Determinants of the Firm's Environmental Performance

Knudsen, Thorbjørn

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By

Thorbjørn Knudsen
University of Southern Denmark/ Odense University,
Department of Marketing, Campusvej 55, DK-5230 Odense M, Denmark
Tel: +45 6550 1000, Fax: +45 6615 5129, E-mail: tok@sam.sdu.dk

Tage Koed Madsen
University of Southern Denmark/ Odense University,
Department of Marketing, Campusvej 55, DK-5230 Odense M, Denmark
Tel: +45 6550 1000, Fax: +45 6615 5129, E-mail: tkm@sam.sdu.dk

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Abstract

The purpose of the present article is to contribute to a more detailed understanding of the determinants of the firm's environmental performance. We pursue this aim by formulating a schematic theoretical model including a number of antecedents, mediators and consequences that are important according to the literature on environmental management and corporate greening. In addition, the model includes market orientation and the firm's level of internationalization as possible determinants of environmental performance. Unfortunately, the previous empirical research on environmental management and corporate greening has not yet developed the measures needed to achieve a reasonable level of construct validity. To fill this gap, we complement previous research by developing and refining the multi-item scales necessary to measure the constructs of our theoretical model. We use a series of nested covariance structure models to test our theoretical model on survey data from 1995 and 1999.

Determinants of the Firm's Environmental Performance

Introduction

The growing importance of the industrial firm's response to environmental issues can be witnessed in a prolific but somewhat heterogeneous literature on environmental management and corporate greening (Dobers, Strannegård and Wolf 2000; Fischer and Schot 1993). As noted in the introduction to Starik, Marcus and Ilinitch (2000), the history of scholarship focusing on environmental management is relatively brief and has often followed practice closely. Despite the rapid increase in empirical studies, more serious efforts in moving beyond the mere descriptive level have been relatively scarce. There is however a few recent studies that mark out promising paths for the future by decisively moving beyond the mere descriptive level. As can be witnessed in the recent *Academy of Management Journal* special research forum on "The Management of Organizations in the Natural Environment" (Starik et al. 2000) these studies have made significant progress in both conceptual development and application of rigorous methods for statistical testing. Much however remains to be done in terms of theoretical development and empirical work.

Concerning theoretical development, a number of studies have identified external stakeholder pressures (especially from authorities) as the antecedents of the firm's environmental performance. Other studies have focussed on the importance of internal drivers, such as champions that promote the environmental cause within the firm. The studies reported in Starik, Marcus and Ilinitch (2000) however make further progress by adopting a theoretical framework where internal organizational factors (such as competence building, information dissemination and incentives) mediate the external antecedents in the form of regulatory and stakeholder pressures.

The purpose of the present article is to contribute to a more detailed understanding of these internal organizational mediators as determinants of environmental performance. We pursue this aim by formulating a schematic theoretical model including a number of antecedents, mediators and consequences that have been emphasized as important in the literature on environmental management and corporate greening. The proposed model is tested on survey data from 1995 and 1999. Despite the popularity of survey data in previous research on environmental management and corporate greening, little effort has been devoted to develop measures with reasonable levels of construct validity. In order to test our theoretical model we therefore complement previous research by developing and refining the

multi-item scales necessary to measure our theoretical constructs. The paper proceeds as follows. First, we present our theoretical model and provide the background for the hypotheses that motivate this model. Second, we present the questionnaire data used to test the theoretical model. Third, we describe the procedures used for scale development and refinement. Fourth, we present the findings pertaining to the test of the theoretical model. A discussion on the findings concludes the article.

Background and Hypotheses

The following schematic model, showed below in Figure 1, summarizes the theoretical relations among the constructs included in our study. The model consists of three dimensions: outcomes in terms of firm-level environmental performance and internationalization, mediating factors that contribute to increasing the firm's environmental performance and its level of internationalization, and internal and external antecedents. The model includes uncertainty related to environmental issues and the industry-level visibility of such issues as external antecedents. The proposed relationship between market orientation and the specific activities of the firm's EH&S function pictures these domains of activity as separated by their distinct logic and professional cultures. The proposed model is motivated in the following.

FIGURE 1

Environmental Proactiveness

The empirical literature on environmental management and corporate greening implies a straightforward relation between the visibility of environmental issues and firm-level environmental proactiveness. To the extent that environmental issues become visible and urgent within a particular industry they may invoke response from important stakeholders (customers, authorities, media and so forth) and thus influence the competitive fate of the firm (see e.g. Fischer and Schot 1993; Hoffman 1999; Mitchell, Agle and Wood 1997; Sharma and Vredenburg 1998). In order to pre-empt stakeholder response, the firm will tend to become increasingly proactive as environmental issues become more visible (Kent and Hellriegel 1991; Madsen and Ulhøi 1996; Sharma and Vredenburg 1998).

Hypothesis 1a: The greater the visibility of environmental issues, the greater the environmental proactiveness.

According to the evidence contained in a large number of empirical studies (e.g. Fischer and Schot 1993; Lewis and Harvey 2001), firms experience complexity, risk and uncertainty from environmental problems.[1] Different causes for this state of affairs have been identified. A number of empirical studies have inferred that lacking institutionalised practises and an unstable regulatory regime are prominent causes for firm-level uncertainty related to environmental issues (Hoffman 1999). It has further been reported that environmental problems have an inherent complexity (Lewis and Harvey 2001). Due to complex and often conflicting stakeholder claims, the firm-level uncertainty related to environmental issues will tend to be aggravated (Hoffman 1999; Kent and Hellriegel 1991; Sharma and Vredenburg 1998). Uncertainty related to environmental issues thus creates strategic uncertainty. As this strategic uncertainty decreases, we argue that firm-level environmental proactiveness increases. According to a number of empirical studies (e.g. Wolff 1996), decision-makers faced with environmental issues choose between three strategies: proactive, reactive, or wait-and-see. An important reason for adopting the policy of wait-and-see is the financial risk associated with committing the firm to one course of action in an uncertain strategic environment (Shell's problems with dumping the Brent Spar oil rig is a case in point). As the uncertainty related to environmental issues decreases we therefore expect that firms will have a greater tendency to adopt environmental proactiveness

Hypothesis 1b: The less uncertainty regarding environmental issues, the greater the environmental proactiveness.

Environmental Information Processing and Environmental Performance

According to Sharma and Vredenburg (1998), roughly three streams of literature have aimed to link environmental concerns to strategic issues. One stream of literature has focused on the concept of sustainable development and the corporation's broader societal role. A second stream of literature, the "eco-efficiency" literature, has advocated for applying the traditional economic approach to the natural environment according to which the firm must aim to realise a cost-efficient utilisation of natural (and other) resources. Following Porter and van der Linde (1995), a third stream of literature has argued that environmental policies if devised from a strategic perspective may inspire innovation.

[1]In the present work we understand complexity as a high number of interactions among effects, i.e. there is complexity when the number of interdependencies among effects is high. Uncertainty refers to what is normally understood as Knightian or Keynesian uncertainty where point probabilities are not assigned to outcomes. Risk refers to the expected variance of outcomes (which presupposes the assignment of point probabilities).

A shared overlap of the three streams of literature is that greater environmental proactiveness will also increase the firm's processing of environmental information. Environmental proactiveness is an offensive strategy on part of the firm with respect to communication (disclosure of environmental information), the quality of information (development of environmental measures, increased investments in such measures, and uncovering information in up- and downstream processing) and the implementation and/ or certification of environmental management systems. According to the sustainability literature (e.g. Fischer and Schot 1993), the proactive firm will need to uncover information about its environmental performance and it needs to communicate with its stakeholders (particularly authorities) regarding their evaluation of the firm's environmental conduct. Such information needs to be discussed within the firm, environmental policies must be defined and revised, choices regarding particular technologies must be made and so forth. According to the eco-efficiency literature, information must be gathered in order to make informed choices on the basis of cost-benefit analyses. Porter and van der Linde's (1995) argument further implies that information is uncovered as a result of innovative efforts. In consequence, these contrasting streams of literature all imply that greater environmental proactiveness entails greater environmental information processing.

Hypothesis 2: The greater the environmental proactiveness, the greater the environmental information processing.

By environmental performance" we understand the adoption of environmental practices such as new process technology, product design and administrative practice that reduce the firm's environmental impact on the natural environment. By uncovering information regarding the environmental impact of alternative technological options the firm is also in a position to improve its environmental performance. According to our line of argument, the tendency of the firm to actually choose an environmentally better technology will increase if there is less uncertainty and environmental issues become more visible within the industry in which it operates. In this case, there will be greater environmental proactiveness and environmental information processing will mediate better environmental performance.

Hypothesis 3: The greater the environmental information processing, the better the environmental performance.

Market Orientation and Internationalization

We use Jaworski and Kohli's (1996, p. 131) process oriented definition of market orientation and define the meaning of this construct as "the organizationwide generation of market

intelligence pertaining to customers, competitors and forces affecting them, internal dissemination of the intelligence and reactive as well as proactive responsiveness to the intelligence." Recently, Diamontopoulos and Cadogan (1996) explored the notion of market orientation in an export context. Their examination of the way market intelligence is generated, disseminated and responded to by exporting firms also necessitated an analysis of the coordination of such activities. As showed in the following this finding is consistent with an unexpected emergent finding of the present study, which was inspired by the need to refine the original MARKOR constructs. Based on in-depth interviews with British exporters, Diamontopoulos and Cadogan (1996, p. 45) found that exporting firms with high market orientation behaved as they did for the reason that their long-term survival depends on their ability to be market oriented and that they have the resources required to be market oriented. Our argument is related to this finding, but we see marketing orientation as an antecedent to exporting behaviour. Because market orientation reflects a firm-specific capability (Teece, Pisano and Shuen 1998) in generating, disseminating and responding to market stakeholders, we argue that an increased export is caused by an increased awareness of market opportunities on foreign markets.

Hypothesis 4: The greater the market orientation, the greater the firm's sales on foreign markets.

Market Orientation and Environmental Performance

It is widely believed that a key to improving the firm's environmental conduct is better integration of the Environment, Health and Safety (EH&S) function into the other functions of the firm. For example, Wolff (1996) considers how environmental management can be integrated in the firm and the consequent improvement in environmental performance. Most companies, however, have not yet followed this advice (Fischer and Schot 1993; Madsen and Ulhøi 1996). The functional isolation of the EH&S function is pertinently called a "green wall" by Wolff (1996). An important aspect of this functional isolation is the low involvement in environmental issues that particular functions (e.g. accountants) manifest (Bebbington et al. 1994). As a result of this, the integration of environmental issues tends to be uneven across functions (Bebbington et al. 1994; Wolff 1996). The firm's EH&S function integrates external environmental issues but further organizational diffusion is impeded by the relative isolation of the EH&S function (Wolff 1996). A possible explanation of this uneven organizational integration of environmental issues is the distinct professional culture related to particular organizational functions (Wolff 1996). Hence the influence of distinct cultures particular to

different professions and the institutionalized practices of different professions might co-influence the (lack of) integration of environmental issues in firms. Because of the tendency raising a "green wall" that isolates the EH&S function we argue that market orientation will not influence the firm's environmental proactiveness or the level of its environmental information processing. We avoid stating the null-hypotheses but test the proposed relations.

What about the influence of market orientation on environmental performance? We believe that market orientation promotes a logic and professional culture that deviates from the logic and culture promoted in the EH&S function. Only when customers demand high environmental quality the two forms of logic and culture may overlap. The firms in our sample do not belong to the sector producing environmental technologies and services, and for these firms there is no sign, however, that this should be the case. Accordingly, we hypothesize:

> *Hypothesis 5: The greater the market orientation, the less the environmental performance.*

Although we have argued that the direct effect of market orientation on environmental performance is negative, market orientation has a possible positive indirect effect. Recently, Porter and van der Linde (1995) argued that growing societal pressures (e.g. from governments or customers) for better environmental conduct can induce environmental innovation, entailing increased product value and/or more efficient resource allocation and thus lower costs. Both effects will increase the competitiveness of the particular firm or industry being the first to raise their level of environmental conduct. This led to the claim that improved environmental conduct may lead to strategic advantage and thus economic gains.

Without clearly stating the case, the argument must build, to some extent, on the assumption that the buyers ascribe value to improved environmental conduct. The following hypothesis is based on Porter and van der Linde's (1995) argument. As the firm increasingly includes foreign customers and thus increases the sales on foreign markets, it will tend to be put under pressure by more demanding customers, and so forth. Assuming that the buyers ascribe value to improved environmental conduct, we hypothesize:

> *Hypothesis 6: The greater the firm's sales on foreign markets, the better the environmental performance.*

Data Collection

Sample I, 1995. The population of the 1995 survey was defined as all Danish firms producing hazardous waste as a by-product of their primary activities. Examples of such firms include

paint producers, the medical industry, electroplating firms, and a number of other firms within the iron, metals or chemical industries. The total number of firms included in the survey totalled 536 and the net response rate was 41%. Among the largest producers of hazardous waste 31 firms participated in qualitative interviews of one or two hours duration. The interviews were semistructured and served to cover the topics of the questionnaire in depth.

In the large firms the respondents were typically the person in charge of the Environment, Health and Safety (EH&S) function. In firms without an EH&S function the respondent was typically the CEO of the company. In both instances there is no doubt that the respondent possessed adequate knowledge. Extensive non-response analyses were conducted among the medium-sized non-respondents; these analyses indicate no substantial discrepancy between respondents and non-respondents (a summary of these analyses is available from the corresponding author). Consequently, with a high degree of confidence, the findings can be generalized to the population.

Sample II, 1999. To ensure that the sample included sufficient variation, the target population was defined as production companies belonging to at least one out of six industries chosen according to two criteria: (1) the degree of emission typically associated with firms in these industries (low, medium or high), and (2) the industry's location in the value chain (industrial market, consumer market). The selected industries were the chemical-, medical-, paint-, electronics-, textile- and dairy-industry. In operational terms, the industries were identified on the basis of the firm's NACE code for 1999 as registered in the publicly available database CD-Direct. A limit of employees >10 was used as cut-off point.

Using these criteria resulted in a sampling frame of 1007 firms with more than ten employees. An initial contact procedure (telephone interview) was applied in order to increase the response rate and to record information that allowed a screening of firms not belonging to the sampling frame. According to this information, the sampling frame was adjusted to 908 firms. Out of these, 545 firms accepted to participate in the survey and were mailed a self-administered questionnaire to be returned by surface mail. Non-respondents were subsequently contacted by telephone in order to inspire response or, alternatively, elucidate a reason for non-response. The 545 firms accepting participation were divided into two groups: group 1 comprising 146 large or medium-sized firms with 50 or more employees, and group 2 comprising 399 small firms with less than 50 employees.

The large or medium-sized firms were mailed two questionnaires: (1) a questionnaire (referred to as type A) directed to the firm's CEO, asking for detailed information on the strategic level, and (2) a questionnaire (referred to as type B) directed to the firm's

environmental manager (or the person with equivalent responsibility), asking for detailed information regarding the firm's environmental practices. The small firms were only mailed one questionnaire (referred to as type C) directed to the firm's CEO, comprising a reduced form of the combination of questionnaires A and B.

A total of 280 out of 908 firms returned at least one completed questionnaire to yield an overall response rate of 30.8% (27.0% if we adjust for the influence of 2 questionnaires on the response rate). In view of the rather large material that had to be completed and the relatively modest interest in the contents of the survey on the part of at least some firms in the sample frame, this result compares favourably with the response rates commonly reported in similar surveys.

Instrument Development: The 1995 Study

In the 1995 study we started developing a scale for measuring uncertainty regarding environmental issues and information processing related to such issues. On the basis of a literature study a large pool of items was generated for each of the two constructs and a subset of items was selected to tap the domain of each of the two constructs as closely as possible. To reduce ambiguities a preliminary version of the questionnaire was administered among executives of seven firms in the population. The items were then refined and the questionnaire was distributed to all the firms in our sample. As part of the sampling procedure we further tested the questionnaire for clarity and appropriateness by conducting 31 interviews. During the interviews the managers were asked to complete the questionnaire including the information processing and uncertainty constructs and to indicate any ambiguity etc. All items in the 1995 study were scored on a 5-point scale ranging from "strongly disagree" to "strongly agree."

Policy driven information processing related to environmental issues was measured on a 5-item scale. Based on a comprehensive literature review we included both process (discussion and involvement) and state variables (the presence of a clear environmental policy and the distribution of knowledge about such policy). The scale measures policy driven information processing as companywide discussions of environmental issues interwoven with items regarding environmental policy (see Appendix). Due to the satisfying reliability (α= 0.87) we decided to retain the information processing scale in the 1999-study.

Uncertainty regarding environmental issues was measured on a 2-item scale because scales including more items turned out to be insufficiently reliable. Since the concept of uncertainty has many meanings it should be noted that this construct captures the perceived

difficulties in representing considerations related to the natural environment in terms of operations and management. This use of the concept of uncertainty corresponds to the notion of Knightian or Keynesian uncertainty as situations in which point probabilities are not assigned to outcomes of actions (Runde 1998). The item dependent nature of Cronbach's α has to be taken into consideration when interpreting the scale-reliability of 0.60. Extrapolation using the General Spearman-Brown formula shows that a two-item α of 0.60 would increase to 0.82 in an equivalent five-item construct, assuming no loss of interitem correlation (Peterson 1994). We therefore used the 2-item scale as a basis for further development of the uncertainty scale in the 1999-study.

Instrument Development and Refinement: The 1999 Study

In the 1999 study we further developed the scales of the 1995 study and began developing scales to measure the visibility of environmental issues, environmental proactiveness and environmental performance. All items in the 1999 study were scored on a 7-point scale ranging from "strongly disagree" to "strongly agree." In the following we assess construct validity by unidimensionality, within-method convergent validity, reliability, stability and across-method convergent validity, and discriminant validity.

According to Steenkamp & van Trijp (1991), many researchers use straightforward techniques such as coefficient α, exploratory factor analysis and bivariate correlations to assess construct validity. In the following we first use such straightforward techniques. Since covariance structure models provide a number of advantages over these techniques, we proceed to use Confirmatory Factor Analysis (CFA) in our assessment of convergent and discriminant validity and Structural Equations Models (SEM) to assess nomological validity. A further reason for using CFA is the fact that this method is more appropriate for the assessment of scale reliability when the individual items reflect the underlying construct to different degrees (Steenkamp and van Trijp 1991). In this case, Cronbach's α (usually slightly) underestimates construct reliability.

Prior to the further analyses we used skewness and kurtosis statistics along with diagrams to assess the distribution of the variables. Most variables were bell-shaped and slightly platykurtic (below 1.50 in absolute magnitude). The three variables with the highest kurtosis were all leptokurtic (the highest value being 4.73). Based on a formal statistical test, the data shows an excess of kurtosis (critical ratio of 4.27 for multivariate kurtosis). Since most variables only slightly depart from univariate kurtosis, the data were not transformed and we did not correct the overall model χ^2.

To assess the validity of the constructs, we proceeded as follows. To assess convergent validity, we used the total sample to compute item-to-total correlations, corrected for the item in question. Scale-reliability was assessed by Cronbach's α, using the total sample. We used Nunnally's (1978) recommended and widely accepted (Peterson 1994) minimum level of 0.70 for exploratory research. To assess across-methods reliability we then computed α for each of the two groups of firms included in our study. As described above, different questionnaires (methods) were used for the two groups of firms. When reliability for *both* samples exceeded 0.70, it is evidence of across-method reliability. Along with a brief description of each scale, we report these assessments in the following paragraphs. Further refinements are reported in the ensuing section.

Policy driven information processing related to environmental issues was measured by the 5-item scale developed in the 1995 study. Cronbach's α for the total sample was 0.93, indicating very high reliability and sufficient across-method reliability (since α= 0.87 for the 1995 sample).

Uncertainty regarding environmental issues was measured on a 5-item scale. This scale used the two items from the 1995 study and then added three items developed on the basis of the interviews conducted in the 1995 study, supplemented by a literature review (see Appendix). According to the Cronbach's α of 0.84, the revised uncertainty scale was sufficiently reliable. Since the obtained value is consistent with the above prediction on the basis of the 1995 study, this indicates reliability across samples and across methods.

Environmental proactiveness was measured on a 7-item scale. This scale was developed on the basis of literature studies as well as the information, gathered in the 1995 study, on the relative importance of different environmental stakeholders. Both sources of information indicated that the authorities were the key environmental stakeholder. Since our interviews indicated that proactiveness was interwoven with the possession of appropriate knowledge about the actual legislative demands, we included a number of items that tapped these aspects of proactiveness. The α of 0.74 showed that the proactiveness scale was a sufficiently reliable measure.

The visibility of environmental issues in the industry was measured on a 2-item scale chosen on the basis of the empirical literature (see Appendix). The first item taps pressure on the industry from environmental organizations, and the second one taps the industry's visibility in the media. An α of 0.71 showed that the visibility scale was a sufficiently reliable measure.

The firm's degree of internationalization was measured as the percentage of the firm's sales on foreign markets. This item was scored on an open question by which the respondent was asked to indicate the distribution of the firm's sales in Denmark, on its most important foreign market, and on other foreign markets. The inverted percentage of the sales in Denmark was used as a measure of internationalization.

Market orientation was measured by the MARKOR scale developed by Kohli, Jaworski and Kumar (1993). Although this scale has a modest track record in terms of reliability we preferred it to the alternatives because we, like Jaworski and Kohli (1996), believe it is useful to define market orientation as the organizationwide generation of market intelligence, internal dissemination of the intelligence and responsiveness to the intelligence. The MARKOR scale also seems to be valid across national cultures and organizational contexts (see e.g. Jaworski and Kohli 1996). The assessment of scale-reliability for the *intelligence generation* construct showed that this scale was not reliable (α =0.60). According to the α (0.74) for the *intelligence dissemination* construct, this scale was a sufficiently reliable measure. Also the *responsiveness* construct was a sufficiently reliable measure (α=0.73). Since the MARKOR scales were developed with samples including large, successful and market-oriented firms (see e.g. Kohli and Jaworski 1993), our results indicate the need to further develop and refine these scales when smaller, less successful and less market-oriented firms are sampled. In the ensuing, we provide a step in this direction by using a subset of seven out of the original twenty MARKOR items to form scales that are reliable across the two groups of firms included in our study.

Environmental performance was measured on a 3-item scale chosen on the basis of the empirical literature (see Appendix). The three items measure the firm's reduction of the harmful impact on the environment by its investment in environmental technology and systems. A coefficient α of 0.74 indicates sufficient reliability.

To further assess predictive validity of the environmental performance scale, we collected two sets of data. First, we collected publicly available information on the firms' actual use of water, energy (electricity, gas, oil), the amount of inputs used, emissions (noise, smell) as well as the amount of waste produced (six categories from water over disposable waste to hazardous waste). These data are available for 1998 and 1999 for those firms that have chosen, or are required, to submit their environmental data to the authorities. Unfortunately, these data were only available for 3 to 30 firms, depending on the particular indicator. In seven cases (pertaining to the firms' use of water, gas and electricity as well as the amount of wastewater produced) the environmental performance scale was correlated with

these measures, and all correlations were negative. This indicates predictive validity of the environmental performance scale since better environmental performance should be negatively related to the firm's use of resources, emissions, and so forth.

Second, we collected questionnaire data on the firms' actual knowledge and use of nine environmental management systems, including BS7750, EMAS, and ISO14000. Also the following six programmes without certification were included: CERES, ICC, CEPE, Responsible Care, environmental branding, a national cleaner technology programme. Each of these nine items was scored on the following scale: "do not know", "know but do not use", "use". Using our performance measure as the dependent variable, we conducted nine ANOVA analyses. In all nine cases the firms that had answered "do not know" scored lower on the environmental performance scale than those firms answering "know but do not use" or "use". Six analyses were significant ($p < 0.05$) and the remaining three were significant at $p< 0.10$. This establishes predictive validity of the environmental performance scale.

Refinement of the Measures

Unidimensionality. To further assess unidimensionality, we followed the procedure used by Germain, Dröge and Daugherty (1994). All eight constructs, including the three MARKOR constructs, were subjected separately to a principal components analysis. In the case of the information processing, the uncertainty, the visibility, and the environmental performance scales only the first eigenvalue was greater than one, indicating sufficient unidimensionality.

In the case of the environmental proactiveness scale two eigenvalues were larger than one. The principal components analysis further showed that the source of this problem was the three items that tapped the influence of the authorities. These items were removed and we retained a four-item scale ($\alpha= 0.71$) in which only the first eigenvalue was greater than one. All item-to-total correlations of the revised scale exceeded 0.48, which shows an improvement in convergent validity. Additional estimations of α however indicated insufficient reliability across the two groups of firms (see Appendix).

The principal components analyses further showed that two or more eigenvalues were larger than one for each of the three MARKOR constructs, indicating insufficient unidimensionality. We therefore used exploratory factor analyses to extract components from the entire pool of twenty MARKOR items. This resulted in three components out of which two could be retained as reliable scales. The first scale included seven items that all tap aspects of marketing orientation related to interdepartmental interaction. We will therefore refer to this emerging construct as "departmental interaction". This scale was sufficiently

reliable (α= 0.81) and the item-to-total correlations was 0.44 for one item and exceeded 0.50 for the remaining six items, indicating sufficient convergent validity. Additional estimations of α indicated reliability across the two groups of firms (see Appendix).

The second revised MARKOR scale included three items that tap coordination aspects of marketing orientation. We will therefore refer to this emerging construct as "coordination of market information". This scale was sufficiently reliable (α= 0.71) and all the item-to-total correlations exceeded 0.50, indicating sufficient convergent validity. Additional estimates also indicated reliability across firms (see Appendix).

To further assess convergent validity, all constructs were subjected separately to confirmatory factor analysis, CFA. In these models we adopted the fitting procedure suggested by Anderson and Gerbing (1988). Instead of arbitrarily constraining the factor loading of one item to unity we constrained the variance of the common factor to unity, i.e., all factor loadings were freely estimated. To test unidimensionality we assessed the overall fit of each model. This test provides the necessary and sufficient information to determine whether a set of items is unidimensional (Steenkamp and van Trijp 1991). These analyses showed a reasonable fit with a one-construct model for all the revised scales in terms of fit indices (as shown in the Appendix all CLI> 0.90 and TLI> 0.90). The revised MARKOR scale, "departmental interaction" however improved considerably in fit by deleting three items. The further revised interaction scale included four items and obtained a very good fit ($\chi^2(2)$= 1.28; TLI= 1.00, CFI= 1.00). Since the visibility scale consists of two items, it was only possible to assess the model fit by imposing unreasonable overfitting constraints. Imposing these constraints (equal variance of the two items and construct error equal to one) we obtained a rather low but sufficient model fit, ($\chi^2(1)$= 21.12; TLI= 0.90, CFI= 0.95). A further test of unidimensionality was conducted by examination of the theoretical model. As described in more detail below, all items loaded significantly and substantially (>0.50) on their underlying factors. Examination of the standardised residuals for this model showed that only three were greater than the commonly accepted limit of 2.58 in absolute magnitude (Steenkamp and van Trijp 1991). The value of these residuals was 2.94, 3.08, and –2.64. These findings and the acceptable fit of all the revised measurement models for the individual constructs demonstrate adequate unidimensionality.

Convergent validity. Since all the separate CFA models for the individual scales had an acceptable overall fit, it can be concluded that our revised measures are unidimensional. This is a first requirement for convergent validity (Steenkamp and van Trijp 1991). To obtain convergent validity, the separate CFA models must also show significant and substantial

item-construct correlation (Steenkamp and van Trijp 1991). We adopted the commonly used criterion for substantial item-construct correlation (Steenkamp and van Trijp 1991), that is, in all the separate CFA models the factor regression coefficient on each item should exceed 0.50. As shown in the appendix, this criterion is met by all item loadings of the revised scales (all coefficients were highly significant, $p< 0.001$). Consistent with our findings using principal components analysis, the three items of the proactiveness scale (item 3, 5 and 7) that were deleted had loadings below 0.50. In the separate CFA's, the original MARKOR constructs had a number of items with loadings below 0.50.

Reliability. As we have seen in the case of the environmental proactivenesss scale and (two of) the MARKOR constructs, unidimensionality was not obtained, despite a coefficient α above 0.70. The reason for this is simply that coefficient α is a measure of reliability and therefore cannot be used to assess unidimensionality (Hattie 1985; Steenkamp and van Trijp 1991). As mentioned above, there is a further problem with coefficient α when each item not to the same degree reflects the underlying construct. We therefore computed composite reliability coefficients for each scale as suggested by Jöreskog (1971). In addition we evaluated the amount of extracted variance and used the criterion of 0.50 as a minimum value.

As shown in the appendix, all the revised scales obtained composite reliability coefficients above 0.50. For the uncertainty scale and the environmental information processing scale, the composite reliability coefficient and coefficient α had the same value. For the other scales, coefficient α slightly underestimated reliability (by 0.02 or less) indicating that each item does not reflect the underlying construct to the same degree. An examination of the variance extracted showed that, apart from the revised proactiveness scale (extracted variance = 0.39) and the revised MARKOR scale "coordination" (extracted variance = 0.46), all the revised scales exceeded the cut-off value of 0.50. It can thus be concluded that all the revised instruments are acceptably reliable and that most of them are sufficiently parsimonious in terms of the variance extracted.

Stability and across-method convergent validity. We were not able to obtain data allowing a test-retest analysis, but obtained some evidence on stability by comparing the environmental information processing scale and the uncertainty scale across the 1995 and the 1999 study. Also evidence that indicated across-methods convergent validity was obtained by assessing reliability across the instruments administered to the small and the larger firms (all the scales except the environmental performance scale were sufficiently reliable across groups).

Discriminant validity. Using CFA, we conducted a comparison among each of the twenty-one possible pairs of the seven revised constructs. In each pairwise analysis we estimated two models. One model constrained the correlation coefficient between the constructs to unity, and the second model estimated this parameter freely. We then conducted a χ^2 difference test on the two models. Discriminant validity is obtained when this difference is significant, implying that the two constructs in question are not perfectly correlated. In each case the correlation coefficient was substantially lower than one and the χ^2 difference test was highly significant, indicating sufficient discriminant validity.[2]

In sum, we obtained evidence supporting unidimensionality, convergent validity, and discriminant validity for all the revised scales. Across-methods convergent validity was obtained for all the revised scales except the environmental performance scale. We also obtained evidence of stability for the two scales where this analysis was possible to conduct (the environmental information processing and uncertainty scales). Although we demonstrated predictive validity for the environmental performance scale, further refinement is necessary to obtain construct validity.

Findings and Discussion

The hypotheses were tested on the total sample by estimation of a structural equations model including each of the constructs as an unobserved latent variable. We use the sequential testing procedure proposed by Anderson and Gerbing (1988). The following eight nested models were estimated:

(1) M_S, the saturated model.
(2) M_N, the independence model (null structural model).
(3) M_T, the hypothesized theoretical model, *including* all the hypothesized effects.
(4) M_{C1}, the next most likely constrained model. This model constrains the effect of internationalization on environmental performance to zero.
(5) M_{C2}, an alternative constrained model. In addition to the constraint of M_{C1}, the effect of market orientation (revised) on internationalization and environmental performance was constrained to zero.
(6) M_{U1}, the next most likely unconstrained model. M_{U1} includes the effects of M_T and in addition relaxes the constraints of the higher order MARKOR factor on the proactiveness and information processing factors.

2 A copy of these analyses can be obtained from the corresponding author.

(7) M_{U2}, a further unconstrained model. M_{U2} includes the effects of M_{U1} and in addition relaxes the constraints of the uncertainty factor and the visibility factor on the environmental information processing and environmental performance factors.

(8) M_{MARKOR}, an alternative to M_T that substitutes the revised MARKOR construct for the original MARKOR construct. Apart from this change all other imposed constraints are identical to M_T.

To test the relative fit of the models, we used Anderson and Gerbing's (1988) recommended two-step modelling approach. In addition to assessment of the overall model fit by sequential χ^2 difference tests, we used Bentler's comparative fit index (CFI) and the Tucker and Lewis index (TLI).[3] In view of the relatively small sample size and the slight excess skewness and kurtosis of the data, we used Maximum Likelihood (ML) estimation (Steenkamp and van Trijp 1991). An important advantage of the employed two-step modelling approach is that it allows an independent assessment of the structural model and the measurement model. This assessment is based on a pseudo χ^2 test (Bentler and Bonnett 1980) in which the χ^2 for M_S (the smallest possible value for any structural model) is tested with the number of degrees of freedom of M_N (the largest number of degrees of freedom for any structural model). As shown in Table 1 below, this pseudo χ^2 value was significant ($\chi^2(378)= 590.60$, $p< 0.001$), indicating problems in the measurement model caused by measurement error in the data. Despite this problem in the measurement model, the sequential test-procedure allows assessment of nomological validity by asymptotically independent tests of the structural models.

TABLE 1

Following Anderson and Gerbing's (1988) proposed procedure, we first assess the difference between the theoretical model M_T and the saturated model M_S. This difference was not significant ($\chi^2(10)= 12.07$, $p= 0.28$). The theoretical model M_T also had a significantly better fit than M_{C1} ($\chi^2(2)= 7.03$, $p= 0.03$). Since neither the difference between M_T and M_{U1} was significant ($\chi^2(2)= 0.80$, $p= 0.67$), nor the difference between M_T and M_{U2} ($\chi^2(4)= 3.95$, $p= 0.41$), M_T is accepted and the nomological validity of the theoretical model is supported. Relaxing the additional constraints in M_{U1} or M_{U2} do not significantly contribute to M_T's

3 These indices were used since they all correct for degrees of freedom, an important requirement for the test of nested models.

explanation of the construct covariances, and M_T is preferred on grounds of parsimony. In other words, adding the additional effects of the higher order MARKOR factor on the proactiveness and environmental information processing factors does not significantly contribute to the explanation. As can be seen from Table 2, neither of these effects were individually significant, supporting the hypothesized tendency to raise a "green wall" that isolates the EH&S function from the general activities of the firm as they are reflected in its market orientation.

So far, we have established that the theoretical model $M_{T,}$ including all the hypothesized effects, is supported by the sequential χ^2 test. We next utilised the sequential χ^2 test to compare M_T with the further constrained alternative M_{C2}. As shown in Table 1, M_T fitted better than M_{C2} ($\chi^2(3)= 13.33$, $p < 0.004$). M_{C2} applies the constraints of M_{C1} and further constrains the effect of market orientation (revised) on internationalization and environmental performance to zero. Since M_T obtained a better fit we can conclude that market orientation actually adds significantly to the explanation of the firm's environmental performance although this effect has a different source than the firm's specific environmental activities.

Finally, we compared M_{MARKOR}, the model where the original MARKOR construct is used, with M_T that employs the revised MARKOR construct. As shown in Table 1, M_T fitted better than M_{MARKOR} ($\chi^2(417)= 840.57$, $p < 0.000$), supporting the nomological validity of M_T. In addition to establishing that the theoretical model $M_{T,}$ including all the hypothesized effects, is supported by the sequential χ^2 test, we have further established that the revised MARKOR construct adds significantly to the explanation of the firm's environmental performance and also obtains better fit than the original MARKOR construct. When all the results of the sequential test-procedure are considered jointly, they support the nomological validity of our proposed model, M_T. We can now turn to the test of the hypotheses.

TABLE 2

Table 2 shows the results obtained from the estimation of the theoretical model, M_T. As can be seen, all the hypotheses are supported, apart from H5 and H6. Moreover, the explanatory power of the model is quite high: the model accounts for more than 50% of the variance in the latent factors used to model environmental proactiveness, environmental information processing and environmental performance. Against this result, only 7-8% of the variance in the firm's internationalization (measured by the percentage of sales on foreign markets) is explained. Although market orientation increases the firm's internationalization

significantly, the effect is modest. The rejection of H6 further shows that the firm's internationalization does not significantly influence its environmental performance. Interestingly, the relation between market orientation and environmental performance is significant but the sign is contrary to H5 positive. A possible reason for this finding could be that we use a revised measure of market orientation. An examination of the test of M_{MARKOR} including the original MARKOR construct however shows that this is not the case. Market orientation increases the firm's environmental performance, but it does so through a separate causal chain that complements the specific environmental causes represented by environmental proactiveness and environmental information processing. This does not refute the hypothesis of separate professional cultures underlying H5 but suggests that these logics constitute complementary rather than competing effects.

Discussion and Conclusion

This study has developed the scales necessary to measure a number of constructs considered as important antecedents and mediators of environmental performance in the literature on environmental management and corporate greening. According to the above assessment, all the "environmental" scales obtained sufficient reliability, convergent validity and discriminant validity.

Despite the need for good measures of constructs such as environmental uncertainty only very few previous studies have attempted to develop such scales. One of the rare exceptions is Lewis and Harvey's (2001) promising "perceived environmental uncertainty" scale. Lewis and Harvey's (2001) scale employs seven subscales and 36 items whereas the uncertainty scale developed in the present study only uses 5 items. When researchers want a detailed assessment of the various different aspects of environmental uncertainty, Lewis and Harvey's (2001) scale could be used. By contrast, when researchers want to assess the relation between the general level of environmental uncertainty and various other constructs, the present scale is more efficient in terms of item numbers and may therefore be preferred to avoid excess questionnaire length. Lewis and Harvey's (2001) assessment of reliability and validity is based on exploratory factor analysis and coefficient α. As discussed above, these assessment criteria are insufficient and should be supplemented by additional confirmatory models (see Steenkamp and van Trijp 1991). Since the environmental uncertainty scale developed in the present study has passed these tests it may complement Lewis and Harvey's (2001) scale when this is further developed.

The present study has further used the MARKOR model as an indicator of the general competence of the firm. This allowed the assessment of the extent to which the firm's specific environmental competence (measured by its environmental proactiveness and environmental information processing) was influenced by its general competence (in managing the flows of market related information). Because the original three MARKOR constructs did not obtain convergent validity, we developed an emergent model employing seven out of the original twenty MARKOR items. A possible reason for the original MARKOR-model's insufficient validity is that the present sample includes much smaller and less market-oriented firms than the samples used by previous authors. Interestingly, the emergent model is based on two constructs that turned out to be valid across the two groups of firms included in the present study, a result that is consistent with the emphasis on coordination as a *general* problem pertaining to any form economic organization. Some of the key sources of this can be found in an extant economics literature, encompassing game theory (Schelling 1999) and the economics of organization (Milgrom and Roberts 1992). The literature on decision-making and management in organizations has further emphasized how the interaction among departments is a foundational managerial problem that must be solved in order to achieve cooperation (alignment of purpose) and coordination (alignment of information) among the employees (Simon 1997). By contrast, the firm's generation of market-related intelligence and its responsiveness are perhaps better viewed as employing specific solutions depending on the demands of the particular industry and the wide political and technological environment within which the firm operates (Milgrom and Roberts 1992).

Anderson and Gerbing's (1988) recommended two-step nested procedure supported nomological validity of the theoretical model including the hypothesized effects. The support of all the hypotheses, except H5 and H6, throws some light on the determinants of the firm's environmental performance. Uncertainty associated with environmental issues reduces the firm's proactiveness (H1b). As mentioned above, our use of the concept of uncertainty is thought to correspond to the notion of Knightian or Keynesian uncertainty as situations in which point probabilities are not assigned to outcomes of actions. When this form of uncertainty increases, the firm simply does not know what to do and possibly substitutes proactiveness for the strategy of wait-and-see emphasized in the empirical literature on environmental management and corporate greening. Previous studies have emphasized that the visibility of environmental issues may induce a proactive response from the business firm, a hypothesis (H1a) that was supported. It is important to note, however, that the realization of this effect crucially depends on the mediating factors (environmental proactiveness and

environmental information processing), as shown in the test of M_T versus M_{U2}. Reduced uncertainty and increased visibility of environmental issues will increase the firm's environmental performance, but only if the firm is environmentally proactive and has a sufficiently high level of environmental information processing.

Previous studies have found that the firm's EH&S function integrates external environmental issues, but that further organizational diffusion is impeded by the relative isolation of the EH&S function. Because of this tendency to raise a "green wall" that isolates the EH&S function we argued that market orientation will not influence the firm's environmental proactiveness or the level of its environmental information processing. As we have seen above, this was indeed the case. Nevertheless, increasing the firm's general market orientation also increased the firm's environmental performance. This effect suggests that future research must go beyond a naive call for better integration of the EH&S function. Perhaps this departmental and functional disintegration is a modular design that enables the firm to handle the uncertainty associated with environmental issues? If this is the case, the integration of the EH&S function proposed in many studies is not a cure, but a cause of further problems. The finding that the revised market orientation factor increased environmental performance further suggests that high levels of competence in the firm's general activities promote environmental excellence. Future research should therefore look deeper into the forms of organizational structures that enables the firm to develop complementary competences between the EH&S function and its marketing activities. Finally, the rejection of H6 implies that internationalization *per se* does not increase the firm's environmental performance. This finding is not inconsistent with Porter and van der Linde's (1995) claim but emphasizes the need to carefully trace the mediating factors in the causal chain that translate external pressures (such as increased visibility of environmental issues) into better environmental performance. The present study provides a step in this direction, and suggests how further may be taken.

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Figure 1:
Schematic Theoretical Model

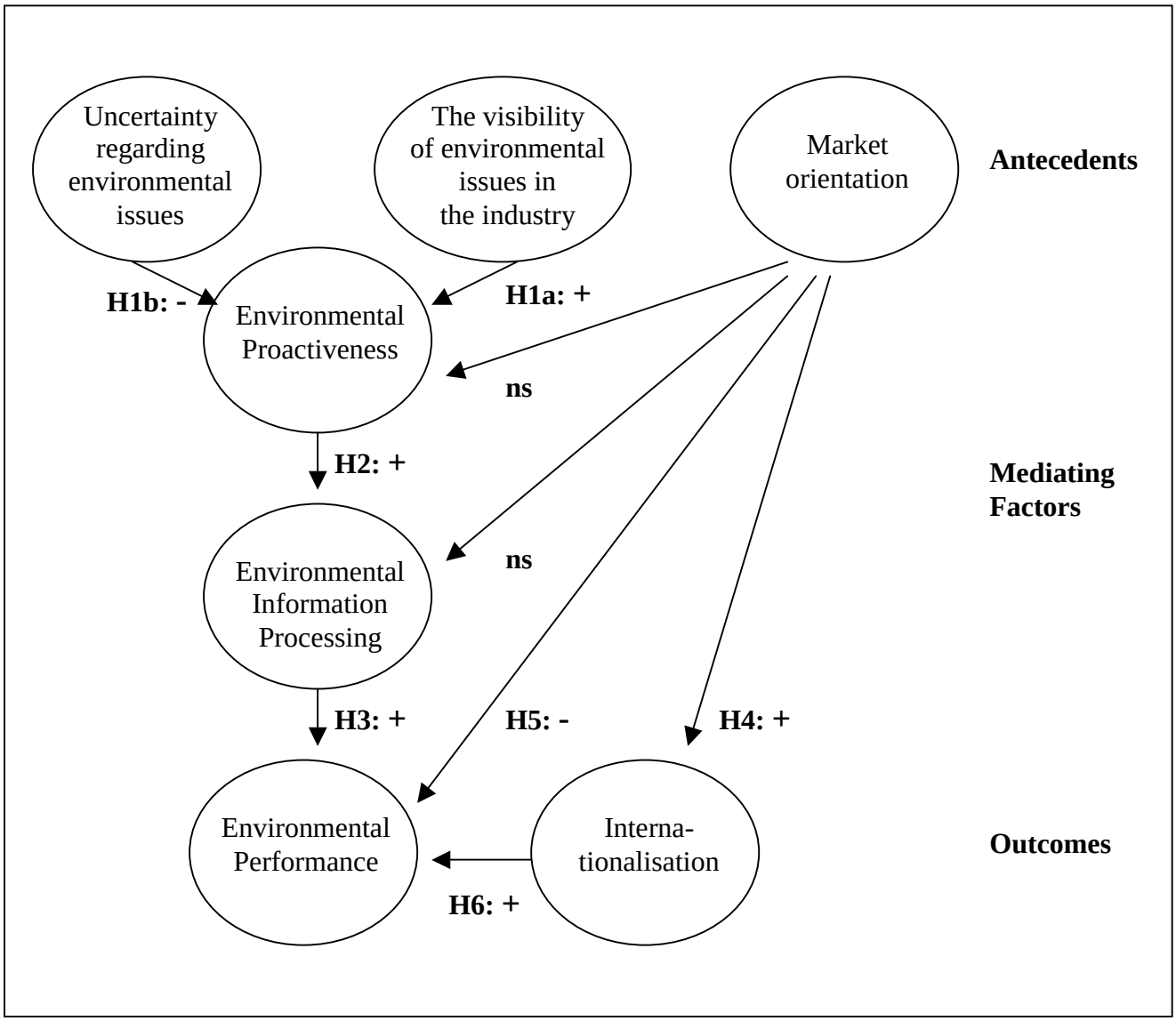

Table 1:
Goodness of fit and model comparisons

Overall goodness of fit indices						
	χ^2	**df**	**P**	**Cmin/df**	**CFI**	**TLI**
M_S	590.60	310	0.000	1.905	0.977	0.972
M_N	12743.43	378	0.000	33.713	0.000	0.000
M_T	602.67	320	0.000	1.883	0.977	0.973
M_{C1}	609.69	322	0.000	1.893	0.977	0.973
M_{C2}	615.99	323	0.000	1.907	0.976	0.972
M_{U1}	601.87	318	0.000	1.893	0.977	0.973
M_{U2}	598.72	316	0.000	1.895	0.977	0.973
M_{MARKOR}	1443.24	737	0.000	1.958	0.966	0.962
Model comparisons						
	$\Delta\chi^2$	**Δdf**	**p**	**ΔCmin/df**	**ΔCFI**	**ΔTLI**
M_T vs. M_S	12.07	10	0.281	-----	-----	-----
M_{C1} vs. M_T	7.03	2	0.030	0.010	0.000	0.000
M_{C2} vs. M_T	13.33	3	0.004	0.024	-0.001	-0.001
M_T vs. M_{U1}	0.80	2	0.670	-0.010	0.000	0.000
M_T vs. M_{U2}	3.95	4	0.413	0.012	0.000	0.000
M_T vs. M_{MARKOR}	840.57	417	0.000	0.075	-0.011	-0.011
Test of the measurement model						
	χ^2	**df**	**p**			
Pseudo chi-square test	590.60	378	0.000			

Table 2:
Estimation of the theoretical model (M_T) and the unconstrained model (M_U)

			Model: M_U		Model: M_T	
			Std. Estimate	P	Std. Estimate	P
Env. Proactiveness	←	Uncertainty	-0.43	0.00	-0.43	0.00
Env. Proactiveness	←	Visibility	0.56	0.00	0.56	0.00
Env. Proactiveness	←	Market Orientation (rev.)	-0.03	0.79	0.00	
Env. Information Proc.	←	Env. Proactiveness	0.73	0.00	0.73	0.00
Internationalization	←	Market Orientation (rev.)	0.27	0.01	0.28	0.01
Env. Information Proc.	←	Market Orientation (rev.)	0.08	0.34	0.00	
Env. Performance	←	Env. Information Proc.	0.62	0.00	0.63	0.00
Departmental Coordination	←	Market Orientation (rev.)	0.61	0.00	0.60	0.00
Departmental Interaction	←	Market Orientation (rev.)	0.71		0.71	
Env. Performance	←	Market Orientation (rev.)	0.29	0.01	0.30	0.01
Env. Performance	←	Internationalization	0.06	0.53	0.05	0.57
Item 1, Uncertainty	←	Uncertainty	0.58		0.58	
Item 2, Uncertainty	←	Uncertainty	0.70	0.00	0.70	0.00
Item 3, Uncertainty	←	Uncertainty	0.76	0.00	0.76	0.00
Item 4, Uncertainty	←	Uncertainty	0.80	0.00	0.80	0.00
Item 5, Uncertainty	←	Uncertainty	0.74	0.00	0.74	0.00
Item 1, Visibility	←	Visibility	0.65		0.65	
Item 2, Visibility	←	Visibility	0.82	0.00	0.82	0.00
Item 1, Env. Information Proc.	←	Env. Information Proc.	0.75		0.75	
Item 2, Env. Information Proc.	←	Env. Information Proc.	0.89	0.00	0.89	0.00
Item 3, Env. Information Proc.	←	Env. Information Proc.	0.88	0.00	0.88	0.00
Item 4, Env. Information Proc.	←	Env. Information Proc.	0.88	0.00	0.88	0.00
Item 5, Env. Information Proc.	←	Env. Information Proc.	0.90	0.00	0.90	0.00
Item 1, Env. Proactiveness	←	Env. Proactiveness	0.53		0.53	
Item 2, Env. Proactiveness	←	Env. Proactiveness	0.58	0.00	0.58	0.00
Item 4, Env. Proactiveness	←	Env. Proactiveness	0.70	0.00	0.70	0.00
Item 6, Env. Proactiveness	←	Env. Proactiveness	0.69	0.00	0.69	0.00
Item 1, Env. Performance	←	Env. Performance	0.73		0.72	
Item 2, Env. Performance	←	Env. Performance	0.70	0.00	0.70	0.00
Item 3, Env. Performance	←	Env. Performance	0.69	0.00	0.69	0.00
Item 9, MARKOR	←	Departmental Coordination	0.63		0.63	
Item 10, MARKOR	←	Departmental Coordination	0.85	0.00	0.85	0.00
Item 17, MARKOR	←	Departmental Coordination	0.82	0.00	0.82	0.00
Item 2, MARKOR	←	Departmental Interaction	0.68	0.00	0.68	0.00
Item 7, MARKOR	←	Departmental Interaction	0.64		0.63	
Item 8, MARKOR	←	Departmental Interaction	0.76	0.00	0.76	0.00
Item 15, MARKOR	←	Departmental Interaction	0.70	0.00	0.70	0.00
Departmental Interaction	<-->	Departmental Coordination	0.46	0.00	0.48	0.00
		Squared Multiple Correlations				
		Env. Proactiveness	0.51		0.51	
		Internationalization	0.07		0.08	
		Env. Information Proc.	0.53		0.53	
		Env. Performance	0.51		0.50	
		Departmental Interaction	0.50		0.50	
		Departmental Coordination	0.38		0.36	

Appendix: List of items used to measure each theoretical construct

Independent variables	Items	Rel./ Loadings	Reference source
Uncertainty regarding environmental issues **Reliability: 0.84** **Variance ext.: 0.51**	1. We think that the handling of environmental problems is connected with such great uncertainty that we ought to await what happens in the future. 2. We feel generally uncertain as to how to include environmental concerns into the company's acitivities and management. 3. We feel uncertain as to the extent of the costs resulting from environmental demands required by law. 4. We feel uncertain as to how to consider the environmental demands from the local, regional and state authorities. 5. We feel uncertain as to how to consider the environmental demands from the other stakeholders, apart from the authorities (e.g. customers, suppliers, media, mother company). *CFA*, items 1-5: TLI= 0.96, CFI= 0.99, $\chi^2(5)= 35.77$, p=0.00. *CFA*, items 2-5: TLI= 0.99, CFI= 1.00, $\chi^2(2)= 6.48$, p=0.04. α, 1999 survey: 0.84, (large: 0.77, small: 0.85). α, 1995 survey (items 1, 2): 0.60.	0.33/ 0.57 0.44/ 0.66 0.59/ 0.77 0.68/ 0.82 0.54/ 0.74	Hoffman (1999); Kent and Hellriegel (1991); Madsen and Ulhøi (1996); Lewis and Harvey (2001); Sharma and Vredenburg (1998).
The visibility of environmental issues in the industry **Reliability: 0.71** **Variance ext.: 0.56**	1. Our industry is often under pressure from environmental organizations, such as Greenpeace and "Danmarks Naturfredningsforening." 2. During the last years our industry has been referred to in the media because of environmental issues. *CFA*: TLI= 0.898, CFI= 0.96, $\chi^2(1)= 21.12$, p=0.00. (equal variance and construct error= 1). α, 1999 survey: 0.71, (large: 0.63, small: 0.75).	0.48/ 0.69 0.63/ 0.79	Fischer and Schot (1993); Hoffman (1999); Mitchell, Agle and Wood (1997); Sharma and Vredenburg (1998).
Sales on foreign markets	1. Total sales in the home market (inversed).		

Mediating variables	Items	Rel./ Loadings	Reference source
Environmental proactiveness **Reliability: 0.75/ 0.72** **Variance ext.: 0.31/ 0.39**	1. We as a company take part in setting the environmental standards. 2. We as a company take part in the work preparing environmental legislation. 3. The legislation makes it necessary to introduce environmental improvements in our company here and now.* 4. We have a thorough knowledge of the demands of the legislation concerning the environment. 5. The state takes part in promoting environmental improvements via grants and subsidies.* 6. We have regular meetings with county/ municipality authorities concerning environmental issues. 7. In environmental issues county and municipality authorities take most interest in cooperating with us in order to achieve environmental improvements. * *CFA*, items 1-7: TLI= 0.97, CFI=0.99, $\chi^2(14)= 54.21$, p=0.00. *CFA*, items 1, 2, 4,6: TLI= 0.96, CFI= 0.99, $\chi^2(2)= 12.89$, p=0.00. α, 1999 survey: 0.74, (large: 0.64, small: 0.68).	0.29/ 0.54 0.32/ 0.56 0.18/ 0.42 0.41/ 0.64 0.20/ 0.45 0.52/ 0.72 0.24/ 0.49	Madsen and Ulhøi (1996); Fischer and Schot (1993); Kent and Hellriegel (1991); Sharma and Vredenburg (1998).
Environmental information processing **Reliability: 0.93** **Variance ext.: 0.73**	1. We often discuss environmental problems internally in the company. 2. We have drawn up a clear environmental policy in our company. 3. Everybody in the company is acquainted with our environmental policy. 4. The top management of the company is strongly involved in our environmental policy. 5. Everybody in the company takes an active part in carrying through the environmental policy. *CFA*, items 1-5: TLI= 0.97, CFI=0.99, $\chi^2(5)= 24.37$, p=0.00. *CFA*, items 2-5: TLI= 0.99, CFI=1.00, $\chi^2(2)= 6.00$, p=0.05. α, 1999 survey: 0.93, (large: 0.91, small: 0.92). α, 1995 survey: 0.87.	0.54/ 0.73 0.77/ 0.88 0.78/ 0.89 0.76/ 0.87 0.83/ 0.91	Farago and Bucher (1992); Fischer and Schot (1993); Lewis and Harvey (2001); Madsen and Ulhøi (1996).

*This item was eliminated during the scale refinement procedure described in the text.

Mediating variables	Items	Rel./ Loadings	Reference source
Generation of market related intelligence **Reliability: 0.62/ 0.68** **Variance ext.: 0.24/ 0.27**	1. In this business unit, we meet with customers at least once a year to find out what products or services they will need in the future.* 2. In this business unit, we do a lot of in-house market research. 3. We are slow to detect changes in our customers' product preferences. (R)* 4. We poll end-users at least once a year to assess the quality of our products and services.* 5. We are slow to detect fundamental shifts in our industry (e.g., competition, technology, regulation). (R)* 6. We periodically review the likely effect of changes in our business environment (e.g. regulation) on customers.* *CFA*: TLI= 0.94, CFI=0.97, $\chi^2(9)= 92.16$, p=0.00. α, 1999 survey: 0.60 (large: 0.37, small: 0.59).	0.42/ 0.65 0.44/ 0.66 0.12/ 0.35 0.28/ 0.53 0.09/ 0.30 0.07/ 0.27	Kohli, Jaworski and Kumar (1993)
Intelligence dissemination throughout the firm **Reliability: 0.73/ 0.80** **Variance ext.: 0.39/ 0.45**	7. We have interdepartmental meetings at least once a quarter to discuss market trends and developments. 8. Marketing personnel in our business unit spend time discussing customers' future needs with other functional departments. 9. When something important happens to a major customer or market, the whole business unit knows about it in a short period. 10. Data on customer satisfaction are disseminated at all levels in this business unit on a regular basis. 11. When one department finds out something important about our competitors, it is slow to alert other departments. (R)* *CFA*: TLI= 0.94, CFI=0.98, $\chi^2(5)= 58.39$, p=0.00. α, 1999 survey: 0.74 (large: 0.83, small: 0.73).	0.66/ 0.81 0.66/ 0.81 0.32/ 0.57 0.23/ 0.48 0.07/ 0.24	Kohli, Jaworski and Kumar (1993)
Responsive-ness at the general level **Reliability: 0.81/ 0.81** **Variance ext.: 0.33/ 0.33**	12. It takes us forever to decide how to respond to our competitors' price changes. (R)* 13. For one reason or another, we tend to ignore changes in our customers' product or service needs. (R)* 14. We periodically review our product development efforts to ensure that they are in line with what customers want. 15. Several departments get together periodically to plan a response to changes taking place in our business environment. 16. If a major competitor were to launch an intensive campaign targeted at our customers, we would implement a response immediately.* 17. The activities of the different departments in this business unit are well coordinated. 18. Customer complaints fall on deaf ears in this business unit. (R)* 19. Even if we came up with a great marketing plan, we probably would not be able to implement it in a timely fashion. (R)* 20. When we find that customers would like us to modify a product or service, the departments involved make concerted efforts to do so.* *CFA*: TLI= 0.98, CFI=0.99, $\chi^2(27)= 82.76$, p=0.00. α, 1999 survey: 0.73, (large: 0.81, small: 0.68).	0.31/ 0.56 0.45/ 0.67 0.42/ 0.65 0.31/ 0.56 0.14/ 0.38 0.54/ 0.73 0.26/ 0.51 0.30/ 0.54 0.24/ 0.49	Kohli, Jaworski and Kumar (1993)

*This item was eliminated in the scale refinement procedure described in the text.

Revised MARKOR	Items	Rel./ Loadings	Reference source
Departmental Interaction **Reliability: 0.80/ 0.80** **Variance ext.: 0.50/ 0.58**	2. In this business unit, we do a lot of in-house market research. 7. We have interdepartmental meetings at least once a quarter to discuss market trends and developments. 8. Marketing personnel in our business unit spend time discussing customers' future needs with other functional departments. 15. Several departments get together periodically to plan a response to changes taking place in our business environment. *CFA*, items 2, 7, 8: TLI= 1.00, CFI= 1.00, $\chi^2(2)= 1.28$, p= 0.53. α, 1999 survey, items 2, 7, 8, 15: 0.79 (large: 0.78, small: 0.79). α, 1999 survey, items 7, 8, 15: 0.80 (large: 0.77, small: 0.80).	0.27/ 0.52 0.73/ 0.85 0.64/ 0.80 0.37/ 0.61	Kohli, Jaworski and Kumar (1993).
Departmental Coordination **Reliability: 0.72** **Variance ext.: 0.46**	9. When something important happens to a major customer or market, the whole business unit knows about it in a short period. 10. Data on customer satisfaction are disseminated at all levels in this business unit on a regular basis. 17. The activities of the different departments in this business unit are well coordinated. *CFA*: TLI 0.99, CFI= 1.00, $\chi^2(1)= 5.46$, p= 0.02. α, 1999 survey: 0.71 (large: 0.73, small: 0.71).	0.37/ 0.61 0.55/ 0.74 0.48/ 0.69	Kohli, Jaworski and Kumar (1993).

Dependent variable	Items	Rel./ Loadings	Reference source
Environmental performance **Reliability: 0.76** **Variance ext.: 0.51**	1. We introduce environmental technology and systems reducing the harmful impact on the *internal* envir onment. 2. We introduce environmental technology and systems reducing the harmful impact on the *external* environment. 3. We invest in environmental technology and systems where the reduction of the harmful impact is well documented. *CFA*, items 1-3: TLI= 1.00, CFI= 1.00, $\chi^2(1)=$, p= 0.44. α, 1999 survey: 0.74, (large: 0.43, small: 0.78).	0.59/ 0.74 0.40/ 0.64 0.55/ 0.77	Madsen and Ulhøi (1996); Fischer and Schot (1993); Kent and Hellriegel (1991); Sharma and Vredenburg (1998).