DISAGGREGATING THE PERFORMANCE OUTCOMES OF TOTAL QUALITY ENVIRONMENTAL MANAGEMENT (TQEM): AN EMPIRICAL EXPLORATION TESTING A RESOURCE-BASED MODEL

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ABSTRACT

Total Quality Environmental Management (TQEM) has been defined as the practice of applying Total Quality Management (TQM) practices to an organization's environmental effort. TQEM is therefore closely tied with the firm's primary functions and is directly dependent on a firm's competencies. As resource-based theory supports, disaggregating the performance outcomes of internal strategic assets enables identification of the sources of competitive disadvantage and advantage. The contribution of this study was the test of an exploratory, resource-based model linking resources, organizationally-embedded TQEM, and competitive advantage.

This study collected survey data from corporations in 15 manufacturing industries and a sample of 143 managers from corporate headquarters and manufacturing plants provided an overall response rate of 27%. Applying moderated, stepwise regression, the majority of hypothesized main effects were supported, but the hypothesized moderated relationships were not supported. The results supported the core theoretical framework which linked the exogenous variable TQEM program implementation with the interim performance outcome of environmental performance. Environmental performance was then successfully linked with the creation of strategic value in the form of protection against competitive threats and exploitation of competitive opportunities, and with the subsequent common proxy for competitive advantage—financial performance.

INTRODUCTION

The resource-based view (RBV) of competitive advantage continues to receive broad interest from strategic management researchers as a complementary theoretical framework to the Structure-Conduct-Performance framework from I/O economics (Makhija, 2003). However, as outlined by Priem and Butler (2001), much work still needs to be done before the full theoretical contributions and limitations of the RBV are demonstrated. In particular, disaggregating the internal performance outcomes and relationships of internal strategic assets to sources of competitive

disadvantage and advantage has been an area of increasing attention (Ray, Barney, & Muhanna, 2004) in order to address the criticism of 'unobserved variables' in much of RBV research (Godfrey & Hill, 1995). To this end, we sought to explore an organization-wide business process, total quality environmental management (TQEM), that is part of a portfolio of voluntary environmental initiatives manufacturing firms have adopted to provide the greatest operational discretion in efficiently and systematically improving both operational and environmental performance.

BODY OF THE MANUSCRIPT

By the mid-1990's, about 75% of large firms in the US and UK claimed to have implemented Total Quality Management (TQM) initiatives (Edwards, Collinson, & Rees, 1998). Preliminary interviews in 1997 by the authors with division managers at a dozen US corporations supported this view. TQEM has been defined as "the practice of applying Total Quality Management (TQM) practices to an organization's environmental efforts" (p. viii, Willig, 1994). In turn, as the organizational process upon which TQEM relies, TQM has been defined as an integrative management approach characterized by the principles of customer focus, continuous improvement, and teamwork (Dean & Bowen, 1994). TQM can be identified by its common practices of: 1) Direct involvement of senior managers. 2) Communication of the TQM philosophy. 3) Increased training based on TQM principles. 4) Closer customer and supplier relationships. 5) Orientation towards process improvement, and 6) Use of heuristics and scientific methods to identify improvement opportunities (Powell, 1995). Furthermore, the central process of ongoing self-study (i.e., organizational learning) results in unique organizational problem-solving capabilities grounded in each firm's history that provides flexibility while inhibiting direct imitation by other firms.

It is this organization-wide implementation of TQEM that provides the vehicle for unbundling the interim performance outcomes of organizational processes and a better understanding of how internal resources may eventually combine to provide a competitive advantage in the form of greater that average industry financial performance. TQEM is a business process by which a manufacturing firm's strategic assets can be combined with organizational capabilities to produce an increase in production efficiency, a reduction in environmental externalities, and contribute to strategic value through enhancing a cost or quality differentiation advantage. The degree to which a firm successfully integrates TQEM processes will influence a wide array of functional outcomes and these, as well as financial performance, are the dependent variables we explored with this study.

To test a resource-based framework of TQEM, a review of the literature was conducted and the theoretical model in Figure 1 was developed. Russo & Fouts (1997) found that knowledge-based resources like TQEM can lead to improvements in environmental performance. Hence, Hypothesis 1 predicts a positive relationship between TQEM and improved environmental performance. Klassen & Whybark (1999) conducted a study of manufacturing plants in the furniture industry and found that pollution prevention practices and environmental management systems contributed to enhancements in environmental performance. In similar fashion, we developed a measure of environmental performance improvement capabilities that where expected to strengthen the relationship between the TQEM process and environmental performance. This was the basis for the

moderated relationship represented in Hypothesis 2. Clelland, Dean, & Douglas (2000) found that reduced pollution from 250 manufacturing firms resulted in a significant cost advantage for these companies. Thus in Hypothesis 3, we hypothesized that improvements in environmental performance can provide strategic value for the firm by enabling it to either exploit a cost advantage or defend against cost pressures. Furthermore, we anticipated that the greater an organization's systematic support for environmental performance goals, the stronger would be the relationship between environmental performance and the creation of strategic value such as a cost advantage. This is presented in Hypothesis 4 as a moderated relationship. Klassen & McLaughlin (1996) also found a significant relationship between environmental performance awards and positive stock valuation supporting our Hypothesis 5 that improvements in environmental performance will lead to higher financial performance. Relatedly, resource-based theory argues that rareness of a strategic asset among competitors, the more likely it will contribute to a competitive advantage (Barney, 2001). If this strategic asset primarily contributed to improving environmental performance such as TQEM, this suggests that the rarer TQEM is among competitors, the greater ability of a firm to exploit the relationship between environmental performance and competitive advantage. Thus, Hypothesis 6 posits that TQEM rareness among competitors will strengthen the relationship between environmental performance and competitive advantage as represented by superior financial performance.

To obtain primary data on the outcomes of TQEM implementation, we developed, pilot tested, and subsequently mailed out two surveys to manufacturing firms in 15 industries (2-Digit SIC) in early 1998. 260 surveys were mailed to managers responsible for environmental management at corporate headquarters and 266 randomly selected plant managers (n = 73 respondents) in a 10% sampling of manufacturing facility in the same corporations (n = 70 respondents). As applied in previous studies (e.g., Douglas & Judge, 2001), a one-way analysis of variance was conducted on the items used in this study and fewer than 8% had significantly different responses between the two groups of respondents, so the data from the two groups were combined for a total of 143 surveys with an overall response rate of 27%. A wide array of manufacturing industries were represented in the sample, but 72% of the respondents represented corporations in the chemical, petroleum, primary metals, machinery, transportation equipment, and measurement instrument industries.

We subjected the items in our survey to factor analysis (principle components, varimax rotation) to determine if we had reliable measures of our key variables. Eight factors emerged after some items were dropped for low factor loadings. These factors and their items were: (1) Competitive Advantage – three items addressing earnings growth, revenue growth, and return on assets (α = .83). (2) Strategic Value – three items addressing exploitation of market opportunities, neutralizing threats, and adding product value (α = .87). (3) Regulatory Environmental Performance – three items addressing environmental accident reduction, pollution reduction, and notice-of-violation reduction (α = .73). (4) Efficient Environmental Performance – three items addressing energy conservation, materials use efficiency, and product use impact reduction (α = .69). (5) TQEM – seven items addressing environmental quality training, continuous environmental performance improvement, employee awareness, employee responsibility, environmental performance monitoring, use of statistical evaluation methods, and top management support (α = .70). (6) Environmental Performance Improvement Capabilities – four items addressing improving

product technology, improving process technology, improving employee practices, and improving environmental management systems ($\alpha = .58$). (7) Organizational Support – four items addressing formal structural support, management policy support, compensation systems support, and information systems support ($\alpha = .84$). (8) TQEM Rareness – two items addressing degree of competitor imitation and competitor implementation ($\alpha = .71$). We also collected the control variable measures firm size (number of employees) and industry type (2-Digit SIC) from Compact Disclosure. Descriptive statistics and correlations on all variables are displayed in Table 1.

A series of stepwise, moderated regression analyses were conducted to test the hypotheses and the results are displayed in Table 2. As can be seen, the main effects in Hypotheses 1, 3 and 5 were statistically significant, but the moderated relationships in Hypotheses 2, 4, and 6 were not supported. Examination of the collinearity diagnostics and correlations in Table 1 suggests that most of the moderator variables did not sufficiently contribute independently to the hypothesized moderated relationships. In addition, although not hypothesized, the organizational support variable was found to be significantly related to the interim outcome of strategic value.

The results, while mixed, provide further support for the multiple sources and paths to competitive advantage within each organization. Different activities, routines, and business practices are created by the portfolio of internal strategic assets a firm combines. The same set of resources and capabilities can be combined to simultaneously produce interim performance outcomes that support competitive advantage and other interim performance outcomes that may erode competitive advantage. This study provides evidence that simply observing or measuring a relationship between strategic assets and competitive advantage does not provide an understanding of "how" the internal selection and planning for certain combinations of activities, routines, and practices by managers and employees enable core competencies to become distinctive competencies.

In addition to making a contribution to the resource-based literature, this exploratory study also provided a framework in which to understand how the ecologically-related performance of a firm may or may not support its financial objectives. We have shown that the same set of environmental resources and practices can simultaneously support environmental performance, strategic value creation, and competitive advantage.

TABLES

TABLE 1
Sample Size, Means, Standard Deviations, and Correlations of All Variables

Variable	N	Mean	s.d.	1	2	3	4	5	6	7	8	9
1. Competitive Advantage (FINPERF)	65	9.73	2.62									
2. Strategic Value (STRATVAL)	139	3.02	.98	.23								
3. Regulatory Env. Perf. (EPREG)	139	10.71	2 .80	.31*	.24**							
4. Efficiency Env. Perf. (EPEFF)	135	7.81	2.73	.32*	.35**	.36**						
5. Tot. Qual. Env. Man. (TQEM)	139	3.52	.79	.22	.29**	.49**	.29**					
6. Env. Perf. Imp. Capabilities (EPI)	142	3.57	.79	.16	.36**	.33**	.31**	.68**				
7. Org. Support of TQEM (ORGSUPP)	138	3.52	.90	.21	.47**	.36**	.32**	.67**	.63**			
8. TQEM Rareness (RARE)	139	2.84	.82	-.13	.35**	.10	.27**	.17*	.21*	.23**		
9. Firm Size (SIZE)	71	9.56	1.36	.00	.24*	.23	.16	.26*	.33**	.17	.08	
10.Industry (2-Digit SIC) (IND)	142	30.97	4.74	.00	.12	-.04	.08	-.13	.04	-.06	.13	.33**

Table 2
Summary Results of Stepwise, Moderated Regression Analyses

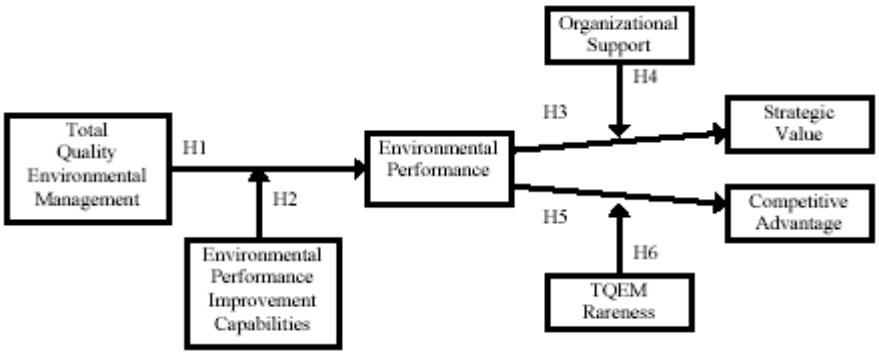
Independent Variables	EPREG	EPEFF	STRATVAL	STRATVAL	FINPERF	FINPERF
TQEM	.49**	.29*	--	--	--	--
EPI	-.00	.20	--	--	--	--
TQEM x EPI	.09	.457 [a]	--	--	--	--
EPREG	--	--	.24*	--	--	--
ORGSUPP	--	--	.50**	--	--	--
EPREG x ORGSUPP	--	--	.61 [a]	--	--	--
EPEFF	--	--		.35**	--	--

Independent Variables	EPREG	EPEFF	STRATVAL	STRATVAL	FINPERF	FINPERF
ORGSUPP	--	--		.46**	--	--
EPEFF x ORGSUPP	--	--		.74 [a]	--	--
EPREG	--	--	--	--	.31*	--
RARE	--	--	--	--	-.13	--
EPREG x RARE	--	--	--	--	-.10	--
\EPEFF	--	--	--	--	--	.32*
RARE	--	--	--	--	--	-.20
EPEFF x RARE	--	--	--	--	--	-.25
SIZE	.12	.09	.15	.15	.12	.09
IND	.03	.12	.15	.15	-- [b]	-- [b]
Adjusted R^2	.224	.072	.253	.287	.083	.087
F-test for Model	20.37**	6.22*	23.91**	27.08**	6.42*	6.52*
df	67	67	66	66	60	58

Standardized regression coefficients for the full model are shown.
[a] Inflated due to significant collinearity between component variables. See Table 1.
[b] 2-Digit SIC was unavailable for this sample of surveys.
* $p<.05$
** $p<.01$

FIGURES

Figure 1.
Total Quality Environmental Management Model: Hypotheses to be Tested



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