

WHY FIRMS CERTIFY TO ISO 14001: AN INSTITUTIONAL AND RESOURCE-BASED VIEW

NICOLE DARNALL
North Carolina State University
Raleigh, NC 27691-8102

INTRODUCTION

Previous studies have suggested that institutional pressures explain why firms participate in government or industry-sponsored voluntary environmental programs (VEP) (e.g. King & Lenox, 2000; Khanna & Damon, 1999). Other research has found that a firm's internal competencies, as articulated by the resource-based view of the firm (RBV), may also be important (e.g., Rugman & Verbeke, 1998; Sharma, 2000; Russo & Fouts, 1997). Despite these findings, institutional theory and RBV are rarely evaluated together (Oliver, 1997). This study combines institutional theory and RBV to empirically evaluate a firm's decision to certify its environmental management system (EMS) to ISO 14001, the international EMS standard.

CONCEPTUAL MODEL & HYPOTHESES

Institutional theory suggests that external pressures shape organizational action. Applied to the natural environment, most institutional studies have emphasized the effects of coercion from *regulatory* and *social* pressures and how they encourage homogeneous outcomes (e.g. Russo & Fouts). However, a criticism of institutional theory is that it often casts organizations as passive participants that respond to institutional expectations (Perrow, 1986; Oliver, 1997).

In contrast, RBV suggests resources that are specialized and non-replicable create opportunities for heterogeneity leading to competitive advantage (Wernerfelt, 1984). Business strategy therefore depends on specific organizational competencies and on a firm's ability to put them to routine productive use and maintain them over time (Wernerfelt, 1984). Applied to the environment, achieving greater levels of internal environmental competency is a function of an organization's basic environmental capabilities such as *pollution prevention* (Hart, 1995). Sustaining these competencies depends on whether a firm *continually improves* its internal operations (Russo & Fouts, 1997; Sharma & Vredenburg, 1998) and *invests in labor over capital* (Hart, 1995). Organizations that adopt environmental strategies without these basic-level competencies are less likely to achieve their strategic goals (Christmann, 2000).

Institutional theory and RBV were combined to evaluate a firm's decision to certify its EMS to ISO 14001. Drawing on these theories, the hypotheses that guide this work are described below.

Regulatory Pressures. To the extent that organizations influence the formation of regulation, managing their environmental impacts may signal to lawmakers that regulatory restrictions should increase for industry as a whole (Salop & Scheffman, 1983). Under such conditions, cleaner firms may gain competitive advantage. Yet, a rival hypothesis suggests that regulatory pressures cause dirtier firms to consider participating in voluntary programs in an effort to preempt more stringent and costly environmental regulation (Maxwell & Decker, 1998).

H1: Cleaner firms are early adopters of ISO 14001.

H2: Dirtier firms are early adopters of ISO 14001.

Social Pressures. Environmental accidents heighten the public's awareness about firms' environmental performance. They also increase social scrutiny and therefore create incentives for firms to improve their future environmental performance (Greening & Gray, 1994).

H3: Firms receiving negative environmental press are early adopters of ISO 14001.

Continual Improvement Capability. Enterprises that have a commitment to continual improvement may more readily apply their system-based knowledge towards environmental management (Sharma & Vredenburg, 1998) because employees work in an existing culture that rewards continual improvement (Sarkis & Kitazawa, 2000). Moreover, organizations with prior management system capabilities have a managerial commitment for systems-based strategies.

H4: Firms with prior continual improvement experience are early adopters of ISO 14001.

Environmental Management Capability. A firm-wide commitment to manage the environment requires multiple levels of managerial support and employee involvement. Without first having basic environmental capabilities in pollution prevention, adopting more advanced environmental strategies may be more costly, and therefore have less managerial support (Hart, 1995).

H5: Firms with prior pollution prevention experience are early adopters of ISO 14001.

Capital Expenditures. Pollution prevention activities are labor intensive rather than capital intensive, and firms that encourage proactive environmental management are expected to invest fewer resources in capital than their competitors (Hart, 1995).

H6: Firms with lower capital expenditures are early adopters of ISO 14001.

EMPIRICAL MODEL

Dependent Variable. A firm's ISO 14001-certification was measured by the year in which its first facility certified to ISO 14001. All U.S.-owned S&P 1500 enterprises within SICs 1000-4999 were evaluated and of them 88 firms had adopted ISO 14001. These 88 firms accounted for 85% (459) of *all* U.S. publicly traded organizations certified to ISO 14001 by December 1999. Using the same restrictions, a sample of 612 non-adopters was also selected.

Independent Variables. To evaluate a firm's *regulatory pressure*, Investor Responsibility Research Center data were used. We evaluated firms' annual violations for six federal laws: the Atomic Energy Act, Clean Air Act, Clean Water Act, Mining Health & Safety Act, Resource Conservation & Control Act and Toxic Substances Control Act. Pollution quantities were measured using firms' production-related toxic waste (logged). *Social pressures* were measured by whether *Mother Jones* identified a firm as a "Top 100 Environmental Criminal of the 1990s."

Continual improvement capability was measured by when firms certified to ISO 9001 and 9002, and participated in OSHA's Voluntary Protection Program (VPP). These management systems are premised on continual improvement strategies. ISO 9002 includes the same quality elements as ISO 9001, but does not have a design requirement (ISO, 2002). VPP participation measured firms' expertise with formalized health and safety management systems.

A firm's voluntary *environmental management capability* was coded "1" when it first participated in EPA's Green Lights "Ally" or "Partner" Programs. "Partners" were required to implement more rigorous energy conservation strategies than "Allies." Firms' annual *capital expenditures* (logged) were measured using data from Compustat[®]. A firm's assets and asset age were indexed using Compustat[®] data to account for capital turnover. Firms' capital expenditures were interacted with their Clean Air Act (CAA) violations because the CAA requires firms to purchase expensive pollution control equipment. Finally, dummies were used to control for *industrial sector* at the 2-digit SIC level. Data were gathered for 1989-1999 for all variables.

A hazard model was used to estimate the probability of a firm's exit from non-ISO 14001-certification status to a state of certification. A firm's "hazard rate" of certification was suspected to increase over time as ISO 14001 gained domestic and international acceptance. Diagnostics confirmed these suspicions, and as a result, in addition to the typical Cox proportional hazard specification, Gompertz and Weibull specifications were also estimated.

RESULTS

Regulatory pressures. In evaluating firms' regulatory pressures, the results show that firms with greater Atomic Energy Act (AEA) violations had hazard rates between 88–114% higher than firms having fewer AEA violations (see Table 1). AEA violations often involve harm to workers and fuel public concern and media scrutiny. Firms incurring these pressures may therefore be using ISO 14001 to signal their commitment to improved environmental management.

Insert Table 1 about here

Firms with more violations of the Resource Conservation & Control Act (RCRA) also certified between 21–22% faster than firms with fewer RCRA violations. RCRA requires firms to track their hazardous waste from production to disposal. This approach parallels ISO 14001 systematic structure and firms having difficulty complying with RCRA may use ISO 14001 as a means to address their environmental problems. Interestingly, a firm's production-related toxic releases had no statistical effect on the timing of its certification decision.

Social Pressures. Whether or not *Mother Jones'* identified a firm as a "Top Environmental Corporate Criminal" predicted firms' certification decisions. Firms on this list adopted ISO 14001 between 569–641% faster than firms not on *Mother Jones'* list.

Management System Capabilities. Turning to firms' internal capabilities, firms that certified to ISO 9002 adopted ISO 14001 between 308–329% faster than firms that did not certify to ISO 9002. ISO 9002 is more relevant to firms that do not design their own products, but have their products designed by their customers (ISO, 2002). Certification to ISO 9002 therefore indicates that a firm operates in the middle of the supply chain. In contrast, ISO 9001, which is more relevant to firms operating towards the end of the supply chain (ISO, 2002), had less effect on firms' hazard rates of adoption. ISO 9001-certified firms adopted ISO 14001 between 87–104% faster than firms having no ISO 9001-certified facilities. Whether or not a firm participated in OSHA's VPP Program had no statistical affect on early adopters' certification decisions.

Continual Improvement Capabilities. Green Lights “Ally” participation did not predict a firm’s decision to adopt ISO 14001, whereas “Partner” participation did. “Partners” certified to ISO 14001 between 64–67% faster than non-partners. The greater energy conservation requirements expected of Partners may have caused them to further develop their pollution prevention capabilities, making ISO 14001 more attractive and also less costly to implement.

Capital Expenditures. Contrary to prior expectations, capital expenditures influenced firms’ ISO 14001-certification decisions, while the age of adopters and non-adopters’ assets were roughly the same. These results suggest that firms were replacing their capital at the same rate, but that early adopters were investing more resources and therefore emphasizing automation over labor. Also, in the presence of greater capital expenditures, CAA fines decreased the hazard rate of ISO 14001 adoption by 4% suggesting that firms investing in end-of-pipe pollution control technology were able to manage their environmental impacts better.

Controls. Finally, with respect to industry differences, the fabricated metal products, industrial machinery, electronics, transportation equipment, instrumentation and textile sectors are the “cleanest” U.S. manufacturing sectors (Mani & Wheeler, 1997). With the exception of the textile industry, these sectors were also early adopters. In contrast, the pulp and paper, chemical, petroleum refining and primary metals industries are the most polluting industries in the U.S. (Mani & Wheeler, 1997). These industries were the slowest adopters of ISO 14001.

CONCLUSION

The results of this study offer evidence that external pressures predicted firms’ ISO 14001 certification decisions. Early adopters were more likely to be “Top Corporate Environmental Criminals,” and therefore endured significant negative environmental publicity for their inability to manage their environmental affairs. These findings, combined with the regulatory and industry differences, suggest that early adopters were the dirtiest firms in the cleanest manufacturing sectors and less able to hide their environmental offenses among their cleaner industry peers.

The second primary finding was that early adopters’ ISO 14001-certification decisions were influenced by their prior internal capabilities. Such results offer additional support for RBV propositions that firms with demonstrated experience in continual improvement have fewer barriers pursuing advanced environmental strategies (e.g. Russo & Fouts, 1997; Rugman & Verbeke, 1998). To a lesser extent, firms’ early pursuit of ISO 14001 also was dependent upon their prior prevention pollution competence. While the ability to prevent *energy* pollution played a significant role, preventing *production-related* pollution from toxic chemicals did not. Also, early adopters had both greater capital expenditures (emphasizing automation over labor) and therefore endorsed end-of-pipe pollution control strategies. As a result, only marginal support is offered for Hart’s (1995) argument that in the absence of a basic pollution prevention competency, it will be difficult to adopt an advanced environmental strategy.

Finally, these results beg the question of whether the environmental performance of ISO 14001-certified firms will improve over time. Early adopters may have certified their EMSs, and thus signaled “green”, merely to deflect attention from their tarnished past. Yet, early adopters also have a greater capacity to improve their environmental performance in the future. For this

reason, we have cause to be optimistic about early adopters' intentions to certify to ISO 14001.

REFERENCES

- Christmann, P. 2000. Effects of 'best practices' of environmental management on cost competitiveness: The role of complementary assets. **Academy of Management Journal**, 43: 663-880.
- Greening, D. & Gray, B. 1994. Testing a model of organizational response to social & political issues. **Academy of Management Journal**, 37: 467-498.
- Hart, S. 1995. A 'natural' resource-based view of the firm. **Academy of Management Review**, 20: 986-1014.
- ISO. 2002. **ISO 9000 - Selection & Use**. Geneva, Switzerland: ISO.
- Khanna, M. & Damon, L. 1999. EPA's voluntary 33/50 program: Impact on toxic releases & economic performance of firms. **J. of Environmental Economics & Management**, 37: 1-25.
- King, A. & Lenox, M. 2000. Industry self-regulation without sanctions: The chemical industry's responsible care program. **Academy of Management Journal**, 43: 698-716.
- Mani, M. & Wheeler, D. 1997. **In Search of Pollution Havens? Dirty industry Migration in the World Economy**, Washington, DC: World Bank Working Paper, No. 16.
- Maxwell, J. & Decker, C. 1998. **Voluntary Environmental Investment & Regulatory Flexibility**. Working paper, Kelley School of Business, Indiana University.
- Oliver, C. 1997. Sustainable competitive advantage: Combining institutional and resource-based views, **Strategic Management Journal**, 18: 679-713.
- Perrow, C. 1986. **Complex Organizations: A Critical Essay**, New York: Random House.
- Rugman, A. & Verbeke, A. 1998. Corporate strategies & environmental regulations: An organizing framework. **Strategic Management Journal**, 19: 363-375.
- Russo, M. & Fouts, P.. 1997. A resource-based perspective on corporate environmental performance & profitability. **Academy of Management Journal**, 40: 534-559.
- Salop, S. & Scheffman, D. 1983. Raising rivals' costs. **American Economic Association Papers & Proceedings**, 73: 267-271.
- Sarkis, J. & Kitazawa, S. 2000. The relationship between ISO 14001 & continuous source reduction programs. **International Journal of Operations & Production Management**, 20: 225-248.

Sharma, S. 2000. Managerial interpretations & organizational context as predictors of corporate choice of environmental strategy. *Academy of Management Journal*, 43: 681-716.

Sharma, S. & Vredenburg, H. 1998. Proactive corporate environmental strategy & the development of competitively valuable organizational capabilities. *Strategic Management Journal*, 19: 729-753.

Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal*, 5: 171-180.

Table 1: Factors Predicting ISO 14001 Certification

VARIABLE	MODEL SPECIFICATION—Hazard Ratio (SE)		
	Gompertz	Weibull	Cox PH
EXTERNAL PRESSURE			
Violations			
Atomic Energy Act	2.1440*** (.359)	2.1082*** (.353)	1.8754*** (.360)
Clean Air Act	1.1416 (.133)	1.1404 (.132)	1.1614 (.134)
Resource Conservat. & Recov. Act	1.2107* (.145)	1.2199* (.132)	1.1152 (.172)
Toxic Substances Control Act	1.1882 (.236)	1.1972 (.232)	1.019 (.375)
Clean Water Act	.8273 (.291)	.8244 (.298)	.7284 (.271)
Mining, Safety & Health Act	.9460 (.047)	.9460 (.046)	.9452 (.043)
Production-Related Toxic Emissions	1.0201 (.015)	1.0200 (.015)	1.0229 (.016)
<i>Mother Jones</i> Environ. Criminal List	7.3893*** (2.95)	7.4107*** (2.98)	6.6846*** (2.71)
INTERNAL CAPABILITY			
ISO 9002 Certification	4.0941*** (1.88)	4.0816*** (1.87)	4.2849*** (1.99)
ISO 9001 Certification	1.8727* (.670)	1.8647* (.698)	2.0353** (.747)
OSHA VPP Participant	1.1104 (.394)	1.1137 (.397)	1.1210 (.390)
EPA Green Lights Partner	1.6697** (.398)	1.6669** (.397)	1.6355** (.386)
EPA Green Lights Ally	1.2608 (.638)	1.2625 (.643)	1.3804 (.690)
Capital Expenditures	1.4505*** (.113)	1.4451*** (.112)	1.4322*** (.107)
Capital Expenditures x Clean Air Act Violations	.9563*** (.011)	.9565*** (.011)	.9566*** (.011)
Asset Age	.9076 (1.32)	.9217 (1.34)	1.5580 (2.28)
INDUSTRY SIC[†]			
10-19—Mining, Construction	.4485 (.317)	.4423 (.312)	.54978 (.370)
20-22—Food, Tobacco, Textile Mill	.0914** (.093)	.0915** (.093)	.10306** (.106)
23-27—Fabric, Wood Prod, Pulp/Paper	.3292*** (.139)	.3286*** (.139)	.36796** (.155)
28-29—Chem., Petroleum Refining	.1690*** (.080)	.1697*** (.080)	.1937*** (.092)
30-33—Rubber, Leather, Prim. Metals	.1642*** (.085)	.1638*** (.085)	.1837*** (.097)
34—Fabricated Metal Products	.4639 (.232)	.4618* (.230)	.5001 (.248)
35—Industrial Machinery & Equip.	.5257* (.192)	.5254* (.191)	.5536* (.197)
36—Electronics	.4846* (.193)	.4850* (.193)	.5193* (.209)
38-39—Instrumentation, Misc. Mfg.	.2373*** (.135)	.2374*** (.135)	.2833** (.154)
40-48—Transport, Communic. Services	.0538*** (.061)	.0542*** (.061)	.0722** (.081)
49—Electric, Gas, Sanitary	.3182 (.253)	.319 (.254)	.4358 (.355)
LR/Wald Chi-Square(27), 8295 obs	242.95***	242.33***	234.09***
LogLikelihood—700 firms, 88 adopters	-54.608	-54.072	-467.687

***p≤0.01; **p≤0.05; *p≤0.10

[†]SIC 37, transportation equipment, was the omitted dummy variable.