaptation by companies is necessary for survival. But, it is difficult to elicit recommendations that fully account for the many issues firms currently face. Our findings, nevertheless, indicate some actions that companies can undertake.

First of all, it would be useful for managers to apply this technique to their company situations. The result of the application of this methodology would tell which CAs to nurture with the available resources of the company. The example provided in this paper is, by necessity, performed across an industry sector. Companies would obviously apply it to their specific context and situation. It is important to note the potentially temporal nature of the voice of the customer and the corresponding advantages needed to maintain competitiveness. As the external environment and customer base of a company changes, it will need to consider if a new evaluation of its customers is warranted.

Second, the early work of Schumpeter (1975) emphasized the high importance of innovation for ultimate marketplace success. Our results show that the three types of innovation (process, business, and product) are important not only for competition leverage, but also for directly fulfilling customer needs. Interviews with U.S. wood products company executives indicated a low emphasis on product and business innovation, with an almost exclusive focus on process innovation. Consistently, firm executives have doggedly pursued operational effectiveness in their companies during the last two decades, as pointed out by Porter (1996). Our results suggest a focus on product and business innovation by U.S. wood products companies, as these topics present significant potential for improvement.

U.S. wood product companies lack the *Export orientation* of Chilean firms, consistent with the differing business environments faced by companies of both countries. We propose that the Export orientation of Chilean firms is a good example of a "natural" advantage enjoyed by companies of small nations. If those companies want to grow, their small domestic markets force them to find new markets overseas, thus competing with everybody from everywhere (Yip 1995). Therefore, company executives from small countries are compelled to know and understand foreign competition.

On the other hand, we found that several managers from U.S. wood product companies did not know or understand what is happening outside U.S. borders, because the huge domestic market does not encourage an export orientation. We suggest U.S. managers should offset this deficiency quickly, because competitors from smaller, distant countries are formidable. In the same regard, we specifically suggest that U.S. companies create a "hostage of good behavior" in the home countries of their main competitors, by installing wholly owned subsidiaries, thus letting their competitors know that they can retaliate with aggressive competitive actions (Yip 1995).

Both *Export orientation* and *Raw material supply from all over the world* are advantages typical of companies with international operations. Thus, our main recommendation for U.S. wood products companies is to become more global, as this characteristic allows a better customer focus and an improved competitive position.

Limitations

There are a number of limitations in this study that must be outlined. The Chilean portion of the study utilized a convenience sample of architects and only one expert for rating the link between architect needs and competitive advantages. Accordingly, results should be interpreted with caution and care should be taken when making inferences based on these results.

With respect to the linking of the Voice of the Demand (architect needs) and the Voice of the Offer (competitive advantages of companies) in the U.S. portion of the study, we exceeded normal QFD practices by using the Delphi technique to gather expert opinion. Although Delphi recommends five experts, we compromised on three. While utilizing five or more experts has the potential of improving the assessment of the linking of both Voices, utilization of experts in this manner is highly time intensive and it is unlikely that future applications of this method would employ a larger pool of experts.

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