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Internationalization and environmental strategies of multinational construction firms

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Abstract

Multinational construction firms have manifested relatively proactive in environmental management which suggest internationalization would impact on proactivity of environmental management. The purpose of this paper is to verify the relationship between internationalization and environmental strategy, especially the difference in geographical diversification. 36 samples of construction firms listed in ENR Top International Contractor are used in the study. The environmental information of each sample is extracted through content analysis method, and further we cluster the environmental management practices into three groups of strategy, which depict reactive, preventive and proactive in strategic environmental management. We take multiple aspects in the evaluation of internationalization and perceived internationalization as indicators of intensity, geographical extensity and geographical concentration. For firms that are highly regional diversified in developed countries, the ANOVA result indicates they are more likely to adopt a proactive environmental strategy rather than a preventive and reactive strategy. Conversely, the firms are more likely to adopt preventive strategy if they are highly spread in both developed and developing countries. In either case, contractors that adopt reactive strategy are the least internationalized. Even after we have accounted for the effects from the home country and firm size, the results suggest that construction firms adopt different environmental strategy are subjected to the level of geographical diversity of developed countries. The study implies that not only the selection of strategy is externally hinged on capability of firm in responding to environmental issues when their legitimating business environment extends to include the institutional contexts and stakeholders in host countries but also internally attributed to organizational capabilities that underlie the adoption of environmental strategies.

Keywords: Environmental strategy, geographical diversification, internationalization, multinational enterprises.

1. Introduction

Multinational construction firms have been relatively proactive in environmental issues. One of the perceived main impetuses to develop an environmental management system is the synergy effect when entering the international construction market [1]. A study on Korean contractors concluded that global contractors are more proactive in environmental strategies than their local counterparts [2]. Zuo, et al. [3] also indicated a high commitment of environmental reporting among international contractors. However, recent environmental strategy studies in the construction industry [2, 4, 5], have not addressed the impacts of environmental proactivity on internationalization.

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There have been no studies from the environmental strategic management perspective that articulate the interplay between a multinational contractor's internationalization characteristics and its environmental practices. Such a gap in causal relationship has left empirical and theoretical ambiguity. For a firm, pursuing a proactive environmental strategy implies both substantial investment and a long-term commitment to market development; therefore, a study is required to determine how firms perform on internationalization based on their environmental strategies.

The primary goal of this study is to construct the environmental strategies of multinational construction firms and to explore the relationship between environmental strategy and degree of internationalization in multinational construction firms. We attempt to accomplish a few tasks pertaining to the goals. The study starts with developing environmental strategies grounded in environmental management literature of resource-based view (RBV) and construction management. A brief understanding of environmental strategy based on RBV theory and internationalization perspective can be found in articles of Hart and Dowell [6] and González-Benito and González-Benito [7]. Previous studies show that MNEs have attributed to higher environmental performances and proactivity in their global operations [8, 9], hence, we intend to verify whether multinational construction firms are aligned with this assertion by measuring internationalization in term of global standpoint, and internationalization in developed and developing regions respectively. Three internationalization indicators are adopted in this study: intensity, geographical extensity, and geographical concentration.

2. Method

2.1 Samples

The samples of multinational contractors were drawn from Engineering News-Record publication, ENR Top International Contractors 2012 [ENR, 10]. Only public listed firms with available financial data and environmental reporting published online were taken into the study. Out of 225 contractors listed, 36 firms are targeted.

2.2 Constructs of Environmental Strategy

We adopted the content analysis method to analyze the environmental information published by each construction firm. Due to our groups' language proficiency, only reports in English and Mandarin were accepted. We gathered environmental data from sustainability reports, CSR reports, online annual reports, and public information on company webpages. Our main targets were environmental reports published in 2011.

Table 1. Final cluster means of environmental strategies ^a

	Strategy Cluster			ANOVA F
	Reactive	Preventive	Proactive	
Management systems and procedures	-4.157	0.420	3.678	22.03***
External environmental reporting	-1.570	0.120	1.480	9.602***
Innovation capability	-0.799	-0.405	1.860	7.408**
Product stewardship	-1.348	0.080	1.327	7.141**
Stakeholder engagement	-4.464	-0.236	5.582	20.676***
Pollution prevention in office	-1.883	-0.058	2.256	7.102**
Pollution prevention on-site	-3.767	-0.231	4.785	12.698***
Managerial vision	-0.429	-0.101	0.724	3.442**
N	9	19	8	

^a Summation of standardized mean values are reported

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.001$

The survey instruments of content analysis consisted of a coding form and a codebook that attached sample excerpts for scoring. The author and two other raters manually performed the content analysis. We examined several aspects of the variable validity and reliability. First, the dimensionality of each domain was examined by exploratory

factor analysis using maximum likelihood extraction (with eigenvalue>1), and we omitted survey items with factor loading below 0.4. Second, we examined the internal consistency of each variable by computing Cronbach's alpha.

We subjected these survey variables to K-mean clustering analysis. Following Buysse and Verbeke's (2003) three-group classification, we identified these clusters as depicting reactive, preventive, and proactive environmental strategies. We ensured the coherence and stability of the cluster solution by repeating the cluster analysis on randomly selected subsamples of our respondents. The results of ANOVA F-statistics showed that the differences between cluster means are highly significant (Table 1).

2.3 Internationalization

Ietto-Gillies and London [11] identified three major dimensions in the internationalization concept: intensity, geographical extensity, and concentration dimension. These three dimensions have been incorporated into our study.

Foreign sales to total sales revenue: For the internationalization intensity, the most common measure used by researchers has been the percentage of foreign sales to total sales revenue (FSTS), and is adopted here.

We invoked regional classification adopted in 2012 Environmental Performances Index data files when deriving the geographical diversity [EPI, 12]. There are a total of six regions, according to the countries listed in EPI 2012. We further sub-divided the six regions into four developed regions and six developing regions. The former includes Asia and Pacific; Europe; Middle East and North Africa; and Americas. The latter includes Asia and Pacific; Eastern Europe and Central Asia; Europe; Americas; Middle East and North Africa; and Sub-Saharan Africa. The countries under our classification of the six developing regions are identical to World Bank's country classification, thereby proving our study's convergent validity. The countries in which each firm worked in 2011 can be found in the ENR report [10].

Network Spread Index (NSI): Developed by Ietto-Gillies [13], NSI has been used to measure the percentage of foreign countries a firm is affiliated with in relation to the total number of foreign countries in which, potentially, the firm could occupy. As in Pheng and Hongbin [14], NSI has been adopted in this study for the country-level analysis of a firm's international business distribution and used as proxy to geographical extensity.

Regional diversification index (RDI): Geographic regions are substantially different in socio-economic environment [15]. The imperative for regional study underscores insufficiency of purely country-level analyses in the evaluation of a firm's operations across multiple locations that are distinct but not entirely independent of each other [16]. As in Qian, et al. [17] study, entropy measure is adopted to measure the geographical concentration. The entropy measure of regional diversification index is defined as:

$$RDI = \left[\sum_{i=1}^m P_i \ln \left(\frac{1}{P_i} \right) \right] / \ln(m) \quad (1)$$

where P_i is the probabilities of number of countries where a firm had its subsidiaries to regional market i , and $\ln(1/P_i)$ is the weight that is given to each global market region, m is the number of total regions considered in the computation.

We created three NSI and three RDI variables for comparison. First we computed them from a global standpoint comprising all 10 regions (NSI10 and RDI10); second, we computed them separately according to the respective number of countries in the four developed regions (NSI4 and RDI4) and six developing regions (NSI6 and RDI6).

2.4 Control Variables

The conditions of a firm's home country would influence its environmental strategic response in host countries [18, 19]. We captured the influences of a firm's home country conditions in two-ways. First, the environmental governance of a home country was measured according to the Environmental Performance Index (EPI), published jointly by Yale University and Columbia University in year 2012 [EPI, 12]. Next, we included the gross domestic

product per capita (GDPCAP) of a construction firm's home country in our study. Many studies in environmental management and internationalization consider firm size [9, 20]. The number of employees was used to measure firm size in our study.

2.5 Analysis method

We adopted the one-way analysis of variance (ANOVA) to test whether mean and standard deviation differences of each internationalization variable were statistically significant among the environmental strategy clusters. Furthermore, post hoc Tukey's HSD (honest significant difference) test was also conducted to test for statistical differences between clusters pairwise. Next, multivariate analysis of variance (MANOVA) was conducted based on overall internationalization variables (excluded RDI2 and FSTS) and environmental strategy clusters. Control variables were entered into the analysis as covariates and one-way analysis of covariance (ANCOVA) was performed to verify whether each of the dependent variable were still associated with differences among the strategy cluster after the home condition effects and firm size had been accounted for. A similar multivariate analysis of covariance test (MANCOVA) was performed taking all internationalization variables together, except FSTS, and the result was compared with MANOVA result.

3. Results

The results of ANOVA and MANOVA analyses are presented in Table 2. From global standpoint (RDI10, NSI10), environmental strategy is significantly associated with degree of internationalization. The geographical concentration and extensity of a firm's global operation was found to be highest for firms with preventive strategy, second highest for firms with proactive strategy, and lowest for firms with reactive strategy. However, investment intensity (FSTS) in foreign countries was not significantly linked to the strategy used. The foreign investment intensity might able to provide more insight if FSTS by regions could be assessed; unfortunately, they are not available.

In developing regions, environmental strategy is significantly associated with geographical extensity (NSI6), and firms with preventive strategy have the highest extensity, followed by firms with proactive strategy, and reactive strategy. While the relationship between environmental strategy and geographical concentration (RDI6) appeared inconclusive.

In developed regions, environmental strategy of a firm is significantly associated to both geographical concentration and extensity. Nonetheless, the effects of environmental strategy on geographical concentration and extensity are deviated. Firms pursuing proactive strategy have the highest concentration (RDI4) but second in extensity (NSI4); conversely preventive strategy's firms have the highest extensity and second in concentration. Reactive strategy always ranked the lowest in either analysis.

With respect to the robustness of our findings, further analysis of ANCOVA and MANCOVA are shown in Table 3. These tests were used to investigate the relationship of environmental strategy with internationalization after the effects of covariates were removed. For the ANCOVA analysis, only regional diversification in developed regions (RDI4) remained significant and robust. The significance of environmental strategies associated to RDI10, NSI10, NSI6, and NSI4 were not sustained after incorporating covariates into the analysis. We have done separate testing on ANCOVA and MANCOVA by including only GDP per capita and EPI to confirm the robustness. The MANCOVA result suggests that relationship between environmental strategy and internationalization is still robust after incorporating home country variables into the analysis. However, when all covariates, included firm size, were taken into MANCOVA analysis, the net effect of environmental strategy on overall internationalization variables was accounted for 49% variance, which is not much different from MANOVA, but the overall relationship becomes insignificant.

Table 2. ANOVA and MANOVA analysis of Internationalization under three environmental strategy clusters

	Cluster of Environmental Strategy ^a			ANOVA F, Brown-Forsythe	MANOVA Wilki's λ ^b
	Reactive	Preventive	Proactive		
RDI10	0.562 (0.220)	0.758 (0.202)	0.720 (0.111)	3.673**	
NSI10	0.098 (0.069)	0.246 (0.194)	0.154 (0.115)	4.657**	
RDI6	0.504 (0.256)	0.693 (0.311)	0.458 (0.330)	2.266	
NSI6	0.097 (0.090)	0.208 (0.164)	0.106 (0.083)	4.256**	
RDI4	0.371 (0.302)	0.631 (0.350)	0.786 (0.115)	5.630**	
NSI4	0.102 (0.077)	0.335 (0.281)	0.259 (0.204)	4.455**	
FSTS	0.324 (0.234)	0.482 (0.322)	0.380 (0.314)	1.010	0.487**

^a Standard deviations are in parentheses.

^b MANOVA analysis excluded RDI2.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.001$

Table 3. ANCOVA and MANCOVA analysis incorporated covariates

	ANCOVA F							MANCOVA Wilki's λ ^a
	RDI10	NSI10	RDI6	NSI6	RDI4	NSI4	FSTS	
Strategy	1.25	0.82	1.27	1.43	3.84**	0.22	0.61	0.551
<i>Covariates:</i>								
GDPCAP	2.54	1.17	0.67	0.15	7.67**	3.38*	0.00	0.660*
EPI	0.71	1.62	0.18	1.13	4.24**	1.93	1.89	0.595**
Size	5.89**	17.70***	4.06*	18.05***	4.64**	13.97***	0.19	0.604**

^a MANCOVA analysis excluded FSTS.

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.001$

4. Discussions and Conclusions

This study examined how construction firms devise environmental strategies on their internationalization profile from the aspect of global deployment and their deployment across developed and developing regions. The study successfully examined the relationship between a construction firm's environmental strategy, aligned with RBV perspectives, and its degree of internationalization. Three environmental strategies emerged from our clustering, which are reactive, preventive, and proactive postures in environmental management. Such classification, rooted in RBV theory, is useful in delineating the competitive advantages embedded under complex configuration of bundles resources. Literally, a resource must be valuable, rare, inimitable, and supported by tacit skills or socially complex organizational processes in order to create sustained competitive advantages [21], thereby strategic environmental capabilities could convey sustained competitive advantages to multinational construction firms.

We found an interesting contradiction between strategic importance of preventive and proactive strategy in developed regions, as the results of geographical extensity and geographical concentration contravened each other. The evidence present here, suggests that construction firms adopting proactive strategies in developed regions were the highest regionally diversified, but not the widest spread among the three clusters. We speculate one of the

possibilities is attributed to market characteristics. Although firms that adopt proactive strategies could maximize business opportunity in developed regions better than in developing regions, the market of customers seeking advanced environmental services and performances is yet geographically dispersed and niche in developed regions. In any case, firms that pursue the reactive strategy were always the least geographical diversified among all clusters.

This study has three managerial implications in environmental management and internationalization, stemming on the strategy posture adopted by the construction firms. First of all, it is essential for multinational construction firms to pay more attention to their environmental management capability development, as firms that adopt the reactive strategy would lag behind in international deployment. Second, for construction firms that wish to expand business in terms of network extensity, the preventive strategy is able to satisfy the diverse business environment across developed and developing regions. Lastly, firms pursuing proactive strategy might not be outstanding in network extensity. Despite, firms pursuing proactive strategy envision the importance of environmental sustainable business, and deploy their operation where the regions and countries could enhance their firm-specific advantages and organizational environmental capabilities. In this respect, firms that adopt proactive strategy should aim to deploy at countries that bestow learning opportunities of sustainable construction in the process of internationalization.

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