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Corporate Relations with Environmental Organizations Represented by Hyperlinks on the *Fortune* Global 500 Companies' Websites

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Abstract This study investigates corporate relationships with environmental organizations by examining hyperlinks in the corporate environmental responsibility (CER) sections of the *Fortune* 2008 Global 500 corporate websites. It is assumed that hyperlinked organizations either represent their current inter-organizational relationship or create symbolic relationships among organizations. Results show that Asian companies have fewer hyperlink relations with other organizations compared with those in North America and Western Europe. Network analysis also confirms that U.S. companies are explicitly connected with stakeholders for CER practices, and governmental organizations have a relatively central role in the global CER system. Nonprofit organizations are the most frequently hyperlinked with *Fortune* Global 500 corporations.

Keywords Corporate social responsibility · Corporate environmental responsibility · Stakeholder · Hyperlink · Network analysis

Abbreviations

CSR	Corporate social responsibility
CER	Corporate environmental responsibility
NPO	Nonprofit organization
IGO	Intergovernmental organization

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Introduction

According to data from the National Center for Charitable Statistics (NCCS), approximately 1,617,301 nonprofit organizations (NPOs) existed in the Unites States as of November 2010. Among them, 59,174 (3.66%) are dedicated to environmental protection. The data also reveal that over the past decade, the number of environmental NPOs has increased more rapidly than the number of general NPOs, as compared to the number of NPOs in 2000. In addition to NPOs, many intergovernmental organizations (IGOs), such as the United Nations (UN) and the European Union (EU), and government environmental agencies, such as the United States Environmental Protection Agency (USEPA) and Britain's Department for Environment, Food and Rural Affairs (DEFRA), play a major role in guiding or regulating business activities to environmentally friendly operations.

In recent years, it has become increasingly desirable for companies to form strategic relationships with environmental protection organizations, as corporate environmental responsibility (CER) has gained much attention in the discussion of corporate social responsibility (CSR). The primary reason is that companies can enhance the image of their CER through these relationships without expending more resources and efforts (Eweje and Palakshappa 2009). This relates to a company's awareness that, as consumers evaluate the company's CER image, the company's environmental protection actions do not conflict with maximum profits (Kim et al. 2010).

In a broader sense, the relationships between companies and environmental organizations can be understood by analyzing websites and hyperlinks contained within the websites. Technically, a hyperlink is defined as a capability that theoretically enables one specific website to connect seamlessly with another (Park 2005). However, a hyperlink

has other symbolic meanings beyond a simple technical connection between two websites or two organizations (Park 2003). As Garrido and Halavais (2003) argued, a website is an official and unique entity representing an organization itself. Thus, a hyperlink embedded in a corporate website can be regarded as an official act of communication between two organizations, representing a reasonable approximation of a social relationship (Jackson 1997). If an organization's website is linked to another's site, it would have the communicative and symbolic meaning of validating the linked organizations, granting them legitimacy or endorsement (Biermann et al. 1999; Vreelnad 2000). In conclusion, as Park (2003) argued, a hyperlink system represents a relationship between two organizations around a particular shared background, interest, or project.

The primary purpose of the current study is to examine the use of hyperlinks in the environmental sections of the *Fortune* 2008 Global 500 companies' websites. Specifically, this study attempts to answer the following questions through hyperlink analysis: (1) How do the *Fortune* Global 500 companies utilize hyperlinks?; (2) Which environmental organizations are linked from the corporate websites?; and (3) Which companies and environmental organizations play a central role in a hyperlink network in terms of CER activities? By proposing answers to these questions, this study also attempts to provide a general perspective of corporate relationships with various types of environmental organizations concerning CER.

Literature Review

Stakeholder Theory and Corporate Relations

Stakeholder theory (Freeman 1984) has been widely adopted as a framework to explain corporate relations with a broad range of stakeholders throughout society (e.g., employees, customers, communities, governments, NPOs, and the environment) for CSR. The main idea of stakeholder theory is that corporations do business in relation to these stakeholder groups; thus, they have to manage these relations in a strategic way in order to achieve corporate goals and missions (Donaldson and Preston 1995; Freeman and Reed 1983; Galbreath 2006). Stakeholder theory focuses on identification, evaluation and assessment of stakeholders and stakeholder relationships. In doing so, it helps guide corporations to formulate and implement their business strategies (Cummings and Doh 2000).

Currently, the external pressures from NPOs, governments, and international societies as well as markets concerning CER activities including environmental performance and management have increased. In this regard, stakeholder theory is a suitable way to approach corporate relations with other CER related environmental organizations, as governing relations with these organizations are emerging as an important aspect of business strategies and practices.

Indeed, these types of organizations require corporations to engage in sound business activities that the organizations deem ethically, socially, and environmentally responsible (Doh and Teegen 2002). Inadequate responses by corporations to these pressures may result in a compromised reputation, a decline in clients' purchasing of associated products and services (Alsop 2004) and a deterioration in corporate relations with external organizations. Corporations, therefore, expand the scope of their corporate responsibility to cover environmental issues at all levels of business operation, thereby reinforcing self-regulation and encouraging voluntary initiatives (Eweje 2007). In addition, companies also broaden the range of their environmental responsibility by playing a more active leadership role in solving critical environmental concerns in cooperation with other external organizations.

Corporation and Stakeholder Relationships via Hyperlinks

Through the Internet, companies can publicize information more inexpensively and faster than ever before. Internet users can access and select information any time they wish via such features as electronic document retrieval, search tools, and multimedia applications (Wanderley et al. 2008). Thus, the Internet has become an essential tool for organizational communication (Capriotti and Moreno 2007; Stuart and Jones 2004; Sullivan 1999). Corporate websites are used as tools for corporate communication such as public relations (Hill and White 2000; Kent and Taylor 1998; Kent et al. 2003; White and Raman 1999), and also to present corporations as socially responsible (Esrock and Leichty 1998, 2000; Wanderley et al. 2008). Moreover, they provide an approved, formalized, and official perspective on CSR within the corporation for all of its stakeholders (Bondy et al. 2004).

In this study, the focus on hyperlinks underlies the assumption that organizational communication structures at the institutional, inter-organizational, and international levels can be revealed by hyperlink analysis. In this regard, the current study suggests that hyperlink analysis could be effective in identifying the interrelationships between corporations and their institutional infrastructures such as other businesses, NPOs, governments, and IGOs.

It is not clear whether a hyperlink between two organizations represents a corporate relationship in the real world. However, a hyperlink between two organizations' websites does not occur automatically or randomly

(Shumate and Dewitt 2008), but is a decision made internally within an organization as a strategic choice (Bach and Stark 2004). Hyperlink researchers agree that hyperlinks represent a wide range of communication behaviors, and hyperlink between two organizations may represent validation, trust, bonding, authority, and legitimacy (Park 2003; Vreelnad 2000). It can also represent an approximation of a social relationship (Jackson 1997). Given the meaning of a hyperlink, it can be assumed that a hyperlink may represent the relationship between two organizations in a broader sense. Based on the theoretical background previously outlined, this study attempts to examine the *Fortune* Global 500 corporate websites to identify how global corporations build their relationships with other stakeholders in terms of environmental responsibility. This study focuses on the use of hyperlinks in official corporate websites since it is one of most efficient methods for promoting environmental effort to the public. A clearly stated hyperlink on a website would be evidence of its connection to other stakeholders for environmental responsibility.

RQ1 How do Fortune Global 500 companies use hyperlinks on their websites for corporate environmental responsibility with other stakeholders?

Different Levels of Hyperlinks with Stakeholders for CER Among Global Companies

CSR practices can differ among global companies. Maignan and Ralston (2002) compared the extent and content of businesses' communications about CSR on their websites in France, the Netherlands, the U.K., and the U.S. and found that U.S. companies mention CSR more explicitly than other countries. Chapple and Moon (2005) found through analysis of companies' websites in seven Asian countries including India, Indonesia, Malaysia, the Philippines, South Korea, Singapore, and Thailand that CSR varies considerably by country and that multinational companies are more likely to adopt CSR. Brammer and Pavelin (2005) show cross-country differences between U.K. and U.S. firms' level of CSR (e.g. corporate community contributions) within significantly different stakeholder environments. Kim et al. (2010) focused on global companies' use of their websites as a way of helping to build CER. Through content analysis, they compared environmental concerns and the use of dialogic principles across three regions: Asia, Europe, and North America. Results show that while European and North American companies focus on climate change, possibly because of international agreements on the topic, Asian companies are concerned with an increased demand on resources and waste management.

Current CSR may differ among global corporations due to the business systems with which they are associated (Chapple and Moon 2005; Matten and Moon 2008). Political, financial, educational, labor, and cultural institutions affect companies' CSR practices in different ways. For example, the United States has relatively less state interference in economic and social activity, more reliance on the stock market as a financial source, lower levels of union membership, and stronger ethics of stewardship than European and Asian countries. For these reasons, U.S. companies would take more "explicit responsibility." "Explicit responsibility" refers to corporate policies that assume and articulate responsibility for some societal interests. "Explicit responsibility" forces companies to be responsive to government and consumer pressure and to involve alliances with other corporations and stakeholders. Also, the specific nature of the firm (e.g. ownership and flexibility of the organization) and organization of market processes would require the company to apply different meanings to and practices of CSR (Matten and Moon 2008).

In this study, it is assumed that the presentation of hyperlinks with other organizations on a company's website could be an explicit form of CSR. Also, it could be a performance criterion for CER practices, as more links to environmental organizations would reflect more interest in building relationships with them. Thus, it is hypothesized that the number of hyperlinks could be associated with the current nature of the company, depending on industry type and corporate financial performance (e.g., revenue and profit). They also could be analyzed in terms of corporate regional affiliation, since corporations within a region could have common concerns about environmental problems and would need to share solutions.

H1 Fortune Global 500 companies show different levels of hyperlink use with stakeholders on their websites based upon regional affiliation, industry type or corporate financial performance.

In addition, network analysis can reveal the structure of corporate interrelations in terms of environmental responsibility by exploring the communication flow at the institutional level. Recently, many studies have focused on hyperlink structure at the institutional level (Kleinberg 1999; Thelwall 2001; Park et al. 2002; Thelwall and Harries 2004) and international level (Brunn and Dodge 2001; Barnett 2005). However, there are few hyperlink studies focusing on CSR and its related communication structures. Esrock and Leighty (2000) found that 44% of global *Fortune* 500 corporate websites use CSR-related active hyperlinks and/or content on their front or "home" pages. O'Neill (1999) criticized some corporations for using hyperlinks to create false impressions of or to exaggerate

relationships with other organizations. In a study of the potential of websites, Ingenhoff and Koelling (2008) found that 65% of websites for 134 Swiss charitable fundraising NPOs have links to external websites to build relations for potential financial resources.

Having a large number of hyperlinks on a website may not represent an environmentally responsible corporation in terms of performance, as the outcome of CSR efforts should be maximized not only through individual CSR activity but also cooperative work between companies. If two companies have a hyperlink to the same environmental organization, it is assumed that they share common interests in environmental issues as well as collaboration on practical projects for corporate environmental responsibility. Therefore, hyperlink network analysis will also identify companies that take a leading role in corporate environmental responsibility, as this can be measured based on the number of organizations shared by companies.

RQ2 Which corporations play a key role in corporate environmental responsibility in the hyperlink network?

Types of Corporate Relationships with Stakeholders

As previously mentioned, it seems inevitable that corporations need to establish sound relations with external environmental organizations to cope with the pressure from those organizations concerning CER. Typically, NPOs and government agencies are seen as desirable targets for corporations. A number of IGOs have recently taken a leading role in coordinating environmental issues between nations; moreover, they have also become important target organizations for corporations with regard to environmental management. Corporations are aware that maintaining positive relationships with such organizations can positively influence their long-term business operations and profits by minimizing potential risks and achieving corporate social responsibility. The types and purposes of corporate relations with other organizations may vary depending on the types of organizations with which a corporation is willing to build relationships.

Corporate–NPO Relations

Traditionally, companies have maintained an antagonistic relationship with environmental NPOs, particularly environmental activist groups (see conflicts between Exxon and Greenpeace in the Exxon Valdez oil spill case) because of conflicts regarding the methods and practices they employ to gain their environmental goals (Glasbergen and Groenenberg 2001). Recently, environmental organizations have entered into collaborative arrangements with companies. This has provided the potential to create new forms of cooperative relationships between companies and NPOs (Glasbergen and Groenenberg 2001). Since the public sees NPOs as more reliable and trustworthy than corporations when it comes to environmental issues, a company with cooperative relationships with NPOs can enhance its corporate image. Besides improving corporate image, a company can gain the opportunity to access the social capital and networks of NPOs (Millar et al. 2004).

Previous case studies have provided examples of these strategic relations. Livesey (1999) examined the green alliance established in 1990 between McDonald's and the Environmental Defense Fund (EDF), a U.S.-based NPO. He revealed that, through the alliance, the business practices of McDonald's were monitored and evaluated, leading to an improvement in its practices based on ecological criteria. McDonald's was able to manage its brand identity and escape the negative image of being a waste dumper. A similar partnership existed between Unilever and the World Wildlife Fund (WWF). Unilever involved the WWF in establishing an independent certification program for sustainable fisheries in 1996. Through this partnership, the WWF offered to provide Unilever with an enhanced environmentally friendly image in return for Unilever's support of the WWF's environmental mission and implementation of changes in its fish-buying practices (Fowler and Heap 2000).

Corporate–Government Relations

A government of a country has legitimate authority to influence corporate performance and practices in regulatory and nonregulatory ways because it is a major employer, purchaser, subsidizer, and persuader in corporate–government relations. Thus, companies have historically maintained contentious relationships with government agencies, in particular with environmental regulatory agencies (Milliman and Grosskopf 2001). For a long time, companies have argued that governmental environmental policies are more punishment- and regulation-oriented and less incentive-oriented (Marcus et al. 2002). In recent years, we witnessed some changes in the corporate–government relations, suggesting that corporations and government agencies collaborate to develop new strategies to achieve greater environmental performance (Marcus et al. 2002; Milliman and Grosskopf 2001). The new relationship between both actors requires not only incentive-based environmental programs for governments, but also voluntary participation in the programs for corporations. Such corporate relationships with governmental agencies lead to business benefits such as enhanced public and regulatory relations. Many environmental initiatives are operating at the state or federal level in the United States, attracting voluntary participation from corporations. For example, the EPA in the United States has

run *Energy Star* as a voluntary program since 1992. This program identifies and promotes energy-efficient products in more than 40 product categories that reduce greenhouse gas emissions. Today, more than 1,400 businesses join this program and receive the technical information and tools needed to choose energy-efficient solutions and adopt the best green management practices.

Corporate–IGO Relations

As environmental protection become a global agenda not limited to national or regional boundaries, the roles of some intergovernmental institutions become significant in not only developing environmental standards and guidelines but also in providing a global platform for establishing relations to coordinate environmental activities across a broad spectrum of economic applications. For example, the United Nations Environmental Programme (UNEP) works with governments and the private sector to advance the environmental dimension, or sustainable development, of social responsibility. They work to create environmental standards, policy and legislation for sustainable development together, eventually aiming to apply them at the global level down to the national and local authority levels. According to the UNEP annual report (2009), 7,700 companies in the world participated in the UN Global Compact, a UN-coordinated strategic environmental policy initiative, through financial contributions. Thus, the next research questions investigate the types of environment-related organizations linked to corporate websites and the environmental issues they addressed in their mission statements. Some corporations seek corporate responses to social demands by establishing dialog with a wide spectrum of stakeholders, including nonprofit organizations, activists, communities, governments, media, and other institutional bodies. This study attempts to provide a broad picture of business strategies for hyperlink relationships in terms of corporate environmental responsibility. For this, hyperlink network analysis will reveal which stakeholders play a key role according to their type of organization. This analysis will suggest corporations' strategies for CSR-related activities.

In addition, this study will investigate which environmental focuses addressed by NPOs are hyperlinked from corporate websites. While government, IGOs, and profit organizations have been broadly concerned with global environmental issues, most NPOs have focused on a specific theme such as air and climate, water, waste management, soil, noise, and biodiversity. Thus, the following research questions are posited:

RQ3a Which types of stakeholders are hyperlinked with the Fortune Global 500 companies for global corporate environmental responsibility?

RQ3b Which stakeholders play a key role through the hyperlink network in global corporate environmental responsibility?

RQ3c What are the properties of NPOs linked to corporate websites in terms of an environmental mission?

Method

This study uses the combined methods of content analysis and hyperlink network analysis to examine the *Fortune* 2008 Global 500 companies and 341 environmental organizations.

Sample and Procedures

A list of the *Fortune* 2008 Global 500 companies was obtained from the *Fortune* 500 website (http://money.cnn.com/magazines/fortune/global500/2008/full_list). In each case, the English version of the corporate website could be accessed by clicking a hyperlink included on the list. To extract hyperlinks in the corporate environmental responsibility section, all of the *Fortune* Global 500 companies were first examined in terms of whether or not they had a clearly labeled standalone menu with a title such as "environment," "environmental responsibility," "environmental sustainability", or the like. Most of these titles were placed either in a top-menu or in a sub-menu under the top-menus of "corporate social responsibility," "corporate citizenship," "corporate stewardship", or "corporate sustainability."

A content analysis was then conducted to investigate the attributes of hyperlinked organizations such as regional affiliation, organizational type and environmental issues. If an organization's website was in a language other than English, a native speaker of its language was employed to translate the main page and information into English for content analysis.

Finally, a hyperlink network analysis was conducted to determine which companies and environmental organizations played a central role in the hyperlink network between company websites and those of the environmental organizations. Prior to conducting the content analysis, three coders separately examined 10 environmental organizations using 10 reference items for all measurements. Inter-coder agreement averaged .92.

Measures

Regional Affiliation

Coding for regional affiliation for both companies and environmental organizations relied heavily on the regional

classification scheme developed by Smith (1997). His classification is Africa, Asia, Middle East, Australia/New Zealand/Pacific Islands, Western Europe, Eastern Europe, North America (excluding Mexico), and South and Central America (including the Caribbean). In this study, we also added one more region, the World, for coding global intergovernmental agencies. The regional affiliation of each company was clearly specified on the *Fortune* website. The study examined company websites from only three regions because the other regions did not have an appropriate sample size [Total ($N = 474$), Asia ($N = 124$), Western Europe ($N = 183$), and North America ($N = 167$)].

Industrial Type

The study classified industrial type into eight categories: (1) Agriculture, mining, and construction; (2) Manufacture of goods for consumption; (3) Manufacture of goods for production; (4) Transportation, communication, electricity, gas, and sanitary services; (5) Wholesale trade; (6) Retail trade; (7) Finance, insurance and real estate; and (8) Services. This classification comes from United States Department of Labor (http://www.osha.gov/pls/imis/sic_manual.html) and was modified for this study.

Organization Type

The organization type was classified according to the Research and Development (RAND) classification. According to the RAND classification (Ronfeldt 1999) for organizations, all hyperlinked organizations can be categorized into four groups: NPOs, profit organizations, government organizations, and IGOs. Organizational type was determined by how an organization was described in its mission statement under either "About us" or "Who we are." When an organization did not address this specific information, it was coded as "Not available."

Environmental Issues

The system of integrated environmental and economic accounting (SEEA) has categorized global environmental issues as: "protection of ambient air and climate," "water for human use and wastewater management," "solid/hazardous waste management," "remediation and cleanup of soil and water," "noise and vibration abatement," "protection of biodiversity and landscape," "research and development" and "other environmental protection activities" (UN 1993). For coding, classification was extracted from the mission statement addressed in either "About us" or "Who we are." If the mission scope included more than one environmental issue, it was classified as "general environmental issue."

Hyperlink Network Analysis

To examine the structures of the networks among environment-related organizations, this study conducted a network analysis. It identifies relationships among the system components rather than the attributes of individual cases (Richards and Barnett 1993; Rogers and Kincaid 1981). Hyperlink network analysis is also an extension of traditional social network analysis in that it focuses on the structure of a social system based on hyperlinks, which are often assumed to represent shared ties among communication partners. The difference between hyperlink and traditional network analysis is in the use of hyperlink data from websites. Two nodes (websites) are connected through being interlinked. In the hyperlink network analytical framework, social actors and their hyperlinked activities may be analyzed as a whole (Park et al. 2005).

This study obtained data based on how environment-related organizations are jointly hyperlinked through specific companies. The primary data are explicit out-links contained in the websites of the *Fortune* Global 500 companies. Specifically, data about the hyperlink affiliation among these organizations were obtained as follows: Firstly, data were coded based on hyperlink relations between companies and organizations. For example, in an environmental reference, it was a 500 × 341 matrix (each company × each organization listed), where each cell was coded "1" for hyperlinked and "0" for non-hyperlinked. This primary data set was pre-multiplied by its transposition to form a 341 × 341 environment-related organization matrix of joint affiliations for all of the organization websites. In this example, the variable s_{ij} indicates the number of companies that hyperlinked to two organizations. For example, s165,23 is 2, indicating that two companies hyperlinked to both the Wildlife Habitat Council and the Carbon Disclosure Project. Then, using UCINET 6 (Borgatti et al. 2002; Krackhardt and Porter 1986), eigenvector centrality is calculated in order to find which organizations played a significant role in the hyperlink network, since it uses other nodes in the system as weights to establish connections between these nodes or concepts as well as among each other. In particular, the eigenvector approach searches for the most central actors in terms of the "global" or "overall" structure of the network and pays less attention to patterns that are more "local" (Hanneman 2005). This approach allows themes that are highly related to each other and "central" to communication to be easily identified. In the same way, the primary data set can yield another 500 × 500 company matrix of joint affiliations with corporate websites with respect to specific CSR issues.

Results

Among the *Fortune* 2008 Global 500 companies, a total of 339 companies had an environmental menu. Then, all hyperlinks from the environmental menu of these samples were extracted; 524 hyperlinks were observed and linked to 341 unique environmental organizations. Finally, 107 companies among 339 companies have at least one hyperlink in their environmental menu. Only five corporate websites (4.0%) among 124 Asian companies contain at least one hyperlink, while 55 corporate websites (32.9%) among 167 North American companies and 47 corporate websites (25.7%) among 183 West European companies provide one or more hyperlinks with other organizations (Table 1).

One-way ANOVA analyses were conducted to test the regional differences. There are 524 hyperlinks ($M = 1.55$, $SD = 3.58$) across the 339 corporate websites (Asia, $N = 65$, Western Europe, $N = 158$; North America, $N = 116$) with an environmental menu. Significance was found for the number of hyperlinks by region (Asia, $M = .25$, $SD = 1.30$; Western Europe, $M = 1.39$, $SD = 3.31$; North America, $M = 2.48$, $SD = 4.46$; $F(2,336) = 8.80$, $P < 0.001$). A Tukey post-hoc analysis yielded that there was no significant difference between North American and Western European corporations, whereas Asian corporations had significantly fewer hyperlinks than those in the other two regions.

To compare the number of hyperlinks by industrial type, a one-way ANOVA analysis was conducted. The ANOVA results showed that industrial type did not influence the number of hyperlinks. The results indicated that there is no significant difference among the eight industrial types, $F(6,49) = 0.88$ $P > 0.05$. Post-hoc analysis also confirmed that no significant differences were found between any pair of industrial types (Table 2).

Correlations were calculated to determine the relationships among the number of hyperlinks, revenue and profit. The results indicate that the number of hyperlinks correlated significantly with neither revenue nor profit, although there were positive relationships (Table 3).

Table 2 Number of links by industrial type

Industry	*N*	*M*	SD
Agriculture, mining, construction	64	1.13	3.718
Manufacture of goods for consumption	52	1.62	3.056
Manufacture of goods for production	112	1.01	3.129
Transportation, communications, electric, gas, and sanitary services	60	1.13	3.223
Wholesale/retail	55	0.51	1.676
Finance, insurance, and real estate	128	0.88	3.014
Services	29	1.69	2.953
Total	500	1.05	3.052

Table 3 Correlations among revenues, profit, and number of hyperlinks

Items	Revenues	Profits	No. of hyperlink
Revenues	–	0.538**	0.163
Profits		–	0.031
No. of hyperlinks			–

** $P < 0.05$

For RQ2, network analyses were conducted to reveal the structure of *Fortune* Global 500 companies in terms of corporate environmental responsibility. Results showed that mostly North American companies were highly ranked in the network of *Fortune* Global 500 companies. CITI group had the highest eigenvector centrality, followed by Marathon Oil, Merck, GM, Conoco, Rio Tinto, IBM, Pfizer, Bank of America, Ford, Caterpillar, and Staples (Table 4).

For RQ3a, it was found that there were 337 unique environmental organizations linked to the 524 hyperlinks. A total of 33 profit organizations (9.8%) were included, such as Earth Force, E and Co, and Ecologic Development Fund. There were 248 nonprofit organizations (73.6%) included, such as The Nature Conservancy, World Resources Institute, and Carbon Disclosure Project. There were 35 governmental organizations (10.4%) included, such as the United States Environmental Protection Agency, Energy Star (U.S.

Table 1 Number of links under the environmental menu

Items		Corporations by region			
		Asia	North America	West Europe	Total
Corporate sites	*N*	124	167	183	474
Corporate sites having environmental menu	*N*	65	116	158	339
Corporate sites having link(s) under environmental menu	*N*	5	55	47	107
Total links under environmental menu	*N*	16	288	220	524
Links per site (among sites having environmental menu)	*M* (SD)	0.25 (1.30)	2.48 (4.46)	1.39 (3.31)	1.55 (3.58)
Links per site (among sites having one or more links)	*M* (SD)	3.2 (3.90)	5.24 (5.26)	4.68 (4.65)	4.90 (4.92)

Table 4 Top 20 central corporations in the hyperlink network analysis for CER activities

No. of hyperlinks			nEigenvector		
Rank	Company	*N*	Rank	Company	nEigenvector
1	Ford[c]	22	1	CITI[c]	41.8
2	Iberdrola[b]	21	2	Marathon Oil[c]	40.5
3	CITI[c]	20	3	Merck[c]	39.7
4	Conoco[c]	20	4	GM[c]	36.6
5	Rio Tinto[b]	17	5	Conoco[b]	32.8
6	Bank of America[c]	16	6	Rio Tinto[c]	31.7
7	Royal Bank of Canada[c]	15	7	IBM[c]	31.4
8	Barclays[b]	15	8	Pfizer[c]	30.0
9	Nokia[b]	13	9	Bank of America[c]	29.7
10	GM[c]	12	10	Ford[c]	26.0
11	Intel[c]	12	11	Caterpillar[c]	25.9
12	British American Tobacco[b]	12	12	Staples[c]	23.6
13	Marathon Oil[c]	11	13	Royal Bank of Canada[c]	23.2
14	Sharp[a]	10	14	Intel[c]	22.9
15	Nestle[b]	10	15	Microsoft[c]	21.7
16	Merck[c]	9	16	Motorola[c]	21.5
17	Staples[c]	9	17	DuPont[c]	21.4
18	Eli Lilly[c]	9	18	Capital One Financial[c]	20.3
19	FedEx[c]	9	19	Sharp[a]	20.2
20	Gaz de France[b]	9	20	Toronto-Dominion Bank[c]	17.2

[a] Asia, [b] Europe, [c] North America

Department of Energy), and Energy API. Finally, 21 intergovernmental organizations (6.2%) were included, such as the United Nations Environment Programme, the EU, and The World Bank.

The mean score of corporations' websites hyperlinked with organizations' websites was 1.6 (SD = 2.0). The results showed that intergovernmental organizations' websites had a relatively higher average number ($M = 2.3$, SD = 3.1) of hyperlinked Global 500 companies than any other type of organization (profit organization, $M = 1.2$, SD = 1.1; nonprofit organization, $M = 1.5$, SD = 1.6; and governmental organization, $M = 1.9$, SD = 3.4). The result of the one-way ANOVA, however, indicated that there was no significant difference among them, $F(3,336) = 1.7$, $P > 0.05$ (Table 5).

In regards to *RQ3b,* the United States Environmental Protection Agency (UEPA) had the highest eigenvector centrality in the network of hyperlinked organizations, followed by The Nature Conservancy, World Resources Institute, Carbon Disclosure Project, United Nations Environment Programme, Wildlife Habitat Council, and Energy star (U.S. Department of Energy).

Comparing scores of normalized eigenvector centrality by organization type and governmental organizations took a relatively more central position in the network of environmental stakeholders ($M = 5.8$, SD = 11.9), followed by nonprofit organizations ($M = 3.6$, SD = 5.9), intergovernmental organizations ($M = 3.6$, SD = 8.6), and profit organizations ($M = 3.1$, SD = 2.7). However, the one-way ANOVA did not confirm that there were significant differences among them, $F(3,336) = 1.2$, $P > 0.05$ (Table 6).

In addition, the final research question inquired about the environmental focuses addressed by the NPOs linked

Table 5 Number of hyperlinked stakeholders and normalized Eigenvector centrality scores by type

Type of organization	No. of hyperlinked stakeholders			nEigenvector	
	N	*M*	*SD*	*M*	*SD*
Profit	33	1.2	1.1	3.1	2.7
Nonprofit	248	1.5	1.6	3.6	5.9
Governmental	35	1.9	3.4	5.8	11.9
Intergovernmental	21	2.3	3.1	3.5	8.6
Total	337	1.6	2.0	3.7	6.7

Table 6 Top 50 central stakeholders related corporate environmental responsibility

Rank	Stakeholders	nEigenvector	Types
1	United States environmental protection agency	68.9	Gov.
2	The Nature Conservancy	43.6	Nonprofit
3	World Resources Institute	42.5	Nonprofit
4	Carbon Disclosure Project	42.5	Nonprofit
5	United Nations Environment programme	39.6	Int.Gov.
6	Wildlife Habitat Council	36.9	Nonprofit
7	Energy star (U.S. Department of Energy)	25.4	Gov.
8	WWF (World Wildlife Fund)	21	Nonprofit
9	The equator principles	17	Nonprofit
10	Business Roundtable	16.7	Nonprofit
11	Green power market development group	14.8	Nonprofit
12	World Business Council for Sustainable Development	13.4	Nonprofit
13	Chicago Climate	12.7	Nonprofit
14	Energy API	11.7	Gov.
15	PEW Center Global Climate Change	10.9	Nonprofit
16	World Environment Center	10.8	Nonprofit
17	Coalition for Environmentally Responsible Economies (CERES)	10.7	Nonprofit
18	Harvard University	10.6	Nonprofit
19	U.S. Green Buildings Council (LEEDS)	10.1	Nonprofit
20	USCAP (United States Climate Action Partnership)	9.8	Nonprofit
	Earth Force	9.7	Profit
22	Conservation Int.Gov.	8.9	Nonprofit
23	EU	8	Int.Gov.
	U.S Department of Energy	7.9	Gov.
25	PayItGreen	7.8	Nonprofit
	Tropical Forest Trust	7.7	Nonprofit
27	Environmental bankers association	7.5	Nonprofit
28	Aspen Institute Business and Society Program	7.3	Nonprofit
	Bank Track	7.3	Nonprofit
	E and Co	7.3	Profit
	Ecologic Development Fund	7.3	Profit
	EcoLogic Finance	7.3	Nonprofit
	Environmental Defense	7.3	Nonprofit
	Forest Trends	7.3	Nonprofit
	Friends of the Earth (U.S.)	7.3	Nonprofit
	Int.Gov. Finance Corporation	7.3	Profit
	National Resources Defense Council	7.3	Nonprofit
	Rainforest Action Network	7.3	Nonprofit
	Sustainable Northwest	7.3	Nonprofit
40	Dow Johns Sustainability Indexes	7.2	Profit
41	Conserving Threatened Species and Ecosystems Worldwide	6.7	Nonprofit
42	Canadian Bankers association	6.6	Nonprofit
43	The World Bank	6.4	Int.Gov.
44	Bureau of Economic Geology	6.3	Gov.
	Carbon Capture and Sequestration Technologies	6.3	Nonprofit
	NWTF (National Wild Turkey Federation)	6.3	Nonprofit
	U.S. Department of The Interior (Bureau of Land Management)	6.3	Gov.
48	National recycling coalition	6.1	Nonprofit
49	Global Reporting Initiative	5.9	Nonprofit
50	Minnesota pollution control agency	5.9	Gov.

Table 7 Number of hyperlinks to environmental focus of NPOs

Environmental focus	Organizations by region							
	Asia ($N = 7$)		North America ($N = 208$)		West Europe ($N = 152$)		Total ($N = 367$)	
	n	%	*n*	%	*n*	%	*n*	%
Air and climate	–	–	48	23.1	45	29.6	93	25.3
Waste water	–	–	–	–	–	–	–	–
Waste	2	28.6	18	8.7	5	3.3	25	6.8
Soil, ground water, and surface water	1	14.3	7	3.4	5	3.3	13	3.5
Biodiversity and landscape	1	14.3	45	21.6	29	19.1	75	20.4
Radiation	–	–	–	–	1	0.7	1	0.3
Research and development	–	–	17	8.2	18	11.8	35	9.5
Administration, education, and regulation	2	28.6	36	17.3	28	18.4	66	18.0
Others	1	14.3	19	9.1	10	6.6	30	8.2
General	–	–	18	8.7	11	7.2	29	7.9

from corporate websites. As shown in Table 7, among 367 hyperlinks from corporate websites, there were 93 hyperlinks to NPOs dealing with the environmental focus related to "Air and climate" ($N = 93$, 25.3%), followed by "Biodiversity and landscape" ($N = 75$, 20.4%), "Administrative, education, and regulation" ($N = 66$, 18.0%), and "Research and development" ($N = 35$, 9.5%). When breaking this down by region, similar results were found in North American and Western European corporate websites. From North American corporate websites, 48 hyperlinks (28.1%) are directed to the NPOs whose environmental focus is "Air and climate," 45 hyperlinks (21.6%) are directed the NPOs concerning "Biodiversity and landscape" and 36 hyperlinks (17.3%) are to NPOs regarding "Administration, education, and regulation." From Western European corporate websites, 45 (29.6%) hyperlinks are linked to the NPOs whose environmental focus is "Air and climate," 29 (19.1%) hyperlinks are to NPOs relating to "Biodiversity and landscape" and 28 (18.4%) hyperlinks go to NPOs concerned with "Administration, education, and regulation." On the contrary, two hyperlinks (28.6%) each from Asian corporate websites are directed to NPOs whose focuses are "Waste" and "Administration, education, and regulation."

Discussion and Conclusion

The purpose of the current study is to explain corporate relationships with stakeholders, in particular various types of environmental organizations, by examining the hyperlinks in the environmental responsibility sections of the *Fortune* 2008 Global 500 corporate websites. The results show that the number of companies that have hyperlinks to external environmental organizations, presumed to reflect inter-organizational relations, is small. Only 21.4% of the *Fortune* 2008 Global 500 company websites have one or more hyperlinks in their environmental sections. These findings may imply that corporations do not use hyperlinks strategically to improve stakeholder relationships in their business strategies. Or, they may reflect that corporations do not make much effort to achieve CER in cooperation with environmental organizations, not recognizing the importance of stakeholder relationships in CER.

It is assumed that hyperlinked organizations may either represent their current inter-organizational relationship or create symbolic relationships among organizations, regardless of what relationships they have in reality. For example, the Coca-Cola Company hyperlinks to WWF, an NPO for nature conservation. The Coca-Cola Company clearly states on its website that the company is working in partnership with WWF to conserve fresh water resources. Similarly, Dell hyperlinks to environmental certifications such as Energy Star, Electronic Products Environmental Assessment Tool (EPEAT), and Blue Angel, with explicit statements that Dell attempts to meet one or more environmental standards set by these certification organizations. It does not cite specific information about actual relationships with these organizations. Meanwhile, Marathon Oil Corporation embeds hyperlinks to the Carbon Disclosure Project, Energy Star, and Global Gas Flaring Reduction Partnership as reference sites without any specific information about the relationships it maintains with these organizations. No matter what the relationship, the hyperlink can provide customers or stakeholders with the impression that the corporation shares the values held by the linked organizations.

In addition, this study found that Asian companies show a very low number of hyperlinks, compared with those in North America and Western Europe. We assume that the

difference might be caused by different political, social, economic, and education systems and cultures. Despite CER concerns such as growth in Asia, the difference represents that this region still has relatively weaker institutional, social, and cultural foundations promoting corporate relations with other external organizations regarding CER, as compared to North America and Western Europe. According to the Responsible Competitiveness Index (RCI) assessing corporate responsibility and competitiveness reported by AccountAbility, a British NPO, nine Western European countries, and Canada are included in the index's top 10, and the United States ranked at 18th. Most Asian countries including Japan, South Korea, and China are ranked lower than North American and Western European regions in the index. Moreover, it can be assumed that many companies still ignore the importance of corporate websites as a tool to communicate with stakeholders. Although the website has become an essential tool for an organization's communication with stakeholders (Stuart and Jones 2004), corporations do not fully utilize the functions of a website. As mentioned, a hyperlink represents communicative behaviors and thus relationships between linked organizations. Accordingly, if corporations either maintain positive relationships with other organizations or create new relations in an attempt to work together for certain social or environmental issues, they can consider a hyperlink to the organizations from their corporate website, adding explicit statements about their relationships with the organizations.

However, it is not a good idea to use hyperlinks simply for impression management. Kent and Taylor (1998) argued that website communication, like interpersonal communication, should be open and honest. Thus, a hyperlink should represent an actual relationship between two organizations and efforts by corporations to achieve their environmental goals by collaborating with the organizations.

Despite the prediction that the number of hyperlinks may be related to a company's annual revenues/profits or industrial affiliations, the results revealed that there is no significance among those variables. Not surprisingly, these findings imply that the drivers for corporate relationships are more closely related to corporate awareness of the importance of stakeholder relationships for CER than to corporate business performance.

Network analysis confirmed that relationships among North American companies and environmental organizations are more explicit than other regions. In regards to *RQ2*, there is a discrepancy in the results for hyperlink frequency analysis and hyperlink network analysis. While the top 20 companies in terms of number of hyperlinks consist of 12 U.S. companies, 7 Western European companies and one Asian company, the top 20 central companies in the hyperlink network include 18 U.S. companies, one Western European company and one Asian company. More specifically, CITI group and Marathon Oil, both based in the United States, were ranked at the top two in their eigenvector centrality scores, even though they ranked third (CITI group) and 13th (Marathon Oil) in number of hyperlinks. In contrast, Iberdrola, a Western Europe-based company, was not included in the top 20 companies, although it was ranked second in the number of hyperlinks. U.S. companies are likely to be located in the central part of the network system, while Asian and Western European companies are likely to be located marginally. These results suggest that U.S. companies are mutually connected via core environmental organizations such as USEPA, The Nature Conservancy, World Resources Institute, Carbon Disclosure Project, and UNEP in a CER system. Therefore, they are capable of being more collaboratively responsive to environmental organizations for CER practices. On the other hand, Asian and Western European companies are more likely to have relationships with local NPOs or their subsidiary foundations for CER practices. In those CER systems, Asian and Western European companies have acted independently on CER practices.

Next, the study examined how organizations, as stakeholders, are collaborating with the *Fortune* Global 500 corporations for corporate environmental responsibility. As expected, the most frequently hyperlinked organizations on corporate websites were NPOs, followed by government, intergovernmental, and profit organizations. The rising influence of NPOs is one of the most significant developments in international affairs, in particular as related to global environmental issues (Doh and Guay 2006). When companies enter relationships with NPOs, these organizations are predominantly asked to bring in the societal and intellectual expertise lacking in the company. In addition, corporations can strengthen their position by cooperating with such organizations because of the normative legitimacy of NPOs (Lister 2003; Ossewaarde et al. 2008). However, besides NPOs, many other types of stakeholders, such as governments, intergovernmental organizations, and other institutional bodies, have great influence on corporations. These groups demand what they consider to be responsible corporate practices. In particular, network analysis indicated that the centrality scores of governmental organizations, such as the U.S. Environmental Protection Agency (first), Energy Star (U.S. Department of Energy; seventh), Energy API (14th), the U.S Department of Energy (24th) and the Bureau of Economic Geology (44th) and of intergovernmental organizations, such as the United Nations Environment Program (fifth), the European Union (23rd), and The World Bank (43rd), are relatively high, which means they play a key role in CER activities.

Based on these findings, it can be concluded that, while the business–NPO relationship is a major form of the corporate relationship, the business–government relationship has emerged as an important form that companies should consider for their business strategies as a way of fulfilling their environmental responsibility.

This study also found that corporate websites are most likely to hyperlink to NPOs whose primary environmental focus is "Air and climate change," which is regarded as the most pressing concern that the world is currently facing. We assume that corporations' focus on "Air and climate change" is closely related to international agreements on climate change drawn in the Kyoto protocol. The Kyoto protocol was negotiated in 1997 among developed and developing countries in an attempt to reduce greenhouses gases (GHS) and to mitigate climate change. The guidelines of the Kyoto protocol have affected corporate operations and resulted in a series of managerial decisions to the effect that corporations should not only strengthen internal regulations but also build positive relationships with the NPOs whose environmental focus is "Air and climate change." Through relations with such NPOs, corporations expect to not only bring NPO resources related to GHS reduction, but also create a public image of the corporations' commitment to ensuring clean operations to mitigate climate change.

Despite some meaningful findings, this research has some limitations. First, despite the assumption that hyperlinks included in corporate websites represent a meaningful relationship between two organizations, it is still unclear as to whether hyperlinks reflect actual relationships. Companies may hyperlink to environmental organizations simply to create a good image as part of a symbolic management strategy rather than to enhance environmental performance by utilizing the benefits of relationships with environmental organizations. Similarly, companies may hyperlink to governmental or inter-governmental agencies, hoping to symbolically improve the pubic impression that they abide by government regulations and international standards.

In addition, this research did not classify NPOs into more detailed categories to determine whether they are included in grassroots (or activist group) or pure NPOs, because most environmental organizations did not reveal enough detailed information about their organizational type on their websites. This is important, given that grassroots environmental organizations have unique relationship-building needs that differ from those of pure NPOs.

For a complete picture of corporate relationships, future research should not only investigate the context of hyperlinks on corporate websites by conducting a website content analysis, but also compare the use of hyperlinks with specific corporate characteristics such as expenditures for CER, CSR index, environmental reputation index, and so forth.

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